Errata

Title & Document Type: 8590B/8592B Spectrum Analyzer
Installation, Verification, and Operation Manual

Manual Part Number: 5958-7098

Revision Date: January 1990

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

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Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.
Installation, Verification, and Operation Manual

HP 8590B/8592B Spectrum Analyzer

SERIAL NUMBERS
This manual applies directly to HP 8590B/8592B Spectrum Analyzers with serial numbers prefixed 3003A and below, with firmware version 03.01.90 or later. If your analyzer has an earlier firmware version, see page vii, "Analyzers with Earlier Firmware Revisions."

HEWLETT PACKARD

HP Part No. 5958-7098    Microfiche Part No. 5958-7099
Printed in USA    January 1990
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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Safety Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Caution Symbol]</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Safety Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Warning Symbol]</td>
<td>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.</td>
</tr>
</tbody>
</table>

General Safety Considerations

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Safety Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Warning Symbol]</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Safety Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Warning Symbol]</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Safety Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Caution Symbol]</td>
<td>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.</td>
</tr>
</tbody>
</table>
HP 8590B/8592B Spectrum Analyzer Documentation Description

Manuals Shipped with Your HP 8590B or HP 8592B

HP 8590B/8592B Installation, Verification, and Operation Manual

- Describes how to install the HP 8590B or HP 8592B Spectrum Analyzer.
- Tells how to make measurements with your HP 8590B or HP 8592B Spectrum Analyzer.
- Describes analyzer features.
- Details what to do in case of a failure.

HP 8590B/8592B Quick Reference Guide

- Describes how to make a simple measurement with the HP 8590B or HP 8592B.
- Briefly describes the analyzer functions.
- Lists all the programming commands.

Options

Option 910: Installation, Verification, and Operation Manual and Quick Reference Guide


HP 8590B, Option 915: Service Manual and Component-Level Information

- Describes troubleshooting and repair of the HP 8590B.
  Option 915 consists of two manuals:
  - *HP 8590B/91A/92B/93A Component-Level Information* provides information for component-level repair of the analyzer.

HP 8592B, Option 915: Service Manual and Component-Level Information

- Describes troubleshooting and repair of the HP 8592B.
  Option 915 consists of two manuals:
  - *HP 8590B/91A/92B/93A Component-Level Information* provides information for component-level repair of the analyzer.

Options 021 and 023: Programming Manual

- The *HP 8590 Series Spectrum Analyzer Programming Manual* describes analyzer operation via a remote controller (computer) for Options 021 and 023. This manual is provided when ordering either Option 021 or Option 023.

How to Order Manuals

Each of the manuals listed above can be ordered individually. To order, contact your local HP Sales and Service Office.
How to Use This Manual

Where to Start

If you have just received the HP 8590B or HP 8592B and want to get it ready to use for the first time:

Skim Chapter 1, “Introducing the Spectrum Analyzer,” for a brief introduction to the unit and its capabilities.

Thoroughly read Chapter 2, “Installation and Preparation for Use,” and follow its instructions for:

- Unpacking the unit.
- Preparing it for use.
- Performing initial self-calibration routines (these are automatic self-checks and require no test equipment).

If you need to verify the unit is operating within its specifications, perform the Verification tests in Chapter 3 (for the HP 8590B) or Chapter 4 (for the HP 8592B).

Then begin Chapter 5, “Operation,” to learn how to use the analyzer.

Chapter 6 contains more extensive information about the analyzer and applications for the analyzer.

Chapter 7 details the analyzer functions.

If the Analyzer Has Been in Use

To verify that it is operating correctly or to solve an apparent problem:

- Perform the calibration routines given in Chapter 2, “Installation and Preparation for Use,” for a quick indication of proper operation.

- If you have the necessary test equipment, perform the Verification tests in Chapter 3 or Chapter 4 to verify that the unit is operating within its specifications.

- If there is an apparent problem, read Chapter 8, “Problems,” for hints on what may be wrong and how to solve the problem, and instructions for calling Hewlett-Packard for additional help.

Manual Terms and Conventions

Front-panel keys appear within a box, for example, \texttt{FREQUENCY}. Softkeys appear within a shaded box, for example, \texttt{CENTER FREQ}. 
Analyzers with Earlier Firmware Revisions

This manual documents functions which may not be available with earlier versions of firmware. The following table lists functions that have been added with a firmware revision.

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<th>Softkey Function</th>
<th>Option Required</th>
<th>First Available with Firmware Revision</th>
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</thead>
<tbody>
<tr>
<td>ALC MTR INT XTAL</td>
<td>010 or 011</td>
<td>03.01.90</td>
</tr>
<tr>
<td>ALC TEST</td>
<td>010 or 011</td>
<td>03.01.90</td>
</tr>
<tr>
<td>AMPCOR</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>AMPLTUD COR FACT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>CAL TRK GEN</td>
<td>010 or 011</td>
<td>03.01.90</td>
</tr>
<tr>
<td>CATALOG AMP CORR</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>CATALOG LMT LINE</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>CATALOG REGISTER</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>DELETE SEGMENT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT DONE</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT LIMIT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT LOWER</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT MID/DELT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT UP/LOW</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT UPPER</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EDIT UPR LWR</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>EXIT SHOw</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>FLAT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>LIMIT LINES</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>LIMITS FIX REL</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>LIMITS ON OFF</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>MAN TRK ADJUST</td>
<td>010 or 011</td>
<td>03.01.90</td>
</tr>
<tr>
<td>NEW LIMIT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>POINT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>POWERON</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>PURGE LIMITS</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>PWR SWP ON OFF</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>RECALL LIMIT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>SAVE LIMIT</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>SELECT AMPLTUD</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>SELECT DLT AMPL</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>SELECT FREQ</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>SELECT LWR AMPL</td>
<td></td>
<td>03.01.90</td>
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</table>
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<th>Softkey Function</th>
<th>Option Required</th>
<th>First Available with Firmware Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT MID AMPL</td>
<td></td>
<td>03 01.90</td>
</tr>
<tr>
<td>SELECT SEGMENT</td>
<td></td>
<td>03 01.90</td>
</tr>
<tr>
<td>SELECT TYPE</td>
<td></td>
<td>03 01.90</td>
</tr>
<tr>
<td>SELECT UPR AMPL</td>
<td></td>
<td>03 01.90</td>
</tr>
<tr>
<td>SLOPE</td>
<td></td>
<td>03.01.90</td>
</tr>
<tr>
<td>SRC PWR OFFSET</td>
<td>010 or 011</td>
<td>03 01.90</td>
</tr>
<tr>
<td>SRC PWR ON OFF</td>
<td>010 or 011</td>
<td>03.01.90</td>
</tr>
<tr>
<td>SRC PWR STP SIZE</td>
<td>010 or 011</td>
<td>03 01.90</td>
</tr>
<tr>
<td>SWP CPLG SR SA</td>
<td>010 or 011</td>
<td>03 01.90</td>
</tr>
<tr>
<td>TRACK GEN</td>
<td>010 or 011</td>
<td>03.01.90</td>
</tr>
<tr>
<td>TRACKING PEAK</td>
<td>010 or 011</td>
<td>03 01.90</td>
</tr>
</tbody>
</table>
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Introducing the Spectrum Analyzer

What You'll Find in This Chapter

This chapter introduces you to the HP 8590B and HP 8592B Spectrum Analyzers, and the options and accessories that allow you to tailor the analyzer to your specific needs. To acquaint you with your analyzer's full capabilities, the specifications and characteristics of the HP 8590B and HP 8592B are provided.

Introducing the HP 8590B and HP 8592B Spectrum Analyzers

![Image of HP 8592B Spectrum Analyzer](image)

**Figure 1-1. The HP 8592B Spectrum Analyzer**

The HP 8590B and HP 8592B Spectrum Analyzers are small, lightweight test instruments that combine a wide frequency range (9 kHz to 1.8 GHz for the HP 8590B, 9 kHz to 22 GHz for the HP 8592B) and amplitude range (-115 dBm to +30 dBm for the HP 8590B, -114 dBm to +30 dBm for the HP 8592B) with over 150 easy-to-use functions to handle most RF or microwave signal measurements. In addition, they have synthesizer frequency accuracy and stability along with a built-in marker counter.

Portability and highly automatic operation make the HP 8590B or HP 8592B ideal for service and troubleshooting use in R & D labs, and in manufacturing and service environments in CATV, mobile radio, and related communications businesses.
Both the HP 8590B and the HP 8592B analyzers are complete, self-contained instruments. An ac power cable, suitable for use in the country to which the analyzer is originally shipped, is included with the unit.

---

**Options and Accessories Available**

**Options**

Many options are available to tailor the analyzer to your needs.

Options can be ordered by option number when you order the analyzer. Some of the options are also available as kits that can be ordered and installed after you have received your analyzer. The options are listed numerically by their option number.

**75Ω Input Impedance (Option 001)**

*Option 001 is available for the HP 8590B only.* This option provides a 75Ω input impedance instead of the standard 50Ω impedance for the HP 8590B. Analyzers with this option use cables, circuit boards, and front panels that are different from the standard units.

**Memory Card Reader (Option 003)**

This option provides a memory card reader to save and recall data from a memory card. Analyzers with this option have an opening on the front panel to insert the memory card. Option 003 includes a 32 kilobyte memory card and a memory card holder.

Option 003 is also available as a kit (HP part number 5062-6456).

**Tracking Generator (Option 010 or 011)**

*Option 010 or 011 is available for the HP 8590B only.* Option 010 or 011 provides a 1.8 GHz built-in tracking generator. This source-receiver combination makes insertion-loss, frequency response, and return-loss measurements. The tracking generator has a wide distortion-free dynamic range, plus good sensitivity and selectivity. Option 010 has the standard 50Ω input impedance, Option 011 has 75Ω input impedance.

Option 010 or 011 is also available as a kit (HP part number 5062-6463 and 5062-6479 respectively).

**HP-IB (Option 021)**

Option 021 enables you to control your analyzer from a computer that uses an Hewlett-Packard interface bus (HP-IB). Such computers include the HP 9000 Series 200 and Series 300, and the HP Vectra PC. This option also enables the analyzer to control a printer or plotter. Option 021 includes a connector for an external keyboard, an HP-IB connector, and the *HP 8590 Series Spectrum Analyzer Programming Manual*.

Option 021 is also available as a kit (HP part number 5062-6454).
RS-232 (Option 023)

Option 023 enables you to control your analyzer from a computer that uses an RS-232 interface bus. Such computers include the HP Vectra PC, the IBM PC, the AT, and compatibles. This option also enables the analyzer to control a printer or plotter. Option 023 includes a connector for an external keyboard, an RS-232 connector, and the HP 8590 Series Spectrum Analyzer Programming Manual.

Option 023 is also available as a kit (HP part number 5062-6455).

Impact Cover Assembly (Option 040)

The impact cover assembly snaps onto the front of your analyzer to protect the front panel during travel and when the unit is not in use.

Option 040 is also available as a kit (Impact Cover Assembly, HP part number 5062-4805).

Soft Carrying Case (Option 042)

Soft carrying case with a pouch for accessories. Option 042 can be used to provide additional protection during travel.

Rack Mount Flange Kit (Option 908)

This option provides the parts necessary to mount the analyzer in an HP System II cabinet or in a standard 19 inch (482.6 mm) equipment rack.

Option 908 is also available as a kit (HP part number 5062-4840).

Rack Mount Flange Kit With Handles (Option 909)

Option 909 is the same as Option 908 but includes front handles for added convenience.

Option 909 is also available as a kit (HP part number 5062-4841).

Installation, Verification, and Operation Manuals (Option 910)

An additional copy of the HP 8590B/8592B Spectrum Analyzer Installation, Verification, and Operation Manual and the HP 8590B/8592B Spectrum Analyzer Quick Reference Guide are available as a set under Option 910.

Service Documentation for the HP 8590B (Option 915)


The manuals can be ordered separately.
Service Documentation for the HP 8592B (Option 915)


The manuals can be ordered separately.

Accessories

A number of accessories are available from Hewlett-Packard to help you configure your analyzer for your specific needs.

50Ω Transmission/Reflection Test Set

The HP 8504-4A Option H10 Transmission/Reflection test set provides the capability to simultaneously measure the impedance and transmission characteristics of 50Ω devices. It is effective over a frequency range of 300 kHz to 3 GHz.

50Ω/75Ω Minimum Loss Pad

The HP 11852B is a low VSWR minimum loss pad that is required for measurements on 75Ω devices using an analyzer with a 50Ω input. It is effective over a frequency range of dc to 2 GHz.

75Ω Matching Transformer

The HP 11694A allows you to make measurements in 75Ω systems using an analyzer with a 50Ω input. It is effective over a frequency range of 3 to 500 MHz.

AC Power Source

The HP 85901A provides 200 watts of continuous power for field and mobile application. The self-contained ac power source has outputs for either 115 V or 230 V and runs on its own internal battery, an external battery, or on another 12 V dc source. Typical operating time exceeds 1 hour for 100 watt continuous use at room temperature.

AC Probe

The HP 85024A High Frequency Probe performs in-circuit measurements without adversely loading the circuit under test. The probe has an input capacitance of 0.7 pF shunted by 1 MΩ of resistance. High probe sensitivity and low distortion levels allow measurements to be made while taking advantage of the full dynamic range of the analyzer.

Caution

Do not use dc-coupled probes on HP 8592B analyzers; they may cause damage to the analyzer input circuit.

1-4 Introducing the Spectrum Analyzer
Broadband Preamplifiers

The HP 10855A preamplifier provides a minimum of 22 dB gain from 2 MHz to 1300 MHz to enhance measurements of very low-level signals. The HP 8449A preamplifier provides a minimum of 23 dB gain from 2 GHz to 22 GHz.

CATV Measurements Card

For use with Option 003. The HP 85711A Cable Television Measurements Card provides a quick and easy way to adapt your analyzer for making cable TV measurements while retaining spectrum analysis capability. The CATV measurements card is a downloadable program on a memory card that adds a set of eight functions to simplify cable TV testing: channel selection, carrier level, carrier-to-noise, power line hum, crossmodulation, composite triple beat, modulation depth, and system frequency response.

Close Field Probes

The HP 11940A/11941A Close-Field Probes are small, hand-held, electromagnetic-field sensors. The probes provide repeatable, absolute, magnetic-field measurements from 30 MHz to 1 GHz with the HP 11940A, and from 9 kHz to 30 MHz with the HP 11941A. When attached to a source, the probes generate a localized magnetic field for electromagnetic interference (EMI) susceptibility testing.

Digital Radio Measurements Card for the HP 8592B

For use with Option 003. The HP 85713A Digital Radio Measurements card provides an easy way to measure band occupancy and transmitter spurious outputs, as well as determine the sources of interference including external broadcast or multipath effects. The digital radio measurements card is a downloadable program on a memory card. It qualifies the occupied bandwidth of a modulated digital radio signal, the mean power level of unmodulated carrier, and quantifies modulator alignment.

EMI Diagnostics Measurements Card for the HP 8590B

For use with Option 003. The HP 85712A EMI Diagnostics Measurements Card provides an easy way to find EMI “hot spots” in your new-product designs quickly and easily with the HP 11940A or HP 11941A Close-Field Probe. The EMI diagnostics measurements card is a downloadable program on a memory card. The field strength is measured directly at the probe tip in dB$\mu$A/m, and antenna factors for the probe are automatically applied. A special function helps you to discriminate between narrowband and broadband signals.

External Keyboard

For use with Option 021 or 023. The HP C1405 Option ABA keyboard is an IBM AT compatible keyboard that can be connected to the external keyboard connector of the rear panel of the analyzer. Screen titles and remote programming commands can be entered easily with the external keyboard.

External Keyboard Cable

The HP C1405 Option 002 or 003 cable is a coiled cable that connects the external keyboard to the rear panel of the analyzer. Option 002 is a 2 meter cable; Option 003 is a 3 meter cable.
HP-IB Cable

For use with Option 021. The HP 10833 HP-IB cables interconnect HP-IB devices and are available in four different lengths. HP-IB cables are used to connect printers, plotters, and controllers to an analyzer.

Memory Card, 32 kilobyte

For use with Option 003. The HP 85700A is a blank memory card with 32 kilobytes of memory for use with the memory card reader. The memory card reader is available with Option 003.

Monitor

The HP 82913A is a 12-inch monitor that provides a larger display for the analyzer in fixed installations.

Plotter

For use with Option 021 or 023. The HP ColorPro 7440A Graphics Plotter adds a color plot capability to the analyzer for permanent records of important measurements. The eight-pen HP ColorPro Plotter produces color plots with 0.025 mm (0.001 inch) resolution on either 8.5 by 11 inch paper or transparency film. The plotter can be ordered with HP-IB or RS-232 interfaces to correspond to the interface option installed on the analyzer.

Printer

For use with Option 021 or 023. The HP 2225A/B/D ThinkJet Personal Printer provides black and white printing for another form of permanent records of your test results. The HP 3630A PaintJet printer provides high-resolution color printing. The printers can be ordered with HP-IB or RS-232 interfaces to correspond to the interface option installed on the analyzer.

Rack Slide Kit

This kit (HP part number 1494-0060) provides the hardware to adapt rack-mount kits (Options 908 and 909) for mounting the analyzer on slides in an HP System II cabinet.

RF Limiters

The HP 11867A and HP 11693A Limiters protect the analyzer input circuits from damage due to high power levels. The HP 11867A operates over a frequency range of dc to 1800 MHz and begins reflecting signal levels over 1 milliwatt up to 10 watts average power and 100 watts peak power. The HP 11693A microwave limiter (0.1 to 12.4 GHz, usable to 18 GHz) guards against input signals over 1 milliwatt up to 1 watt average power and 10 watts peak power.

RS-232 Cable

For use with Option 023. The HP 13242G is a 25-pin, male-to-male RS-232 cable. The HP 13242G cable can be used with the HP 7475A, HP ThinkJet, and HP LaserJet.
Transit Case

The transit case (HP part number 9211-5604) provides extra protection for your analyzer for frequent travel situations. The HP transit case protects your instrument from hostile environments, shock, vibration, moisture, and impact while providing a secure enclosure for shipping.

Analyzers Covered by This Manual

This manual applies to analyzers with the serial-number prefixes listed under “Serial Numbers” on the title page.

Serial Numbers

Hewlett-Packard makes frequent improvements to its products to enhance their performance, usability, or reliability, and to control costs. HP service personnel have access to complete records of design changes to each type of equipment, based on the equipment’s serial number. Whenever you contact Hewlett-Packard about your analyzer, have the complete serial number available to ensure obtaining the most complete and accurate information possible.

A Mylar serial-number label is attached to the rear of the analyzer. It contains the serial number and the options installed in the analyzer. The serial number has two parts: the prefix (the first four numbers and a letter), and the suffix (the last five numbers). See Figure 1-2.

![Typical Serial Number Label](image)

**Figure 1-2. Typical Serial Number Label**

The first four numbers of the prefix are a code that identifies the date of the last major design change that is incorporated in your analyzer. The letter identifies the country in which the unit was manufactured. The five-digit suffix is a sequential number and is different for each unit.
The option section of the serial label contains the option number(s) of the option(s) installed in the analyzer.

Whenever you specify the serial number or refer to it in obtaining information about your analyzer, be sure to use the complete number, including the full prefix and the suffix.
### Specifications for the HP 8590B

The analyzer specifications for the HP 8590B are listed in Table 1-1.

**Table 1-1. HP 8590B Specifications (1 of 4)**

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<td><strong>Audible Noise</strong></td>
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<td><strong>Power Requirements</strong></td>
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<td>50Ω</td>
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<td>75Ω (Option 001)</td>
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<td><strong>Frequency Accuracy</strong></td>
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<td>Readout Accuracy</td>
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<td>Second Harmonic Distortion</td>
</tr>
<tr>
<td>Third Order Intermodulation Distortion</td>
</tr>
<tr>
<td>Other Input Related Spurious</td>
</tr>
<tr>
<td><strong>Residual Responses</strong></td>
</tr>
<tr>
<td>150 kHz to 1 MHz</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1 MHz to 1.8 GHz</td>
</tr>
</tbody>
</table>

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuator (dB).
**Table 1-1. HP 8590B Specifications (3 of 4)**

**AMPLITUDE SPECIFICATIONS (continued)**

<table>
<thead>
<tr>
<th>Display Range</th>
<th>0 to −70 dB from reference level is calibrated; 1 to 20 dB/division in 1 dB steps; 8 divisions displayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Scale</td>
<td>8 divisions</td>
</tr>
<tr>
<td>Linear Scale</td>
<td>8 divisions</td>
</tr>
<tr>
<td>Scale Units</td>
<td>dBm, dBmV, dBμV, volts and watts</td>
</tr>
<tr>
<td>Marker Readout Resolution</td>
<td>0.05 dB for log scale 0.05% of reference level for linear scale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
</tr>
<tr>
<td>50Ω</td>
</tr>
<tr>
<td>75Ω (Option 001)</td>
</tr>
<tr>
<td>Resolution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 dBm to −59.9 dBm</td>
</tr>
<tr>
<td>−60 dBm to −115 dBm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute</td>
</tr>
<tr>
<td>Relative Flatness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calibrator Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Amplitude</td>
</tr>
<tr>
<td>50Ω</td>
</tr>
<tr>
<td>75Ω (Option 001)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Attenuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resolution Bandwidth Switching Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 kHz to 3 MHz RBW</td>
</tr>
<tr>
<td>1 kHz</td>
</tr>
</tbody>
</table>

| Log to Linear Switching | ±0.25 dB at reference level |

<table>
<thead>
<tr>
<th>Display Scale Fidelity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Incremental Accuracy</td>
</tr>
<tr>
<td>Log Maximum Cumulative</td>
</tr>
<tr>
<td>Linear Accuracy</td>
</tr>
</tbody>
</table>
### Table 1-1. HP 8590B Specifications (4 of 4)

**TRACKING GENERATOR SPECIFICATIONS**

All specifications apply over 0°C to +55°C. The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMP TD, and CAL TRK GEN have been run.

<table>
<thead>
<tr>
<th>Warm-up</th>
<th>30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output Frequency</strong></td>
<td></td>
</tr>
<tr>
<td>Range, 50Ω, Option 010</td>
<td>100 kHz to 1,8 GHz</td>
</tr>
<tr>
<td>75Ω, Option 011</td>
<td>1 MHz to 1.8 GHz</td>
</tr>
<tr>
<td><strong>Output Power Level</strong></td>
<td></td>
</tr>
<tr>
<td>Range, 50Ω, Option 010</td>
<td>0 to −15 dBm</td>
</tr>
<tr>
<td>75Ω, Option 011</td>
<td>+42.8 to +27.8 dBmV</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 dB</td>
</tr>
<tr>
<td><strong>Absolute Accuracy</strong></td>
<td>±1.5 dB (at 300 MHz and −10 dBm source power)</td>
</tr>
<tr>
<td>Vernier</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>±1.0 dB (referred to −10 dBm source power)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>(Option 011: use +38.8 dBmV instead of −10 dBm)</td>
</tr>
<tr>
<td><strong>Output Power Sweep</strong></td>
<td></td>
</tr>
<tr>
<td>Range, 50Ω, Option 010</td>
<td>−15 dBm to 0 dBm</td>
</tr>
<tr>
<td>Range, 75Ω, Option 011</td>
<td>+27.8 to +42.8 dBmV</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 dB</td>
</tr>
<tr>
<td><strong>Accuracy (zero span)</strong></td>
<td>&lt;2 dB peak-to-peak</td>
</tr>
<tr>
<td><strong>Output Flatness</strong></td>
<td>±1.75 dB (referred to 300 MHz)</td>
</tr>
<tr>
<td><strong>Spurious Outputs</strong></td>
<td></td>
</tr>
<tr>
<td>50Ω, Option 010</td>
<td>(0 dBm output, 100 kHz to 1.8 GHz)</td>
</tr>
<tr>
<td>75Ω, Option 011</td>
<td>(+42.8 dBmV output, 1 MHz to 1.8 GHz)</td>
</tr>
<tr>
<td><strong>Harmonic Spurs</strong></td>
<td>&lt;−25 dBc</td>
</tr>
<tr>
<td><strong>Non-Harmonic Spurs</strong></td>
<td>&lt;−30 dBc</td>
</tr>
<tr>
<td><strong>Dynamic Range</strong></td>
<td></td>
</tr>
<tr>
<td>Tracking Generator Feedthrough, 50Ω, Option 010</td>
<td>&lt;−106 dBm</td>
</tr>
<tr>
<td>Tracking Generator Feedthrough, 75Ω, Option 011</td>
<td>&lt;−57.24 dBmV</td>
</tr>
</tbody>
</table>
Characteristics for the HP 8590B

The analyzer characteristics for the HP 8590B are listed in Table 1-2.

<table>
<thead>
<tr>
<th>FREQUENCY CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution Bandwidth (−3 dB)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Video Bandwidth (−3 dB)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>AMPLITUDE CHARACTERISTICS</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>Absolute Amplitude Calibration Uncertainty*</td>
</tr>
<tr>
<td>Log Scale Switching Uncertainty</td>
</tr>
<tr>
<td>Input Attenuation Uncertainty†</td>
</tr>
<tr>
<td>Attenuator Setting</td>
</tr>
<tr>
<td>0 dB</td>
</tr>
<tr>
<td>10 dB</td>
</tr>
<tr>
<td>20 dB</td>
</tr>
<tr>
<td>30 dB</td>
</tr>
<tr>
<td>40 dB</td>
</tr>
<tr>
<td>50 dB</td>
</tr>
<tr>
<td>60 dB</td>
</tr>
<tr>
<td>Input Attenuator Repeatability</td>
</tr>
<tr>
<td>300 MHz</td>
</tr>
<tr>
<td>1.8 GHz</td>
</tr>
<tr>
<td>RF Input SWR</td>
</tr>
<tr>
<td>9 kHz to 1.8 GHz</td>
</tr>
<tr>
<td>9 kHz to 1.8 GHz</td>
</tr>
</tbody>
</table>

* Error in the CAL AMPTD routine. Absolute amplitude reference settings: 300 MHz Center Frequency; 10 dB Input Attenuator; –20 dBm Reference Level; 3 kHz Resolution Bandwidth; Linear Scale.

† Referred to 10 dB input attenuator setting from 9 kHz to 1.8 GHz; See Table 1-1, Frequency Response Specification.
Table 1-2. HP 8590B Characteristics (3 of 7)

DYNAMIC RANGE

NOMINAL DYNAMIC RANGE

![Graph showing dynamic range vs mixer level](image)

**HP 8590B Dynamic Range**

<table>
<thead>
<tr>
<th>FRONT PANEL INPUT / OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT 50Ω</strong></td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Impedance</td>
</tr>
<tr>
<td>Type N female</td>
</tr>
<tr>
<td>50Ω nominal</td>
</tr>
<tr>
<td><strong>PROBE POWER</strong></td>
</tr>
<tr>
<td>Voltage/Current</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

* Total current drawn from the +15 V dc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 V dc on the PROBE POWER and the −15 V dc on the AUX INTERFACE cannot exceed 150 mA.
<table>
<thead>
<tr>
<th>REAR-PANEL INPUTS / OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUX IF OUTPUT</strong></td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Amplitude Range</td>
</tr>
<tr>
<td>Impedance</td>
</tr>
<tr>
<td><strong>AUX VIDEO OUTPUT</strong></td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Amplitude Range</td>
</tr>
<tr>
<td><strong>EXT KEYBOARD (Option 021/023)</strong></td>
</tr>
<tr>
<td>Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards</td>
</tr>
<tr>
<td><strong>EXT TRIG INPUT</strong></td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Trigger Level</td>
</tr>
<tr>
<td><strong>HI-SWEEP IN/OUT</strong></td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Input</td>
</tr>
<tr>
<td><strong>MONITOR OUTPUT</strong></td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Format</td>
</tr>
<tr>
<td><strong>REMOTE INTERFACE</strong></td>
</tr>
<tr>
<td>Option 021, HPIB</td>
</tr>
<tr>
<td>HPIB Codes</td>
</tr>
<tr>
<td>Option 023, RS-232</td>
</tr>
<tr>
<td><strong>SWEEP OUTPUT</strong></td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Amplitude</td>
</tr>
</tbody>
</table>
### Table 1-2. HP 8590B Characteristics (5 of 7)

#### WEIGHT

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net HP 8590B</td>
<td>14.1 kg (31 lb)</td>
</tr>
<tr>
<td>Shipping HP 8590B</td>
<td>16.8 kg (37 lb)</td>
</tr>
</tbody>
</table>

#### DIMENSIONS

- \( A = 8 \text{ in (200 mm)} \)
- \( B = 7.25 \text{ in (184 mm)} \)
- \( C = 14.69 \text{ in (373 mm)} \)
- \( D = 13.25 \text{ in (337 mm)} \)
- \( E = 18.12 \text{ in (460.5 mm)} \)

---

HP 8590B Dimensions
### Table 1-2. HP 8590B Characteristics (6 of 7)

#### AUX INTERFACE

**Connector Type**: 9 Pin Subminiature “D”

**Connector Pinout**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
<th>Current</th>
<th>“Logic” Mode</th>
<th>“Serial Bit” Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control A</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>TTL Output Hi/Lo</td>
</tr>
<tr>
<td>2</td>
<td>Control B</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>TTL Output Hi/Lo</td>
</tr>
<tr>
<td>3</td>
<td>Control C</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>Strobe</td>
</tr>
<tr>
<td>4</td>
<td>Control D</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>Serial Data</td>
</tr>
<tr>
<td>5</td>
<td>Control I</td>
<td>—</td>
<td>TTL Input Hi/Lo</td>
<td>TTL Input Hi/Lo</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
<td>—</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>7†</td>
<td>−15 V dc ±7%</td>
<td>150 mA</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>8*</td>
<td>+5 V dc ±5%</td>
<td>150 mA</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>9†</td>
<td>+15 V dc ±5%</td>
<td>150 mA</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### TRACKING GENERATOR INPUTS AND OUTPUTS

#### RF Output

<table>
<thead>
<tr>
<th>Impedance Connector</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 010</td>
<td>50Ω, Type N female</td>
</tr>
<tr>
<td>Option 011</td>
<td>75Ω, BNC female</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Safe Reverse Level</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 010</td>
<td>+20 dBm (0.1 W), 25 V dc</td>
</tr>
<tr>
<td>Option 011</td>
<td>+69 dBmV (0.1 W), 100 V dc</td>
</tr>
</tbody>
</table>

#### External ALC Input

| Impedance                     | 1 Megohm                             |
| Polarity                      | Positive or Negative                 |
| Range                         | −66 dBV to +6 dBV                    |
| Connector                     | BNC                                  |

* Exceeding the +5 V current limits may result in loss of factory correction constants.

† Total current drawn from the +15 V dc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 V dc on the PROBE POWER and the −15 V dc on the AUX INTERFACE cannot exceed 150 mA.
### Table 1-2. HP 8590B Characteristics (7 of 7)

<table>
<thead>
<tr>
<th>TRACKING GENERATOR CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output Tracking</strong></td>
</tr>
<tr>
<td>Drift (usable in 10 kHz bandwidth after 30 minute warmup)</td>
</tr>
<tr>
<td><strong>Spurious Outputs</strong></td>
</tr>
<tr>
<td>Option 010: 0 dBm output, &gt;1.8 GHz to 4.0 GHz</td>
</tr>
<tr>
<td>Option 011: +42.8 dBmV 75Ω, &gt;1.8 GHz to 4.0 GHz</td>
</tr>
<tr>
<td>Harmonic</td>
</tr>
<tr>
<td>Non-Harmonic</td>
</tr>
<tr>
<td>2121.4 MHz Feedthrough</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>RF Power-Off Residuals</strong></td>
</tr>
<tr>
<td>Option 010: 100 kHz to 1.8 GHz</td>
</tr>
<tr>
<td>Option 011: 1 MHz to 1.8 GHz</td>
</tr>
<tr>
<td><strong>Dynamic Range</strong> (difference between maximum power output and tracking generator feedthrough)</td>
</tr>
<tr>
<td>Option 010: 100 kHz to 1.8 GHz</td>
</tr>
<tr>
<td>Option 011: 1 MHz to 1.8 GHz</td>
</tr>
</tbody>
</table>

### Specifications for the HP 8592B

The analyzer specifications for the HP 8592B are listed in Table 1-3.
### GENERAL SPECIFICATIONS

All specifications apply over 0°C to +55°C. The analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the analyzer is turned on and after CAL FREQ, CAL AMPTD and CAL YTF have been run.

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>0°C to +55°C</td>
</tr>
<tr>
<td>Storage</td>
<td>−40°C to +75°C</td>
</tr>
</tbody>
</table>

| EMI Compatibility       | Conducted and radiated interference CISPR Pub. 11 and Messempfaenger Postverfuegung 526/527/79 |

| Audible Noise           | <37.5 dBA pressure and <5.0 Bel's power (ISODP7779) |

<table>
<thead>
<tr>
<th>Power Requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ON (LINE 1)</td>
<td>86 to 127, or 195 to 250 V rms, 47 to 66 Hz. 103 to 126 V rms, 400 Hz ±10%</td>
</tr>
<tr>
<td>Standby (LINE 0)</td>
<td>Power consumption &lt;300 VA Power consumption &lt;7 watts</td>
</tr>
</tbody>
</table>

### FREQUENCY SPECIFICATIONS

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Band LO Harmonic (N)*</td>
<td>9 kHz to 22 GHz</td>
</tr>
<tr>
<td>0</td>
<td>9 kHz to 2.9 GHz</td>
</tr>
<tr>
<td>1</td>
<td>2.75 GHz to 6.4 GHz</td>
</tr>
<tr>
<td>2</td>
<td>6.0 GHz to 12.8 GHz</td>
</tr>
<tr>
<td>3</td>
<td>12.4 GHz to 19.4 GHz</td>
</tr>
<tr>
<td>4</td>
<td>19.1 GHz to 22 GHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Accuracy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Readout Accuracy</td>
<td>±[(5 × N)MHz + 0.01% of center frequency +2% of frequency span]</td>
</tr>
<tr>
<td>Resolution</td>
<td>4 digits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Span</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0 Hz (zero span), (50 × N*) kHz to 19.25 GHz</td>
</tr>
<tr>
<td>Resolution</td>
<td>4 digits</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2% of span, span &gt;10 MHz and single band spans ±5% of span, span &lt;10 MHz and single band spans</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Sweep Time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>20 ms to 100 s</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±3% of indicated sweep time</td>
</tr>
<tr>
<td>Sweep Trigger</td>
<td>Free run, Single, Line, Video, External</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Sidebands</td>
<td>&lt;(-95 + 20 log N*) dBc/Hz &gt;30 kHz offset from CW signal</td>
</tr>
<tr>
<td></td>
<td>(1 kHz RBW, 30 Hz VBW, and sample detector)</td>
</tr>
<tr>
<td>System Related Sidebands</td>
<td>&lt;−65 dBc + 20 Log N* at &gt;30 kHz offset from CW signal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comb Generator</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Accuracy</td>
<td>100 MHz fundamental frequency</td>
</tr>
<tr>
<td></td>
<td>±0.007%</td>
</tr>
</tbody>
</table>

* N = LO Harmonic.
REPLACE THIS PAGE
<table>
<thead>
<tr>
<th>AMPLITUDE SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amplitude Range</strong></td>
</tr>
<tr>
<td><strong>Maximum Safe Input Level</strong></td>
</tr>
<tr>
<td>Average Continuous Power</td>
</tr>
<tr>
<td>Peak Pulse Power</td>
</tr>
<tr>
<td>DC</td>
</tr>
<tr>
<td><strong>Gain Compression</strong></td>
</tr>
<tr>
<td>&gt;10 MHz</td>
</tr>
<tr>
<td><strong>Displayed Average Noise Level</strong></td>
</tr>
<tr>
<td>400 kHz to 2.9 GHz</td>
</tr>
<tr>
<td>2.75 GHz to 6.4 GHz</td>
</tr>
<tr>
<td>6.0 GHz to 12.8 GHz</td>
</tr>
<tr>
<td>12.4 GHz to 19.4 GHz</td>
</tr>
<tr>
<td>19.1 GHz to 22 GHz</td>
</tr>
<tr>
<td><strong>Spurious Responses</strong></td>
</tr>
<tr>
<td>Second Harmonic Distortion</td>
</tr>
<tr>
<td>10 MHz to 2.9 GHz</td>
</tr>
<tr>
<td>&gt;2.75 GHz</td>
</tr>
<tr>
<td>(or below displayed average noise level)</td>
</tr>
<tr>
<td>Third Order Intermodulation Distortion</td>
</tr>
<tr>
<td>&gt;10 MHz</td>
</tr>
<tr>
<td>Other Input Related Spurious</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Residual Responses</strong></td>
</tr>
<tr>
<td>150 kHz to 2.9 GHz (Band 0)</td>
</tr>
<tr>
<td>2.75 GHz to 6.4 GHz (Band 1)</td>
</tr>
<tr>
<td><strong>Display Range</strong></td>
</tr>
<tr>
<td>Log Scale</td>
</tr>
<tr>
<td>Linear Scale</td>
</tr>
<tr>
<td>Scale Units</td>
</tr>
<tr>
<td>Marker Readout Resolution</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

* Mixer Power Level (dBm) = Input Power (dBm) - Input Attenuator (dB)
### Table 1-3. HP 8592B Specifications (3 of 3)

**AMPLITUDE SPECIFICATIONS (continued)**

<table>
<thead>
<tr>
<th>Reference Level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>-114 dBm to +30 dBm</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 dB for log scale</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.12% of reference level for linear scale</td>
<td></td>
</tr>
<tr>
<td>(Referred to -20 dBm Reference Level)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 dBm to -59.9 dBm</td>
<td>±(0.5 dB + Input Attenuator Accuracy at 50 MHz)</td>
<td></td>
</tr>
<tr>
<td>-60 dBm to -114 dBm</td>
<td>±(1.25 dB + Input Attenuator Accuracy at 50 MHz)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Response</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 kHz to 2.9 GHz†</td>
<td>N/A</td>
<td>±1.5 dB</td>
</tr>
<tr>
<td>2.75 GHz to 6.4 GHz</td>
<td>±2.0 dB</td>
<td>±3.0 dB</td>
</tr>
<tr>
<td>6.0 GHz to 12.8 GHz</td>
<td>±2.5 dB</td>
<td>±3.0 dB</td>
</tr>
<tr>
<td>12.4 GHz to 19.4 GHz</td>
<td>±3.0 dB</td>
<td>±4.0 dB</td>
</tr>
<tr>
<td>19.1 GHz to 22 GHz</td>
<td>±3.0 dB</td>
<td>±5.0 dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relative Flatness‡</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9 kHz to 2.9 GHz†</td>
<td>N/A</td>
<td>±1.0 dB</td>
</tr>
<tr>
<td>2.75 GHz to 6.4 GHz</td>
<td>±1.5 dB</td>
<td>N/A</td>
</tr>
<tr>
<td>6.0 GHz to 12.8 GHz</td>
<td>±2.0 dB</td>
<td>N/A</td>
</tr>
<tr>
<td>12.4 GHz to 19.4 GHz</td>
<td>±2.0 dB</td>
<td>N/A</td>
</tr>
<tr>
<td>19.1 GHz to 22 GHz</td>
<td>±2.0 dB</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calibrator Output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>300 MHz ±30 kHz</td>
<td></td>
</tr>
<tr>
<td>Amplitude</td>
<td>-20 dBm ±0.4 dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Attenuator</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0 to 70 dB, in 10 dB steps</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.5 dB at 50 MHz, referred to 10 dB attenuation</td>
<td></td>
</tr>
<tr>
<td>0 to 60 dB</td>
<td>1.2 dB at 50 MHz, referred to 10 dB attenuation</td>
<td></td>
</tr>
<tr>
<td>70 dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resolution Bandwidth Switching</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty</td>
<td>(Referred to 3 kHz RBW)</td>
<td></td>
</tr>
<tr>
<td>3 kHz to 3 MHz RBW</td>
<td>±0.4 dB</td>
<td></td>
</tr>
<tr>
<td>1 kHz</td>
<td>±0.5 dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Log to Linear Switching</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±0.25 dB at reference level</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display Scale Fidelity</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Incremental Accuracy</td>
<td>±0.2 dB/2 dB, 0 to -70 dB from reference level</td>
<td></td>
</tr>
<tr>
<td>Log Maximum Cumulative</td>
<td>±0.75 dB, 0 to -60 dB from reference level</td>
<td></td>
</tr>
<tr>
<td>Linear Accuracy</td>
<td>±1.0 dB, 0 to -70 dB from reference level</td>
<td></td>
</tr>
</tbody>
</table>

* Referred to 300 MHz CAL OUT.
† Presselector is not used in Band 0 (9 kHz to 2.9 GHz).
‡ Referred to midpoint between highest and lowest frequency response deviations.
Characteristics for the HP 8592B

The analyzer characteristics for the HP 8592B are listed in Table 1-4.

<table>
<thead>
<tr>
<th>FREQUENCY CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution Bandwidth (-3 dB)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Video Bandwidth (-3 dB)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Absolute Amplitude Calibration Uncertainty*</td>
</tr>
<tr>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Log Scale Switching Uncertainty</td>
</tr>
<tr>
<td><strong>Input Attenuation Uncertainty†</strong></td>
</tr>
<tr>
<td>Attenuator Setting</td>
</tr>
<tr>
<td>0 dB</td>
</tr>
<tr>
<td>10 dB</td>
</tr>
<tr>
<td>20 dB</td>
</tr>
<tr>
<td>30 dB</td>
</tr>
<tr>
<td>40 dB</td>
</tr>
<tr>
<td>50 dB</td>
</tr>
<tr>
<td>60 dB</td>
</tr>
<tr>
<td>70 dB</td>
</tr>
<tr>
<td><strong>Input Attenuator 10 dB Step Uncertainty</strong></td>
</tr>
<tr>
<td>Center Frequency</td>
</tr>
<tr>
<td>9 kHz to 19 GHz</td>
</tr>
<tr>
<td>19 GHz to 22 GHz</td>
</tr>
<tr>
<td><strong>Input Attenuator Repeatability</strong></td>
</tr>
<tr>
<td><strong>RF Input SWR</strong></td>
</tr>
<tr>
<td>300 MHz, at 10 dB atten</td>
</tr>
<tr>
<td>9 kHz to 12.4 GHz, at 10 to 70 dB atten</td>
</tr>
<tr>
<td>12.4 GHz to 19 GHz, at 10 to 70 dB atten</td>
</tr>
<tr>
<td>19 GHz to 22 GHz, at 10 to 70 dB atten</td>
</tr>
</tbody>
</table>

* Error in the CAL AMPTD routine. Absolute amplitude reference settings: 300 MHz Center Frequency, 10 dB Input Attenuator; −20 dBm Reference Level; 3 kHz Resolution Bandwidth, Linear Scale.

† Referred to 10 dB input attenuator setting; See Table 1-3, Frequency Response Specification.
Table 1-4. HP 8592B Characteristics (3 of 6)

**DYNAMIC RANGE**

**NOMINAL DYNAMIC RANGE**

<table>
<thead>
<tr>
<th>Sensitivity 1 kHz RBW</th>
<th>Third Order Intermod</th>
<th>Second Order Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9 - 1 to 22 GHz</td>
<td>5.6 - 10 to 12.8 GHz</td>
<td>400 kHz to 1.6 MHz</td>
</tr>
</tbody>
</table>

**MIXER LEVEL**

HP 8592B Dynamic Range

**FRONT PANEL INPUTS / OUTPUT**

<table>
<thead>
<tr>
<th>INPUT 50Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Impedance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROBE POWER*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage/Current</td>
</tr>
</tbody>
</table>

| Type N female |
| 50Ω nominal |

| +15 V dc, ±7% at 150 mA max |
| -12.6 V dc ±10% at 150 mA max |

* Total current drawn from the +15 V dc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the -12.6 V dc on the PROBE POWER and the -15 V dc on the AUX INTERFACE cannot exceed 150 mA.
| **AUX IF OUTPUT**            | Frequency | 21.4 MHz |
|                            | Amplitude Range | −10 to −60 dBm |
|                            | Impedance | 50Ω Nominal |
| **AUX VIDEO OUTPUT**        | Connector | BNC female |
|                            | Amplitude Range | 0 to 1 volt (uncorrected) |
| **EXT KEYBOARD (Option 021/023)** | Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards |
| **EXT TRIG INPUT**          | Connector | BNC female |
|                            | Trigger Level | Positive edge initiates sweep in EXT TRIG mode (TTL) |
| **HI-SWEEP IN/OUT**         | Connector | BNC female |
|                            | Output | TTL high=sweep, low=retrace |
|                            | Input | Open collector, low stops sweep |
| **MONITOR OUTPUT**          | Connector | BNC female |
|                            | Format | NTSC Video. 19.2 kHz horizontal rate |
| **REMOTE INTERFACE**        | Option 021, HPIB | SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28 |
|                            | HPIB Codes | Option 023, RS-232 |
| **SWEEP OUTPUT**            | Connector | BNC female |
|                            | Amplitude | 0 to +10 volt ramp |
### Table 1-4. HP 8592B Characteristics (5 of 6)

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net HP 8592B</td>
<td>15.9 kg (35 lb)</td>
</tr>
<tr>
<td>Shipping HP 8592B</td>
<td>18.6 kg (41 lb)</td>
</tr>
</tbody>
</table>

### DIMENSIONS

- A = 8 in (200 mm)
- B = 7.25 in (184 mm)
- C = 14.69 in (373 mm)
- D = 13.25 in (337 mm)
- E = 18.12 in (460.5 mm)

![HP 8592B Dimensions](Image)
Table 1-4. HP 8592B Characteristics (6 of 6)

AUX INTERFACE

Connector Type: 9 Pin Subminiature “D”

Connector Pinout

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
<th>Current</th>
<th>“Logic” Mode</th>
<th>“Serial Bit” Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control A</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>TTL Output Hi/Lo</td>
</tr>
<tr>
<td>2</td>
<td>Control B</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>TTL Output Hi/Lo</td>
</tr>
<tr>
<td>3</td>
<td>Control C</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>Strobe</td>
</tr>
<tr>
<td>4</td>
<td>Control D</td>
<td>—</td>
<td>TTL Output Hi/Lo</td>
<td>Serial Data</td>
</tr>
<tr>
<td>5</td>
<td>Control I</td>
<td>—</td>
<td>TTL Input Hi/Lo</td>
<td>TTL Input Hi/Lo</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
<td>—</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>7†</td>
<td>-15 V dc ±7%</td>
<td>150 mA</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>8*</td>
<td>+5 V dc ±5%</td>
<td>150 mA</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>9†</td>
<td>+15 V dc ±5%</td>
<td>150 mA</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Exceeding the +5 V current limits may result in loss of factory correction constants.

† Total current drawn from the +15 V dc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the -12.6 V dc on the PROBE POWER and the -15 V dc on the AUX INTERFACE cannot exceed 150 mA.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. Figure 1-3 shows an example of a static-safe work station using two types of ESD protection:

- Conductive table-mat and wrist-strap combination.
- Conductive floor-mat and heel-strap combination.

Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone.

To ensure user safety, the static-safe accessories must provide at least 1 MΩ of isolation from ground. Refer to Table 1-5 for information on ordering static-safe accessories.
Warning

These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Figure 1-3. Example of a Static-Safe Work Station

Reducing Damage Caused by ESD

The following suggestions may help reduce ESD damage that occurs during testing and servicing operations.

- Before connecting any coaxial cable to an analyzer connector for the first time each day, momentarily ground the center and outer conductors of the cable.

- Personnel should be grounded with a resistor-isolated wrist strap before touching the center pin of any connector and before removing any assembly from the unit.

- Be sure that all instruments are properly earth-grounded to prevent a buildup of static charge.

Table 1-5 lists static-safe accessories that can be obtained from Hewlett-Packard by using the HP part numbers shown.
<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
<th>HP Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static-control mat and ground wire</td>
<td>Set includes:</td>
<td>9300-0797</td>
</tr>
<tr>
<td></td>
<td>3M static-control mat, 0.6 m × 1.2 m (2 ft × 4 ft)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ground wire, 4.6 m (15 ft)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(The wrist strap and wrist-strap cord are not included. They must be ordered</td>
<td></td>
</tr>
<tr>
<td></td>
<td>separately)</td>
<td></td>
</tr>
<tr>
<td>Wrist-strap cord</td>
<td>1.5 m (5 ft)</td>
<td>9300-0980</td>
</tr>
<tr>
<td>Wrist strap</td>
<td>Black, stainless steel with four adjustable links and 7-mm post-type connector (The wrist-strap cord is not included.)</td>
<td>9300-1383</td>
</tr>
<tr>
<td>ESD heel strap</td>
<td>Reusable 6 to 12 months</td>
<td>9300-1169</td>
</tr>
<tr>
<td>Hard-surface static-control mat*</td>
<td>Large, black, 1.2 m × 1.5 m (4 ft × 5 ft)</td>
<td>92175A</td>
</tr>
<tr>
<td></td>
<td>Small, black, 0.9 m × 1.2 m (3 ft × 4 ft)</td>
<td>92175C</td>
</tr>
<tr>
<td>Soft-surface static-control mat*</td>
<td>Brown, 1.2 m × 2.4 m (4 ft × 8 ft)</td>
<td>92175B</td>
</tr>
<tr>
<td>Tabletop static-control mat*</td>
<td>58 cm × 76 cm (23 in × 30 in)</td>
<td>92175T</td>
</tr>
<tr>
<td>Antistatic carpet*</td>
<td>Small, 1.2 m × 1.8 m (4 ft × 6 ft)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>natural color</td>
<td>92176A</td>
</tr>
<tr>
<td></td>
<td>russet color</td>
<td>92176C</td>
</tr>
<tr>
<td></td>
<td>Large, 1.2 m × 2.4 m (4 ft × 8 ft)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>natural color</td>
<td>92176B</td>
</tr>
<tr>
<td></td>
<td>russet color</td>
<td>92176D</td>
</tr>
</tbody>
</table>

* These accessories can be ordered either through a Hewlett-Packard Sales Office or through HP DIRECT Phone Order Service. In the USA, the HP DIRECT phone number is (800) 538-8787. Contact your nearest Hewlett-Packard Sales Office for more information about HP DIRECT availability in other countries.

1-30   Introducing the Spectrum Analyzer
Installation and Preparation for Use

What You'll Find in This Chapter

This chapter describes the process of getting the spectrum analyzer ready to use. The process includes initial inspection, setting up the unit for the selected ac power source, and performing automatic self-calibration routines. Information about insertion of the memory card, replacement of the memory card battery, and replacement of the analyzer battery is also provided. The memory card reader is available with Option 003.

Getting Ready

Initial Inspection

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, keep it until you have verified that the contents are complete and you have tested the analyzer mechanically and electrically.

The analyzer is packed within a carton as shown in Figure 2-1. Table 2-1 contains the description and part numbers of the packaging materials. Table 2-2 contains the accessories shipped with the analyzer. If the contents are incomplete or if the analyzer does not pass the verification tests (procedures are provided in Chapter 3 and in Chapter 4), notify the nearest Hewlett-Packard office. If the shipping container is damaged or the cushioning material shows signs of stress, also notify the carrier. Keep the shipping materials for the carrier’s inspection. The HP office will arrange for repair or replacement without waiting for a claim settlement.

If the shipping materials are in good condition, retain them for possible future use. You may wish to ship the analyzer to another location or to return it to Hewlett-Packard for service. See “How to Return Your Analyzer for Servicing,” in Chapter 8.

Note

Complete instructions for installing your analyzer in an equipment rack are provided in a service note that is included with Options 908 and 909 Rack Mounting Kits.
Figure 2-1. HP 8590B/8592B Packaging

Table 2-1. Packaging Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>HP Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outer Carton</td>
<td>9211-5636</td>
</tr>
<tr>
<td>2</td>
<td>Foam Pad Set</td>
<td>08590-80013</td>
</tr>
<tr>
<td>3</td>
<td>Bottom Tray</td>
<td>08590-80014</td>
</tr>
<tr>
<td>4</td>
<td>Front Frame Insert</td>
<td>9220-4488</td>
</tr>
</tbody>
</table>

2-2 Installation and Preparation for Use
Table 2-2. Accessories Supplied with the Analyzer (but not Shown)

<table>
<thead>
<tr>
<th>Description</th>
<th>HP Part Number</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 kilobyte Memory Card</td>
<td>HP 0950-1964</td>
<td>Shipped with Option 003</td>
</tr>
<tr>
<td>Memory Card Holder</td>
<td>HP 9222-1545</td>
<td>Shipped with Option 003</td>
</tr>
<tr>
<td>Adapter, Type N (m) to BNC (f)</td>
<td>HP 1250-0780</td>
<td>Not shipped with Option 001. Two adapters are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>shipped with Option 010.</td>
</tr>
<tr>
<td>Cable, 50Ω, BNC</td>
<td>HP 8120-2682</td>
<td>Not shipped with Options 001 or 011.</td>
</tr>
<tr>
<td>Cable, SMA (m) to type N (m)</td>
<td>HP 8120-5148</td>
<td>Not shipped with HP 8590B analyzers.</td>
</tr>
<tr>
<td>Cable, 75Ω BNC</td>
<td>HP 5062-6452</td>
<td>Shipped with Options 001 or 011 only</td>
</tr>
<tr>
<td>Power cable</td>
<td>See Table 2-4</td>
<td>Shipped with analyzer.</td>
</tr>
</tbody>
</table>

Preparing the Analyzer for Use

The analyzer is a portable instrument and requires no physical installation other than connection to a power source.

Caution

*Do not* connect ac power until you have verified that the line voltage is correct, the proper fuse is installed, and the line voltage selector switch is properly positioned, as described in the following paragraphs. Damage to the equipment could result.

Power Requirements

Table 2-3. Power Requirements

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage Frequency</td>
<td>86 to 127, or 195 to 250 V rms 47 to 66 Hz</td>
</tr>
<tr>
<td>Input Voltage (for 400 Hz operation)</td>
<td>103 to 126 V rms, 400 Hz ±10% 300 VA</td>
</tr>
<tr>
<td>Power</td>
<td>&lt;300 VA</td>
</tr>
</tbody>
</table>
Setting the Line Voltage Selector Switch

Caution

Before connecting the analyzer to the power source, you must set the rear-panel voltage selector switch correctly to adapt the analyzer to the power source. An improper selector switch setting can damage the analyzer when it is turned on.

Set the instrument’s rear-panel voltage selector switch to the line voltage range (115 V or 230 V) corresponding to the available ac voltage. See Figure 2-2. Insert a small screwdriver or similar tool in the slot and slide the switch up or down so that the proper voltage label is visible.

![Setting the Line Voltage Selector Switch](image)

Figure 2-2. Setting the Line Voltage Selector Switch

Checking the Fuse

The recommended fuse is size 5 by 20 mm, rated F5A, 250 V (IEC approved). This fuse may be used with input line voltages of 115 V or 230 V. Its HP part number is 2110-0709.

In areas where the recommended fuse is not available, a size 5 by 20 mm, rated fast blow, 5 A, 125 V (UL/CSA approved) fuse may be substituted. Use this fuse with an input line voltage of 115 V only. Its HP part number is 2110-0756.

The line fuse is housed in a small container beside the rear-panel power connector (see Figure 2-3). The container provides space for storing a spare fuse, as shown in the figure.

To check the fuse, insert the tip of a screwdriver in the slot at the middle of the container and pry gently to extend the container.

Note

The fuse container is attached to the line module; it cannot be removed.

The fuse closest to the analyzer is the fuse in use. If the fuse is defective or missing, install a new fuse in the proper position and reinsert the fuse container.
Power Cable

The analyzer is equipped with a three-wire power cable, in accordance with international safety standards. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet.

Warning

Failure to ground the analyzer properly can result in personal injury. Before turning on the analyzer, you must connect its protective earth terminals to the protective conductor of the main power cable. Insert the main power cable plug only into a socket outlet that has a protective earth contact. DO NOT defeat the earth-grounding protection by using an extension cable, power cable, or autotransformer without a protective ground conductor.

If you are using an autotransformer, make sure its common terminal is connected to the protective earth contact of the power source outlet socket.

Various power cables are available to connect the analyzer to the types of ac power outlets unique to specific geographic areas. The cable appropriate for the area to which the analyzer is originally shipped is included with the unit. You can order additional ac power cables for use in different areas. Table 2-4 lists the available ac power cables, illustrates the plug configurations, and identifies the geographic area in which each cable is appropriate.
### Table 2-4. AC Power Cables Available

<table>
<thead>
<tr>
<th>PLUG TYPE *</th>
<th>CABLE HP PART NUMBER</th>
<th>PLUG DESCRIPTION</th>
<th>CABLE LENGTH CM (INCHES)</th>
<th>CABLE COLOR</th>
<th>FOR USE IN COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>250V</td>
<td>8120-1351</td>
<td>Straight** BS1363A 90°</td>
<td>229 (90)</td>
<td>Mint Gray</td>
<td>Great Britain, Cyprus, Nigeria, Rhodesia, Singapore, So. Africa, India</td>
</tr>
<tr>
<td></td>
<td>8120-1703</td>
<td></td>
<td>229 (90)</td>
<td>Mint Gray</td>
<td></td>
</tr>
<tr>
<td>250V</td>
<td>8120-1369</td>
<td>Straight** NZS198/ASC112 90°</td>
<td>201 (79)</td>
<td>Gray</td>
<td>Australia, New Zealand</td>
</tr>
<tr>
<td></td>
<td>8120-0696</td>
<td></td>
<td>221 (87)</td>
<td>Gray</td>
<td></td>
</tr>
<tr>
<td>250V</td>
<td>8120-1689</td>
<td>Straight** CEE7-111 90°</td>
<td>201 (79)</td>
<td>Mint Gray</td>
<td>East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)</td>
</tr>
<tr>
<td></td>
<td>8120-1692</td>
<td></td>
<td>201 (79)</td>
<td>Mint Gray</td>
<td></td>
</tr>
<tr>
<td>125V</td>
<td>8120-1348</td>
<td>Straight** NEMA5-15P 90°</td>
<td>203 (80)</td>
<td>Black</td>
<td>United States Canada, Japan (100 V or 200 V), Mexico, Philippines, Taiwan</td>
</tr>
<tr>
<td></td>
<td>8120-1398</td>
<td>Straight** NEMA5-15P</td>
<td>203 (80)</td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8120-1754</td>
<td></td>
<td>91 (36)</td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8120-1378</td>
<td>Straight** NEMA5-15P 90°</td>
<td>203 (80)</td>
<td>Jade Gray</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8120-1521</td>
<td>Straight** NEMA5-15P</td>
<td>203 (80)</td>
<td>Jade Gray</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8120-1676</td>
<td></td>
<td>91 (36)</td>
<td>Jade Gray</td>
<td></td>
</tr>
<tr>
<td>250V</td>
<td>8120-2104</td>
<td>Straight** SEV1011 1959-24507 Type 12</td>
<td>201 (79)</td>
<td>Gray</td>
<td>Switzerland</td>
</tr>
<tr>
<td>220V</td>
<td>8120-0698</td>
<td>Straight** NEMA6-15P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250V</td>
<td>8120-1860</td>
<td>Straight** CEE22-VI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* E = Earth Ground, L = Line, N = Neutral
** Part number for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable, including plug.
Turning on the Analyzer for the First Time

When you turn the analyzer on for the first time, you should perform frequency and amplitude self-calibration routines to generate correction factors and indicate that the unit is functioning correctly.

Perform the following steps:

1. Plug the power cord into the analyzer.
2. Press **LINE**.
   
   After a few seconds, the screen displays the firmware date (for example, 31.1.89 indicates 31 January 1989).

**Note**

Record the firmware date and keep it for reference. If you should ever need to call Hewlett-Packard for service or with any questions regarding your analyzer, it will be helpful to have the firmware date readily available.

If your analyzer is equipped with Option 021 (HP-IB interface), the appropriate interface address (HP-IB ADRS: XX) also appears on the screen.

If your analyzer is equipped with Option 023 (RS-232 interface), the baud rate (RS232: XXXX) is displayed.

3. To meet spectrum analyzer specifications, allow a 30 minute warm-up before attempting to make any calibrated measurements. Be sure to calibrate the analyzer only **after** the analyzer has met the operating temperature conditions.

4. Connect the type N (m) to BNC (f) connector (shipped with the analyzer) to the INPUT 50Ω. Connect the 50Ω coaxial cable (also shipped with the instrument) between the front-panel CAL OUT and the INPUT 50Ω connector.

   **Option 001**: Omit the adapter and use the 75Ω cable to connect the CAL OUT and the INPUT 75Ω connectors.

5. Perform the frequency and amplitude self-calibration routine by pressing **CAL** and **CAL FREQ & AMPTD**.

   During the frequency routine, **CAL**: SWEEP, **CAL**: FREQ, and **CAL**: SPAN are displayed as the sequence progresses. During the amplitude routine, **CAL**: AMPTD, **CAL**: 3 dB BW, **CAL**: ATTEN, and **CAL**: LOGAMP are displayed as the sequence progresses. **CAL**: DONE appears when the routine is completed. Any failures or discrepancies produce a message on the screen; see Appendix A.

6. When the frequency and amplitude self-calibration routines have been completed successfully, store the correction factors by pressing **CAL STORE**.

   The self-calibration routines calibrate the analyzer by generating correction factors. The softkey **CAL STORE** stores the correction factors in the area of analyzer memory that is saved when the analyzer is turned off; the analyzer will automatically apply these factors in future measurements. If **CAL STORE** is not pressed, the correction factors remain in effect until the unit is turned off.
For analyzers with Option 010 or 011, the tracking-generator self-calibration routine should be performed prior to using the tracking generator.

**Note**

Since the CAL TRK GEN routine uses the absolute amplitude level of the analyzer, the analyzer amplitude should be calibrated prior to using CAL TRK GEN.

1. To calibrate the tracking generator, connect the tracking generator output (RF OUT 50Ω) to the analyzer input connector, using an appropriate cable and BNC-to-Type N adapters.

**Note**

A low-loss cable should be used for accurate calibration. Use the 50Ω cable shipped with the analyzer (Option 011: use the 75Ω cable shipped with the analyzer).

2. Press the following analyzer keys: [CAL], MORE 1 of 3, MORE 2 of 3, CAL TRK GEN. TG SIGNAL NOT FOUND will be displayed if the tracking generator output is not connected to the analyzer input.

3. To save this data in the area of analyzer memory that is saved when the analyzer is turned off, press CAL STORE.

For HP 8592B analyzers only, the CAL YTF self-calibration routine should be performed periodically. See “When Is Self-Calibration Needed?” in Chapter 5 for some helpful guidelines on how often the self-calibration routines should be performed.

To perform the CAL YTF self-calibration routine:

1. Connect a low-loss cable (such as HP part number 8120-5148) from 100 MHz COMB OUT to the analyzer input.

2. Press [CAL]. CAL YTF. The YTF self-calibration routine completes in approximately 4 minutes.

3. Press [CAL]. CAL STORE.

When the self-calibration routines have been completed successfully, the analyzer is ready for normal operation.

2-8  Installation and Preparation for Use
Inserting a Memory Card (Option 003 Only)

Use the following information to ensure that the memory card is inserted correctly. Improper insertion causes error messages to occur, but generally does not damage the card or instrument. Care must be taken, however, not to force the card into place. The cards are easy to insert when installed properly.

1. Locate the arrow printed on the card's label.

2. Insert the card with its arrow matching the raised arrow on the bezel around the card-insertion slot. See Figure 2-4.

![Image of a memory card being inserted into a device]

Figure 2-4. Inserting the Memory Card

3. Press the card into the slot. When correctly inserted, about 19 mm (0.75 in) of the card is exposed from the slot.
Changing the Memory Card Battery

It is recommended that the memory card battery be changed every 2 years. The battery is a lithium commercial CMOS type battery, part number CR 2016.

**Note** The minimum lifetime of the battery (under ordinary conditions) is more than 2 years.

The date that the memory card battery was installed is either engraved on the side of the memory card or written on a label on the memory card.

If the memory card does not have a label with the date that the battery was installed, use the date code engraved on side of the memory card. The date code engraved on the memory card consists of numbers and letters engraved in the black plastic on the side of the memory card. (See Figure 2-5). The first number indicates the year, the following two characters indicate the month, and the following number indicates the week in the month that the memory card battery was installed. For example, 8OC3 indicates the battery was installed in the third week in October in 1988.

![Memory Card Battery Date Code Location](image)

**Figure 2-5. Memory Card Battery Date Code Location**

**Procedure to Change the Memory Card Battery**

The battery is located beside the card's write-protect switch on the end opposite the connector.

2-10 Installation and Preparation for Use
Caution

The battery power enables the memory card's memory to retain data. You can lose the data when the battery is removed. Replace the battery while the card is installed in a powered-up instrument.

1. Locate the groove along the edge of the battery clip. See Figure 2-6.
2. Gently pry the battery clip out of the card. The battery fits within this clip.
3. Replace the battery, making sure the plus (+) sign on the battery is on the same side as the plus (+) sign on the clip.
4. Insert the battery clip into the memory card, holding the clip as oriented in Figure 2-6. (Face the "open" edge of the clip toward the write-protect switch on the memory card.)
5. Write the date that the battery was replaced on the memory card label. This will help you to remember when the battery should be replaced.

![Image of battery clip and memory card](image-url)

**Figure 2-6. Memory Card Battery Replacement**
Analyzer Battery Information

The HP 8590B and HP 8592B Spectrum Analyzers use a 3.6 V lithium battery to enable the analyzer memory to retain data. The date when the battery was installed is on a label on the rear panel of the analyzer. (See Figure 2-7.)

The minimum life expectancy of the battery is 8 years at 25°C, or 1 year at 55°C. If you experience problems with the battery or the recommended time period for battery replacement has elapsed, see “How to Return Your Analyzer for Service” in Chapter 8.

If you wish to replace the battery yourself, you can purchase the service documentation that provides all necessary test and maintenance information. The battery is soldered onto the analyzer’s processor board.

You can order the service documentation for the HP 8590B or HP 8592B through your HP Sales and Service office. The package is described under “Service Documentation for the HP 8590B (Option 915)” or “Service Documentation for the HP 8592B (Option 915)” in Chapter 1 of this manual.

After replacing the analyzer battery, write the date of battery replacement on the rear-panel label.

![Figure 2-7. Rear-Panel Battery Information Label](image-url)
Verifying Specified Operation for the HP 8590B

What You'll Find in This Chapter

This chapter contains test procedures which test the electrical performance of the HP 8590B Spectrum Analyzer.

None of the test procedures involve removing the cover of the spectrum analyzer.

What Is Performance Verification?

Performance Verification verifies that the spectrum analyzer performance is within all specifications of Table 1-1. It is time consuming and requires extensive test equipment. Performance Verification consists of all the performance tests. See Table 3-1 for a complete listing of performance tests.

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Frequency Drift</td>
</tr>
<tr>
<td>2.</td>
<td>Frequency Readout Accuracy</td>
</tr>
<tr>
<td>3.</td>
<td>Noise Sidebands</td>
</tr>
<tr>
<td>4.</td>
<td>System Related Sidebands</td>
</tr>
<tr>
<td>5.</td>
<td>Frequency Span Readout Accuracy</td>
</tr>
<tr>
<td>6.</td>
<td>Sweep Time Accuracy</td>
</tr>
<tr>
<td>7.</td>
<td>Scale Fidelity</td>
</tr>
<tr>
<td>8.</td>
<td>Input Attenuator Accuracy</td>
</tr>
<tr>
<td>9.</td>
<td>Reference Level Accuracy</td>
</tr>
<tr>
<td>10.</td>
<td>Resolution Bandwidth Switching Uncertainty</td>
</tr>
<tr>
<td>11.</td>
<td>Calibrator Amplitude and Frequency Accuracy</td>
</tr>
<tr>
<td>12.</td>
<td>Frequency Response</td>
</tr>
<tr>
<td>13.</td>
<td>Spurious Response</td>
</tr>
<tr>
<td>14.</td>
<td>Gain Compression</td>
</tr>
<tr>
<td>15.</td>
<td>Displayed Average Noise Level</td>
</tr>
<tr>
<td>16.</td>
<td>Residual Responses</td>
</tr>
<tr>
<td>17.</td>
<td>Absolute Amplitude, Vernier, and Power Sweep Accuracy (Option 010 or 011)</td>
</tr>
<tr>
<td>18.</td>
<td>Tracking Generator Level Flatness (Option 010 or 011)</td>
</tr>
<tr>
<td>19.</td>
<td>Harmonic Spurious Outputs (Option 010 or 011)</td>
</tr>
<tr>
<td>20.</td>
<td>Non-Harmonic Spurious Outputs (Option 010 or 011)</td>
</tr>
<tr>
<td>21.</td>
<td>Tracking Generator Feedthrough (Option 010 or 011)</td>
</tr>
</tbody>
</table>
What Is Operation Verification?

Operation Verification consists of a subset of the performance tests which test only the most critical specifications of the analyzer. It requires less time and equipment than the Performance Verification and is recommended for verification of overall instrument operation, either as part of incoming inspection or after repair. Operation Verification consists of the following performance tests:

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Frequency Readout Accuracy</td>
</tr>
<tr>
<td>3</td>
<td>Noise Sidebands</td>
</tr>
<tr>
<td>7</td>
<td>Scale Fidelity</td>
</tr>
<tr>
<td>8</td>
<td>Input Attenuator Accuracy</td>
</tr>
<tr>
<td>9</td>
<td>Reference Level Accuracy</td>
</tr>
<tr>
<td>10</td>
<td>Resolution Bandwidth Switching Uncertainty</td>
</tr>
<tr>
<td>11</td>
<td>Calibrator Amplitude and Frequency Accuracy</td>
</tr>
<tr>
<td>12</td>
<td>Frequency Response</td>
</tr>
<tr>
<td>13</td>
<td>Second Harmonic Distortion (part of Spurious Response)</td>
</tr>
<tr>
<td>15</td>
<td>Displayed Average Noise Level</td>
</tr>
</tbody>
</table>

Before You Start the Verification Tests

There are four things you should do before starting a verification test:

1. Switch the analyzer on and let it warm up in accordance with the Temperature Stability specification in Table 1-1.
2. Read “Making a Measurement” in Chapter 5.
3. After the analyzer has warmed up as specified, perform the Self-Calibration Procedure documented in “Improving Accuracy With Self-Calibration Routines” in Chapter 5. The performance of the analyzer is only specified after the analyzer calibration routines have been run and if the analyzer is autocoupled.
4. Read the rest of this section before you start any of the tests, and make a copy of the Performance Verification Test Record described in “Recording the Test Results.”

**Note**  Use only 75Ω cables, connectors, or adapters on the 75Ω input of an Option 001 or damage to the input connector will occur.

3-2 Verifying Specified Operation for the HP 8590B
Test Equipment You'll Need

Table 3-3 lists the recommended test equipment for the performance tests. The table also lists recommended equipment for the analyzer's adjustment procedures which are located in the HP 8590B Service Manual. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model(s).

Recording the Test Results

A small test results table is provided at the end of each test procedure for your convenience in recording test results as you perform the procedure.

In addition, a complete Performance Verification Test Record, (Table 3-25), has been provided at the end of the chapter. We recommend that you make a copy of the table, record the test results on the copy, and keep the copy for your calibration test record. This record could prove valuable in tracking gradual changes in test results over long periods of time.

If the Analyzer Doesn't Meet Specifications

If the analyzer fails a test, rerun the CAL FREQ & AMPTD routine, press CAL STORE, and repeat the test. If the analyzer still fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to “Problems” in Chapter 8, for instructions on how to solve the problem.

Periodically Verifying Operation

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year with either Operation Verification or the complete set of Performance Verification tests.
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesized Sweeper</td>
<td>Frequency Range: 10 MHz to 18 GHz</td>
<td>HP 8340A/B</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Frequency Accuracy (CW): ± 0.02%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leveling Modes: Internal and External</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modulation Modes: AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power Level Range: −35 to +16 dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Function Generator</td>
<td>Frequency Range: 0.1 Hz to 500 Hz</td>
<td>HP 3325B</td>
<td>P,T</td>
</tr>
<tr>
<td></td>
<td>Frequency Accuracy: ±0.02%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waveform: Triangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Level Generator</td>
<td>Frequency Range: 1 kHz to 80 MHz</td>
<td>HP 3335A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: +12 to −85 dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flatness ±0.15 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attenuator Accuracy: ±0.09 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM/FM Signal Generator</td>
<td>Frequency Range: 1 MHz to 1000 MHz</td>
<td>HP 8640B, Option 002</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: −35 to +16 dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SSB Noise: &lt;−120 dBc/Hz at 20 kHz offset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring Receiver</td>
<td>Compatible with Power Sensors</td>
<td>HP 8902A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>dB Relative Mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resolution: 0.01 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Accuracy: ±1.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Meter</td>
<td>Power Range: Calibrated in dBm and dB relative to reference power −70 dBm to +41 dBm, sensor dependent</td>
<td>HP 436A</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Power Sensor</td>
<td>Frequency Range: 100 kHz to 1800 MHz</td>
<td>HP 8482A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Maximum SWR: 1.60 (100 kHz to 300 kHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.20 (300 kHz to 1 MHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1 (1 MHz to 2.0 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.30 (2.0 to 2.9 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Sensor †</td>
<td>Frequency Range: 1 MHz to 2 GHz</td>
<td>HP 8483A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Maximum SWR: 1.18 (600 kHz to 2.0 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>75 ohms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-Power Power Sensor</td>
<td>Frequency Range: 300 MHz</td>
<td>HP 8484A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: −20 dBm to −70 dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum SWR: 1.1 (300 MHz)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = Performance Test, A = Adjustment, T = Troubleshooting

† Option 001 and Option 011 Only

3-4 Verifying Specified Operation for the HP 8590B
Table 3-3. Recommended Test Equipment (continued)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
</table>
| Microwave Frequency Counter | Frequency Range: 9 MHz to 7 GHz  
Timebase Accy (Aging): <5 x 10^{-10}/day | HP 5343A          | P,A,T |
| Oscilloscope          | Bandwidth: dc to 100 MHz  
Vertical Scale Factor of 5 V/Div | HP 1741A          | T    |
| Digital Voltmeter     | Input Resistance: ≥10 megohms  
Accuracy: ±10 mV on 100 V range | HP 3456A          | P,A,T |
| DVM Test Leads        | For use with HP 3456A                                               | HP 34118          | A,T  |
| Spectrum Analyzer     | Frequency Range: 100 kHz to 7 GHz  
Relative Amplitude Accuracy:  
100 kHz to 1.8 GHz: <±1.8 dB  
Frequency Accuracy: <±10 kHz @ 7 GHz | HP 8566A/B       | P,A,T |
| Minimum Loss Adapter  | 50 to 75Ω, matching  
Frequency Range: dc to 2 GHz  
Insertion Loss: 5.7 dB | HP 11852B         | P,A,T |
| Power Splitter        | Frequency Range: 50 kHz to 1.8 GHz  
Insertion Loss: 6 dB (nominal)  
Output Tracking: <0.25 dB  
Equivalent Output SWR <1.22:1 | HP 11667A         | P,A   |
| Directional Bridge    | Frequency Range: 0.1 to 110 MHz  
Directivity: >40 dB  
Maximum VSWR: 1.1:1  
Transmission Arm Loss: 6 dB (nominal)  
Coupling Arm Loss: 6 dB (nominal) | HP 8721A          | P,T   |
| 10 dBattenuator       | Type N (m to f)  
Frequency: 300 MHz | HP 8491A          | P,A,T |
| 1 dB Step Attenuator  | Attenuation Range: 0 to 12 dB  
Frequency Range: 50 MHz  
Connectors: BNC female | HP 355C           | P,A   |
| 10 dB Step Attenuator | Attenuation Range: 0 to 30 dB  
Frequency Range: 50 MHz  
Connectors: BNC female | HP 355D           | P,A   |
| Low Pass Filter       | Cutoff Frequency: 50 MHz  
Rejection at 80 MHz >50 dB | 0955-0306         | P,T   |

* P = Performance Test, A = Adjustment, T=Troubleshooting
† Option 001 Only
Table 3-3. Recommended Test Equipment (continued)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
</table>
| Low Pass Filter | Cutoff Frequency: 300 MHz  
Bandpass Insertion Loss: <0.9 dB at 300 MHz  
Stopband Insertion Loss: >40 dB at 435 MHz | 0955-0455 | P,A,T |
| Termination | Impedance: 50Ω (nominal)  
(2 required for option 010) | HP 908A | P,T |
| Termination † | Impedance: 75Ω (nominal)  
(2 required for option 011) | HP 909E Option 201 | P,T |
| Logic Pulser | TTL voltage and current drive levels | HP 546A | T |
| Digital Current Tracer | Sensitivity: 1 mA to 500 mA  
Frequency Response: Pulse trains to 10 MHz  
Minimum Pulse Width: 50 ns  
Pulse Rise Time: <200 ns | HP 547A | T |
| Logic Chip | TTL voltage and current drive levels | HP 548A | T |
| Cable | Type N, 163 cm (72 in) | HP 11500A | P,A,T |
| Cable | Frequency Range: dc to 1 GHz  
Length: ≥91 cm (36 in)  
Connectors: BNC (m) both ends  
(4 required) | HP 10503A | P,A,T |
| Cable | Frequency Range: dc to 310 MHz  
Length: 20 cm (9 in)  
Connectors: BNC (m) both ends | HP 10502A | P,A,T |
| Cable † | BNC, 75 ohms, 30 cm (12 in) | 5062-6452 | P,A,T |
| Cable † | BNC, 75 ohms, 120 cm (48 in) | 15525-80010 | P,A,T |
| Test Cable | Length: ≥91 cm (36 in)  
Connectors: SMB (f) to BNC (m)  
(2 required) | 85680-60093 | A,T |
| Adapter | Type N (f) to BNC (f)  
(4 required) | 1250-1474 | P,A,T |
| Adapter | Type N (m) to BNC (f)  
(4 required) | 1250-1476 | P,A,T |

* P = Performance Test, A = Adjustment, T = Troubleshooting
† Option 001 Only

3-6 Verifying Specified Operation for the HP 8590B
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Type N (m) to BNC (m) (2 required)</td>
<td>1250-1473</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>Type N (f) to BNC (m)</td>
<td>1250-1477</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>Type N (m) to APC 3.5 (m)</td>
<td>1250-1743</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>Type N (f) to APC 3.5 (f)</td>
<td>1250-1745</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>APC 3.5 (f) to APC 3.5 (f)</td>
<td>5061-5311</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter †</td>
<td>Type N (f) to BNC (m), 75 ohms</td>
<td>1250-1534</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter †</td>
<td>BNC (m) to BNC (m), 75Ω</td>
<td>1250-1288</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>Type N (f) to APC 3.5 (m)</td>
<td>1250-1750</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter †</td>
<td>Type N (f), 75 ohms, to Type N (m), 50 ohms</td>
<td>1250-0597</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>BNC (f) to dual banana plug</td>
<td>1251-1277</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>SMB (f) to SMB (f)</td>
<td>1250-0692</td>
<td>A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>SMB (m) to SMB (m)</td>
<td>1250-0813</td>
<td>A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>BNC (m) to BNC (m)</td>
<td>1250-0216</td>
<td>P,A,T</td>
</tr>
<tr>
<td>Adapter</td>
<td>BNC tee (m) (f) (f)</td>
<td>1250-0781</td>
<td>T</td>
</tr>
<tr>
<td>Adapter</td>
<td>BNC (f) to SMB (m)</td>
<td>1250-1237</td>
<td>A,T</td>
</tr>
<tr>
<td>Active Probe</td>
<td>5 Hz to 500 MHz</td>
<td>HP 41800A</td>
<td>T</td>
</tr>
<tr>
<td></td>
<td>300 kHz to 3 GHz</td>
<td>HP 85024A</td>
<td>T</td>
</tr>
</tbody>
</table>

* P = Performance Test, A = Adjustment, T=Troubleshooting

† Option 001 Only
1. Frequency Drift

Specification

<75 kHz drift per 5 minute interval after 2 hour warm-up and 5 minutes after setting center frequency.

Description

A 300 MHz, CW signal is applied to the analyzer RF input. After centering the signal on the analyzer display (CRT) for 5 minutes, the MAX HOLD function of the analyzer is used to determine frequency drift over a 5-minute period. The spectrum analyzer must be warmed up for a minimum of 2 hours prior to running this test.

Equipment

Synthesized Sweeper .............................................. HP 8340A/B

Adapters

APC 3.5 (f) to Type N (f) ................................................. 1250-1745
Type N (m) to BNC (f) (two required) ............................ 1250-1476

Cable

BNC, 120 cm (48 in) .................................................. HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter .............................................. HP 11852B
Adapter Type N (f) to BNC (m), 75 Ω ............................ 1250-1534

Note

The analyzer must be warmed up as described in the Table 1-1 specifications before performing the frequency drift test.

Procedure

1. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:

   POWER LEVEL ..................................................... −10 dBm
   CW .............................................................. 300 MHz

2. Connect the equipment as shown in Figure 3-1.
1. Frequency Drift

3. On the analyzer, press [Preset] and wait until the preset is finished. Set the controls as follows:

CENTER FREQUENCY .......................................... 300 MHz
SPAN .......................................................... 10 MHz

4. On the analyzer, press [Peak Search], [Signal Track] (ON), [Span], 150 kHz.

5. Wait 5 minutes, then press the following analyzer keys:

MARKERS OFF
TRACE A B C (trace B) MAX HOLD B.

Note the position of the signal peak on the analyzer display. Wait 5 minutes, accurately timing the period using a timepiece.

6. Measure the frequency drift by pressing the following analyzer keys:

TRACE A B C VIEW B
MORE 1 of 3 A <--> B.

Press [Mark] and adjust the knob to position the marker on the left signal peak. Press MARKER DELTA and position the marker delta on the right signal peak. Read the marker Δ frequency as the frequency shift of the analyzer. Drift should not exceed 75 kHz.

Frequency Drift: ________ <75 kHz
2. Frequency Readout Accuracy

Specification

9 kHz to 1.8 GHz: ±(5 MHz + 1% of SPAN setting).

Description

The frequency readout accuracy of the HP 8590B is tested with an input signal of known frequency.

Equipment

Synthesized Sweeper ........................................ HP 8340A/B

Adapters

Type N (f) to APC 3.5 (f) ................................ 1250-1745

Cable

Type N, 183 cm (72 in) ........................................ HP 11500A

Additional Equipment for Option 001

Minimum Loss Adapter ........................................ HP 11852B

Adapter, Type N (f) to BNC (m), 75Ω ..................... 1250-1534

Procedure

1. Connect the equipment as shown in Figure 3-2.

2. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:

   - CW ........................................ 10 MHz
   - POWER LEVEL ................................. −10 dBm

3. Press [PRESET] on the HP 8590B and wait for the preset to finish. Set the controls as follows.

   - CENTER FREQUENCY .......................... 10 MHz
   - SPAN ........................................... 12 MHz

4. On the HP 8590B, press [PEAK SEARCH], [SIGNAL TRACK] (ON), [SPAN], 200 (kHz). Record the MKR frequency reading in Table 3-4. The reading should be within the limits shown.

5. Press [SPAN], 12 (MHz).

6. Repeat steps 4 and 5 for the HP 8340A/B CW and HP 8590B center frequencies listed in Table 3-4.

3-10 Verifying Specified Operation for the HP 8590B
2. Frequency Readout Accuracy

![Diagram of frequency readout accuracy test setup](Image)

**Figure 3-2. Frequency Readout Accuracy Test Setup**

**Table 3-4. Frequency Readout Accuracy**

<table>
<thead>
<tr>
<th>HP 8340A/B CW Frequency (MHz)</th>
<th>HP 8590B Center Frequency (MHz)</th>
<th>MKR Reading</th>
<th>Min (MHz)</th>
<th>Actual (MHz)</th>
<th>Max (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td></td>
<td>4.9980</td>
<td></td>
<td>15.0020</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td></td>
<td>44.9980</td>
<td></td>
<td>55.0020</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td></td>
<td>94.9980</td>
<td></td>
<td>105.0020</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
<td></td>
<td>494.9980</td>
<td></td>
<td>505.0020</td>
</tr>
<tr>
<td>1000</td>
<td>1000</td>
<td></td>
<td>994.9980</td>
<td></td>
<td>1005.0020</td>
</tr>
<tr>
<td>1800</td>
<td>1800</td>
<td></td>
<td>1794.9980</td>
<td></td>
<td>1805.0020</td>
</tr>
</tbody>
</table>
3. Noise Sidebands

Specification
\[ \leq 95 \text{ dBC/Hz at } >30 \text{ kHz offset from CW signal}. \]

Description
A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the noise level 30 kHz above and below the carrier. The difference between these two measurements is compared to specification.

Equipment
Signal Generator .................................................. HP 8640B
Cable
Type N, 183 cm (72 in) ......................................... HP 11500A

Additional Equipment for Option 001
Minimum Loss Adapter ........................................... HP 11852B
Adapter Type N (f) to BNC (m), 75Ω ....................... 1250-1534

Procedure
1. Set the HP 8640B controls as follows:
   FREQUENCY .................................................. 500 MHz
   OUTPUT LEVEL .............................................. 0 dBm
   AM .............................................................. OFF
   FM .............................................................. OFF
   COUNTER .................................................... INT
   RF ............................................................. ON
2. Connect the equipment as shown in Figure 3-3.
3. Noise Sidebands

Figure 3-3. Noise Sidebands Test Setup

3. Press **preset** on the HP 8590B and wait for the preset to finish. Set the controls as follows:

- CENTER FREQUENCY ........................................ 500 MHz
- SPAN ......................................................... 10 MHz

4. On the 8590B, press the following analyzer keys:

   - **peak search** **signal track** (on)
   - **span** 200 kHz
   - **bw** res bw auto man 1 kHz
   - **vid bw auto man** 30 Hz
   - **signal track** (off) sgl swp peak search.

5. Record the MKR amplitude reading as the Carrier Amplitude.

   Carrier Amplitude ________ dBm

   *(Option 001) Carrier Amplitude ________ dBmV*

6. Press the following analyzer keys:

   - **marker delta** 30 kHz
   - **mkR** marker normal.

Verifying Specified Operation for the HP 8590B  3-13
3. **Noise Sidebands**

Record the MKR amplitude reading as the Noise Sideband Level at +30 kHz.

Noise Sideband Level at +30 kHz _________ dBm

*(Option 001)* Noise Sideband Level at +30 kHz _________ dBmV

7. Press **PEAK SEARCH**, **MARKER DELTA , -30 kHz**, **MKR**, **MARKER NORMAL**. Record the MKR amplitude reading as the Noise Sideband Level at -30 kHz.

Noise Sideband Level at -30 kHz _________ dBm

*(Option 001)* Noise Sideband Level at -30 kHz _________ dBmV

8. Record the more positive value from steps 6 and 7 above and record as the Maximum Noise Sideband Level.

Maximum Noise Sideband Level _________ dBm

*(Option 001)* Maximum Noise Sideband Level _________ dBmV

9. Subtract the Carrier Amplitude (step 5) from the Maximum Noise Sideband Level (step 8) and record as the Noise Sideband Suppression. The suppression should be \( \leq -65 \) dBc.

\[
\text{Noise Sideband Suppression} = \text{Maximum Noise Sideband Level} - \text{Carrier Amplitude}
\]

Noise Sideband Suppression _________ dBc

---

**Note**

The resolution bandwidth is normalized to 1 Hz as follows:

1 Hz noise-power = (noise-power in dBc) - \((10 \times \log(\text{RBW}))\).

For example, -65 dBc in a 1 kHz resolution bandwidth is normalized to -95 dBc/Hz.
4. System Related Sidebands

Specification

<-65 dBC at >30 kHz from CW signal.

Description

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the amplitude of any system related sidebands 30 kHz above and below the carrier. System related sidebands are any internally generated line related, power supply related or local oscillator related sidebands.

Equipment

Signal Generator ........................................HP 8640B
Cable

Cable, Type N, 183 cm (72 in) ............................ HP 11500A

Additional Equipment for Option 001

Minimum Loss Adapter ......................................HP 11852B
Adapter Type N (f) to BNC (m), 75Ω .......................... 1250-1534

Procedure

1. Set the HP 8640B controls as follows:

   FREQUENCY ........................................500 MHz
   OUTPUT LEVEL .....................................0 dBm
   AM ..............................................OFF
   FM ..............................................OFF
   COUNTER .......................................INT
   RF ..............................................ON

2. Connect the equipment as shown in Figure 3-4.
4. System Related Sidebands

![Diagram of Spectrum Analyzer and Signal Generator]

**Figure 3-4. System Related Sidebands Test Setup**

3. Press [Preset] on the HP 8590B and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY ........................................... 500 MHz
   SPAN .................................................................. 10 MHz

4. On the HP 8590B, press the following analyzer keys:

   PEAK SEARCH (SIGNAL TRACK) (ON)
   SPAN 200 kHz
   BW 1 kHz
   VID BW AUTO MAN, 30 Hz.

   Allow analyzer to stabilize for approximately 1 minute. Press [SIGNAL TRACK] (OFF),
   FREQUENCY, CF STEP AUTO MAN 130 kHz.

5. On the analyzer, press [SGL SWP] and wait for the completion of the sweep. Press
   PEAK SEARCH, MARKER DELTA.

6. On the HP 8590B, press the following analyzer keys:

   FREQUENCY \( \Delta \) (step-up key).

7. Press [SGL SWP]. Wait for the completion of a new sweep. Press [PEAK SEARCH].

   Record the Marker \( \Delta \) Amplitude:

   \[
   \text{Marker} \Delta \text{ Amplitude} \quad \text{dBc}
   \]

   The Marker \( \Delta \) Amplitude above the signal should be \(< -65 \text{ dB} \).

---

3-16 Verifying Specified Operation for the HP 8590B
4. System Related Sidebands

8. On the HP 8590B, press the following analyzer keys:
   - (step-down key) (step-down key).

   Record the Marker Δ Amplitude:

   Marker Δ Amplitude _________ dBC

   The Marker Δ Amplitude below the signal should be < −65 dB.
5. Frequency Span Readout Accuracy

Specification

±3% of indicated span.

Description

For testing each frequency span, two sources are used to provide two precisely-spaced signals. The analyzer's marker functions are used to measure this frequency difference and the marker reading is compared to the specification.

Equipment

Synthesized Sweeper .................................................. HP 8340A/B
Signal Generator ........................................................ HP 8640B
Power Splitter ............................................................ HP 11667A

Adapters

Type N (m) to Type N (m) ............................................. 1250-1475
Type N (f) to APC 3.5 (m) ........................................... 1250-1745

Cables

Type N, 183 cm (72 in) ................................................ HP 11500A
Type N, 152 cm (60 in) ................................................ HP 11500D

Additional Equipment for Option 001

Minimum Loss Adapter ................................................. HP 11852B
Adapter Type N (f) to BNC (m), 75Ω ............................... 1250-1534
5. Frequency Span Readout Accuracy

Procedure

Spans ≥500 MHz

1. Connect the equipment as shown in Figure 3-5. Note that the Power Splitter is used as a combiner. Option 001: Connect the minimum loss adapter to the INPUT 75Ω using the appropriate adapters.

![Diagram of Frequency Span Accuracy Test Setup]

Figure 3-5. Frequency Span Accuracy Test Setup

2. Press (PRESET) on the analyzer and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY .................................................. 900 MHz
   SPAN ...................................................................... 500 MHz

3. Press (INSTR PRESET) on the HP 8340A/B and set the controls as follows:

   CW ................................................................. 1100 MHz
   POWER LEVEL ...................................................... -5 dBm

4. On the HP 8640B, set the controls as follows:

   FREQUENCY (LOCKED MODE) .............................. 700 MHz
   CW OUTPUT ......................................................... 0 dBm

5. Adjust the analyzer’s center frequency, if necessary, to place the lower frequency on the second vertical graticule line (one division from the left-most graticule line).

Verifying Specified Operation for the HP 8590B  3-19
5. Frequency Span Readout Accuracy

6. Press [SGL SWP], [PEAK SEARCH]. If necessary, continue pressing NEXT PEAK until the marker is on the left-most signal. This is the “marked” signal.

7. Press MARKER DELTA and continue pressing NEXT PK RIGHT. The marker delta should be on the right-most signal.

8. Record the MKR $\Delta$ frequency reading in Table 3-5. The MKR reading should be within the limits shown.

9. On the 8590B, press MKR, MARKERS OFF, TRIG, FREE RUN.

10. Repeat steps 5 through 9 for the remaining span settings listed in Table 3-5. Adjust the frequency of each for the corresponding new span settings.

Table 3-5. Frequency Span Readout Accuracy, Spans $\geq$500 MHz

<table>
<thead>
<tr>
<th>Span Setting</th>
<th>HP 8640B Setting</th>
<th>HP 8340A/B Setting</th>
<th>MKR-$\Delta$ Freq. Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 MHz</td>
<td>700 MHz</td>
<td>1100 MHz</td>
<td>385 MHz 415 MHz</td>
</tr>
<tr>
<td>1000 MHz</td>
<td>500 MHz</td>
<td>1300 MHz</td>
<td>770 MHz 830 MHz</td>
</tr>
<tr>
<td>1800 MHz</td>
<td>200 MHz</td>
<td>1700 MHz</td>
<td>1446 MHz 1554 MHz</td>
</tr>
</tbody>
</table>

Spans $<$500 MHz

11. Press [PRESET] on the analyzer and wait for the PRESET to finish. Set the control as follows:
   
   CENTER FREQUENCY .................................................. 70 MHz
   SPAN ........................................................................... 100 MHz

12. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:
   
   CW ................................................................. 110 MHz
   POWER LEVEL ...................................................... $-5$ dBm

13. Set the HP 8640B controls as follows:
   
   FREQUENCY ........................................................ 30 MHz
   CW OUTPUT ......................................................... 0 dBm

14. If necessary, adjust the analyzer center frequency to center the two signals on the display.

15. On the analyzer, press the following keys:
   
   [PEAK SEARCH] MARKER DELTA NEXT PEAK.

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

3-20 Verifying Specified Operation for the HP 8590B
5. Frequency Span Readout Accuracy

16. Record the MKR-Δ frequency reading in Table 3-6. The MKR-Δ frequency reading should be within the limits shown.

17. Press \( \text{MARKER OFF} \).

18. Repeat steps 13 through 16 for the remaining span settings listed in Table 3-6, setting the HP 8340A/B CW and HP 8640B Frequency as shown in the table.

<table>
<thead>
<tr>
<th>HP 8640B Frequency MHz</th>
<th>HP 8340A/B Frequency MHz</th>
<th>HP 8590B Span Setting MHz</th>
<th>MKR-Δ Reading MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.0</td>
<td>110.0</td>
<td>100 MHz</td>
<td>77.0 MHz</td>
</tr>
<tr>
<td>50.0</td>
<td>90.0</td>
<td>50 MHz</td>
<td>38.5 MHz</td>
</tr>
<tr>
<td>62.0</td>
<td>78.0</td>
<td>20 MHz</td>
<td>15.4 MHz</td>
</tr>
<tr>
<td>66.0</td>
<td>74.0</td>
<td>10 MHz</td>
<td>7.7 MHz</td>
</tr>
<tr>
<td>68.0</td>
<td>72.0</td>
<td>5 MHz</td>
<td>3.850 MHz</td>
</tr>
<tr>
<td>69.2</td>
<td>70.8</td>
<td>2 MHz</td>
<td>1.540 MHz</td>
</tr>
<tr>
<td>69.6</td>
<td>70.4</td>
<td>1 MHz</td>
<td>770.0 kHz</td>
</tr>
<tr>
<td>69.8</td>
<td>70.2</td>
<td>500 kHz</td>
<td>385.0 kHz</td>
</tr>
<tr>
<td>69.92</td>
<td>70.08</td>
<td>200 kHz</td>
<td>154.0 kHz</td>
</tr>
<tr>
<td>69.96</td>
<td>70.04</td>
<td>100 kHz</td>
<td>77.0 kHz</td>
</tr>
</tbody>
</table>
6. Sweep Time Accuracy

Specification

20 ms to 100 s <±3%.

Description

This test uses a synthesizer function generator to amplitude modulate a 500 MHz CW signal from another signal generator. The analyzer demodulates this signal in zero span to display the response in the time domain. The marker delta frequency function on the analyzer is used to read out the sweep time accuracy.

Equipment

Synthesizer/Function Generator ........................................ HP 3325A
Signal Generator ........................................................... HP 8640B

Cables

Type N Cable, 152 cm (60 in) ........................................... HP 11500D
BNC, 120 cm (48 in) ...................................................... HP 10503A

Additional Equipment for Option 001

Minimum Loss Adapter .................................................... HP 11852B
Adapter Type N (f) to BNC (m), 75Ω ................................. 1250-1534

Procedure

1. Set the signal generator to output a 500 MHz, −10 dBm, CW signal. Set the AM and FM controls to off. Option 001: Set the output to −4 dBm.

2. Set the synthesizer function generator to output a 500 Hz, +5 dBm triangle waveform signal.

3. Connect the equipment as shown in Figure 3-6.
6. Sweep Time Accuracy

![Diagram of test setup]

**Figure 3-6. Sweep Time Accuracy Test Setup**

4. Press **Preset** on the analyzer and wait for the preset to finish. Set the controls as follows:
   
   CENTER FREQUENCY ........................................... 500 MHz
   SPAN ............................................................... 10 MHz
   
   Press **Peak Search**. Set the controls as follows:
   
   SIGNAL TRACK .................................................... ON
   SPAN ............................................................... 50 kHz
   
   Wait for the AUTO ZOOM routine to finish. Press **Span**, ZERO SPAN.
   
   Set the controls as follows:
   
   BW ................................................................. 3 MHz
   AMPLITUDE SCALE ............................................ LINEAR
   SWEEP TIME .................................................. 20 ms
   
   Adjust signal amplitude for a mid-screen display.

5. Set the signal generator AM switch to the AC position.

6. On the analyzer, press the following keys:
   
   **TRIG** VIDEO
   
   Adjust the video trigger so that the analyzer is sweeping.

7. Press **SGL SWP**. After the completion of the sweep, press **Peak Search**. If necessary, press **NEXT PEAK** until the marker is on the leftmost signal. This is the "marked signal."

8. Press **MARKER DELTA**, **MARKER DELTA** and press **NEXT PK RIGHT** until the marker $\Delta$ is on the eighth signal peak. Record the marker $\Delta$ reading in Table 3-7.

9. Repeat steps 6 through 9 for the remaining sweep time settings listed in Table 3-7.
### 6. Sweep Time Accuracy

#### Table 3-7. Sweep Time Accuracy

<table>
<thead>
<tr>
<th>HP 8590B Sweep Time Setting</th>
<th>HP 3325A Frequency</th>
<th>Minimum Reading</th>
<th>MKR Δ</th>
<th>Maximum Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 ms</td>
<td>500 Hz</td>
<td>15.4 ms</td>
<td></td>
<td>16.6 ms</td>
</tr>
<tr>
<td>50 ms</td>
<td>200 Hz</td>
<td>38.5 ms</td>
<td></td>
<td>41.5 ms</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 Hz</td>
<td>77.0 ms</td>
<td></td>
<td>83.0 ms</td>
</tr>
<tr>
<td>500 ms</td>
<td>20 Hz</td>
<td>3850 ms</td>
<td></td>
<td>4150 ms</td>
</tr>
<tr>
<td>1 s</td>
<td>10 Hz</td>
<td>7700 ms</td>
<td></td>
<td>8300 ms</td>
</tr>
<tr>
<td>10 s</td>
<td>1 Hz</td>
<td>7.7 s</td>
<td></td>
<td>8.3 s</td>
</tr>
<tr>
<td>50 s</td>
<td>0.2 Hz</td>
<td>38.5 s</td>
<td></td>
<td>41.5 s</td>
</tr>
<tr>
<td>100 s</td>
<td>0.1 Hz</td>
<td>77.0 s</td>
<td></td>
<td>83.0 s</td>
</tr>
</tbody>
</table>
7. Scale Fidelity

Specification
Log Mode:
\[ \pm 0.2 \text{ dB/2 dB 0 to } -70 \text{ dB from Reference Level range.} \]
\[ \pm 0.75 \text{ dB maximum over 0 to } -60 \text{ dB from REF LEVEL.} \]
\[ \pm 1.0 \text{ dB maximum over 0 to } -70 \text{ dB from REF LEVEL.} \]
Linear Mode:
\[ \pm 3\% \text{ of REF LEVEL.} \]
Log to Linear Switching Uncertainty:
\[ \pm 0.25 \text{ dB at the Reference Level.} \]

Related Adjustment
Log and Linear Amplitude Adjustment.

Description
A 50 MHz CW signal is applied to the INPUT 50\(\Omega\) of the analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The source's internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

Equipment

Synthesizer/Level Generator ........................................... HP 3335A
Step Attenuator, 1 dB steps ........................................... HP 355C
Step Attenuator, 10 dB steps ......................................... HP 355D

Cables
BNC Cable 122 cm (48 in) (2 required) ............................ HP 10503A

Adapter
Type N (m) to BNC (f) .................................................. 1250-1476
Type BNC (m) to BNC (m) ............................................. 1250-0216

Additional Equipment for Option 001
Minimum Loss Adapter .................................................. HP 11852B
Adapter Type N (f) to BNC (m), 75\(\Omega\) .......................... 1250-1534
7. Scale Fidelity

Procedure

Log Scale

1. Set the HP 3335A controls as follows:
   
   **FREQUENCY** .................................................. 50 MHz  
   **AMPLITUDE** .................................................... +10 dBm  
   **AMPTD INCR** ................................................... 0.05 dB  
   **OUTPUT** ....................................................... 50Ω  

2. Connect the equipment as shown in Figure 3-7. Set the HP 355D to 10 dB attenuation and the 355C to 0 dB attenuation.

   *Option 001:* Set the attenuation of the HP 355D to 0 dB. Connect the minimum loss pad to the INPUT 75Ω using adapters.

![Figure 3-7. Scale Fidelity Test Setup](image)

3. Press **PRESET** on the analyzer and wait for the preset to finish. Set the controls as follows:

   **CENTER FREQUENCY** ........................................ 50 MHz  
   **SPAN** ....................................................... 10 MHz  

   *(Option 001: Press **AMPLITUDE**, MORE 1 of 2, AMPTD UNITS, dBm.)*

4. On the analyzer, press the following keys:

   **PEAK SEARCH** **SIGNAL TRACK** (ON)  
   **SPAN** 50 kHz.

3-26 Verifying Specified Operation for the HP 8590B
After the auto zoom procedure is finished, set the resolution bandwidth to 3 kHz and the video bandwidth to 30 Hz.

5. If necessary, adjust the HP 355C attenuation until the MKR amplitude reads between 0 dBm and -1 dBm.

6. On the HP 3335A, press **AMPLITUDE** and use the INCR keys to adjust the amplitude until the analyzer MKR amplitude reads 0 dBm ± 0.05 dB.

**Note**

It may be necessary to decrease the resolution of the amplitude increment of the HP 3335A to 0.01 dB to obtain a MKR reading of 0 dBm ± 0.05 dB.

7. On the analyzer, press **PEAK SEARCH**, **MARKER DELTA**.

8. Set the HP 3335A AMP TD INCR to 2 dB.

9. On the HP 3335A, press **AMPLITUDE** and **INCR** (down) to step the HP 3335A to the next lowest nominal amplitude listed in Table 3-8. Record the MKR Δ amplitude reading in Table 3-8. The MKR amplitude should be within the limits shown.

10. Repeat step 9 for the remaining HP 3335A Nominal Amplitudes listed in Table 3-8.

11. For each MKR Δ reading, subtract the previous MKR Δ reading. Add 2 dB to the number and record the result as the incremental error in Table 3-8. The incremental error should not exceed 0.2 dB/2 dB.

**Table 3-8. Incremental Error, Log Mode**

<table>
<thead>
<tr>
<th>HP 3335A Nominal Amplitude</th>
<th>dB from Ref Level (nominal)</th>
<th>MKR Δ Reading</th>
<th>Incremental Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min (dB)</td>
<td>Actual (dB)</td>
<td>Max (dB)</td>
</tr>
<tr>
<td>+10 dBm</td>
<td>0</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>+8 dBm</td>
<td>-2</td>
<td>-2.2</td>
<td></td>
</tr>
<tr>
<td>+6 dBm</td>
<td>-4</td>
<td>-4.4</td>
<td></td>
</tr>
<tr>
<td>+4 dBm</td>
<td>-6</td>
<td>-6.6</td>
<td></td>
</tr>
<tr>
<td>+2 dBm</td>
<td>-8</td>
<td>-8.75</td>
<td></td>
</tr>
<tr>
<td>0 dBm</td>
<td>-10</td>
<td>-10.75</td>
<td></td>
</tr>
</tbody>
</table>

**Scale Fidelity, Log Mode**

12. Set the HP 3335A AMP TD INCR to 10 dB.


14. One the HP 3335A, press **INCR** (down) to step the HP 3335A to the next lowest nominal amplitude listed in Table 3-9. Record the MKR Δ amplitude reading in Table 3-9. The MKR amplitude should be within the limits shown.
7. Scale Fidelity

15. Repeat step 14 for the remaining HP 3335A Nominal Amplitudes listed in Table 3-9.

<table>
<thead>
<tr>
<th>HP 3335A Nominal Amplitude</th>
<th>dB From Ref Level (nominal)</th>
<th>MKR Δ Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>+10 dBm</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>0 dBm</td>
<td>-10</td>
<td>-10.75</td>
</tr>
<tr>
<td>-10 dBm</td>
<td>-20</td>
<td>-20.75</td>
</tr>
<tr>
<td>-20 dBm</td>
<td>-30</td>
<td>-30.75</td>
</tr>
<tr>
<td>-30 dBm</td>
<td>-40</td>
<td>-40.75</td>
</tr>
<tr>
<td>-40 dBm</td>
<td>-50</td>
<td>-50.75</td>
</tr>
<tr>
<td>-50 dBm</td>
<td>-60</td>
<td>-60.75</td>
</tr>
<tr>
<td>-60 dBm</td>
<td>-70</td>
<td>-71.00</td>
</tr>
</tbody>
</table>

Linear Scale

16. Set the HP 3335A controls as follows:
   AMPLITUDE ......................................................... +10 dBm
   AMPTD INCR ...................................................... 0.05 dB

17. Set the 355C to 0 dB attenuation.


   Option 001: Press MORE 1 of 2, INPUT Z 50 75 (50).

   Set the controls as follows:
   FREQUENCY ......................................................... 50 MHz
   SPAN .............................................................. 10 MHz

19. On the analyzer, press the following keys:

   [PEAK SEARCH] [SIGNAL TRACK] (ON)
   [SPAN] 50 kHz

   After the auto zoom procedure is finished, set the resolution bandwidth to 3 kHz and video bandwidth to 30 Hz.

20. If necessary, adjust the HP 355C attenuation until the MKR reads approximately 223.6 mV.

3-28 Verifying Specified Operation for the HP 8590B
It may be necessary to decrease the resolution of the amplitude increment of the HP 3335A to 0.01 dB to obtain a MKR reading of 223.6 mV ±0.4 mV.

21. On the HP 3335A, press **AMPLITUDE** and use the INCR keys to adjust the amplitude until the analyzer MKR amplitude reads 223.6 mV ±0.4 mV.

22. On the analyzer, press **PEAK SEARCH**.

23. Set the HP 3335A amplitude increment to 3 dB.

24. On the HP 3335A, press **AMPLITUDE** and **INCR ▼** (step-down key) to step the HP 3335A to the next lowest Nominal Amplitude listed in Table 3-10.

   Record the MKR amplitude reading in Table 3-10. The MKR amplitude should be within the limits shown.

25. Repeat step 9 for the remaining HP 3335A Nominal Amplitudes listed in Table 3-10.

### Table 3-10. Scale Fidelity, Linear Mode

<table>
<thead>
<tr>
<th>HP 3335A Nominal Amplitude</th>
<th>% of Ref Level (nominal)</th>
<th>MKR Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min (mV)</td>
<td>Actual (mV)</td>
</tr>
<tr>
<td>+10 dBm</td>
<td>100</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>+7 dBm</td>
<td>70.7</td>
<td>150.98</td>
</tr>
<tr>
<td>+4 dBm</td>
<td>50</td>
<td>104.69</td>
</tr>
<tr>
<td>+1 dBm</td>
<td>35.48</td>
<td>72.22</td>
</tr>
<tr>
<td>−2 dBm</td>
<td>25</td>
<td>48.79</td>
</tr>
</tbody>
</table>

Log to Linear Switching

26. Set the HP 355D to 10 dB attenuation and the HP 355C to 0 dB attenuation.

27. Set the synthesizer controls as follows:

   FREQUENCY ......................................................... 50 MHz
   AMPLITUDE .......................................................... +6 dBm

28. On the spectrum analyzer, press **PRESET** and wait for the preset to complete. Set the control as follows:

   CENTER FREQ ......................................................... 50 MHz
   SPAN ................................................................. 10 MHz
   RES BW .............................................................. 300 kHz

7. Scale Fidelity

30. Press **AMPLITUDE**, SCALE LOG LIN (LIN), MORE 1 of 2, AMPTD UNITS, dBm to change the scale to linear and set the amplitude units to dBm.

31. If the MKR Δ amplitude is less than 0 dB, record the MKR Δ amplitude reading here. The absolute value of the reading should be less than 0.25 dB. If the MKR Δ amplitude is greater than 0 dB, continue with step 32 below.

   Log-to-Lin Switching Uncertainty ________ dB

32. Press **MKR - >**, MKR -> REF LVL, **PEAK SEARCH**, and MARKER DELTA.

33. Press **AMPLITUDE**, and SCALE LOG LIN to change the scale to LOG 10 dB/DIV.

34. Record the MKR Δ amplitude reading here. The absolute value of the reading should be less than 0.25 dB.

   Log-to-Lin Switching Uncertainty ________ dB
8. Input Attenuator Accuracy

Specification

Range:
0 to 60 dB in 10 dB steps.

Accuracy:
20 to 50 dB ±0.5 dB at 50 MHz referred to 10 dB attenuation.
60 dB ±0.75 dB at 50 MHz referred to 10 dB attenuation.

Description

The input attenuator’s switching accuracy is tested over the full 0 dB to 60 dB range. Switching accuracy is referenced to the 10 dB attenuator setting. The attenuator in the synthesizer/level generator is used as the measurement standard.

Equipment

Synthesizer/Level Generator .............................................. HP 3335A
Step Attenuator, 1 dB steps .............................................. HP 355C
Step Attenuator, 10 dB steps ............................................. HP 355D

Cables

BNC Cable, 120 cm (48 in) (2 required) ............................... HP 10503A

Adapters

Type N (m) to BNC (f) .................................................. 1250-1476
Type BNC (m) to BNC (m) .............................................. 1250-0216

Additional Equipment for Option 001

Minimum Loss Adapter .................................................... HP 11852B
Adapter Type N (f) to BNC (m), 75Ω .................................. 1250-1534

Procedure

1. Connect the equipment as shown in Figure 3-8. Set the HP 355D to 20 dB attenuation and the HP 355C to 0 dB attenuation. Option 001: Connect the minimum loss adapter to the INPUT 75Ω using adapters, and set the HP 355D to 10 dB attenuation.
8. Input Attenuator Accuracy

![Diagram of test setup](image)

**Figure 3-8. Input Attenuator Accuracy Test Setup**

2. Set the HP 3335A controls as follows:

- **FREQUENCY** .................................................. 50 MHz
- **AMPLITUDE** .................................................. -50 dBm
- **AMPTD INCR** .................................................. 10 dB
- **OUTPUT** ..................................................... 50Ω

3. On the analyzer, press **PRESET** and wait for the preset to finish. Set the controls as follows:

   **Option 001**: Press **AMPLITUDE**, MORE 1 of 2, AMPTD UNITS, dBm.

   - **CENTER FREQUENCY** .................................. 50 MHz
   - **SPAN** .................................................. 10 MHz
   - **REF LEVEL** ........................................... -70 dBm
   - **LOG dB/DIV** ........................................... 1 dB
   - **RES BW** .............................................. 10 kHz

4. On the analyzer, press **PEAK SEARCH**, **SIGNAL TRACK** (ON), **SPAN**, 100 kHz. Set the video bandwidth to 100 Hz.

5. Set the HP 355C attenuation to place the signal peak two to three dB (two to three divisions) below the reference level.

6. On the analyzer, press the following keys:

   - **SGL SWP** **PEAK SEARCH** **MARKER DELTA**

7. Set the HP 3335A Amplitude to -60 dBm as indicated in row 2 of Table 3-11.

---

3-32 Verifying Specified Operation for the HP 8590B
8. On the analyzer, press [SGL SWP], and wait for a new sweep to finish. Press [PEAK SEARCH] and record the MKR Δ amplitude in Table 3-11 as the Actual MKR Δ Reading. The MKR Δ amplitude reading should be within the limits shown.

9. Repeat step 8 using the HP 3335A Amplitude and HP 8590B reference level and attenuation settings listed in Table 3-11.

<table>
<thead>
<tr>
<th>HP 3335A Amplitude (dBm)</th>
<th>HP 8590B Reference Level (dBm)</th>
<th>HP8590B Attenuation (dB)</th>
<th>MKR Δ Min (dB)</th>
<th>MKR Δ Actual (dB)</th>
<th>MKR Δ Max (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50</td>
<td>-70</td>
<td>10</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>-40</td>
<td>-60</td>
<td>20</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-30</td>
<td>-50</td>
<td>30</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-20</td>
<td>-40</td>
<td>40</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-10</td>
<td>-30</td>
<td>50</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>0</td>
<td>-20</td>
<td>60</td>
<td>-0.75</td>
<td></td>
<td>+0.75</td>
</tr>
</tbody>
</table>
9. Reference Level Accuracy

Specification

Accuracy referred to \(-20\) dBm reference level:

\[
\begin{align*}
0 \text{ to } & -59.9 \text{ dBm } \pm (0.5 \text{ dB } + \text{ input attenuator accuracy at } 50 \text{ MHz}). \\
-60 \text{ to } & -115 \text{ dBm } \pm (1.25 \text{ dB } + \text{ input attenuator accuracy at } 50 \text{ MHz}).
\end{align*}
\]

Related Adjustment

A12 Cal Attenuator Error Correction.

Description

A 50 MHz CW signal is applied to the INPUT 50Ω of the analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The source’s internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as \(-90\) dBm (with 10 dB ATTEN) since lower reference levels are a function of the analyzer’s microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

Equipment

- Synthesizer/Level Generator ........................................... HP 3335A
- Step Attenuator, 1 dB steps ................................................. HP 355C
- Step Attenuator, 10 dB steps ................................................ HP 355D

Cable

- BNC Cable 122 cm (48 in) (2 required) ............................... HP 10503A

Adapter

- Type N (m) to BNC (f) ..................................................... 1250-1476
- Type BNC (m) to BNC (m) .................................................. 1250-0216

Additional Equipment for Option 001

- Minimum Loss Adapter ..................................................... HP 11852B
- Adapter Type N (f) to BNC (m), 75Ω .................................. 1250-1534
9. Reference Level Accuracy

Procedure

Log Scale

1. Set the HP 3335A controls as follows:
   
   FREQUENCY ........................................ 50 MHz
   AMPLITUDE ........................................ -10 dBm
   AMPTD INCR ....................................... 10 dB
   OUTPUT ........................................... 50Ω

2. Connect the equipment as shown in Figure 3-9. Set the HP 355D to 10 dB attenuation and the 355C to 0 dB attenuation.
   
   Option 001: Connect the minimum loss adapter to the INPUT 75Ω (using adapters), and set the HP 355D to 0 dB attenuation.

![Figure 3-9. Reference Level Accuracy Test Setup](image)

3. Press \[ \text{Preset} \] on the analyzer and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY ................................ 50 MHz
   SPAN .............................................. 10 MHz
   PEAK SEARCH
   SIGNAL TRACK .................................... ON
   SPAN .............................................. 50 kHz

   Option 001: Press \[ \text{Amplitude} \], MORE 1 of 2, AMPTD UNITS, dBm.
9. Reference Level Accuracy

Set the controls as follows:

REF LEVEL ................................................................. −20 dBm
LOG dB/DIV ................................................................. 1 dB
RES BW ................................................................. 3 kHz
VIDEO BW ................................................................. 30 Hz

4. Set the HP 355C attenuation to place the signal peak one to two dB (one to two divisions) below the reference level.

5. On the analyzer, press the following keys:

[SGL SWP] PEAK SEARCH MARKER DELTA.

6. Set the HP 3335A Amplitude and HP 8590B reference level according to Table 3-12. At each setting, press [SGL SWP] PEAK SEARCH on the analyzer. Record the MKR Δ amplitude reading in Table 3-12. The MKR Δ reading should be within the limits shown.

<table>
<thead>
<tr>
<th>HP 3335A Amplitude (dBm)</th>
<th>HP 8590B Ref Level (dBm)</th>
<th>MKR Δ Reading</th>
<th>Min (dB)</th>
<th>Actual (dB)</th>
<th>Max (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>−10</td>
<td>−20</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>−10</td>
<td>−0.5</td>
<td></td>
<td>+0.5</td>
<td></td>
</tr>
<tr>
<td>+10</td>
<td>0</td>
<td>−0.5</td>
<td></td>
<td>+0.5</td>
<td></td>
</tr>
<tr>
<td>−20</td>
<td>−30</td>
<td>−0.5</td>
<td></td>
<td>+0.5</td>
<td></td>
</tr>
<tr>
<td>−30</td>
<td>−40</td>
<td>−0.5</td>
<td></td>
<td>+0.5</td>
<td></td>
</tr>
<tr>
<td>−40</td>
<td>−50</td>
<td>−0.5</td>
<td></td>
<td>+0.5</td>
<td></td>
</tr>
<tr>
<td>−50</td>
<td>−60</td>
<td>−1.25</td>
<td></td>
<td>+1.25</td>
<td></td>
</tr>
<tr>
<td>−60</td>
<td>−70</td>
<td>−1.25</td>
<td></td>
<td>+1.25</td>
<td></td>
</tr>
<tr>
<td>−70</td>
<td>−80</td>
<td>−1.25</td>
<td></td>
<td>+1.25</td>
<td></td>
</tr>
<tr>
<td>−80</td>
<td>−90</td>
<td>−1.25</td>
<td></td>
<td>+1.25</td>
<td></td>
</tr>
</tbody>
</table>

Linear Scale

7. Set the HP 3335A Amplitude to −10 dBm.
8. Set the 355C to 0 dB attenuation.
9. Set the analyzer controls as follows:

REF LEVEL ................................................................. −20 dBm
AMPLITUDE SCALE ....................................................... LINEAR
9. Reference Level Accuracy

Press the following analyzer keys:

AMPLITUDE MORE 1 of 2 AMP TD UNITS dBm
SWEEP SWEEP CONT SGL (CONT).

Press MKR, MARKERS OFF.

10. Set the HP 355C attenuation to place the signal peak one to two divisions below the reference level.

11. On the analyzer, press SGL SWP, PEAK SEARCH, MARKER DELTA.

12. Set the HP 3335A Amplitude and analyzer reference level according to Table 3-13. At each setting, press SGL SWP, PEAK SEARCH on the analyzer. Record the MKR $\Delta$ amplitude reading in Table 3-13. The MKR $\Delta$ reading should be within the limits shown.

Table 3-13. Reference Level Accuracy, Linear Mode

<table>
<thead>
<tr>
<th>HP 3335A Amplitude (dBm)</th>
<th>HP 8590B Ref Level (dBm)</th>
<th>MKR $\Delta$ Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>-20</td>
<td>0 (Ref) 0 (Ref) 0 (Ref)</td>
</tr>
<tr>
<td>0</td>
<td>-10</td>
<td>-0.5</td>
</tr>
<tr>
<td>+10</td>
<td>0</td>
<td>-0.5</td>
</tr>
<tr>
<td>-20</td>
<td>-30</td>
<td>-0.5</td>
</tr>
<tr>
<td>-30</td>
<td>-40</td>
<td>-0.5</td>
</tr>
<tr>
<td>-40</td>
<td>-50</td>
<td>-0.5</td>
</tr>
<tr>
<td>-50</td>
<td>-60</td>
<td>-1.25</td>
</tr>
<tr>
<td>-60</td>
<td>-70</td>
<td>-1.25</td>
</tr>
<tr>
<td>-70</td>
<td>-80</td>
<td>-1.25</td>
</tr>
<tr>
<td>-80</td>
<td>-90</td>
<td>-1.25</td>
</tr>
</tbody>
</table>

13. In Table 3-12, locate the Actual MKR $\Delta$ Amplitude Reading for the 0 to -50 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

Log Mode Reference Level Accuracy _________ dB
(0 to -50 dBm reference level settings)
9. Reference Level Accuracy

14. In Table 3-12, locate the Actual MKR Δ Amplitude Reading for the 0 to −90 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

Log Mode Reference Level Accuracy _________ dB
(0 to −90 dBm reference level settings)

15. In Table 3-13, locate the Actual MKR Δ Amplitude Reading for the 0 to −50 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

Linear Mode Reference Level Accuracy _________ dB
(0 to −50 dBm reference level settings)

16. In Table 3-13, locate the Actual MKR Δ Amplitude Reading for the 0 to −90 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

Linear Mode Reference Level Accuracy _________ dB
(0 to −90 dBm reference level settings)
10. Resolution Bandwidth Switching Uncertainty

Specification

±0.4 dB for 3 kHz to 3 MHz RES BW settings, referred to 3 kHz RES BW setting.
±0.5 dB for 1 kHz to 3 MHz RES BW settings, referred to 3 kHz RES BW setting.

Related Adjustments

Crystal and LC Bandwidth Adjustment.

Description

For this test, the CAL OUT signal is used as the input signal. An amplitude reference is taken with the RES BW set to 1 kHz using the marker delta function. The RES BW is changed to settings between 3 MHz and 1 kHz and the amplitude variation is measured at each setting and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

Equipment

Cable

BNC, 23 cm (9 in) ......................................................... HP 10502A

Adapter

Type N (m) to BNC (f) ..................................................... 1250-1476

Additional Equipment for Option 001

BNC Cable, 75Ω, 30 cm (12 in) ...................................... 5062-6452

Procedure

1. Connect the CAL OUT to the spectrum analyzer input using the BNC cable and adapter, as shown in Figure 3-10. Option 001: Use the 75Ω cable and omit the adapter.

Figure 3-10. Resolution Bandwidth Switching Uncertainty Test Setup
10. Resolution Bandwidth Switching Uncertainty

2. Press **Preset** on the analyzer and wait for the preset to finish. Set the controls as follows:

   *(Option 001: Press **Amplitude**, MORE 1 of 2, AMPTD UNITS, dBm.)*

   CENTER FREQUENCY ........................................... 300 MHz
   SPAN ....................................................... 10 MHz

Press **Peak Search**, **Signal Track** (ON).

Set the controls as follows:

   SPAN ................................................................. 50 kHz
   REF LEVEL .......................................................... −20 dBm
   LOG dB/DIV ......................................................... 1 dB
   RES BW ........................................................... 3 kHz
   VIDEO BW ......................................................... 1 kHz

3. Press **Amplitude** and use the knob to adjust the reference level until the signal appears one division below the reference level. Press **Peak Search**, **Marker Delta**, **Signal Track** (ON).

4. Set the RES BW and span according to Table 3-14.

5. Press **Peak Search** then record the MKR Δ TRK amplitude reading in Table 3-14.

   The amplitude reading should be within the limits shown.

6. Repeat steps 4 and 5 for each of the remaining resolution bandwidth and span settings listed in Table 3-14.

### Table 3-14. Resolution Bandwidth Switching Uncertainty

<table>
<thead>
<tr>
<th>RES BW Setting</th>
<th>Span Setting</th>
<th>MKR Δ TRK Amplitude Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min (dB)</td>
</tr>
<tr>
<td>3 kHz</td>
<td>50 kHz</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td>−0.5</td>
</tr>
<tr>
<td>10 kHz</td>
<td>50 kHz</td>
<td>−0.4</td>
</tr>
<tr>
<td>30 kHz</td>
<td>500 kHz</td>
<td>−0.4</td>
</tr>
<tr>
<td>100 kHz</td>
<td>500 kHz</td>
<td>−0.4</td>
</tr>
<tr>
<td>300 kHz</td>
<td>5 MHz</td>
<td>−0.4</td>
</tr>
<tr>
<td>1 MHz</td>
<td>10 MHz</td>
<td>−0.4</td>
</tr>
<tr>
<td>3 MHz</td>
<td>10 MHz</td>
<td>−0.4</td>
</tr>
</tbody>
</table>
11. Calibrator Amplitude and Frequency Accuracy

Specification
Amplitude:
\[-20 \text{ dBm} \pm 0.4 \text{ dB} \ (\text{Option 001: } +28.75 \text{ dBmV} \pm 0.4 \text{ dB}.)\]

Frequency:
\[300 \text{ MHz} \pm 30 \text{ kHz}.\]

Related Adjustment
Calibrator Amplitude Adjustment.
Third Converter, 600 MHz Frequency Adjustment.

Description
This test measures the accuracy of the analyzer's CAL OUT signal. The first part of the test characterizes the insertion loss of a Low Pass Filter (LPF) and 10 dB attenuator. The harmonics of the CAL OUT signal are suppressed with the LPF before the amplitude accuracy is measured using a power meter. A frequency counter is used to measure the frequency accuracy of the CAL OUT signal and the measured frequency is compared to the specification.

Equipment
Frequency Counter ........................................... HP 5343A
Low Pass Filter .............................................. 0955-0455
Synthesized Sweeper ........................................ HP 8340A/B
Measuring Receiver (used as a power meter) ............. HP 8902A
Power Meter .................................................. HP 436A
Low Power Sensor with a 50 MHz reference attenuator ... HP 8484A
Power Sensor ................................................ HP 8482A
Power Splitter ............................................... HP 11667A
10 dB Attenuator, Type N (m to f), dc-12.4 GHz Opt 010 .... HP 8491A

Cables
BNC, 121 cm (48 in) ........................................ HP 10503A
Type N, 152 cm (60 in) ..................................... HP 11500D

Adapters
APC 3.5 (f) to Type N (f) .................................. 1250-1745
Type N (f) to BNC (m) (2 required) ....................... 1250-1477
Type N (m) to BNC (f) ..................................... 1250-1476
11. Calibrator Amplitude and Frequency Accuracy

Additional Equipment for Option 001

Cable, BNC, 75Ω ...................................................... 15525-80010
Adapter, Type N (f) to Type N (f), 75Ω ......................... 1250-1529
Minimum Loss Adapter ........................................ HP 11852B
Mechanical Adapter, 75Ω to 50Ω .................................. 1250-0597
Adapter, Type N (f) 75Ω to BNC (m) 75Ω ......................... 1250-1534

Procedure

LPF, Attenuator and Adapter Insertion Loss Characterization

1. Zero and calibrate the HP 8902A and HP 8482A in LOG mode as described in the HP 8902A Operation Manual.

2. Zero and calibrate the HP 436A and HP 8484A, as described in the HP 436A Operation Manual.

Caution

Do not attempt the calibrate the HP 8484A without the reference attenuator or damage to the HP 8484A will occur.

3. Press [INSTR PRESET] on the HP 8340A/B. Set the controls as follows:
   CW ................................................................. 300 MHz
   POWER LEVEL ................................................... −15 dBm

4. Connect the equipment as shown in Figure 3-11. Connect the HP 8484A directly to the power splitter (bypass the LPF, attenuator and adapters).

Note

Allow the power sensors to settle before proceeding.

5. On the HP 8902A, press [RATIO] mode. Power indication should be zero dB.

6. On the HP 436A, press the dB REF mode key. Power indication should be zero dB.
7. Connect the LPF, attenuator and adapters as shown in Figure 3-11.

8. Record the HP 8902A reading in dB. This is the relative error due to mismatch.

Mismatch Error ________ dB

9. Record the HP 436A reading in dB. This is the relative uncorrected insertion loss of the LPF, attenuator and adapters.

Uncorrected Insertion Loss ________ dB
11. Calibrator Amplitude and Frequency Accuracy

10. Subtract the Mismatch Error (step 8) from the Uncorrected Insertion Loss (step 9). This is the Corrected Insertion Loss.

Corrected Insertion Loss ________ dB

Example: If the Mismatch Error is +0.3 dB and the Uncorrected Insertion Loss is −10.2 dB, subtract the mismatch error from the insertion loss to yield a corrected reading of −10.5 dB.

Calibrator Amplitude Accuracy

11. Connect the equipment as shown in Figure 3-12. The analyzer should be positioned so that the setup of the adapters, LPF and attenuator do not bind. It may be necessary to support the center of gravity of the devices.

![Figure 3-12. Calibrator Amplitude Accuracy Test Setup](image)

12. On the HP 436A, press the dBm mode key. Record the HP 436A Reading in dBm.

HP 436A Reading ________ dBm

13. Subtract the Corrected Insertion Loss (step 10) from the HP 436A Reading (step 12) and record as the CAL OUT power. The CAL OUT should be −20 dBm ±0.4 dB.

CAL OUT Power = HP 436A Reading − Corrected Insertion Loss
11. Calibrator Amplitude and Frequency Accuracy

Example: If the Corrected Insertion Loss is \(-10.0\) dB, and the HP 8902A reading is 
\(-30\) dB, then \(-30\) dB \(-\) \((-10.0\) dB\) \(= \) \(-20\) dB

\[
\text{CAL OUT Power} \quad \text{_______ dBm}
\]

Option 001: The CAL OUT power measured on 75\(\Omega\) instruments will be the same as 50\(\Omega\) instruments. To convert from dBm to dBmV use the following equation.

\[
d\text{BmV} = d\text{Bm} + 48.75 \text{ dB}
\]

Example: \(-20 + 48.75 = 28.75\).

\[
\text{CAL OUT Power} \quad \text{_______ dBmV}
\]

Calibrator Frequency Accuracy

14. Connect the equipment as shown in Figure 3-13.

\(\text{(Option 001: Use a 75\(\Omega\) cable instead of a 50\(\Omega\) cable.)}\)

\[\text{SPECTRUM ANALYZER}\]
\[\text{FREQUENCY COUNTER}\]

\[\text{CAL OUT}\]

\[\text{10 GHz-500 MHz INPUT}\]

\[\text{10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH}\]

\[\text{50\(\Omega\)}\]

\[\text{Midrange}\]

\[\text{SAMPLE RATE}\]

\[\text{50\(\Omega\)/1 M\(\Omega\) SWITCH}\]

\[\text{15 Hz-500 MHz/500 MHz-26.5 GHz SWITCH}\]

\[\text{Set the HP 5343A controls as follows:}\]

15. Set the HP 5343A controls as follows:

\[
\begin{align*}
\text{SAMPLE RATE} & \quad \text{__________________________} \quad \text{Midrange} \\
\text{50\(\Omega\)/1 M\(\Omega\) SWITCH} & \quad \text{__________________________} \quad \text{50\(\Omega\)} \\
\text{10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH} & \quad \text{__________________________} \quad \text{10 Hz-500 MHz}
\end{align*}
\]

16. Wait for the frequency counter to settle. This may take two or three gate times.
11. Calibrator Amplitude and Frequency Accuracy

17. Read the frequency counter display. The frequency should be within the following limits:

CAL OUT Frequency: 299.97 MHz ≤ _______ ≤ 300.03 MHz
12. Frequency Response

Specification

With 10 dB INPUT ATTEN setting:

Absolute referred to 300 MHz
9 kHz to 1.8 GHz (Option 001: 1 MHz to 1.8 GHz) <±1.5 dB.

Relative flatness referred to midpoint between maximum and minimum peak excursions
9 kHz to 1.8 GHz (Option 001: 1 MHz to 1.8 GHz) <±1.0 dB.

Related Adjustment

Frequency Response Error Correction.

Description

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the analyzer. The synthesized sweeper's power level is adjusted at 300 MHz to place the displayed signal at the analyzer's center horizontal graticule line. The measuring receiver, used as a power meter, is placed in RATIO mode. At each new sweeper frequency and analyzer center frequency setting, the sweeper's power level is adjusted to place the signal at the center horizontal graticule line. The measuring receiver displays the inverse of the frequency response relative to 300 MHz (CAL OUT frequency).

Testing the flatness of Option 001, INPUT 75Ω, is accomplished by first characterizing the system flatness.

Equipment

Synthesized Sweeper ........................................ HP 8340A/B
Measuring Receiver (used as a power meter) ....................... HP 8902A
Synthesizer-Level Generator ...................................... HP 3335A
Power Sensor ...................................................... HP 8482A
Power Splitter ..................................................... HP 11667A

Adapters

Type N (f) to APC 3.5 (f) ........................................ 1250-1745
Type N (m) to Type N (m) ........................................ 1250-1475

Cables

BNC, 122 cm (48 in) ................................................. HP 10503A
Type N, 183 cm (72 in) ............................................. HP 11500A
12. Frequency Response

Additional Equipment for Option 001

- Power Meter ................................................................. HP 436A
- Power Sensor ............................................................... HP 8483A
- Cable, BNC, 120 cm (48 in) 75Ω .................................. 15525-80010
- Adapter, Type N (f) 75Ω to Type N (m) 50Ω ....................... 1250-0597
- Adapter Type N (m) to BNC (m), 75Ω ............................. 1250-1533

Procedure for System Characterization, Option 001 Only

1. Zero and calibrate the HP 8902A and HP 8482A as described in the HP 8902A Operation Manual.


3. Press INSTR PRESET on the HP 8340A/B. Set the HP 8340A/B controls as follows:
   - CW ................................................................. 50 MHz
   - FREQ STEP .................................................. 50 MHz
   - POWER LEVEL .............................................. 5 dBm

4. Connect the equipment as shown in Figure 3-14.

![Synthesized Sweeper](image)

![Measuring Receiver](image)

![Power Meter](image)

**Figure 3-14. System Characterization Test Setup (Option 001)**

5. Adjust the HP 8340A/B power level for a 0 dBm reading on the HP 8902A.

6. Record the HP 436A reading in Column 4 of Table 3-15, taking into account the Cal Factors of both the HP 8482A and the HP 8483A.

7. On the HP 8340A/B, press [CW] and [step-up key], to step through the remaining frequencies listed in Table 3-15.

   At each new frequency repeat steps 5 and 6, entering each power sensor’s Cal Factor into the respective power meter.

3-48 Verifying Specified Operation for the HP 8590B
12. Frequency Response

Procedure

1. Zero and calibrate the HP 8902A and HP 8482A in log mode as described in the HP 8902A Operation Manual.

2. Connect the equipment as shown in Figure 3-15. Option 001 only: Refer to Figure 3-16.

3. Press [INSTR PRESET] on the HP 8340A/B. Set the HP 8340A/B controls as follows:
   - CW ................................................................. 300 MHz
   - FREQ STEP ..................................................... 50 MHz
   - POWER LEVEL ................................................ -8 dBm

Figure 3-15. Frequency Response Test Setup, ≥50 MHz

Figure 3-16. Frequency Response Test Setup, ≥50 MHz, for Option 001
12. Frequency Response

4. On the analyzer, press [PRESET] and wait for the preset to finish. Press [FREQUENCY]. Set the analyzer’s controls as follows:

   CENTER FREQUENCY ................................................. 300 MHz
   CF STEP ................................................................. 50 MHz
   SPAN ................................................................. 10 MHz

   (Option 001: Press [AMPLITUDE], MORE 1 of 2, AMPTD UNITS, dBm.)

   REF LEVEL ......................................................... −10 dBm
   LOG dB/DIV ........................................................... 1 dB
   RES BW ............................................................. 1 MHz
   VIDEO BW ......................................................... 3 kHz

5. On the analyzer, press [PEAK SEARCH], [SIGNAL TRACK] (ON).

6. Adjust the HP 8340A/B power level for a MKR-TRK amplitude reading of −14 dBm ±0.05 dB.

7. Set the sensor Cal Factor on the HP 8902A and then press [RATIO] on the HP 8902A.

8. Set the HP 8340A/B CW to 50 MHz.

9. Set the analyzer center frequency to 50 MHz.

10. Adjust the HP 8340A power level for an analyzer MKR-TRK amplitude reading of −14 dBm ±0.05 dB.

11. Set the sensor Cal Factor on the HP 8902A and record the negative of the power ratio here and in Table 3-15.

   Negative of HP 8902A Reading at 50 MHz _______ dB

12. Set the HP 8340A/B CW to 100 MHz.

13. Set the analyzer center frequency to 100 MHz.

14. Adjust the HP 8340A/B power level for an analyzer MKR-TRK amplitude reading of −14 dBm ±0.05 dB.

15. Set the sensor Cal Factor on the HP 8902A and record the negative of the power ratio displayed on the HP 8902A in Table 3-15 as the Error Relative to 300 MHz.

16. On the HP 8340A/B, press [CW], and [△] (step-up key), and on the analyzer, press [FREQUENCY], and [△] (step-up key), to step through the remaining frequencies listed in Table 3-15. At each new frequency repeat steps 14 through 16, entering the power sensor’s Cal Factor into the HP 8902A as indicated in Table 3-15.

   Frequency Response, (≤50 MHz)

17. Using a cable, connect the HP 3335A directly to the INPUT 50Ω. Refer to Figure 3-17.

   (Option 001: Using a 75Ω cable, connect the HP 3335A from the 75Ω OUTPUT to the INPUT 75Ω. Set the HP 3335A 50–75Ω switch to the 75Ω position.)

3-50  Verifying Specified Operation for the HP 8590B
12. Frequency Response

Figure 3-17. Frequency Response Test Setup (<50 MHz)

Set the HP 3335A controls as follows:

- **FREQUENCY**: 50 MHz
- **AMPLITUDE**: -15 dBm
- **AMPTD INCR**: 0.05 dB

18. On the analyzer press the following keys:

- **SPAN**: 10 MHz
- **FREQUENCY**: 50 MHz
- **PEAK SEARCH**: SIGNAL TRACK (ON)
- **SPAN**: 100 kHz

Wait for AUTO ZOOM to finish. Press the following keys:

- **BW**: 3 kHz
- **VID BW AUTO MAN 1 kHz**

19. Adjust the HP 3335A Amplitude until the MKR-TRK reads -14 dBm. This corresponds to the amplitude at 50 MHz recorded in step 11. Record the HP 3335A amplitude:

   HP 3335A Amplitude Setting (50 MHz) ________ dBm

20. On the analyzer, press **MARKER DELTA**, **SIGNAL TRACK** (ON).

21. Set the HP 3335A frequency to 20 MHz.

22. On the HP 8590B, press the following keys:

- **FREQUENCY**: CF STEP AUTO MAN 30 MHz
- **FREQUENCY**: ▼ (step-down key)

23. Adjust the HP 3335A amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the HP 3335A amplitude setting in Table 3-16 as the HP 3335A amplitude at 20 MHz.

24. Repeat steps 21 through 23 for each of the frequencies listed in Table 3-16. Change the analyzers's center frequency step size to the relative frequency change for each new frequency.
12. Frequency Response

frequency (for example, use 10 MHz CF STEP size when changing from 20 MHz to 10 MHz). *Option 001*: Do not test below 1 MHz.

---

**Note**

When measuring the 50 kHz center frequency flatness and below, there will be two signals on screen, the LO feedthrough and the signal from the HP 3335A. Ensure that the marker is on the signal from the HP 3335A (to the right of the LO feed through).

---

25. For each of the frequencies in Table 3-16, subtract the HP 3335A Amplitude Reading (column 2) from the HP 3335A Amplitude setting (50 MHz) recorded in step 19. Record the result as the Response Relative to 50 MHz (column 3) of Table 3-16.

26. Add to each of the Response Relative to 50 MHz entries in Table 3-16 the HP 8902A Reading at 50 MHz recorded in step 11. Record the results as the Response Relative to 300 MHz (column 4) in Table 3-16.

27. *Option 001*: Starting with the error at 50 MHz, subtract Column 4 (System Error) to Column 2 (Error Relative to 300 MHz) and record the result in Column 5 (Corrected Error Relative to 300 MHz).

---

**Test Results**

28. Frequency Response:

a. Enter most positive number from Table 3-16, column 4: __________ dB
b. Enter most positive number from Table 3-15, column 2  
   (*Option 001*: Use column 5)
c. Enter more positive of numbers from (a) and (b): __________ dB
d. Enter the most negative number from Table 3-16, column 4: __________ dB
e. Enter most negative number from Table 3-15, column 2: __________ dB  
   (*Option 001*: Use column 5)
f. Enter more negative of numbers from (d) and (e): __________ dB
g. Subtract (f) from (c): __________ dB
   The result should be less than 2.0 dB.
h. The absolute values in (c) and (f) should be less than 1.5 dB.
Table 3-15. Frequency Response Errors

<table>
<thead>
<tr>
<th>Column 1 Frequency (MHz)</th>
<th>Column 2 Error Relative to 300 MHz (dB)</th>
<th>Column 3 Sensor CAL FACTOR Frequency (GHz)</th>
<th>Column 4 System Error (dB)</th>
<th>Column 5 (Option 001) Corrected Error Relative to 300 MHz (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td></td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>0.1</td>
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<td>150</td>
<td></td>
<td>0.1</td>
<td></td>
<td></td>
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<tr>
<td>200</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 (Ref)</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>350</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
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<td>0.3</td>
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<td>500</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td></td>
<td>1.0</td>
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<tr>
<td>750</td>
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<td>1.0</td>
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<tr>
<td>800</td>
<td></td>
<td>1.0</td>
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</tbody>
</table>
12. Frequency Response

Table 3-15. Frequency Response Errors (continued)

<table>
<thead>
<tr>
<th>Column 1 Frequency (MHz)</th>
<th>Column 2 Error Relative to 300 MHz (dB)</th>
<th>Column 3 Sensor CAL FACTOR Frequency (GHz)</th>
<th>Column 4 System Error (dB)</th>
<th>Column 5 (Option 001) Corrected Error Relative to 300 MHz (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>850</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
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<tr>
<td>900</td>
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<td>1.0</td>
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<td>950</td>
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<td>1.0</td>
<td></td>
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<tr>
<td>1000</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1050</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
<td>1.0</td>
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<td></td>
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<tr>
<td>1150</td>
<td></td>
<td>1.0</td>
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</tr>
<tr>
<td>1200</td>
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<td></td>
</tr>
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<td>1.0</td>
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</tr>
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<td>1300</td>
<td></td>
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</tr>
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<td></td>
<td>1.0</td>
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<td></td>
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<tr>
<td>1500</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1550</td>
<td></td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1650</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1700</td>
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<td></td>
</tr>
<tr>
<td>1750</td>
<td></td>
<td>2.0</td>
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<td></td>
</tr>
<tr>
<td>1800</td>
<td></td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 3-16. Frequency Response (<50 MHz)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Column 2 HP 3335A Amplitude (dBm)</th>
<th>Column 3 Response Relative to 50 MHz</th>
<th>Column 4 Response Relative to 300 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 MHz</td>
<td></td>
<td>0 (Reference)</td>
<td></td>
</tr>
<tr>
<td>20 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 kHz</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>50 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. Spurious Response

Specification

Second Harmonic Distortion:

\[-70 \text{ dBc, 5 MHz to 1.8 GHz, for } -45 \text{ dBm tone at input mixer.}\]

Third Order Intermodulation Distortion:

\[-70 \text{ dBc, 5 MHz to 1.8 GHz, for dBm two } -30 \text{ dBm tones at input mixer and } >50 \text{ kHz signal separation.}\]

Description

This test is performed in two parts. The first part measures second harmonic distortion; the second part measures third order intermodulation distortion.

To test second harmonic distortion, a 50 MHz low pass filter is used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. To measure the distortion products, the power at the mixer is set 25 dB higher than specified. New test limits have been developed based on this higher power.

With \(-45 \text{ dBm at the input mixer and the distortion products suppressed by 70 dBc, the equivalent Second Order Intercept (SOI) is } +25 \text{ dBm } (-45 \text{ dBm } + 70 \text{ dBc}). Therefore, with } -20 \text{ dBm at the mixer, and the distortion products suppressed by 45 dBc, the equivalent SOI is also } +25 \text{ dBm } (-20 \text{ dBm } + 45 \text{ dBc}).

For third order intermodulation distortion, two signals are combined in a directional bridge (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two \(-30 \text{ dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is } +5 \text{ dBm } (-30 \text{ dBm } + 70 \text{ dBc}/2). However, if two \(-22 \text{ dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also } +5 \text{ dBm } (-22 \text{ dBm } + 54 \text{ dBc}/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source’s noise sideband performance.

Equipment

Synthesizer/Level Generator ........................................... HP 3335A
Synthesized Sweeper ...................................................... HP 8340A/B
Measuring Receiver (or Power Meter) ................................... HP 8902A
Power Sensor, 100 kHz to 4.2 GHz ..................................... HP 8482A
50 MHz Low Pass Filter ................................................... 0955-0306
Directional Bridge .......................................................... HP 8721A

Cables

BNC Cable, 120 cm (48 in) (2 required) .............................. HP 10503A

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Adapters

Type N (f) to APC 3.5 (f) .................................................. 1250-1745
Type N (f) to BNC (m) .................................................. 1250-1477
Type N (m) to BNC (f) .................................................. 1250-1476
N (m) to BNC (m) .................................................. 1250-1473

Additional Equipment for Option 001

Power Sensor ................................................................. HP 8483A
Mechanical Adapter, 75Ω to 50Ω .................................. HP 1250-0697
Minimum Loss Adapter .................................................. HP 11852B
Adapter Type N (f) to BNC (m), 75Ω .......................... 1250-1534
BNC (m) to BNC (m) .................................................. 1250-1288

Procedure

Second Harmonic Distortion, 30 MHz

1. Set the HP 3335A controls as follows:
   - FREQUENCY ......................................................... 30 MHz
   - AMPLITUDE ........................................................... −10 dBm
   - AMPLITUDE (Option 001) .......................................... −4.3 dBm

2. Connect the equipment as shown in Figure 3-18. (Option 001: Connect the HP 11852B between the LPF and INPUT 75Ω).

3. Press [Preset] on the analyzer and wait for the preset to finish. Set the controls as follows:
   - CENTER FREQUENCY .............................................. 30 MHz
   - SPAN ................................................................. 10 MHz
   (Option 001: Press [Amplitude], MORE 1 of 2, AMPD UNITS, dBm.)
   - REF LEVEL .......................................................... −10 dBm
   - Press [Peak Search], SIGNAL TRACK (ON), [Span], 1 MHz, SIGNAL TRACK (OFF), [BW], 30 kHz.

4. Adjust the HP 3335A Amplitude to place the peak of the signal at the reference level (−10 dBm).
13. Spurious Response

![Diagram of test setup]

*Figure 3-18. Second Harmonic Distortion Test Setup, 30 MHz*

5. Set the analyzer control as follows:

   - **RES BW** ........................................ 10 kHz
   - **VIDEO BW** ....................................... 300 Hz


7. Press the **△** (step-up key) key on the analyzer to step to the second harmonic (at 60 MHz). Press **PEAK SEARCH**. Record the MKR ∆ Amplitude reading:

   MKR ∆ Amplitude Reading ________ <−45 dBc
Third Order Intermodulation Distortion, 50 MHz

8. Zero and calibrate the HP 8902A and HP 8482A combination in log mode (RF Power readout in dBm). Enter the power sensor’s 50 MHz Cal Factor into the HP 8902A. *(Option 001: Calibrate the HP 8483A 75Ω power sensor.)*

9. Connect the equipment as shown in Figure 3-19 with the output of the directional bridge connected to the power sensor.

*(Option 001: Use the HP 8483A power sensor with an HP 1250-1534 Type N (f) to BNC (m) 75Ω adapter and use an 1250-1288 BNC (m) to BNC (m) 75Ω adapter in place of the 50Ω adapter.)*

**Note**

*Option 001:* The power measured at the output of the 50Ω directional bridge by the 75Ω power sensor, is the equivalent power “seen” by the 75Ω analyzer.

---

**Figure 3-19. Third Order Intermodulation Distortion Test Setup**

10. Press **INSTR PRESET** the HP 8340A/B. Set the HP 8340A/B controls as follows:

- **POWER LEVEL** .................................................. -6 dBm
- **CW** ................................................................. 50 MHz
- **RF** ................................................................. OFF
13. Spurious Response

11. Set the HP 3335A controls as follows:
   FREQUENCY ........................................ 50.050 MHz
   AMPLITUDE ....................................... –6 dBm
   50Ω/75Ω switch ....................................... 75Ω (no RF output)

12. On the analyzer, press [PRESET] and wait until the preset is finished. Set the controls as follows:
   CENTER FREQUENCY .................................. 50 MHz
   SPAN ................................................. 10 MHz

   (Option 001: Press [AMPLITUDE], MORE 1 of 2, AMPTD UNITS, dBm.)
   AMPLITUDE ........................................... –10 dBm

Press the following analyzer keys:
   [PEAK SEARCH] PEAK EXCURSN 3 [db]
   [DISPLAY] THRESHLD ON OFF (ON) 90 [–dBm].

13. On the HP 8340A/B, set RF on. Adjust the power level until the HP 8902A reads –12 dBm ±0.05 dB.

14. Disconnect the power sensor from the directional bridge. Connect the directional bridge directly to the analyzer’s RF INPUT using an adapter (do not use a cable). Option 001: Use a 75Ω adapter, BNC (m) to BNC (m).

15. On the analyzer, press [PEAK SEARCH], [SIGNAL TRACK] (ON), [SPAN], 200 [kHz]. Wait for the AUTO ZOOM message to disappear. Press [SIGNAL TRACK] (OFF), [PEAK SEARCH], MARKER -> REF LVL.

16. On the HP 3335A, set the 50Ω/75Ω switch to the 50Ω position (RF on). Adjust the Amplitude until the two signals are displayed at the same amplitude.

17. If necessary, adjust the analyzer center frequency until the two signals are centered on the display. Set the controls as follows:
   RES BW ........................................... 1 kHz
   VIDEO BW ........................................... 100 Hz

18. Press [PEAK SEARCH], [DISPLAY], DSP LINE ON OFF (ON). Set the display line to a value 54 dB below the current reference level setting.

19. The third order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line.

20. If the distortion products can be seen, proceed as follows:
   a. On the analyzer, press [SGL SWP]. wait for completion of the sweep, then press [PEAK SEARCH], MARKER DELTA.
   b. Repeatedly press NEXT PEAK until the active marker is on the highest distortion product.
   c. Record the MKR Δ amplitude reading below. The MKR Δ reading should be less than –54 dBc.

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13. Spurious Response

Third Order Intermodulation Distortion, 50 MHz: _________ dBC

21. If the distortion products cannot be seen, proceed as follows:
   a. On both the HP 8340A/B and the HP 3335A, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
   b. On the analyzer, press \textit{SGL SWP}, \textit{PEAK SEARCH}, \textit{MARKER DELTA}.
   c. Repeatedly press \textit{NEXT PEAK} until the active marker is on the highest distortion products.
   d. On both the HP 8340A/B and the HP 3335A, reduce the power level by 5 dB and wait for the completion of a new sweep.
   e. Record the MKR $\Delta$ amplitude reading below. The MKR $\Delta$ reading should be less than $-54$ dBC.

Third Order Intermodulation Distortion, 50 MHz: _________ dBC
14. Gain Compression

Specification

INPUT 50Ω:

>10 MHz ≤0.5 dB for −10 dBm total power at input mixer.

Description

Gain Compression is measured by applying two signals, separated by 3 MHz. First, the test places a −30 dBm signal at the input of the spectrum analyzer (the analyzer’s reference level is also set to −30 dBm). Then, a 0 dBm signal is applied to the analyzer, overdriving its input. The decrease in the first signal's amplitude (gain compression) caused by the second signal is the measured gain compression.

Equipment

Synthesized Sweeper .................................................. HP 8340A/B
Synthesizer/Level Generator ......................................... HP 3335A
Measuring Receiver (used as a power meter) ..................... HP 8902A
Power Sensor .......................................................... HP 8482A
Directional Bridge ...................................................... HP 8721A

Cables

BNC Cable, 120 cm (48 in) (2 required) .......................... HP 10503A

Adapters

Type N (f) to BNC (m) ................................................ 1250-1477
Type N (m) to BNC (m) ................................................ 1250-1473
Type N (f) to APC 3.5 (f) ........................................... 1250-1745
Type N (m) to BNC (f) ................................................ 1250-1476

Additional Equipment for Option 001

Power Sensor, 75Ω .................................................... HP 8483A
Adapter, Type N (f) to BNC (m), 75Ω ............................ 1250-1534
BNC (m) to BNC (m), 75Ω ........................................... 1250-1288

Procedure

1. Zero and calibrate the HP 8902A and HP 8482A combination in log mode (power reads out in dBm). Enter the power sensor's 50 MHz Cal Factor into the HP 8902A.  
   *Option 001*: Calibrate the HP 8483A 75Ω power sensor.

2. Connect the equipment as shown in Figure 3-20, with the load (reflected) of the directional coupler connected to the power sensor.  
   *Option 001*: Use the HP 8483A power sensor with an 1250-1534 Type N (f) to BNC (m) 75Ω adapter and use an HP 1250-1288 BNC (m) to BNC (m) 75Ω adapter in place of the 50Ω adapter.

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Note *Option 001:* The power measured at the output of the 50Ω directional bridge by the 75Ω power sensor, is the equivalent power “seen” by the 75Ω analyzer.

![Diagram of Gain Compression Test Setup]

**Figure 3-20. Gain Compression Test Setup**

3. Press **INSTR PRESET** on the HP 8340A/B. Set the HP 8340A/B controls as follows:
   
   - CW .................................................. 53 MHz
   - POWER LEVEL ........................................... 6 dBm

4. Set the HP 3335A controls as follows:
   
   - CW .................................................. 50 MHz
   - AMPLITUDE ......................................... −14 dBm
   - 50Ω/75Ω SWITCH ....................................... 75Ω (no RF output)

5. On the analyzer, press **PRESET** and wait for the preset to finish. Set the controls as follows:
   
   - CENTER FREQUENCY .................................. 50 MHz
   - SPAN .................................................. 20 MHz
   
   (*Option 001:* Press **AMPLITUDE**, **MORE** 1 of 2, **AMPTD UNITS, dBm**.)
   
   - REF LEVEL ......................................... −20 dBm
   - LOG dB/DIV ........................................... 1 dB
   - RES BW ............................................... 300 kHz

6. On the HP 8340A/B, adjust the power level for a 0 dBm reading on the HP 8902A. Set RF to off. On the HP 3335A, set the 50Ω/75Ω switch to 50Ω.
14. Gain Compression

**Note**

The power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB attenuation setting. A power level of 0 dBm at the analyzer input yields -10 dBm at the input mixer.

7. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50Ω connector of the spectrum analyzer using an adapter. Do not use a cable. *Option 001*: Use a 75Ω adapter, BNC (m) to BNC (m).

8. On the analyzer, press the following keys:

```
PEAK SEARCH SIGNAL TRACK (ON)
SPAN 10 MHz
```

Wait for the AUTO ZOOM message to disappear.

9. On the HP 3335A, adjust the Amplitude to place the signal 1 dB below the analyzer’s reference level.

10. On the analyzer, press **SGL SWP**, **PEAK SEARCH**, **MARKER DELTA**.

11. On the HP 8340A/B, set RF to on.

12. On the analyzer, press **SGL SWP**, **PEAK SEARCH**, **NEXT PEAK**. The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the analyzer’s knob.

13. Read the MKR Δ amplitude and record below. The absolute value of this amplitude should be less than or equal to 0.5 dB.

```
Actual MKR Δ Amplitude Reading: __________ dB
```

---

3-64 Verifying Specified Operation for the HP 8590B
15. Displayed Average Noise Level

Specification

400 kHz to 1 MHz: \( \leq -115 \text{ dBm} \).
1 MHz to 1.5 GHz: \( \leq -115 \text{ dBm} \) (Option 001: \( \leq -63 \text{ dBmV} \)).
1.5 GHz to 1.8 GHz: \( \leq -113 \text{ dBm} \) (Option 001: \( \leq -61 \text{ dBmV} \)).

Related Adjustment

Frequency Response Adjustment.

Description

This test measures the displayed average noise level within the frequency range specified. The analyzer’s input is terminated in 50\( \Omega \).

The LO feedthrough is used as a frequency reference for these measurements. The test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing [RESET].

Equipment

50\( \Omega \) Termination ................................................. HP 908A

Cable

BNC, 23 cm (9 in) ......................................................... HP 10502A

Adapters

Type N (m) to BNC (f) .................................................. 1250-1476

Additional Equipment for Option 001

Cable, BNC 75\( \Omega \), 30 cm (12 in) ........................................ 5062-6452
75\( \Omega \) Termination, Type N (m) ...................................... HP 909E
Adapter, Type N (f) to BNC (m) 75\( \Omega \) ............................ 1250-1534

Procedure

1. Connect a cable from the CAL OUT to the INPUT 50\( \Omega \) of the analyzer as shown in Figure 3-21. Option 001: Use a 75\( \Omega \) cable and omit the adapter.
15. Displayed Average Noise Level

![Spectrum Analyzer Diagram]

Figure 3-21. Displayed Average Noise Level Test Setup

Press **Preset** and wait for the preset to finish. Set the controls as follows:

- **Center Frequency**: 300 MHz
- **Span**: 10 MHz
- **Ref Level**: -20 dBm
- **Ref Level (Option 001)**: +28.75 dBmV
- **Attenuation**: 0 dB

2. Press the following analyzer keys:

   - **Peak Search**
   - **Signal Track (ON)**
   - **Span**: 100 kHz

   Wait for the **Auto Zoom** message to disappear. Set the controls as follows:

   - **Video BW**: 30 Hz
   - **Signal Track**: OFF

3. Press **Sgl Swp** and wait for completion of a new sweep. Press the following analyzer keys:

   - **Peak Search**
   - **Amplitude**
   - **MORE 1 of 2**
   - **Ref Lvl Offset**

Subtract the MKR amplitude reading from -20 dBm and enter the result as the **Ref Lvl Offset**. For example, if the marker reads -20.21 dBm, enter +0.21 dB (-20 dBm - (-20.21 dBm) = +0.21 dB). *Example for Option 001*: If the marker reads 26.4 dBmV, enter +2.35 dBmV (28.75 dBmV - 26.4 dBmV = 2.35 dBmV).

**Ref Lvl Offset _____ dB**

*Option 001 Ref Lvl Offset _____ dBmV*
15. Displayed Average Noise Level

4. Disconnect the cable from the INPUT 50Ω connector of the analyzer. Connect the 50Ω termination to the analyzer INPUT 50Ω connector. (Option 001: Use the 75Ω termination.)

400 kHz

**Note**

*Option 001: Omit steps 5 through 9 and proceed to step 10.*

5. Press the following analyzer keys:

`VID BW AUTO MAN (AUTO)`

Set the analyzer's controls as follows:

- CENTER FREQUENCY ........................................ 0 Hz
- SPAN .......................................................... 10 MHz
- REF LEVEL .............................................. −10 dBm
- TRIGGER .................................................. CONT

6. Press the following analyzer keys:

```
PEAK SEARCH SIGNAL TRACK (ON)
SPAN 800 kHz.
```

Wait for the AUTO ZOOM message to disappear. Press the following analyzer keys:

```
SIGNAL TRACK (OFF) BW 3 kHz
```

7. Adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

- SPAN .......................................................... 0 Hz
- REF LEVEL .............................................. −50 dBm
- RES BW .................................................. 1 kHz
- VIDEO BW .............................................. 30 Hz
- SWEEP TIME ........................................... 5 s

Press `TRACE`, MORE 1 of 3, DETECTOR SAMPL PK (SAMPL), 6GL SWP.

Wait for completion of a new sweep.

8. Press the following analyzer keys:

```
DISPLAY, DSP LINE ON OFF (ON).
```

Verifying Specified Operation for the HP 8590B  3-67
15. Displayed Average Noise Level

Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals). Record the display line amplitude setting in Table 3-17 as the noise level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

9. Press the following analyzer keys:

AUTO COUPLE RES BW AUTO MAN (AUTO) VID BW AUTO MAN (AUTO).

Set the analyzer’s controls as follows:

CENTER FREQUENCY ........................................... 0 Hz
SPAN ............................................................... 10 MHz
REF LEVEL ......................................................... −10 dBm
REF LEVEL (Option 001) ..................................... −35 dBmV
TRIGGER ....................................................... CONT

10. Press the following analyzer keys:

PEAK SEARCH SIGNAL TRACK (ON)
MKR -> MARKER -> REF LVL
SPAN 2 MHz

Wait for the AUTO ZOOM message to disappear. Press SIGNAL TRACK (OFF).

11. Press FREQUENCY and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

SPAN ............................................................... 50 kHz
REF LEVEL ......................................................... −50 dBm
REF LEVEL (Option 001) ..................................... −1.2 dBmV
VIDEO BW ...................................................... 30 Hz

12. Press SGL SWP. Wait for the completion of a new sweep.

13. Press the following analyzer keys:

DISPLAY, DSP LINE ON OFF (ON).
15. Displayed Average Noise Level

Adjust the display line so that it is centered on the average trace noise, ignoring any
residual responses (refer to the Residual Responses verification test for any suspect
residuals). Record the display line amplitude setting in Table 3-17 as the noise level at
1 MHz. The average noise level should be less than the specified limit.

1 MHz to 1.5 GHz

14. Press the following analyzer keys:

(FREQUENCY) START FREQ 1 (MHz)
STOP FREQ 1.5 (GHz).

Set the controls as follows:
RES BW ......................................................... 1 MHz
VIDEO BW ...................................................... 10 kHz
TRIGGER ...................................................... CONT

15. Adjust the START FREQ setting, if necessary, to place the LO feedthrough just off-screen
to the left.

16. Press the following analyzer keys:

(SGL SWP)
(TRACE) CLEAR WRITE A MORE 1 of 3
VID AVG ON OFF (ON) 10 (Hz).

Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten
sweeps, then stop).

17. Press (PEAK SEARCH) and record the MKR frequency as the Measurement Frequency in
Table 3-17 for 1 MHz to 1.5 GHz.

18. Press the following analyzer keys:

(TRACE) MORE 1 of 3 VID AVG ON OFF (OFF)
(AUTO COUPLE) RES BW AUTO MAN (AUTO)
VID BW AUTO MAN (AUTO)
SPAN 50 (kHz)
(FREQUENCY) CENTER FREQ.

Set the center frequency to the measurement frequency recorded in Table 3-17 for 1 MHz
to 1.5 GHz. Set the controls as follows:
RES BW ......................................................... 1 kHz
VIDEO BW ...................................................... 30 Hz

19. Press (SGL SWP).

Wait for the sweep to finish. Press the following analyzer keys:

(DISPLAY) DSP LINE ON OFF (ON).
15. Displayed Average Noise Level

Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses (refer to the Residual Responses verification test for any suspect residuals). Record the display line amplitude setting in Table 3-17. The average noise level should be less than the specified limit.

1.5 GHz to 1.8 GHz

20. Press the following analyzer keys:

[AUTO COUPLE] RES BW AUTO MAN (AUTO)
VID BW AUTO MAN (AUTO).

Set the controls as follows:

SPAN .................................................. 10 MHz
REF LEVEL ......................................... −50 dBm
REF LEVEL (Option 001) ...................... −1.2 dBmV
TRIGGER ............................................. CONT

Press the following analyzer keys:

FREQUENCY START FREQ 1.5 GHz
STOP FREQ 1.8 GHz.

21. Repeat steps 16 through 19 above for frequencies from 1.5 GHz to 1.8 GHz.

Note

If the Displayed Average Noise at 1.8 GHz is at or out of specification, it is recommended that a known frequency source be used as a frequency marker. This ensures that testing is done at or below 1.8 GHz.

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Measurement Frequency</th>
<th>Displayed Average Noise Level (dBm) (Option 001: dBmV)</th>
<th>Specification (dBm) (Option 001: dBmV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 kHz</td>
<td>400 kHz</td>
<td>_______</td>
<td>−115 dBm</td>
</tr>
<tr>
<td>1 MHz</td>
<td>1 MHz</td>
<td>_______</td>
<td>−115 dBm (Option 001: ≤−63 dBmV)</td>
</tr>
<tr>
<td>1 MHz to 1.5 GHz</td>
<td>_______</td>
<td>_______</td>
<td>−115 dBm (Option 001 ≤−63 dBmV)</td>
</tr>
<tr>
<td>1.5 GHz to 1.8 GHz</td>
<td>_______</td>
<td>_______</td>
<td>−113 dBm (Option 001: ≤−61 dBmV)</td>
</tr>
</tbody>
</table>

3-70 Verifying Specified Operation for the HP 8590B
16. Residual Responses

Specification
With 0 dB INPUT ATTEN setting and input terminated:

\[-90 \text{ dBm from } 150 \text{ kHz to } 1 \text{ MHz.}\]
\textit{Option 001:} Not applicable.

\[-90 \text{ dBm from } 1 \text{ MHz to } 1.8 \text{ GHz.}\]
\textit{Option 001:} \(-38 \text{ dBmV.}\)

Description
The spectrum analyzer's input is terminated and the analyzer is swept from 150 kHz above
the LO to 1 MHz. Then the analyzer is swept in 50 MHz spans throughout the 1 MHz to
1.8 GHz range. Any responses above the specification are noted.

Equipment
50Ω Termination .................................................. HP 908A

Additional Equipment for Option 001
75Ω Termination, Type N (m) ............................... HP 909E, Option 201
Adapter, Type N (f) to BNC (m), 75Ω ...................... 1250-1534

Procedure

\textbf{150 kHz to 1 MHz}

1. Connect the termination to the analyzer’s input as shown in Figure 3-22. \textit{Option 001:} Use
the 75Ω termination with the adapter, skip steps 2 through 4, and proceed with step 5.

2. Press \textbf{Preset} on the analyzer and wait for the preset to finish. Press the following
analyzer keys:

\begin{center}
\textbf{PEAK SEARCH} \text{ SIGNAL TRACk } \text{(ON)} \text{ SPAN} \text{ 1 MHz.}
\end{center}

Wait for the AUTO ZOOM message to disappear. Press \textbf{SIGNAL TRACk} (OFF).
3. Adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Press the following analyzer keys: PEAK SEARCH, MKR. Set the controls as follows:

- MARKER DELTA: 150 kHz
- MARKER: NORMAL
- REF LVL: −60 dBm
- ATTN: 0 dB
- RES BW: 3 kHz
- VID BW: 1 kHz
- DISPLAY LINE: −90 dBm

4. Press SGL SWP and wait for a new sweep to finish. Look for any residual responses at or above the display line. If a residual is suspected, press SGL SWP again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line and to the right of the marker in Table 3-18.

**1 MHz to 1.8 GHz**

5. Press PRESET on the analyzer and wait for the preset to finish. Set the controls as follows:

- CENTER FREQUENCY: 25 MHz
- SPAN: 50 MHz
- REF LEVEL: −60 dBm
- REF LEVEL (Option 001): −11.25 dBmV
- ATTN: 0 dB

6. Adjust the center frequency until the LO feedthrough (the “signal” near the left of the screen) is just off the left-most vertical graticule line. Set the controls as follows:

- CF STEP: 45 MHz
- RES BW: 10 kHz
- VIDEO BW: 3 kHz
- DISPLAY LINE: −90 dBm
- DISPLAY LINE (Option 001): −38 dBmV

7. Press SGL SWP and wait for a new sweep to finish. Look for any residual responses at or above the display line. If a residual is suspected, press SGL SWP again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 3-18.

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8. Press **FREQUENCY**, ▲ (step-up key), to step to the next frequency and repeat step 7.

9. Repeat steps 7 and 8 until the range from 1 MHz to 1.8 GHz has been checked. This requires 40 additional frequency steps. The test for this band requires about 6 minute to complete if no residuals are found.

**Note**

If there are any residuals at or near the frequency specification limits (1 MHz or 1.8 GHz), it is recommended that a known frequency source be used as a frequency marker. This will ensure that testing is done within the specification limits.

**Table 3-18. Residual Responses Above Display Line**

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Amplitude (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
17. Absolute Amplitude, Vernier, and Power Sweep Accuracy

Specification

Absolute Amplitude Accuracy: $<\pm 1.5 \, \text{dB} \, (-10 \, \text{dBm setting at 300 MHz})$

($Option \ 011$: $+38.8 \, \text{dBmV setting at 300 MHz}$)

Vernier Accuracy: $<\pm 1.0 \, \text{dB} \, \text{max (referred to } -10 \, \text{dBm, 15 dB range)}$

($Option \ 011$: Referred to $+38.8 \, \text{dBmV, 15 dB range}$)

Power Sweep Accuracy: $<2 \, \text{dB peak-to-peak}$

Related Adjustment

Modulator Offset and Gain Adjustment.

Description

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz.

The measuring receiver is then set for RATIO mode so that future power level readings are in dB relative to the power level at $-10 \, \text{dBm}$ ($Option \ 011$: $+38.8 \, \text{dBmV}$). The output power level setting is decreased in 1 dB steps and the power level is measured at each step. The difference between ideal and actual power levels is calculated at each step.

Since a power sweep is accomplished by stepping through the vernier settings, the peak-to-peak variation of the vernier accuracy is equal to the power sweep accuracy.

Equipment

Measuring Receiver .......................................................... HP 8902A
Power Sensor ................................................................. HP 8482A

Cable
Type N, 62 cm (24 in) ..................................................... HP 11500B/C

Additional Equipment for Option 011:

Power Sensor ................................................................. HP 8483A
BNC Cable, 75Ω ............................................................... 5062-6452
Adapter, Type N (f) to BNC (m), 75Ω .............................. 1250-1534
Mechanical Adapter, Type N, 50Ω (m) to 75Ω (f) .............. 1250-0597

3-74 Verifying Specified Operation for the HP 8590B
17. Absolute Amplitude, Vernier, and Power Sweep Accuracy

![Diagram of measuring receiver and spectrum analyzer](image)

Figure 3-23. Absolute Amplitude, Vernier, and Power Sweep Accuracy Test Setup

**Procedure**

1. Connect the Type N cable between the RF OUT 50Ω and INPUT 50Ω connectors on the spectrum analyzer. See Figure 3-23.

   *Option 011*: Connect the BNC cable between the RF OUT 75Ω and INPUT 75Ω connectors on the spectrum analyzer.

2. Press `[PRESET]` on the spectrum analyzer and set the controls as follows:
   
   CENTER FREQ ................................ 300 MHz
   SPAN ......................................... 0 Hz


   *Option 011*: 38 [+dBm] (+38 dBmV).


5. Zero and calibrate the measuring receiver/power sensor combination in log mode (power levels readout in dBm). Enter the power sensor’s 300 MHz Cal Factor into the measuring receiver.

6. Disconnect the Type N cable from the RF OUT 50Ω and connect the power sensor to the RF OUT 50Ω as shown in Figure 3-23.

   *Option 011*: Disconnect the BNC cable from the RF OUT 75Ω and connect the power sensor to the RF OUT 75Ω using an adapter.

7. On the spectrum analyzer, press 10 [−dBm], `[SGL SWP]`.

   *Option 011*: 38.8 [+dBm] (+38.8 dBmV).

---

*Verifying Specified Operation for the HP 8590B 3-75*
17. Absolute Amplitude, Vernier, and Power Sweep Accuracy

8. Subtract \(-10\) dBm from the power level displayed on the measuring receiver and record the result below as the Absolute Amplitude Accuracy.

\[
\text{Absolute Amplitude Accuracy } \quad \underline{\text{dB}} \\
\text{(Measurement Uncertainty. } < +0.25/ \text{–}0.26 \text{ dB)}
\]

9. Press RATIO on the measuring receiver. Power levels now readout in dB relative to the power level just measured at the \(-10\) dBm output power level setting. 
\textit{Option 011: } +38.8 dBmV output power level setting.

10. Set the SRC POWER to the settings indicated in Table 3-19. At each setting, record the power level displayed on the measuring receiver.

11. Calculate the Vernier Accuracy by subtracting the SRC POWER setting and 10 dB from the Measured Power Level for each SRC POWER setting in Table 3-19.

\[
\text{Vernier Accuracy} = \text{Measured Power Level} - \text{SRC POWER} + 10 \text{ dB}
\]

\textit{OPTION 011:} Calculate the Vernier Accuracy by subtracting the SRC POWER setting from the Measured Power Level, adding 38.8 dB to each SRC POWER setting in Table 3-19.

\[
\text{Vernier Accuracy} = \text{Measured Power Level} - \text{SRC POWER} - 38.8 \text{ dB}
\]

12. Locate the most positive and most negative Absolute Vernier Accuracy values in Table 3-19 and record below.

\[
\text{Positive Vernier Accuracy } \quad \underline{\text{dB}} \\
\text{Negative Vernier Accuracy } \quad \underline{\text{dB}}
\]

13. Calculate the power sweep accuracy by subtracting the Negative Vernier Accuracy recorded in step 12 from the Positive Vernier Accuracy recorded in step 12. Record the result below as the Power Sweep Accuracy.

\[
\text{Power Sweep Accuracy} = \text{Positive Vernier Accuracy} - \text{Negative Vernier Accuracy}
\]

\[
\text{Power Sweep Accuracy } \quad \underline{\text{dB pk-pk}}
\]

3-76 Verifying Specified Operation for the HP 8590B
## 17. Absolute Amplitude, Vernier, and Power Sweep Accuracy

### Table 3-19. Vernier Accuracy

<table>
<thead>
<tr>
<th>SRC POWER Setting</th>
<th>Measured Power Level</th>
<th>Vernier Accuracy</th>
<th>Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opt 011, dBMV</td>
<td>Opt 010, dBm</td>
<td>(dB)</td>
<td>(dB)</td>
</tr>
<tr>
<td>+38.8</td>
<td>-10</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>+39.8</td>
<td>-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+40.8</td>
<td>-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+41.8</td>
<td>-7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+42.8</td>
<td>-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+37.8</td>
<td>-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+36.8</td>
<td>-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+35.8</td>
<td>-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+34.8</td>
<td>-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+33.8</td>
<td>-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+32.8</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+31.8</td>
<td>-15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+30.8</td>
<td>-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+29.8</td>
<td>-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+28.8</td>
<td>-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+27.8</td>
<td>-11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
18. Tracking Generator Level Flatness

Specification

Flatness

Option 010:  <±1.75 dB referred to 300 MHz, 100 kHz to 1.8 GHz

Option 011:  <±1.75 dB referred to 300 MHz, 1 MHz to 1.8 GHz

Related Adjustment

Modulator Offset and Gain Adjustment.

Description

The tracking generator output is connected to the spectrum analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. A calibrated power sensor is then connected to the tracking generator output to measure the power level at 300 MHz. The measuring receiver is set for RATIO mode so that future power level readings are in dB relative to the power level at 300 MHz.

The tracking generator is stepped to several frequencies throughout its range. The output power difference relative to the power level at 300 MHz is measured at each frequency and recorded.

Equipment

Measuring Receiver .......................................................... HP 8902A
Power Sensor ................................................................. HP 8482A
Cable
Type N, 62 cm (24 in) ..................................................... HP 11500B/C

Additional Equipment for Option 011:

Power Sensor ................................................................. HP 8483A
BNC Cable, 75Ω ............................................................. 5062-6452
Adapter, Type N (f) to BNC (m), 75Ω ................................. 1250-1534
Mechanical Adapter, Type N, 50Ω (m) to 75Ω (f) .................... 1250-0597

3-78  Verifying Specified Operation for the HP 8590B
18. Tracking Generator Level Flatness

![Diagram of measuring receiver and spectrum analyzer](image)

**Figure 3-24. Tracking Generator Level Flatness Test Setup**

**Procedure**

1. Connect the Type N cable between the RF OUT 50Ω and INPUT 50Ω connectors on the spectrum analyzer. See Figure 3-24.
   
   *Option 011*: Connect the BNC cable between the RF OUT 75Ω and INPUT 75Ω connectors on the spectrum analyzer.

2. Press **Preset** on the spectrum analyzer. Set the controls as follows:
   
   CENTER FREQ .............................. 0 Hz
   SPAN ........................................ 15 MHz

3. Press **Peak Search**, **Signal Track** (ON), **Span**, 100 kHz. Wait for the **Auto Zoom** message to disappear. Press **Frequency**, **Freq Offset**. Enter the negative of the MKR-TRK frequency displayed in the upper right-hand corner of the display. For example, if the MKR-TRK frequency is 132 kHz, enter -132 kHz. Press **Signal Track** (OFF), **Span**, **Zero Span**, **(BW)**, 1 MHz.

4. Set the spectrum analyzer controls as follows:
   
   CENTER FREQ .............................. 300 MHz
   CF STEP .................................... 100 MHz
   SPAN ........................................ 0 Hz

   
   *Option 011*: 38 dBm (+38 dBmV).

6. On the spectrum analyzer, press **Tracking Peak**. Wait for the **Peaking** message to disappear.

7. Zero and calibrate the measuring-receiver/power-sensor combination in log mode (power levels readout in dBm). Enter the power sensor's 300 MHz Cal Factor into the measuring receiver.
18. Tracking Generator Level Flatness

8. Disconnect the Type N cable from the RF OUT 50Ω and connect the power sensor to the RF OUT 50Ω.
   
   Option 011: Disconnect the BNC cable from the RF OUT 75Ω and connect the power sensor to the RF OUT 75Ω using an adapter.

9. On the spectrum analyzer, press **AUX CTRL**, **TRACK GEN**, **SRC PWR ON**, 10 **–dBm**.
   
   Option 011: 38.8 **+dBm**.

10. Press RATIO on the measuring receiver. The measuring receiver readout is now for power levels relative to the power level at 300 MHz.

11. Set the spectrum analyzer CENTER FREQ to 100 kHz. Press **SGL SWP**.
   
   Option 011: Set the spectrum analyzer CENTER FREQ to 1 MHz. Press **SGL SWP**.

12. Enter the appropriate power sensor Cal Factor into the measuring receiver as indicated in Table 3-20.

13. Record the power level displayed on the measuring receiver as the Level Flatness in Table 3-20.

14. Repeat steps 11 through 13 above to measure the flatness at each CENTER FREQ setting listed in Table 3-20. The △ (step-up key) may be used to tune to center frequencies above 100 MHz.

   **Note**
   
   Analyzers equipped with Option 011 should be tested only at frequencies of 1 MHz to 1.8 GHz.

15. Locate the most positive Level Flatness reading in Table 3-20 for the indicated frequency ranges and record as the Maximum Flatness.

   Option 010:
   
   Maximum Flatness, 100 kHz_________dB
   
   Maximum Flatness, 300 kHz to 5 MHz_________dB
   
   Maximum Flatness, 10 MHz to 1800 MHz_________dB

   Option 011:
   
   Maximum Flatness, 1 MHz to 1800 MHz_________dB

---

3-80 Verifying Specified Operation for the HP 8590B
16. Locate the most negative Level Flatness reading in Table 3-20 for the indicated frequency ranges as the Minimum Flatness.

Option 010:
Minimum Flatness, 100 kHz
Minimum Flatness, 300 kHz to 5 MHz
Minimum Flatness, 10 MHz to 1800 MHz

Option 011:
Minimum Flatness, 1 MHz to 1800 MHz

17. Press [Preset] on the spectrum analyzer.
### Table 3-20. Level Flatness Relative to 300 MHz

<table>
<thead>
<tr>
<th>Center Freq</th>
<th>Level Flatness (dB)</th>
<th>Cal Factor Freq (MHz)</th>
<th>Measurement Uncertainty (dB)</th>
<th>Option 010</th>
<th>Option 011</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz*</td>
<td></td>
<td>0.1</td>
<td>+0.42/-0.45</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>300 kHz*</td>
<td></td>
<td>0.3</td>
<td>+0.28/-0.28</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>500 kHz*</td>
<td></td>
<td>0.3</td>
<td>+0.28/-0.28</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>1 MHz</td>
<td></td>
<td>1</td>
<td>+0.28/-0.28</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>2 MHz</td>
<td></td>
<td>3</td>
<td>+0.28/-0.28</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>5 MHz</td>
<td></td>
<td>3</td>
<td>+0.28/-0.28</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>10 MHz</td>
<td></td>
<td>10</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>20 MHz</td>
<td></td>
<td>30</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>50 MHz</td>
<td></td>
<td>50</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>100 MHz</td>
<td></td>
<td>100</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>200 MHz</td>
<td></td>
<td>300</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>300 MHz</td>
<td>0 (Ref)</td>
<td>300</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td></td>
</tr>
<tr>
<td>400 MHz</td>
<td></td>
<td>300</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>500 MHz</td>
<td></td>
<td>300</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>600 MHz</td>
<td></td>
<td>300</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>700 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>800 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>900 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1000 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1100 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1200 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1300 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1400 MHz</td>
<td></td>
<td>1000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1500 MHz</td>
<td></td>
<td>2000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1600 MHz</td>
<td></td>
<td>2000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1700 MHz</td>
<td></td>
<td>2000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
<tr>
<td>1800 MHz</td>
<td></td>
<td>2000</td>
<td>+0.24/-0.24</td>
<td>+0.18/-0.39</td>
<td></td>
</tr>
</tbody>
</table>

* These frequencies are tested on Option 010 spectrum analyzers only.
19. Harmonic Spurious Outputs

Specification
Harmonic Spurious Outputs: \(-25 \text{ dBC}\)

Related Adjustment
There are no related adjustment procedures for this performance test.

Description
The tracking generator output is connected to the HP 8590B Spectrum Analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of an HP 8566A/B Spectrum Analyzer. The tracking generator is tuned to several frequencies and the amplitude of the second and third harmonics relative to the fundamental are measured at each frequency.

Equipment
Microwave Spectrum Analyzer ........................................ HP 8566A/B

Cables
Type N, 62 cm (24 in) .................................................. HP 11500B/C
BNC, 23 cm (9 in) .......................................................... HP 10502A

Adapter
Type N (m) to BNC (f) .................................................. 1250-1476

Additional Equipment for Option 011:
Minimum Loss Adapter .................................................. HP 11852B
BNC Cable, 75Ω ............................................................... 5062-6452
Adapter, Type N (f) to BNC (m), 75Ω .......................... 1250-1534
19. Harmonic Spurious Outputs

Procedure

1. Connect the Type N cable between the RF OUT 50Ω and INPUT 50Ω connectors on the HP 8590B spectrum analyzer. See Figure 3-25.
   
   Option 011: Connect the 75Ω BNC cable between the RF OUT 75Ω and INPUT 75Ω connectors on the HP 8590B Spectrum Analyzer.

2. Press PRESET on the HP 8590B and set the controls as follows:
   - CENTER FREQ ............................................. 300 MHz
   - SPAN .................................................. 0 Hz

3. On the HP 8590B, press [MKR], [AUX_CTRL], TRACK GEN, SRC PWR ON, 5 dBm.
   - Option 011: 42 dBm (+42 dBmV).

4. On the HP 8590B, press TRACKING PEAK. Wait for the PEAKING message to disappear.

5. On the HP 8590B, press 0 dBm, [FREQUENCY], 10 MHz, [SGL SWP].
   - Option 011: 42.8 dBm.
   - It is only necessary to perform step 6 if more than 2 hours have elapsed since a front-panel calibration of the HP 8566A/B has been performed.

Note

The HP 8566A/B should be allowed to warm up for at least 30 minutes before proceeding.
6. Perform a front-panel calibration of the HP 8566A/B as follows:
   a. Connect a BNC cable between CAL OUTPUT and RF INPUT.
   b. Press \(2 - 22 \text{ GHz}\) (INSTR PRESET), \(\text{RECALL}\). Adjust AMPTD CAL for a marker amplitude reading of \(-10 \text{ dBm}\).
   c. Press \(\text{RECALL}\), \(\text{FREQ ZERO}\) for a maximum amplitude response.

7. Connect the Type N cable from the tracking generator output to the HP 8566A/B RF INPUT. See Figure 3-25.
   \(\text{Option 011}\): Use the minimum loss adapter and Type N (f) to BNC (m) adapter.

8. Set the HP 8566A/B controls as follows:
   
   CENTER FREQUENCY .................................................. 10 MHz
   SPAN ................................................................. 10 MHz
   REFERENCE LEVEL .................................................. +5 dBm
   RES BW ............................................................. 30 kHz
   LOG dB/DIV .......................................................... 10 dB

9. On the HP 8566A/B do the following:
   a. Press \(\text{PEAK SEARCH}\) and \(\text{SIGNAL TRACK}\) (ON). Wait for the signal to be displayed at center screen.
   b. Press \(\text{PEAK SEARCH}\), \(\text{MKR} \rightarrow \text{CF STEP}\), \(\text{A}\), and \(\text{SIGNAL TRACK}\) (OFF).
   c. Press \(\text{CENTER FREQUENCY}\), \(\text{A}\) (step-up key) to tune to the second harmonic. Press \(\text{PEAK SEARCH}\). Record the marker amplitude reading in Table 3-21 as the 2nd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
   d. Perform this step only if the tracking generator output frequency is less than 600 MHz. Press \(\text{CENTER FREQUENCY}\), \(\text{A}\) (step-up key) to tune to the third harmonic. Press \(\text{PEAK SEARCH}\). Record the marker amplitude reading in Table 3-21 as the 3rd Harmonic Level for the 10 MHz Tracking Generator Output Frequency.
   e. Press \(\text{MARKER OFF}\).

10. Repeat steps 8 and 9 above for the remaining Tracking Generator Output Frequencies listed in Table 3-21. Note that the HP 8590B CENTER FREQ is the same as the Tracking Generator Output Frequency.

11. Locate the most positive 2nd Harmonic Level in Table 3-21 and record below.

   2nd Harmonic Level _______________dBc

12. Locate the most positive 3rd Harmonic Level in Table 3-21 and record below.

   3rd Harmonic Level _______________dBc
### Table 3-21. Harmonic Spurious Responses

<table>
<thead>
<tr>
<th>Tracking Generator Frequency</th>
<th>2nd Harmonic Level (dBc)</th>
<th>3rd Harmonic Level (dBc)</th>
<th>Measurement Uncertainty (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz</td>
<td></td>
<td></td>
<td>+1.55/−1.80</td>
</tr>
<tr>
<td>100 MHz</td>
<td></td>
<td></td>
<td>+1.55/−1.80</td>
</tr>
<tr>
<td>300 MHz</td>
<td></td>
<td></td>
<td>+1.55/−1.80</td>
</tr>
<tr>
<td>850 MHz</td>
<td></td>
<td>N/A</td>
<td>+1.55/−1.80</td>
</tr>
</tbody>
</table>
20. Non-Harmonic Spurious Outputs

Specification

Non-Harmonic Spurious Outputs

Option 010: \(-30 \text{ dBc}, 100 \text{ kHz to } 1.8 \text{ GHz}\)
Option 011: \(-30 \text{ dBc}, 1 \text{ MHz to } 1.8 \text{ GHz}\)

Related Adjustment

There are no related adjustment procedures for this performance test.

Description

The tracking generator output is connected to the HP 8590B Spectrum Analyzer input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is then connected to the input of an HP 8566A/B Spectrum Analyzer. The tracking generator is set to several different output frequencies.

For each output frequency, several sweeps are taken on the HP 8566A/B over different frequency spans and the highest displayed spurious response is measured in each span. Responses at the fundamental frequency of the tracking generator output or their harmonics are ignored. The amplitude of the highest spurious response is recorded.

Equipment

Microwave Spectrum Analyzer ............................. HP 8566A/B
Cables
Type N, 62 cm (24 in) .................................... HP 11500B/C
BNC, 23 cm (9 in) ........................................ HP 10502A
Adapter
Type N (m) to BNC (f) .................................... 1250-1476

Additional Equipment for Option 011:

Minimum Loss Adapter ................................. HP 11852B
BNC Cable, 75\(\Omega\) ........................................ 5062-6452
Adapter, Type N (f) to BNC (m), 75\(\Omega\) ................. 1250-1534
20. Non-Harmonic Spurious Outputs

![Diagram of Spectrum Analyzer with connections and adapters]

Figure 3-26. Non-Harmonic Spurious Outputs Test Setup

Procedure

1. Connect the Type N cable between the RF OUT 50Ω and INPUT 50Ω connectors on the HP 8590B Spectrum Analyzer. See Figure 3-26.
   *Option 011:* Connect the 75Ω BNC cable between the RF OUT 75Ω and INPUT 75Ω on the HP 8590B Spectrum Analyzer.

2. Press [PRESET] on the HP 8590B and set the controls as follows:
   - CENTER FREQ .................................................. 300 MHz
   - SPAN .................................................................. 0 Hz

3. On the HP 8590B, press [MARK], [AUX CTRL], TRACK GEN, SRC PWR ON, 5 [-dBm].
   *Option 011:* 38 [+dBm] (+38 dBm).

4. On the HP 8590B, press TRACKING PEAK. Wait for the PEAKING message to disappear.

5. On the HP 8590B, press 0 [+dBm].
   *Option 011:* 42.8 [+dBm].

   It is only necessary to perform step 6 if more than 2 hours have elapsed since a front-panel calibration of the HP 8566A/B has been performed.

Note

The HP 8566A/B should be allowed to warm up for at least 30 minutes before proceeding.
6. Perform a front-panel calibration of the HP 8566A/B as follows:
   a. Connect a BNC cable between CAL OUTPUT and RF INPUT.
   b. Press (2 – 22 GHz) (INSTR PRESET), (RECALL). Adjust AMPTD CAL for a marker
      amplitude reading of –10 dBm.
      Press (SHIFT), (FREQUENCY SPAN) to start the 30 second internal error correction routine.
   d. Press (SHIFT), (START FREQ) to use the error correction factors just calculated.
7. Connect the Type N cable from the tracking generator output to the HP 8566A/B RF
   INPUT as shown in Figure 3-26.
   Option 011: Use the minimum loss adapter and Type N (f) to BNC (m) adapter.
8. Set the HP 8590B CENTER FREQ to the Fundamental Frequency listed in Table 3-22.
9. Set the HP 8566A/B controls as follows:
    SPAN .................................................. 100 kHz
    REFERENCE LEVEL .................................. +5 dBm
    ATTN ................................................. 20 dB
    LOG dB/DIV ........................................... 10 dB
10. Set the HP 8566A/B CENTER FREQUENCY to the Fundamental Frequency listed in
    Table 3-22.
    another sweep to finish.
12. Record the HP 8566A/B marker amplitude reading in Table 3-22 as the Fundamental
    Amplitude.
13. Set the HP 8566A/B (START FREQ), (STOP FREQ), and (RES BW) as indicated in the first row
    of Table 3-23.
15. Verify that the marked signal is not the fundamental or a harmonic of the fundamental as
    follows:
    a. Divide the marker frequency by the fundamental frequency (the HP 8590B CENTER
       FREQ setting). For example, if the marker frequency is 30.3 MHz and the fundamental
       frequency is 10 MHz, dividing 30.3 MHz by 10 MHz yields 3.03.
    b. Round the number calculated in step a the nearest whole number. In the example
       above, 3.03 should be rounded to 3.
    c. Multiply the fundamental frequency by the number calculated in step b. Following the
       example, multiplying 10 MHz by 3 yields 30 MHz.
    d. Calculate the difference between the marker frequency and the frequency calculated in
       step c above. Continuing the example, the difference would be 300 kHz.
    e. Due to span accuracy uncertainties in the HP 8566A/B and center frequency
       uncertainties in the HP 8590B, the marker frequency might not equal the actual
       frequency. Given the marker frequency, check if the difference calculated in step d is
       within the appropriate tolerance:
          For marker frequencies < 55 MHz, tolerance = ±750 kHz
20. Non-Harmonic Spurious Outputs

For marker frequencies >55 MHz, tolerance = ±10 MHz

f. If the difference in step d is within the indicated tolerance, the signal in question is the fundamental signal (if the number in step b = 1) or a harmonic of the fundamental (if the number in step b >1). This response should be ignored.

16. Verify that the marked signal is a true response and not a random noise peak by pressing [SINGLE] to trigger a new sweep and press [PEAK SEARCH]. A true response will remain at the same frequency and amplitude on successive sweeps but a noise peak will not.

17. If the marked signal is either the fundamental or a harmonic of the fundamental (see step 15) or a noise peak (see step 16), move the marker to the next highest signal by pressing [SHIFT], [PEAK SEARCH]. Continue with step 15.

18. If the marked signal is not the fundamental or a harmonic of the fundamental (see step 15) and is a true response (see step 16), calculate the difference between the amplitude of marked signal and the Fundamental Amplitude as listed in Table 3-22.

For example, if the Fundamental Amplitude for a fundamental frequency of 10 MHz is +1.2 dBm and the marker amplitude is -40.8 dBm, the difference is -42 dBc.

Record this difference as the Non-Harmonic Response Amplitude for the appropriate HP 8590B CENTER FREQ and HP 8566A/B START and STOP FREQ settings in Table 3-23.

Non-Harmonic Amplitude = Marker Amplitude - Fundamental Amplitude

19. If a true non-harmonic spurious response is not found, record “NOISE” as the Non-Harmonic Response Amplitude in Table 3-23 for the appropriate HP 8590B CENTER FREQ and HP 8566A/B START and STOP FREQ settings.

20. Repeat steps 14 through 19 for the remaining HP. 8566A/B settings for [START FREQ], [STOP FREQ], and [RES BW] for the HP 8590B CENTER FREQ setting of 10 MHz.

21. Repeat steps 8 through 20 with the HP 8590B CENTER FREQ set to 900 MHz.

22. Repeat steps 8 through 20 with the HP 8590B CENTER FREQ set to 1.8 GHz.

23. Locate in Table 3-23 the most-positive Non-Harmonic Response Amplitude. Record this amplitude below.

Highest Non-Harmonic Response Amplitude ___________ dBc

<table>
<thead>
<tr>
<th>Fundamental Frequency</th>
<th>Fundamental Amplitude (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz</td>
<td></td>
</tr>
<tr>
<td>900 MHz</td>
<td></td>
</tr>
<tr>
<td>1.8 GHz</td>
<td></td>
</tr>
</tbody>
</table>
Table 3-23. Non-Harmonic Responses

<table>
<thead>
<tr>
<th>HP 8566A/B Settings</th>
<th>Non-Harmonic Response Amplitude (dBc)</th>
<th>Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start Freq (MHz)</td>
<td>Stop Freq (MHz)</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>0.1*</td>
<td>5.0</td>
<td>10 kHz</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>100 kHz</td>
</tr>
<tr>
<td>55</td>
<td>1240</td>
<td>1 MHz</td>
</tr>
<tr>
<td>1240</td>
<td>1800</td>
<td>1 MHz</td>
</tr>
</tbody>
</table>

* Option 011: Set START FREQ to 1 MHz.
21. Tracking Generator Feedthrough

Specification
Tracking Generator Feedthrough

Option 010: \(-106 \text{ dBm}, 1 \text{ MHz to } 1.8 \text{ GHz}\)
Option 011: \(-57.24 \text{ dBmV}, 1 \text{ MHz to } 1.8 \text{ GHz}\)

Related Adjustment
There is no related adjustment procedure for this performance test.

Description
The tracking generator output is connected to the spectrum analyzer’s input and the tracking is adjusted at 300 MHz for a maximum signal level. The tracking generator output is terminated and set for 0 dBm output power (maximum output power). The spectrum analyzer’s input is also terminated. The noise level of the spectrum analyzer is then measured at several frequencies.

Equipment

50\(\Omega\) Termination (2 required) .......................... HP 908A

Cables
Type N, 62 cm (24 in) .......................... HP 11500B/C
BNC, 23 cm (9 in) .......................... HP 10502A

Adapter
Type N (m) to BNC (f) .......................... 1250-1476

Additional Equipment for Option 011

75\(\Omega\) Termination, Type N (m) (2 required) .......................... HP 909E, Option 201
BNC Cable, 75\(\Omega\) .......................... 5062-6452
Adapter, Type N (f) to BNC (m), 75\(\Omega\) (2 required) .......................... 1250-1534
21. Tracking Generator Feedthrough

![Spectrum Analyzer Diagram]

**Figure 3-27. Tracking Generator Feedthrough Test Setup**

**Procedure**

1. Connect the Type N cable between the RF OUT 50Ω and INPUT 50Ω connectors on the spectrum analyzer. See Figure 3-27.
   *Option 011*: Connect the 75Ω BNC cable between the RF OUT 75Ω and INPUT 75Ω connectors on the spectrum analyzer.

2. Press PRESET on the spectrum analyzer and set the controls as follows:
   - CENTER FREQ: 300 MHz
   - SPAN: 1 MHz

3. On the spectrum analyzer, press [MKR], [AUX CTRL], TRACK GEN, SRC PWR ON, 5 -dBm.
   *Option 011*: 42 +dBm (+42 dBmV).

4. On the spectrum analyzer, press TRACKING PEAK. Wait for the PEAKING message to disappear.

5. Connect the CAL OUTPUT to the INPUT 50Ω.
   *Option 011*: Connect the CAL OUTPUT to the INPUT 75Ω.
   Set the spectrum analyzer controls as follows:
   - REF LEVEL: -20 dBm
   - REF LEVEL (Option 011): +28.75 dBmV
   - SPAN: 10 MHz
   - ATTEN: 0 dB

6. Press [PEAK SEARCH], [SIGNAL TRACK] (ON), [SPAN], 100 kHz. Wait for the AUTO ZOOM message to disappear. Set the controls as follows:
   - VIDEO BW: 30 Hz
   - SIGNAL TRACK: OFF

7. Press [SGL SWP] and wait for completion of a new sweep. Press [PEAK SEARCH], [AMPLITUDE], MORE 1 of 2, REF LVL OFFSET.
   Subtract the [MKR] amplitude reading from -20 dBm and enter the result as the REF LVL OFFSET.
21. Tracking Generator Feedthrough

For example, if the marker reads \(-20.21\) dBm, enter \(+0.21\) dB

\[\text{[-20 dBm} - (-20.21 \text{ dBm}) = +0.21 \text{ dB]}\].

Example for Option 011: If the marker reads 26.4 dBmV, enter \(+2.35\) dB

\((28.75 \text{ dBmV} - 26.4 \text{ dBmV} = 2.35 \text{ dB})\).

REF LVL OFFSET ________dB

8. Connect one HP 908A 50Ω termination to the spectrum analyzer INPUT 50Ω and another to the tracking generator’s RF OUT 50Ω.

Option 011: Connect one HP 909E 75Ω termination to the spectrum analyzer INPUT 75Ω and another to the tracking generator’s RF OUT 75Ω.

9. Press [AUX CTRL], TRACK GEN, SRC PWR OFF.

10. Set the spectrum analyzer controls as follows:

CENTER FREQ ................................................. 0 Hz
SPAN .......................................................... 10 MHz
REF LVL ........................................................ -10 dBm
REF LVL (Option 011) ...................................... +38.75 dBmV
VIDEO BW .................................................... AUTO
Markers .......................................................... OFF
TRIG ............................................................. CONT

11. Press [PEAK SEARCH], [SIGNAL TRACK] (ON), [MKR ->], MARKER -> REF LVL, [SPAN], 2 (MHz). Wait for the AUTO ZOOM message to disappear. Press [SIGNAL TRACK] (OFF).

12. Press [FREQUENCY] and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

SPAN .......................................................... 50 kHz
REF LEVEL .................................................... -50 dBm
REF LEVEL (Option 011) .................................... -1.25 dBmV
VIDEO BW .................................................... 30 Hz

13. Press [AUX CTRL], TRACK GEN, SRC PWR ON, 0 (+dBm).

Option 011: 42.8 (+dBm) (+42.8 dBmV).


15. Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses. Record the display line amplitude setting in Table 3-24 as the noise level at 1 MHz.

16. Repeat steps 14 and 15 for the remaining Tracking Generator Output Frequencies (spectrum analyzer CENTER FREQ) listed in Table 3-24.

3-94 Verifying Specified Operation for the HP 8590B
17. In Table 3-24, locate the most positive Noise Level Amplitude. Record this amplitude here:

TG Feedthrough _______dBm

Option 011: TG Feedthrough _______dBmV

<table>
<thead>
<tr>
<th>Tracking Generator Output Frequency</th>
<th>Noise Level Amplitude (dBm or dBmV)</th>
<th>Measurement Uncertainty (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>20 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>50 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>100 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>250 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>400 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>550 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>700 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>850 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
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<tr>
<td>1000 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>1150 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>1300 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>1450 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>1600 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
<tr>
<td>1750 MHz</td>
<td></td>
<td>+1.15/-1.24</td>
</tr>
</tbody>
</table>
Performance Verification Test Record

Table 3-25. Performance Verification Test Record (Page 1 of 8)

Hewlett-Packard Company
Address: ____________________________

_______________________________  Report No. ____________________________

_______________________________  Date ____________________________

_______________________________  (e.g. 10 SEP 1989)

Model HP 8590B
Serial No. ____________________________
Options ____________________________
Firmware Revision ____________________________

Customer ____________________________  Tested by ____________________________

Ambient temperature _____________ °C  Relative humidity _____________ %
Power mains line frequency _____________ Hz (nominal)

Test Equipment Used:

<table>
<thead>
<tr>
<th>Description</th>
<th>Model No.</th>
<th>Trace No.</th>
<th>Cal Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesized Sweeper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Function Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Level Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM/FM Signal Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring Receiver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Meter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Power Sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-Sensitivity Power Sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Test Equipment Used:

<table>
<thead>
<tr>
<th>Description</th>
<th>Model No.</th>
<th>Trace No.</th>
<th>Cal Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microwave Frequency Counter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal Frequency Counter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Splitter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Loss Adapter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Options 001 and 011 only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 MHz Low Pass Filter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50Ω Termination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75Ω Termination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Options 001 and 011 only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microwave Spectrum Analyzer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Options 010 and 011 only)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes/Comments**

----------------------------------

----------------------------------

----------------------------------

----------------------------------
## Performance Verification Test Record

### Test Description

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Description</th>
<th>Results</th>
<th>Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Frequency Drift</td>
<td>Min: -75 kHz</td>
<td>Max: +75 kHz</td>
</tr>
<tr>
<td>2.</td>
<td>Frequency Readout Accuracy</td>
<td>Center Freq:</td>
<td>Frequency (MHz)</td>
</tr>
<tr>
<td></td>
<td>Frequency Readout Accuracy</td>
<td>10 MHz: 49.988</td>
<td>15.0020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 MHz: 44.988</td>
<td>55.0020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 MHz: 94.988</td>
<td>105.0020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 MHz: 494.988</td>
<td>505.0020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 MHz: 994.988</td>
<td>1005.0020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1800 MHz: 1794.988</td>
<td>1805.0020</td>
</tr>
<tr>
<td>3.</td>
<td>Noise Sidebands</td>
<td></td>
<td>-65 dBc</td>
</tr>
<tr>
<td>4.</td>
<td>System Related Sidebands</td>
<td></td>
<td>-65 dBc</td>
</tr>
<tr>
<td>5.</td>
<td>Frequency Span Readout Accuracy</td>
<td>Span Setting:</td>
<td>MKRΔ Reading (MHz)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 MHz: 385.00</td>
<td>415.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 MHz: 770.00</td>
<td>830.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1800 MHz: 1446.00</td>
<td>1554.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 MHz: 77.0</td>
<td>83.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 MHz: 38.5</td>
<td>41.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 MHz: 15.40</td>
<td>16.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 MHz: 7.70</td>
<td>8.30</td>
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<td></td>
<td></td>
<td>5 MHz: 3.850</td>
<td>4.150</td>
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<td>2 MHz: 1.540</td>
<td>1.660</td>
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<td></td>
<td></td>
<td>Span Setting:</td>
<td>MKRΔ Reading (kHz)</td>
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<td></td>
<td></td>
<td>1 MHz: 770.0</td>
<td>830.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 kHz: 385.0</td>
<td>415.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 kHz: 154.0</td>
<td>166.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 kHz: 77.0</td>
<td>83.0</td>
</tr>
</tbody>
</table>

3-98 Verifying Specified Operation for the HP 8590B
### Performance Verification Test Record

**Hewlett-Packard Company**  
**Model HP 8590B**  
**Report No.**  
**Serial No.**  
**Date**

---

**Test No.**  
**Test Description**  
**Results**  
**Measurement**  

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Description</th>
<th>Results Min</th>
<th>Measured</th>
<th>Results Max</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>Sweep Time Accuracy</td>
<td><strong>MKRA Reading</strong></td>
<td>20 ms 15.4 ms</td>
<td>16.6 ms ±0.057 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SWEEP TIME Setting</td>
<td>50 ms 38.5 ms</td>
<td>41.5 ms ±0.141 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 ms 77.0 ms</td>
<td>83.0 ms ±0.283 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 ms 385.0 ms</td>
<td>415.0 ms ±1.41 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 s 770.0 ms</td>
<td>830.0 ms ±2.83 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 s 7.7 s</td>
<td>8.3 s ±23.8 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 s 38.5 s</td>
<td>41.5 s ±141.4 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 s 77.0 s</td>
<td>83.0 s ±283.0 ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**7. Scale Fidelity**  
**Incremental Error**  
**dB from Ref Level**  

<table>
<thead>
<tr>
<th>Incremental Error</th>
<th>Results Min</th>
<th>Measured</th>
<th>Results Max</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>±0.06 dB</td>
</tr>
<tr>
<td>-2</td>
<td>-0.2 dB</td>
<td>+0.2 dB</td>
<td>±0.06 dB</td>
<td></td>
</tr>
<tr>
<td>-4</td>
<td>-0.2 dB</td>
<td>+0.2 dB</td>
<td>±0.06 dB</td>
<td></td>
</tr>
<tr>
<td>-6</td>
<td>-0.2 dB</td>
<td>+0.2 dB</td>
<td>±0.06 dB</td>
<td></td>
</tr>
<tr>
<td>-8</td>
<td>-0.2 dB</td>
<td>+0.2 dB</td>
<td>±0.06 dB</td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td>-0.2 dB</td>
<td>+0.2 dB</td>
<td>±0.06 dB</td>
<td></td>
</tr>
</tbody>
</table>

**Log Mode**  
**dB from Ref Level**  

<table>
<thead>
<tr>
<th>Log Mode</th>
<th>Results Min</th>
<th>Measured</th>
<th>Results Max</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>±0.06 dB</td>
</tr>
<tr>
<td>-10</td>
<td>-10.75 dB</td>
<td>-9.25 dB</td>
<td>±0.06 dB</td>
<td></td>
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<tr>
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**Linear Mode**  
**% of Ref Level**  

<table>
<thead>
<tr>
<th>% of Ref Level</th>
<th>Results Min</th>
<th>Measured</th>
<th>Results Max</th>
<th>Uncertainty</th>
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<tbody>
<tr>
<td>100.00</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
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</tr>
<tr>
<td>70.70</td>
<td>150.98 mV</td>
<td>165.20 mV</td>
<td>±1.84 mV</td>
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<tr>
<td>50.00</td>
<td>104.69 mV</td>
<td>118.91 mV</td>
<td>±1.84 mV</td>
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</tr>
<tr>
<td>35.48</td>
<td>72.22 mV</td>
<td>86.44 mV</td>
<td>±1.84 mV</td>
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</tr>
<tr>
<td>25.00</td>
<td>48.79 mV</td>
<td>63.01 mV</td>
<td>±1.84 mV</td>
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**Log-to-Linear Switching**  

Log-to-Linear Switching:  
-0.25 dB ±0.25 dB ±0.05 dB
<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Description</th>
<th>Min</th>
<th>Measured</th>
<th>Max</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Input Attenuator Accuracy</td>
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<tr>
<td></td>
<td>Attenuation (dB)</td>
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</tr>
<tr>
<td></td>
<td>10</td>
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<td>0 (Ref)</td>
<td>0 (Ref)</td>
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<tr>
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<td>0</td>
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<td>0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.12 dB</td>
</tr>
<tr>
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<td>20</td>
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<td>+0.5 dB</td>
<td>+/-0.12 dB</td>
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</tr>
<tr>
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<td>30</td>
<td>-0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.12 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>-0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.12 dB</td>
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</tr>
<tr>
<td></td>
<td>50</td>
<td>-0.5 dB</td>
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<td>+/-0.12 dB</td>
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</tr>
<tr>
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<td>Reference Level Accuracy</td>
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<td>Log Mode</td>
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<td>Reference Level (dBm)</td>
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</tr>
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<td>0 (Ref)</td>
<td>0 (Ref)</td>
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<tr>
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<td>+0.5 dB</td>
<td>+/-0.06 dB</td>
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</tr>
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<td>+0.5 dB</td>
<td>+/-0.06 dB</td>
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</tr>
<tr>
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<td>-30</td>
<td>-0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.06 dB</td>
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</tr>
<tr>
<td></td>
<td>-40</td>
<td>-0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.08 dB</td>
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</tr>
<tr>
<td></td>
<td>-50</td>
<td>-0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.08 dB</td>
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</tr>
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<td>-60</td>
<td>-1.25 dB</td>
<td>+1.25 dB</td>
<td>+/-0.12 dB</td>
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</tr>
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</tr>
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<td></td>
<td>-80</td>
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</tr>
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<td>-90</td>
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<td>+1.25 dB</td>
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</tr>
<tr>
<td></td>
<td>Linear Mode</td>
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<td></td>
</tr>
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<td>Reference Level (dBm)</td>
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<td></td>
</tr>
<tr>
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<td>-20</td>
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<td>0 (Ref)</td>
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<td>+/-0.06 dB</td>
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</tr>
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<td>+/-0.06 dB</td>
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<td>-50</td>
<td>-0.5 dB</td>
<td>+0.5 dB</td>
<td>+/-0.08 dB</td>
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</tr>
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<td>-60</td>
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<td>+1.25 dB</td>
<td>+/-0.12 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-70</td>
<td>-1.25 dB</td>
<td>+1.25 dB</td>
<td>+/-0.12 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-80</td>
<td>-1.25 dB</td>
<td>+1.25 dB</td>
<td>+/-0.12 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-90</td>
<td>-1.25 dB</td>
<td>+1.25 dB</td>
<td>+/-0.12 dB</td>
<td></td>
</tr>
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3-100 Verifying Specified Operation for the HP 8590B
<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Description</th>
<th>Results</th>
<th>Measurement Uncertainty</th>
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<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Measured</td>
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<td>10.</td>
<td>Resolution Bandwidth</td>
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<td>Switching Uncertainty</td>
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<td></td>
<td>RES BW Setting</td>
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<td>3 kHz</td>
<td></td>
<td>0</td>
<td>(Ref)</td>
</tr>
<tr>
<td>1 kHz</td>
<td></td>
<td>-0.5 dB</td>
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</tr>
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<td>-0.4 dB</td>
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</tr>
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<td>30 kHz</td>
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<td>-0.4 dB</td>
<td></td>
</tr>
<tr>
<td>100 kHz</td>
<td></td>
<td>-0.4 dB</td>
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</tr>
<tr>
<td>300 kHz</td>
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<td>-0.4 dB</td>
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</tr>
<tr>
<td>1 MHz</td>
<td></td>
<td>-0.4 dB</td>
<td></td>
</tr>
<tr>
<td>3 MHz</td>
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<td>-0.4 dB</td>
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<td>Calibrator Amplitude and Frequency Accuracy</td>
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<td>Option 001</td>
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<td>Frequency</td>
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<td>Max Positive Response</td>
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<td></td>
<td>Max Negative Response</td>
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<td></td>
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<td></td>
<td>Peak-to-Peak Response</td>
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<td>13.</td>
<td>Spurious Responses</td>
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<tr>
<td></td>
<td>Second Harmonic Distortion</td>
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<td></td>
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<td></td>
<td>Third Order</td>
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<td>Intermodulation Distortion</td>
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<td>14.</td>
<td>Gain Compression</td>
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<td>15.</td>
<td>Displayed Average Noise Level</td>
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<tr>
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<td>Non-Option 001: Frequency</td>
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</tr>
<tr>
<td>400 kHz</td>
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<tr>
<td>1 MHz</td>
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</tr>
<tr>
<td>1 MHz to 1.5 GHz</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1.5 GHz to 1.8 GHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test No.</td>
<td>Test Description</td>
<td>Results</td>
<td>Measurement Uncertainty</td>
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<td>---------</td>
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<td>1 MHz to 1.5 GHz</td>
<td>-63 dBmV</td>
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<td></td>
<td>1.5 GHz to 1.8 GHz</td>
<td>-61 dBmV</td>
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<td>Residual Responses</td>
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<td>Non-Option 001:</td>
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<td>150 kHz to 1 MHz</td>
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</tr>
<tr>
<td></td>
<td>1 MHz to 1.8 GHz</td>
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<td>-90 dBm</td>
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<td>Option 001:</td>
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<td>-38 dBmV</td>
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<tr>
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<td>Absolute Amplitude, Vernier, and Power Sweep Accuracy</td>
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</tr>
<tr>
<td></td>
<td>Absolute Amplitude</td>
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<td>Positive Vernier Accuracy</td>
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</tr>
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<td></td>
<td>Negative Vernier Accuracy</td>
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<td>-1.0 dB</td>
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<tr>
<td></td>
<td>Power Sweep Accuracy</td>
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<td>18.</td>
<td>Tracking Generator Level Flatness</td>
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<td>Option 010:</td>
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<tr>
<td></td>
<td>Maximum Flatness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 kHz</td>
<td></td>
<td>+1.75 dB</td>
</tr>
<tr>
<td></td>
<td>300 kHz to 5 MHz</td>
<td></td>
<td>+1.75 dB</td>
</tr>
<tr>
<td></td>
<td>10 MHz to 1800 MHz</td>
<td></td>
<td>+1.75 dB</td>
</tr>
<tr>
<td></td>
<td>Minimum Flatness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 kHz</td>
<td>-1.75 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300 kHz to 5 MHz</td>
<td>-1.75 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 MHz to 1800 MHz</td>
<td>-1.75 dB</td>
<td></td>
</tr>
<tr>
<td>Test No.</td>
<td>Test Description</td>
<td>Results</td>
<td>Measurement Uncertainty</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------</td>
<td>---------</td>
<td>-------------------------</td>
</tr>
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<td>18.</td>
<td>Tracking Generator Level Flatness (continued)</td>
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<td>Option 011:</td>
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<td>Maximum Flatness</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>1 MHz to 1800 MHz</td>
<td></td>
<td>+1.75 dB +0.18/-0.39 dB</td>
</tr>
<tr>
<td></td>
<td>Minimum Flatness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 MHz to 1800 MHz</td>
<td>-1.75 dB</td>
<td>+0.18/-0.39 dB</td>
</tr>
<tr>
<td>19.</td>
<td>Harmonic Spurious Outputs</td>
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<td></td>
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<tr>
<td></td>
<td>2nd Harmonic Level</td>
<td></td>
<td>-25 dBc +1.55/-1.80 dB</td>
</tr>
<tr>
<td></td>
<td>3rd Harmonic Level</td>
<td></td>
<td>+1.55/-1.80 dB</td>
</tr>
<tr>
<td>20.</td>
<td>Non-Harmonic Spurious Outputs</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Highest Non-Harmonic Response Amplitude</td>
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<td>-30 dBc +1.55/-1.80 dB</td>
</tr>
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<td>21.</td>
<td>Tracking Generator Feedthrough</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>TG Feedthrough (Opt 010)</td>
<td></td>
<td>-106 dBm +1.15/-1.24 dB</td>
</tr>
<tr>
<td></td>
<td>TG Feedthrough (Opt 011)</td>
<td></td>
<td>-57.24 dBmV +1.15/-1.24 dB</td>
</tr>
</tbody>
</table>
Verifying Specified Operation for the HP 8592B

What You'll Find in This Chapter

This chapter contains test procedures which test the electrical performance of the HP 8592B Spectrum Analyzer.

None of the test procedures involve removing the cover of the spectrum analyzer.

What Is Performance Verification?

Performance Verification verifies that the spectrum analyzer performance is within all specifications of Table 1-3. It is time-consuming and requires extensive test equipment. Performance Verification consists of all the performance tests. See Table 4-1 for a complete listing of performance tests.

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
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<tbody>
<tr>
<td>1.</td>
<td>Comb Generator Frequency Accuracy</td>
</tr>
<tr>
<td>2.</td>
<td>Frequency Readout Accuracy</td>
</tr>
<tr>
<td>3.</td>
<td>Noise Sidebands</td>
</tr>
<tr>
<td>4.</td>
<td>System Related Sidebands</td>
</tr>
<tr>
<td>5.</td>
<td>Frequency Span Readout Accuracy</td>
</tr>
<tr>
<td>6.</td>
<td>Sweep Time Accuracy</td>
</tr>
<tr>
<td>7.</td>
<td>Scale Fidelity</td>
</tr>
<tr>
<td>8.</td>
<td>Input Attenuator Accuracy</td>
</tr>
<tr>
<td>9.</td>
<td>Reference Level Accuracy</td>
</tr>
<tr>
<td>10.</td>
<td>Resolution Bandwidth Switching Uncertainty</td>
</tr>
<tr>
<td>11.</td>
<td>Calibrator Amplitude and Frequency Accuracy</td>
</tr>
<tr>
<td>12.</td>
<td>Frequency Response</td>
</tr>
<tr>
<td>13.</td>
<td>Other Input Related Spurious</td>
</tr>
<tr>
<td>14.</td>
<td>Spurious Response</td>
</tr>
<tr>
<td>15.</td>
<td>Gain Compression</td>
</tr>
<tr>
<td>16.</td>
<td>Displayed Average Noise Level</td>
</tr>
<tr>
<td>17.</td>
<td>Residual Responses</td>
</tr>
</tbody>
</table>
What Is Operation Verification?

Operation Verification consists of a subset of the performance tests which test only the most critical specifications of the analyzer. It requires less time and equipment than the Performance Verification and is recommended for verification of over all instrument operation, either as part of incoming inspection or after repair. Operation Verification consists of the following performance tests:

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Frequency Readout Accuracy</td>
</tr>
<tr>
<td>3.</td>
<td>Noise Sidebands</td>
</tr>
<tr>
<td>7.</td>
<td>Scale Fidelity</td>
</tr>
<tr>
<td>8.</td>
<td>Input Attenuator Accuracy</td>
</tr>
<tr>
<td>9.</td>
<td>Reference Level Accuracy</td>
</tr>
<tr>
<td>10.</td>
<td>Resolution Bandwidth Switching Uncertainty</td>
</tr>
<tr>
<td>11.</td>
<td>Calibrator Amplitude and Frequency Accuracy</td>
</tr>
<tr>
<td>12.</td>
<td>Frequency Response</td>
</tr>
<tr>
<td>14.</td>
<td>Second Harmonic Distortion (part of Spurious Response)</td>
</tr>
<tr>
<td>16.</td>
<td>Displayed Average Noise Level</td>
</tr>
</tbody>
</table>

Before You Start the Verification Tests

There are four things you should do before starting a verification test:

1. Switch the analyzer on and let it warm up in accordance with the Temperature Stability specification in Table 1-3.

2. Read “Making a Measurement” in Chapter 5.

3. After the analyzer has warmed up as specified, perform the Self-Calibration Procedure documented in “Improving Accuracy With Self-Calibration Routines” in Chapter 5. The performance of the analyzer is only specified after the analyzer calibration routines have been run and if the analyzer is autocoupled.

4. Read the rest of this section before you start any of the tests, and make a copy of the Performance Verification Test Record described in “Recording the Test Results.”

Test Equipment You'll Need

Table 4-3 lists the recommended test equipment for the performance tests. The table also lists recommended equipment for the analyzer's adjustment procedures which are located in the HP 8592B Service Manual. Any equipment that meets the critical specifications given in the table can be substituted for the recommended model(s).
Recording the Test Results

A small test results table is provided at the end of each test procedure for your convenience in recording test results as you perform the procedure.

In addition, a complete Performance Verification Test Record, (Table 4-27), has been provided at the end of the chapter. We recommend that you make a copy of the table, record the test results on the copy, and keep the copy for your calibration test record. This record could prove valuable in tracking gradual changes in test results over long periods of time.

If the Analyzer Doesn't Meet Specifications

If the analyzer fails a test, rerun the CAL FREQ & AMPTD routine, press CAL STORE, and repeat the test. If the analyzer still fails one or more specifications, complete any remaining tests and record all test results on a copy of the test record. Then refer to “Problems” in Chapter 8, for instructions on how to solve the problem.

Periodically Verifying Operation

The analyzer requires periodic verification of operation. Under most conditions of use, you should test the analyzer at least once a year with either Operation Verification or the complete set of Performance Verification tests.
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesized Sweeper</td>
<td>Frequency Range: 10 MHz to 22 GHz</td>
<td>HP 8340A/B</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Frequency Accuracy (CW): ±0.02%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leveling Modes: Internal and External</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modulation Modes: AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power Level Range: -35 to +16 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer Function</td>
<td>Frequency Range: 0.1 Hz to 500 Hz</td>
<td>HP 3325B</td>
<td>P,T</td>
</tr>
<tr>
<td>Generator</td>
<td>Frequency Accuracy: ±0.02%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waveform: Triangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Level Generator</td>
<td>Frequency Range: 500 Hz to 80 MHz</td>
<td>HP 3335A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: +12 to -85 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flatness: ±0.15 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attenuator Accuracy: ±0.09 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM/FM Signal Generator</td>
<td>Frequency Range: 1 MHz to 1000 MHz</td>
<td>HP 8640B</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: -35 to +16 dB</td>
<td>Option 002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SSB Noise: &lt; -120 dBc/Hz at 20 kHz offset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring Receiver</td>
<td>Compatible with Power Sensors</td>
<td>HP 8902A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>dB Relative Mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resolution: 0.01 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reference Accuracy ±1.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Meter</td>
<td>Power Range Calibrated in dBm and</td>
<td>HP 436A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>dB relative to reference power -70 dB to +44 dB, sensor dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Sensor</td>
<td>Frequency Range: 1 MHz to 350 MHz</td>
<td>HP 8482A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Maximum SWR: 1.1 (1 MHz to 2.0 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.30 (2.0 to 2.9 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Power Sensor</td>
<td>Frequency Range: 300 MHz</td>
<td>HP 8484A</td>
<td>P,T,A</td>
</tr>
<tr>
<td></td>
<td>Amplitude Range: -20 dB to -70 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum SWR: 1.1 (300 MHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Sensor</td>
<td>Frequency Range: 50 MHz to 26.5 GHz</td>
<td>HP 8485A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Maximum SWR: 1.15 (50 MHz to 100 MHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.10 (100 MHz to 2 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.15 (2.0 GHz to 12.4 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.20 (12.4 GHz to 18.0 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.25 (18 GHz to 26.5 GHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microwave Frequency Counter</td>
<td>Frequency Range: 9 MHz to 7 GHz</td>
<td>HP 5343A</td>
<td>P,A,T</td>
</tr>
<tr>
<td></td>
<td>Timebase Accy (Aging): &lt;5 × 10^{-10}/day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P = Performance Test, A = Adjustment, T = Troubleshooting

4-4 Verifying Specified Operation for the HP 8592B
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectrum Analyzer</td>
<td>Frequency Range: 10 MHz to 7 GHz</td>
<td>HP 8566A/B</td>
<td>A,T</td>
</tr>
</tbody>
</table>
| Oscilloscope       | Bandwidth: dc to 100 MHz  
|                    | Vertical Scale Factor of 0.5 V to 5 V/Div  
|                    | External Trigger Mode                                                                                                 | HP 1741A          | T    |
| Digital Voltmeter  | Input Resistance: ≥10 megohms  
|                    | Accuracy: ±10 mV on 100 V range                                                                                       | HP 3456A          | P,A,T |
| DVM Test Leads     | For use with HP 3456A                                                                                                  | HP 34118          | A,T  |
| Power Splitter     | Frequency Range: 50 kHz to 22 GHz  
|                    | Insertion Loss: 6 dB (nominal)                                                                                         | HP 11667B         | P,A  |
|                    | Output Tracking: <0.25 dB                                                                                            |                   |      |
|                    | Equivalent Output SWR: <1:22:1                                                                                          |                   |      |
| Directional Bridge | Frequency Range: 0.1 to 110 MHz  
|                    | Directivity: >40 dB                                                                                                    | HP 8721A          | P,T  |
|                    | Maximum VSWR: 1:1:1                                                                                                |                   |      |
|                    | Transmission Arm Loss: 6 dB (nominal)                                                                                 |                   |      |
|                    | Coupling Arm Loss: 6 dB (nominal)                                                                                     |                   |      |
| Directional Coupler| Frequency Range: 1.7 GHz to 8 GHz  
|                    | Coupling: 16 dB (nominal)                                                                                              | 0955-0125         | P,T  |
|                    | Max. Coupling Deviation: ± 1 dB                                                                                       |                   |      |
|                    | Directivity: 14 dB                                                                                                     |                   |      |
|                    | Flatness: 0.75 dB maximum                                                                                            |                   |      |
|                    | VSWR: <1.45                                                                                                           |                   |      |
|                    | Insertion Loss: <1.3 dB                                                                                               |                   |      |
| Low Pass Filter    | Cutoff Frequency: 300 MHz                                                                                              | 0955-0455         | P,A,T|
|                    | Bandpass Insertion Loss: <0.9 dB at 300 MHz                                                                           |                   |      |
|                    | Stopband Insertion Loss: >40 dB at 435 MHz                                                                             |                   |      |
| 10 dB Attenuator   | Type N (m to f)  
|                    | Frequency: 300 MHz                                                                                                     | HP 8491A          | A    |
|                    | Option 010                                                                                                            |                   |      |
| 20 dB Attenuator   | Attenuation: 20 dB                                                                                                    | HP 8491A          | A    |
|                    | Frequency dc to 12.4 GHz                                                                                               | Option 020        |      |
| 1 dB Step Attenuator| Attenuation Range: 0 to 12 dB  
|                    | Frequency Range: 50 MHz  
|                    | Connectors: BNC female                                                                                                | HP 355C           | P,A  |

* P = Performance Test, A = Adjustment, T=Troubleshooting
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
</table>
| 10 dB Step Attenuator | Attenuation Range: 0 to 30 dB  
Frequency Range: 50 MHz  
Connectors: BNC female                                              | HP 355D           | P,A  |
| Low Pass Filter       | Cutoff Frequency: 4.4 GHz  
Rejection at 5.5 GHz: >40 dB                                         | HP 11689A         | P    |
| Low Pass Filter       | Cutoff Frequency: 50 MHz  
Rejection at 80 MHz: >50 dB  
Termination Impedance: 50 ohms (nominal)                            | 0955-0306         | P    |
| Logic Pulser          | TTL voltage and current drive levels                                                                                 | HP 546A           | T    |
| Digital Current Tracer| Sensitivity: 1 mA to 500 mA  
Frequency Response: Pulse trains to 10 MHz  
Minimum Pulse Width: 50 ns  
Pulse Rise Time: <200 ns                                                   | HP 547A           | T    |
| Logic Clip            | TTL voltage and current drive levels                                                                                 | HP 548A           | T    |
| Cable                 | Frequency Range: 10 MHz to 22 GHz  
Maximum SWR: <1.4 at 22 GHz  
Length: ≥91 cm (36 in)  
Connectors: APC 3.5 (m) both ends  
Maximum Insertion Loss: 2 dB (2 required)                              | 8120-4921         | P,A  |
| Cable                 | Frequency Range: 50 MHz to 7 GHz  
Length: ≥91 cm (36 in)  
Connectors: SMA (m) both ends                                         | 5061-5458         | P,A,T |
| Cable                 | Frequency Range: dc to 1 GHz  
Length: ≥91 cm (36 in)  
Connectors: BNC (m) both ends (4 required)                            | HP 10503A         | P,A,T |
| Cable                 | Frequency Range: dc to 310 MHz  
Length: 20 cm (9 in)  
Connectors: BNC (m) both ends                                         | HP 10502A         | P,A,T |
| Test Cable            | Length: ≥91 cm (36 in)  
Connectors: SMB (f) to BNC (m) (2 required)                           | 85680-60093       | A,T  |
| Cable Assembly        | Length: approximately 15 cm (6 in)  
Connectors: BNC (f) to Alligator Clips                                | 8120-1292         | A    |

* P = Performance Test, A = Adjustment, T=Troubleshooting
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Critical Specifications for Equipment Substitution</th>
<th>Recommended Model</th>
<th>Use*</th>
</tr>
</thead>
</table>
| Cable Assembly | Length: ≥91 cm (36 in)  
Connectors: Banana Plug to Alligator Clips | HP 11102A | A |
| Adapter      | Type N (f) to Type N (f) | 1250-1472 | P,A,T |
| Adapter      | Type N (m) to BNC (f) *(# required)* | 1250-1476 | P,A,T |
| Adapter      | Type N (m) to BNC (m) | 1250-1473 | P,A,T |
| Adapter      | Type N (f) to BNC (m) | 1250-1477 | P,A,T |
| Adapter      | Type N (f) to SMA (f) | 1250-1772 | P,A,T |
| Adapter      | Type N (m) to APC 3.5 (m) | 1250-1743 | P,A,T |
| Adapter      | Type N (f) to APC 3.5 (f) | 1250-1745 | P,A,T |
| Adapter      | APC 3.5 (f) to APC 3.5 (f) | 5061-5311 | P,A,T |
| Adapter      | Type N (m) to APC 3.5 (f) | 1250-1744 | P,A,T |
| Adapter      | SMA (f) to SMA (f) | 1250-1158 | P,A,T |
| Adapter      | SMA (m) to SMA (m) | 1250-1159 | P,A,T |
| Adapter      | SMB (m) to SMB (m) | 1250-0813 | A,T |
| Adapter      | BNC (m) to BNC (m) | 1250-0216 | P,A,T |
| Adapter      | SMC (m) to SMC (m) | 1250-0827 | A,T |
| Adapter      | BNC tee (m) (f) (f) | 1250-0781 | T |
| Adapter      | BNC (f) to SMB (m) | 1250-1237 | A,T |

* P = Performance Test, A = Adjustment, T=Troubleshooting
1. Comb Generator Frequency Accuracy

Specification

$<\pm 0.007\%$.

Related Adjustment

Comb Generator Frequency Adjustment.

Description

A 100 MHz signal from a synthesized source and the output from a comb generator are applied to the input of the HP 8592B. The source frequency is adjusted until the two signals appear at the same frequency. The frequency setting of the source is then equal to the comb generator frequency and this frequency is compared to the specification.

Equipment

Synthesized Sweeper ................................................. HP 8340A/B
Power Splitter ......................................................... HP 11667B

Cables

APC mm (m) 91 cm (36 in) ........................................... 8120-4921
SMA Cable 61 cm (18 in) (m) to (m) ......................... 8120-1578

Adapters

Type N (m) to APC 3.5 (m) ....................................... 1250-1743
3.5 mm (f) to 3.5 mm (f) ........................................ 5061-5311

Procedure

1. Connect the equipment as shown in Figure 4-1.

![Figure 4-1. Comb Generator Frequency Accuracy Test Setup](image)
1. Comb Generator Frequency Accuracy

2. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:
   
   CW .................................................. 100.025 MHz
   POWER LEVEL ........................................ 0 dBm
   RF ................................................... OFF

3. Press [PRESET] on the HP 8592B (wait for PRESET to complete) and set the controls as follows:
   
   CENTER FREQUENCY .................................. 100 MHz
   
   Press [AUX CTRL], and set the controls as follows:
   
   COMB GEN ............................................. ON
   SPAN .................................................. 12 MHz
   REF LEVEL ........................................... +10 dB
   RES BW ................................................ 10 kHz

4. On the HP 8592B, press [PEAK SEARCH], [SIGNAL TRACK] (ON), [SPAN], 100 kHz. Press [AMPLITUDE] and adjust the reference level setting until the signal peak is 10 dB below the reference level.

5. Set the HP 8340A/B RF on. Adjust the HP 8340A/B power level until the two signals are the same amplitude.

6. Set the HP 8592B LOG dB/DIV to 2 dB.

7. If necessary, readjust the HP 8340A/B power level until the two signals are the same amplitude.

8. Set the HP 8340A/B CW to 100 MHz. A very unstable signal will probably appear. The peak amplitude should be at least 3 dB greater in amplitude than either of the individual signals.

9. Adjust the HP 8340A/B CW setting until a single signal appears to rise and fall in amplitude at the slowest rate (1 Hz frequency resolution will be necessary). The signal peak should be displayed approximately 6 dB above the amplitude of the individual signals.

10. Record the HP 8340A/B CW frequency setting. The frequency should be between 99.993 MHz and 100.007 MHz.

   Comb Generator Frequency ________________ MHz
2. Frequency Readout Accuracy

Specification

\[(5 \times N)\text{MHz} + 0.01\% \text{ center frequency} + 2\% \text{ span.}\]

Related Adjustment

Frequency Reference Adjustment.

Description

The frequency readout accuracy of the HP 8592B is tested with an input signal of known frequency.

Equipment

Synthesized Sweeper ........................................ HP 8340A/B

Adapters

Type N (m) to APC 3.5 (f) ...................................... 1250-1744
APC 3.5 (f) to APC 3.5 (f) .................................... 5061-5311

Cable

APC 3.5, 91 cm (36 in) ........................................ 8120-4921

Procedure

1. Connect the equipment as shown in Figure 4-2.

   ![Figure 4-2. Frequency Readout Accuracy Test Setup](image)

2. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:

   CW ............................................................... 10 MHz
   POWER LEVEL ................................................... −5 dBm
2. Frequency Readout Accuracy

3. Press [Preset] on the HP 8592B and wait for the preset to finish. Set the controls as follows:

FREQUENCY .................................................. 10 MHz
SPAN .......................................................... 12 MHz

4. On the HP 8592B, press [Peak Search], [Signal Track] (ON), [Span], 10 MHz. Record the MKR frequency reading in Table 4-4. The reading should be within the limits shown.

5. Repeat step 4 for the HP 8340A/B CW and HP 8592B center frequency and span combinations listed in Table 4-4.

Note Use [Signal Track] and a wider frequency span if it is difficult to keep the signal on-screen.

<table>
<thead>
<tr>
<th>8340A/B CW Frequency (MHz)</th>
<th>HP 8592B Span (MHz)</th>
<th>HP 8592B Center Frequency (GHz)</th>
<th>Min Frequency (GHz)</th>
<th>Actual Frequency (GHz)</th>
<th>Max Frequency (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>0.010</td>
<td>4.80 MHz</td>
<td></td>
<td>15.20 MHz</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0.010</td>
<td>4.98 MHz</td>
<td></td>
<td>15.02 MHz</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>0.050</td>
<td>44.80 MHz</td>
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<td>55.21 MHz</td>
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<td>1000</td>
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<td>4000</td>
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<td>8.98890</td>
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<td>9.01092</td>
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<td>15.98320</td>
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<td>20.977880</td>
<td></td>
<td>21.022120</td>
</tr>
</tbody>
</table>

Verifying Specified Operation for the HP 8592B 4-11
2. Frequency Readout Accuracy

3. Noise Sidebands

Specification

\[ -95 \text{ dBC/Hz} + 20 \log \frac{N}{\text{Hz}} \text{ at } >30 \text{ kHz offset from CW signal, where } N \text{ is the desired harmonic of the 1st LO.} \]

Description

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the noise level 30 kHz above and below the carrier. The difference between these two measurements is compared to specification.

Equipment

Signal Generator .......................................................... HP 8640B
Cable
Type N, 183 cm (72 in) .............................................. HP 11500A

Procedure

1. Set the HP 8640B controls as follows:
   - FREQUENCY ......................................................... 500 MHz
   - OUTPUT LEVEL ................................................. 0 dBm
   - AM ................................................................. OFF
   - FM ................................................................. OFF
   - COUNTER ......................................................... INT
   - RF ................................................................. ON

2. Connect the equipment as shown in Figure 4-3.

![Figure 4-3. Noise Sidebands Test Setup](image)

3. Press \( \text{PRESET} \) on the HP 8593A and wait for the preset to finish. Set the controls as follows:
   - CENTER FREQUENCY ........................................ 500 MHz
   - SPAN .............................................................. 10 MHz

4-12 Verifying Specified Operation for the HP 8592B
3. Noise Sidebands

4. On the 8593A, press the following analyzer keys:

   PEAK SEARCH | SIGNAL TRACK (ON)
   SPAN 200 kHz
   BW RES BW AUTO MAN 1 kHz
   VID BW AUTO MAN 30 Hz
   SIGNAL TRACK (OFF) SGL SWP PEAK SEARCH.

5. Record the MKR amplitude reading as the Carrier Amplitude.

   Carrier Amplitude _______ dBm

6. Press the following analyzer keys:

   MARKER DELTA 30 kHz
   MKR MARKER NORMAL.

   Record the MKR amplitude reading as the Noise Sideband Level at +30 kHz.

   Noise Sideband Level at +30 kHz _______ dBm

7. Press (PEAK SEARCH), MARKER DELTA, −30 kHz, MKR, MARKER NORMAL. Record the MKR amplitude reading as the Noise Sideband Level at −30 kHz.

   Noise Sideband Level at −30 kHz _______ dBm

8. Record the more positive value from steps 6 and 7 above and record as the Maximum Noise Sideband Level.

   Maximum Noise Sideband Level _______ dBm

9. Subtract the Carrier Amplitude (step 5) from the Maximum Noise Sideband Level (step 8) and record as the Noise Sideband Suppression. The suppression should be <−65 dBc.

   Noise Sideband Suppression = Maximum Noise Sideband Level − Carrier Amplitude

   Noise Sideband Suppression _______ dBc

**Note**

The resolution bandwidth is normalized to 1 Hz as follows:

1 Hz noise-power = (noise-power in dBc) − (10 × log(RBW)).

For example, −65 dBc in a 1 kHz resolution bandwidth is normalized to −95 dBc/Hz.
4. System Related Sidebands

Specification

$<-65\,\text{dBc/Hz} + 20\,\log N\text{ at }>30\,\text{kHz from CW signal, where }N\text{ is the desired harmonic of the 1st LO.}$

Description

A 500 MHz CW signal is applied to the input of the spectrum analyzer. The marker functions are used to measure the amplitude of the carrier and the amplitude of any system related sidebands 30 kHz above and below the carrier. System related sidebands are any internally generated line related, power supply related or local oscillator related sidebands.

Equipment

- Signal Generator .................................................. HP 8640B
- Cable
  - Cable, Type N, 183 cm (72 in) ............................. HP 11500A

Procedure

1. Set the HP 8640B controls as follows:
   - FREQUENCY .................................................. 500 MHz
   - OUTPUT LEVEL .............................................. 0 dBm
   - AM ................................................................. OFF
   - FM ................................................................. OFF
   - COUNTER ..................................................... INT
   - RF ................................................................. ON

2. Connect the equipment as shown in Figure 4-4.

![Figure 4-4. System Related Sidebands Test Setup](image)

3. Press [Preset] on the analyzer and wait for the preset to finish. Set the controls as follows:
   - CENTER FREQUENCY .......................................... 500 MHz
   - SPAN ........................................................... 12 MHz

4-14 Verifying Specified Operation for the HP 8592B
4. System Related Sidebands

4. On the analyzer, press the following analyzer keys:

- **PEAK SEARCH** (SIGNAL TRACK) (ON)
- **SPAN** 200 kHz
- **BW** 1 kHz
- **VID BW AUTO MAN** 30 Hz.

Let the analyzer stabilize for approximately 1 minute.

Press the following analyzer keys:

- **SIGNAL TRACK** (OFF)
- **FREQUENCY** CF STEP AUTO MAN 130 kHz.

5. On the analyzer, press **SGL SWP** and wait for the completion of the sweep. Press **PEAK SEARCH**, **MARKER DELTA**.

6. On the analyzer, press the following analyzer keys:

- **FREQUENCY** (step-up key) **SGL SWP**.

7. Wait for the completion of a new sweep. Press **PEAK SEARCH**. Record the Marker Delta Amplitude:

   Marker Delta Amplitude _________ dBc

   The marker delta amplitude above the signal should be < −65 dB.

8. On the analyzer, press the following analyzer keys:

- **(step-down key)** **(step-down key) SGL SWP**.

9. Wait for the completion of a new sweep. Press **PEAK SEARCH**. Record the Marker Delta Amplitude:

   Marker Delta Amplitude _________ dBc

   The marker delta amplitude below the signal should be < −65 dB.
5. Frequency Span Readout Accuracy

Specification

±2% of span, span >10 MHz.
±5% of span, span ≤10 MHz, in single band span.

Related Adjustment
Comb Generator Adjustment.

Description
For testing spans between 100 kHz and 200 MHz, two synthesized sources are used to provide two precisely-spaced signals. The analyzer’s marker functions are used to measure this frequency difference and the marker reading is compared to the specification.

For spans greater than 200 MHz, the analyzer’s internal comb generator provides the precisely-spaced signals. Again, the analyzer’s marker functions are used to measure the separation of the signals and the marker reading is compared to the specification.

Equipment

Synthesized Sweeper .................................................. HP 8340A/B
Synthesizer/Level Generator .......................... HP 3335A
Power Splitter ......................................................... HP 11667B

Adapters
Type N (m) to APC 3.5 (m) ............................... 1250-1743
3.5 mm (f) to 3.5 mm (f) ................................. 5061-5311
BNC (f) to SMA (m) .............................................. 1250-1200

Cables
BNC, 122 cm (48 in) ........................................ HP 10503A
APC 3.5, 91 cm (36 in) .................................. 8120-4921
Type N (m) to SMA (m) .................................... 8120-5148

Procedure

Spans ≥500 MHz

1. Connect the equipment as shown in Figure 4-5.
5. Frequency Span Readout Accuracy

![Spectrum Analyzer Diagram]

Figure 4-5. Frequency Span Accuracy Test Setup (Spans ≥500 MHz)

2. Press [Preset] on the HP 8592B and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY ........................................ 10 GHz
   SPAN ......................................................... 500 MHz
   COMB GEN .................................................. ON

3. Adjust the analyzer’s center frequency, if necessary, to place the left-most comb tooth on the second vertical graticule line (one division from the left-most graticule line).

4. Press [Peak Search]. If necessary, continue pressing NEXT PK LEFT or NEXT PK RIGHT until the marker is on the comb tooth at the second vertical graticule line. This is the “marked” comb tooth.

5. Press MARKER DELTA, MARKER DELTA and continue pressing NEXT PK RIGHT until the active marker is on the fourth comb tooth to the right of the marked comb tooth.

6. Record the MKR δ frequency reading in Table 4-5. The MKR reading should be within the limits shown.

7. Repeat steps 3 through 6 for the remaining span settings listed in Table 4-5. For each setting, the right-most marker should be on the Nth comb tooth to the right of the marked comb tooth, where N is given in Table 4-5.
5. Frequency Span Readout Accuracy

Table 4-5. Frequency Span Readout Accuracy, Spans \( \geq 500 \) MHz

<table>
<thead>
<tr>
<th>Span Setting</th>
<th>N</th>
<th>MKR ( \Delta ) Frequency Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Actual</td>
</tr>
<tr>
<td>500 MHz</td>
<td>4</td>
<td>390.00 MHz</td>
</tr>
<tr>
<td>1000 MHz</td>
<td>8</td>
<td>780.00 MHz</td>
</tr>
<tr>
<td>2000 MHz</td>
<td>16</td>
<td>1560.00 MHz</td>
</tr>
</tbody>
</table>

Spans \(<500 \) MHz

8. Connect the equipment as shown in Figure 4-6. Note that the power splitter is used as a combiner.

![Figure 4-6. Frequency Span Accuracy Test Setup (Spans \(<500 \) MHz)](image)

9. Press [PRESET] on the HP 8592B and wait for the PRESET to finish. Set the control as follows:

   CENTER FREQUENCY ........................................... 70 MHz  
   SPAN ....................................................................... 100 MHz

10. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:

   CW ................................................................. 110 MHz  
   POWER LEVEL ......................................................... \(-5 \) dBm

11. Set the HP 3335A controls as follows:

   FREQUENCY ......................................................... 30 MHz  
   AMPLITUDE ......................................................... 0 dBm

12. If necessary, adjust the HP 8592B Center Frequency to center the two signals on the display.

4-18 Verifying Specified Operation for the HP 8592B
13. On the HP 8592B, press the following keys:

![PEAK SEARCH MARKER DELTA MARKER DELTA NEXT PEAK.](image)

The two markers should be on the signals near the second and tenth vertical graticule lines (the first graticule line is the left-most).

14. Record the MKR $\Delta$ frequency reading in Table 4-6. The MKR $\Delta$ frequency reading should be within the limits shown.

15. Repeat steps 12 through 14 for the remaining span settings listed in Table 4-6, setting the HP 8340A/B CW and HP 3335A frequency as shown in the table.

### Table 4-6. Frequency Span Readout Accuracy, Spans <500 MHz

<table>
<thead>
<tr>
<th>HP 3335A Frequency</th>
<th>HP 8340A/B Span Setting</th>
<th>HP 8592B Span Setting</th>
<th>MKR $\Delta$ Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHz</td>
<td>MHz</td>
<td>Min</td>
<td>Actual</td>
</tr>
<tr>
<td>30.0</td>
<td>110.0</td>
<td>100 MHz</td>
<td>78.0 MHz</td>
</tr>
<tr>
<td>50.0</td>
<td>90.0</td>
<td>50 MHz</td>
<td>39.0 MHz</td>
</tr>
<tr>
<td>62.0</td>
<td>78.0</td>
<td>20 MHz</td>
<td>15.4 MHz</td>
</tr>
<tr>
<td>66.0</td>
<td>74.0</td>
<td>10 MHz</td>
<td>7.5 MHz</td>
</tr>
<tr>
<td>68.0</td>
<td>72.0</td>
<td>5 MHz</td>
<td>3.75 MHz</td>
</tr>
<tr>
<td>69.2</td>
<td>70.8</td>
<td>2 MHz</td>
<td>1.5 MHz</td>
</tr>
<tr>
<td>69.6</td>
<td>70.4</td>
<td>1 MHz</td>
<td>750.0 kHz</td>
</tr>
<tr>
<td>69.8</td>
<td>70.2</td>
<td>500 kHz</td>
<td>375.0 kHz</td>
</tr>
<tr>
<td>69.92</td>
<td>70.08</td>
<td>200 kHz</td>
<td>150.0 kHz</td>
</tr>
<tr>
<td>69.96</td>
<td>70.04</td>
<td>100 kHz</td>
<td>75.0 kHz</td>
</tr>
</tbody>
</table>
6. Sweep Time Accuracy

Specification

20 ms to 100 s ±3%.

Description

This test uses a synthesizer function generator to amplitude modulate a 500 MHz CW signal from another signal generator. The analyzer demodulates this signal in zero span to display the response in the time domain. The marker delta frequency function on the analyzer is used to read out the sweep time accuracy.

Equipment

Synthesizer/Function Generator ...................................... HP 3325A
Signal Generator ......................................................... HP 8640B

Cables

Type N Cable, 152 cm (60 in) .......................................... HP 11500D
BNC, 120 cm (48 in) ................................................... HP 10503A

Procedure

1. Set the signal generator to output a 500 MHz, −10 dBm, CW signal. Set the AM and FM controls to off.

2. Set the synthesizer function generator to output a 500 Hz, +5 dBm triangle waveform signal.

3. Connect the equipment as shown in Figure 4-7.

![Figure 4-7. Sweep Time Accuracy Test Setup]

4. Press [Preset] on the analyzer and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY .................................................. 500 MHz
   SPAN ................................................................. 12 MHz

4-20 Verifying Specified Operation for the HP 8592B
6. Sweep Time Accuracy

Press [PEAK SEARCH]. Set the controls as follows:

- SIGNAL TRACK ......................................................... ON
- SPAN .............................................................. 50 kHz

Wait for the AUTO ZOOM routine to finish. Press [SPAN], ZERO SPAN.

Set the controls as follows:

- BW ............................................................ 3 MHz
- AMPLITUDE SCALE ........................................ LINEAR
- SWEEP TIME ................................................... 20 ms

Adjust signal amplitude for a mid-screen display.

5. Set the signal generator AM switch to the AC position.

6. On the analyzer, press the following keys:

[TRIG] VIDEO.

Adjust the video trigger so that the analyzer is sweeping.

7. Press [SGL SWP]. After the completion of the sweep, press [PEAK SEARCH]. If necessary, press NEXT PK LEFT or NEXT PK RIGHT until the marker is on the left most signal. This is the “marked signal.”

8. Press MARKER DELTA, MARKER DELTA and press NEXT PK RIGHT until the marker delta is on the eighth signal peak. Record the marker delta reading in Table 4-7.

9. Repeat steps 6 through 9 for the remaining sweep time settings listed in Table 4-7.

---

Table 4-7. Sweep Time Accuracy

<table>
<thead>
<tr>
<th>HP 8590B Sweep Time Setting</th>
<th>HP 3325A Frequency</th>
<th>Minimum Reading</th>
<th>MKR Delta</th>
<th>Maximum Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 ms</td>
<td>500 Hz</td>
<td>15.4 ms</td>
<td></td>
<td>16.6 ms</td>
</tr>
<tr>
<td>50 ms</td>
<td>200 Hz</td>
<td>38.5 ms</td>
<td></td>
<td>41.5 ms</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 Hz</td>
<td>77.0 ms</td>
<td></td>
<td>83.0 ms</td>
</tr>
<tr>
<td>500 ms</td>
<td>20 Hz</td>
<td>385.0 ms</td>
<td></td>
<td>415 0 ms</td>
</tr>
<tr>
<td>1 s</td>
<td>10 Hz</td>
<td>770 0 ms</td>
<td></td>
<td>830 0 ms</td>
</tr>
<tr>
<td>10 s</td>
<td>1 Hz</td>
<td>7.7 s</td>
<td></td>
<td>8.3 s</td>
</tr>
<tr>
<td>50 s</td>
<td>0.2 Hz</td>
<td>38.5 s</td>
<td></td>
<td>41.5 s</td>
</tr>
<tr>
<td>100 s</td>
<td>0.1 Hz</td>
<td>77.0 s</td>
<td></td>
<td>83.0 s</td>
</tr>
</tbody>
</table>
7. Scale Fidelity

Specification

Log Mode:

±0.2 dB/2 dB 0 to −70 dB from Reference Level range.
±0.75 dB maximum over 0 to −60 dB from Reference Level.
±1.0 dB maximum over 0 to −70 dB from Reference Level.

Linear Mode:

±3% of REF LEVEL.

Log to Linear Switching Uncertainty:

±0.25 dB at the Reference Level.

Related Adjustment

Log and Linear Amplitude Adjustment.

Description

A 50 MHz CW signal is applied to the INPUT 50Ω of the analyzer through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the analyzer marker functions are used to measure the amplitude difference between steps. The source’s internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

Equipment

Synthesizer/Level Generator ........................................ HP 3335A
Step Attenuator, 1 dB steps ......................................... HP 355C
Step Attenuator, 10 dB steps .................................... HP 355D

Cables

BNC Cable 23 cm (9 in) ........................................... HP 10502A
BNC Cable 122 cm (48 in) (2 required) ........................ HP 10503A

Adapter

Type N (m) to BNC (f) ............................................. 1250-1476
7. Scale Fidelity

---

Procedure

Log Scale

1. Set the HP 3335A controls as follows:

   FREQUENCY .................................................. 50 MHz
   AMPLITUDE .................................................. +10 dBm
   AMPTD INCR .................................................. 0.05 dB
   OUTPUT ...................................................... 50Ω

2. Connect the equipment as shown in Figure 4-8. Set the HP 355D to 10 dB attenuation and the 355C to 0 dB attenuation.

![Figure 4-8. Scale Fidelity Test Setup](image)

3. Press [Preset] on the analyzer and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY ....................................... 50 MHz
   SPAN .......................................................... 10 MHz

4. On the analyzer, press the following keys:

   ![PEAK SEARCH](image) SIGNAL TRACK (ON)
   SPAN 50 kHz.

   After the auto zoom procedure is finished, set the resolution bandwidth to 3 kHz and the video bandwidth to 30 Hz.

5. If necessary, adjust the HP 355C attenuation until the MKR amplitude reads between 0 dBm and -1 dBm.

6. On the HP 3335A, press [AMPLITUDE] and use the INCR keys to adjust the amplitude until the analyzer MKR amplitude reads 0 dBm ±0.05 dB.

---

Verifying Specified Operation for the HP 8592B 4-23
7. Scale Fidelity

**Note**

It may be necessary to decrease the resolution of the amplitude increment of the HP 3335A to 0.01 dB to obtain a MKR reading of 0 dBm ± 0.05 dB.

7. On the analyzer, press **(PEAK SEARCH)**, **MARKER DELTA**.

8. Set the HP 3335A AMPTD INCR to 2 dB.

9. On the HP 3335A, press **AMPLITUDE** and **INCR** (down) to step the HP 3335A to the next lowest nominal amplitude listed in Table 4-8. Record the MKR delta amplitude reading in Table 4-8. The MKR amplitude should be within the limits shown.

10. Repeat step 9 for the remaining HP 3335A Nominal Amplitudes listed in Table 4-8.

11. For each MKR delta reading, subtract the previous MKR delta reading. Add 2 dB to the number and record the result as the incremental error in Table 4-8. The incremental error should not exceed 0.2 dB/2 dB.

### Table 4-8. Incremental Error, Log Mode

<table>
<thead>
<tr>
<th>HP 3335A Nominal Amplitude</th>
<th>dB from Ref Level (nominal)</th>
<th>MKR δ Reading</th>
<th>Incremental Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min (dB) Actual (dB) Max (dB)</td>
<td>(dB)</td>
<td></td>
</tr>
<tr>
<td>+10 dBm</td>
<td>0 0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>+8 dBm</td>
<td>−2 −2.2 (Ref)</td>
<td>−1.8</td>
<td></td>
</tr>
<tr>
<td>+6 dBm</td>
<td>−4 −4.4 (Ref)</td>
<td>−3.6</td>
<td></td>
</tr>
<tr>
<td>+4 dBm</td>
<td>−6 −6.6 (Ref)</td>
<td>−5.4</td>
<td></td>
</tr>
<tr>
<td>+2 dBm</td>
<td>−8 −8.75 (Ref)</td>
<td>−7.25</td>
<td></td>
</tr>
<tr>
<td>0 dBm</td>
<td>−10 −10.75 (Ref)</td>
<td>−9.25</td>
<td></td>
</tr>
</tbody>
</table>

**Scale Fidelity, Log Mode**

12. Set the HP 3335A AMPTD INCR to 10 dB.


14. On the HP 3335A, press **INCR** (down) to step the HP 3335A to the next lowest nominal amplitude listed in Table 4-9. Record the MKR delta amplitude reading in Table 4-9. The MKR amplitude should be within the limits shown.

15. Repeat step 14 for the remaining HP 3335A Nominal Amplitudes listed in Table 4-9.

4-24 Verifying Specified Operation for the HP 8592B
Table 4-9. Scale Fidelity, Log Mode

<table>
<thead>
<tr>
<th>HP 3335A Nominal Amplitude</th>
<th>dB From Ref Level (nominal)</th>
<th>MKR Δ Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min (db)</td>
<td>Actual (dB)</td>
</tr>
<tr>
<td>+10 dBm</td>
<td>0</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>0 dBm</td>
<td>-10</td>
<td>-10.75</td>
</tr>
<tr>
<td>-10 dBm</td>
<td>-20</td>
<td>-20.75</td>
</tr>
<tr>
<td>-20 dBm</td>
<td>-30</td>
<td>-30.75</td>
</tr>
<tr>
<td>-30 dBm</td>
<td>-40</td>
<td>-40.75</td>
</tr>
<tr>
<td>-40 dBm</td>
<td>-50</td>
<td>-50.75</td>
</tr>
<tr>
<td>-50 dBm</td>
<td>-60</td>
<td>-60.75</td>
</tr>
<tr>
<td>-60 dBm</td>
<td>-70</td>
<td>-71.00</td>
</tr>
</tbody>
</table>

Linear Scale

16. Set the HP 3335A controls as follows:

   AMPLITUDE .............................................. +10 dBm
   AMPTD INCR ........................................ 0.05 dB

17. Set the 355C to 0 dB attenuation.


   Set the controls as follows:

   FREQUENCY ............................................. 50 MHz
   SPAN .................................................. 10 MHz

19. On the analyzer, press the following keys:

   [PEAK SEARCH] [SIGNAL TRACK] (ON)
   [SPAN] 50 [kHz].

   After the auto zoom procedure is finished, set the resolution bandwidth to 3 kHz and video bandwidth to 30 Hz.

20. If necessary, adjust the HP 355C attenuation until the MKR reads approximately 223.6 mV.

Note

   It may be necessary to decrease the resolution of the amplitude increment of the HP 3335A to 0.01 dB to obtain a MKR reading of 223.6 mV ±0.4 mV.
7. Scale Fidelity

21. On the HP 3335A, press [AMPLITUDE] and use the INCR keys to adjust the amplitude until the analyzer MKR amplitude reads 223.6 mV ±0.4 mV.

22. On the analyzer, press [PEAK SEARCH].

23. Set the HP 3335A amplitude increment to 3 dB.

24. On the HP 3335A, press [AMPLITUDE] and [INCR ▼] (step-down key) to step the HP 3335A to the next lowest Nominal Amplitude listed in Table 4-10.

Record the MKR amplitude reading in Table 4-10. The MKR amplitude should be within the limits shown.

25. Repeat step 9 for the remaining HP 3335A Nominal Amplitudes listed in Table 4-10.

<table>
<thead>
<tr>
<th>HP 3335A Nominal Amplitude</th>
<th>% of Ref Level (nominal)</th>
<th>MKR Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min (mV)</td>
<td>Actual (mV)</td>
</tr>
<tr>
<td>+10 dBm</td>
<td>100</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>+7 dBm</td>
<td>70.7</td>
<td>150.98</td>
</tr>
<tr>
<td>+4 dBm</td>
<td>50</td>
<td>104.69</td>
</tr>
<tr>
<td>+1 dBm</td>
<td>35.48</td>
<td>72.22</td>
</tr>
<tr>
<td>−2 dBm</td>
<td>25</td>
<td>48.79</td>
</tr>
</tbody>
</table>

Log to Linear Switching

26. Set the HP 355D to 10 dB attenuation and the HP 355C to 0 dB attenuation.

27. Set the synthesizer controls as follows:

   FREQUENCY ........................................... 50 MHz
   AMPLITUDE ........................................... +6 dBm

28. On the spectrum analyzer, press [PRESET] and wait for the preset to complete. Set the control as follows:

   CENTER FREQ ......................................... 50 MHz
   SPAN .................................................. 10 MHz
   RES BW ............................................... 300 kHz

29. On the spectrum analyzer, press [PEAK SEARCH], [MKR ->], MKR -> REF LVL,
   [PEAK SEARCH], MARKER DELTA.

30. Press [AMPLITUDE], SCALE LOG LIN (LIN), MORE 1 of 2, AMPTD UNITS, dBm to change the scale to linear and set the amplitude units to dBm.
31. If the MKR \( \Delta \) amplitude is less than 0 dB, record the MKR \( \Delta \) amplitude reading here. The absolute value of the reading should be less than 0.25 dB. If the MKR \( \Delta \) amplitude is greater than 0 dB, continue with step 32 below.

Log-to-Lin Switching Uncertainty \( \quad \) dB

32. Press [MKR ->], [MKR -> REF LVL], (PEAK SEARCH), and [MARKER DELTA].

33. Press [AMPLITUDE], and [SCALE LOG LIN] to change the scale to LOG 10 dB/DIV.

34. Record the MKR \( \Delta \) amplitude reading here. The absolute value of the reading should be less than 0.25 dB.

Log-to-Lin Switching Uncertainty \( \quad \) dB
8. Input Attenuator Accuracy

Specification

Range:

0 to 70 dB in 10 dB steps.

Accuracy:

0 to 60 dB ±0.5 dB at 50 MHz referred to 10 dB attenuation.
70 dB ± 1.2 dB at 50 MHz referred to 10 dB attenuation.

Description

The input attenuator's switching accuracy is tested over the full 0 dB to 70 dB range. Switching accuracy is referenced to the 10 dB attenuator setting. The attenuator in the synthesizer/level generator is used as the measurement standard.

Equipment

Synthesizer/Level Generator .................................................. HP 3335A
Step Attenuator, 1 dB steps .................................................. HP 355C
Step Attenuator, 10 dB steps .................................................. HP 355D

Cables

BNC Cable, 120 cm (48 in) .................................................... HP 10503A
BNC Cable, 23 cm (9 in) ....................................................... HP 10502A

Adapters

Type N (m) to BNC (f) ......................................................... 1250-1476

Procedure

1. Connect the equipment as shown in Figure 4-9. Set the HP 355D to 20 dB attenuation and the HP 355C to 0 dB attenuation.

Figure 4-9. Input Attenuator Accuracy Test Setup
2. Set the HP 3335A controls as follows:

   FREQUENCY ........................................... 50 MHz
   AMPLITUDE ............................................. −50 dBm
   AMPTD INCR .......................................... 10 dB
   OUTPUT .................................................. 50Ω

3. On the HP 8592B, press **Preset** and wait for the preset to finish. Set the controls as follows:

   FREQUENCY ........................................... 50 MHz
   SPAN ................................................... 12 MHz
   AMPLITUDE ............................................ −70 dBm
   LOG dB/DIV ........................................... 1 dB
   RES BW ................................................ 10 kHz

4. On the HP 8592B, press the following keys:

   [PEAK SEARCH] [SIGNAL TRACK] (ON)
   SPAN 100 kHz
   BW VID BW AUTO MAN 100 Hz.

5. Set the HP 355C attenuation to place the signal peak two to three dB (two to three divisions) below the reference level.

6. On the HP 8592B, press the following keys:

   SGL SWP PEAK SEARCH MARKER DELTA.

7. Set the HP 3335A amplitude to −60 dBm as indicated in row 2 of Table 4-11.

8. Press the following keys of the analyzer:

   [AMPLITUDE] 80 (−dBm)
   ATTEN AUTO MAN 0 (dB).

   Set the HP 8592B reference level to −80 dBm and attenuation to 0 dB as indicated in row 2 of Table 4-11.

9. On the HP 8592B, press **SGL SWP**, and wait for a new sweep to finish. Press **PEAK SEARCH** and record the MKR Δ amplitude in Table 4-11 as the Actual MKR Δ Reading. The MKR Δ amplitude reading should be within the limits shown.

10. Repeat step 9 using the HP 3335A amplitude and HP 8592B reference level and attenuation settings listed in Table 4-11.
8. Input Attenuator Accuracy

<table>
<thead>
<tr>
<th>HP 3335A Amplitude (dBm)</th>
<th>HP 8592B Reference Level (dBm)</th>
<th>HP8592B Attenuation (dB)</th>
<th>Min (dB)</th>
<th>Actual (dB)</th>
<th>Max (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50</td>
<td>-70</td>
<td>10</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>-60</td>
<td>-80</td>
<td>0</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-40</td>
<td>-60</td>
<td>20</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-30</td>
<td>-50</td>
<td>30</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-20</td>
<td>-40</td>
<td>40</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-10</td>
<td>-30</td>
<td>50</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>0</td>
<td>-20</td>
<td>60</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>10</td>
<td>-10</td>
<td>70</td>
<td>-1.2</td>
<td></td>
<td>+1.2</td>
</tr>
</tbody>
</table>
9. Reference Level Accuracy

**Specification**

Accuracy Referred to –20 dBm Reference Level:

0 to –59.9 dBm ±(0.5 dB + Input Attenuator Accuracy at 50 MHz).

–60 to –112 dBm ±(1.25 dB + Input Attenuator Accuracy at 50 MHz).

**Related Adjustment**

A12 Cal Attenuator Error Correction Adjustment.

**Description**

A 50 MHz CW signal is applied to the INPUT 50Ω of the HP 8592B through two step attenuators. The attenuators increase the effective amplitude range of the source. The amplitude of the source is decreased in 10 dB steps and the HP 8592B marker functions are used to measure the amplitude difference between steps. The source’s internal attenuator is used as the reference standard. The test is performed in both log and linear amplitude scales.

It is only necessary to test reference levels as low as –90 dBm (with 10 dB ATTN) since lower reference levels are a function of the HP 8592B’s microprocessor manipulating the trace data. There is no error associated with the trace data manipulation.

**Equipment**

- Synthesizer/Level Generator .................................................. HP 3335A
- Step Attenuator, 10 dB steps .................................................. HP 355D
- Step Attenuator, 1 dB steps .................................................. HP 355C

**Cables**

- BNC Cable, 23 cm (9 in) .................................................. HP 10502A
- BNC Cable, 122 cm (48 in) (2 required) .................................. HP 10503A

**Adapter**

Type N (m) to BNC (f) .................................................. 1250-1476

**Procedure**

**Log Scale**

1. Set the HP 3335A controls as follows:

   - FREQUENCY .......................................................... 50 MHz
   - AMPLITUDE ........................................................... –10 dBm
   - AMPTD INCR ............................................................ 10 dB
   - OUTPUT ............................................................. 50Ω
9. Reference Level Accuracy

2. Connect the equipment as shown in Figure 4-10. Set the HP 355D to 10 dB attenuation and the 355C to 0 dB attenuation.

![Figure 4-10. Reference Level Accuracy Test Setup](image)

3. Press [PRES] on the HP 8592B and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY .................................................. 50 MHz
   SPAN ................................................................. 12 MHz

   Press [PEAK SEARCH], [SIGNAL TRACK] (ON). Set the controls as follows:

   REF LEVEL ........................................................... -20 dBm
   LOG dB/DIV .......................................................... 1 dB
   RES BW .............................................................. 3 kHz
   VIDEO BW ............................................................. 30 Hz

4. Set the HP 355C attenuation to place the signal peak one to two dB (one to two divisions) below the reference level.

5. On the HP 8592B, press the following keys:

   SGL SWP
   PEAK SEARCH MARKER DELTA

6. Set the HP 3335A amplitude and HP 8592B reference level according to Table 4-12. At each setting, press [SGL SWP], [PEAK SEARCH] on the HP 8592B. Record the MKR Δ amplitude reading in Table 4-12. The MKR Δ reading should be within the limits shown.
### Table 4-12. Reference Level Accuracy, Log Mode

<table>
<thead>
<tr>
<th>HP 3335A Amplitude (dBm)</th>
<th>HP 8592B Ref Level (dBm)</th>
<th>MKR Δ Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>−10</td>
<td>−20</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>0</td>
<td>−10</td>
<td>−0.5</td>
</tr>
<tr>
<td>+10</td>
<td>0</td>
<td>−0.5</td>
</tr>
<tr>
<td>−20</td>
<td>−30</td>
<td>−0.5</td>
</tr>
<tr>
<td>−30</td>
<td>−40</td>
<td>−0.5</td>
</tr>
<tr>
<td>−40</td>
<td>−50</td>
<td>−0.5</td>
</tr>
<tr>
<td>−50</td>
<td>−60</td>
<td>−1.25</td>
</tr>
<tr>
<td>−60</td>
<td>−70</td>
<td>−1.25</td>
</tr>
<tr>
<td>−70</td>
<td>−80</td>
<td>−1.25</td>
</tr>
<tr>
<td>−80</td>
<td>−90</td>
<td>−1.25</td>
</tr>
</tbody>
</table>

**Linear Scale**

7. Set the HP 3335A amplitude to −10 dBm.

8. Set the 355C to 0 dB attenuation.

9. Set the HP 8592B controls as follows:
   - REF LEVEL ................................................................. −20 dBm
   - AMPLITUDE SCALE .................................................. LINEAR

   Press **MORE 1 of 2**, **AMPTD UNITS**, **dBm**. Set the HP 8592B controls as follows:
   - AMPTD UNITS ......................................................... dBm
   - SWEEP ................................................................. CONT

10. Set the HP 355C attenuation to place the signal peak one to two divisions below the reference level.


12. Set the HP 3335A amplitude and HP 8592B reference level according to Table 4-13. At each setting, press **SGL SWP**, **PEAK SEARCH** on the HP 8592B. Record the MKR Δ amplitude reading in Table 4-13. The MKR Δ reading should be within the limits shown.
9. Reference Level Accuracy

13. In Table 4-12, locate the Actual MKR Δ Amplitude Reading for the 0 to −50 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

   Log Mode Reference Level Accuracy ________ dB
   (0 to −50 dBm reference level settings)

14. In Table 4-12, locate the Actual MKR Δ Amplitude Reading for the 0 to −90 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

   Log Mode Reference Level Accuracy ________ dB
   (0 to −90 dBm reference level settings)

15. In Table 4-13, locate the Actual MKR Δ Amplitude Reading for the 0 to −50 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

   Linear Mode Reference Level Accuracy ________ dB
   (0 to −50 dBm reference level settings)

16. In Table 4-13, locate the Actual MKR Δ Amplitude Reading for the 0 to −90 dBm reference level settings with the greatest deviation (positive or negative) from 0 dB and record below.

   Linear Mode Reference Level Accuracy ________ dB
   (0 to −90 dBm reference level settings)
### Table 4-13. Reference Level Accuracy, Linear Mode

<table>
<thead>
<tr>
<th>HP 3335A Amplitude (dBm)</th>
<th>HP 8592B Ref Level (dBm)</th>
<th>Min (dB)</th>
<th>Actual (dB)</th>
<th>Max (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>-20</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>0</td>
<td>-10</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-20</td>
<td>-30</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-30</td>
<td>-40</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-40</td>
<td>-50</td>
<td>-0.5</td>
<td></td>
<td>+0.5</td>
</tr>
<tr>
<td>-50</td>
<td>-60</td>
<td>-1.25</td>
<td></td>
<td>+1.25</td>
</tr>
<tr>
<td>-60</td>
<td>-70</td>
<td>-1.25</td>
<td></td>
<td>+1.25</td>
</tr>
<tr>
<td>-70</td>
<td>-80</td>
<td>-1.25</td>
<td></td>
<td>+1.25</td>
</tr>
<tr>
<td>-80</td>
<td>-90</td>
<td>-1.25</td>
<td></td>
<td>+1.25</td>
</tr>
</tbody>
</table>
10. Resolution Bandwidth Switching Uncertainty

Specification

±0.4 dB for 3 kHz to 3 MHz RES BW settings, referred to 3 kHz RES BW setting.
±0.5 dB for 1 kHz RES BW settings, referred to 3 kHz RES BW setting.

Related Adjustments

Crystal and LC Bandwidth Filter Adjustment.

Description

For this test, the CAL OUT signal is used as the input signal. An amplitude reference is taken with the RES BW set to 1 kHz using the marker delta function. The RES BW is changed to settings between 3 MHz and 1 kHz and the amplitude variation is measured at each setting and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

Equipment

Cable

BNC, 23 cm (9 in) ................................................. HP 10502A

Adapter

Type N (m) to BNC (f) ............................................. 1250-1476

Procedure

1. Connect the CAL OUT to the spectrum analyzer input using the BNC cable and adapter, as shown in Figure 4-11.

![Spectrum Analyzer Setup](image)

Figure 4-11. Resolution Bandwidth Switching Uncertainty Test Setup

4-36 Verifying Specified Operation for the HP 8592B
2. Press **Preset** on the analyzer and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY ........................................ 300 MHz  
   SPAN ......................................................... 12 MHz  

Press **Peak Search**, **Signal Track** (ON). Set the controls as follows:

   SPAN ......................................................... 50 kHz  
   REF LEVEL ................................................... -20 dBm  
   LOG dB/DIV .................................................. 1 dB  
   RES BW ...................................................... 3 kHz  
   VIDEO BW .................................................... 100 Hz  

3. Press **Amplitude** and use the knob to adjust the REF LEVEL until the signal appears one division below the reference level. Press **Peak Search**, **Marker Delta**, **Signal Track** (ON).

4. Set the RES BW and span according to Table 4-14.

5. Record the MKR Δ TRK amplitude reading in Table 4-14.

   The amplitude reading should be within the limits shown.

6. Repeat steps 4 and 5 for each of the remaining RES BW and span settings listed in Table 4-14.

### Table 4-14. Resolution Bandwidth Switching Uncertainty

<table>
<thead>
<tr>
<th>RES BW Setting</th>
<th>Span Setting</th>
<th>MKR Δ TRK Amplitude Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 kHz</td>
<td>50 kHz</td>
<td>0 (Ref) 0 (Ref) 0 (Ref)</td>
</tr>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td>-0.5</td>
</tr>
<tr>
<td>10 kHz</td>
<td>50 kHz</td>
<td>-0.4</td>
</tr>
<tr>
<td>30 kHz</td>
<td>500 kHz</td>
<td>-0.4</td>
</tr>
<tr>
<td>100 kHz</td>
<td>500 kHz</td>
<td>-0.4</td>
</tr>
<tr>
<td>300 kHz</td>
<td>5 MHz</td>
<td>-0.4</td>
</tr>
<tr>
<td>1 MHz</td>
<td>10 MHz</td>
<td>-0.4</td>
</tr>
<tr>
<td>3 MHz</td>
<td>10 MHz</td>
<td>-0.4</td>
</tr>
</tbody>
</table>
11. Calibrator Amplitude and Frequency Accuracy

Specification
Amplitude:
\(-20 \text{ dBm } \pm 0.4 \text{ dB}\).
Frequency:
\(300 \text{ MHz } \pm 30 \text{ kHz}\).

Related Adjustment
Calibrator Amplitude Adjustment.

Description
This test measures the accuracy of the analyzer's CAL OUT signal. The first part of the test characterizes the insertion loss of a Low Pass Filter (LPF) and 10 dB Attenuator. The harmonics of the CAL OUT signal are suppressed with the LPF before the amplitude accuracy is measured using a power meter. A frequency counter is used to measure the frequency accuracy of the CAL OUT signal and the measured frequency is compared to the specification.

Equipment

Frequency Counter .......................... HP 5343A
Low Pass Filter ................................ 0955-0455
Synthesized Sweeper .......................... HP 8340A/B
Measuring Receiver (used as a power meter) .. HP 8902A
Power Meter .................................. HP 436A
Low Power Sensor with a 50 MHz reference attenuator .. HP 8484A
Power Sensor .................................. HP 8482A
Power Splitter .................................. HP 11667A
10 dB Attenuator, Type N (m to f), dc-12.4 GHz Opt 010 ........... HP 8491A

Cables

BNC, 121 cm (48 in) .......................... HP 10503A
Type N, 152 cm (60 in) ......................... HP 11500D

Adapters

APC 3.5 (f) to Type N (f) ........................ 1250-1745
Type N (f) to BNC (m) (2 required) ............ 1250-1477
Type N (m) to BNC (f) .......................... 1250-1476
11. Calibrator Amplitude and Frequency Accuracy

Procedure

LPF, Attenuator and Adapter Insertion Loss Characterization

1. Zero and calibrate the HP 8902A and HP 8482A in LOG mode as described in the HP 8902A Operation Manual.

2. Zero and calibrate the HP 436A and HP 8484A, as described in the HP 436A Operation Manual.

Caution  Do not attempt the calibrate the HP 8484A without the reference attenuator or damage to the HP 8484A will occur.

3. Connect the equipment as shown in Figure 4-12. Connect the HP 8484A directly to the power splitter (bypass the LPF, attenuator and adapters).

Figure 4-12. LPF Characterization
11. Calibrator Amplitude and Frequency Accuracy

4. Press [INSTR PRESET] on the HP 8340A/B. Set the controls as follows:

   CW ................................................................. 300 MHz
   POWER LEVEL .................................................. -15 dBm

**Note**  
Allow the power sensors to settle before proceeding.

5. On the HP 8902A, press [RATIO] mode. Power indication should be zero dB.
6. On the HP 436A, press the dB REF mode key. Power indication should be zero dB.
7. Connect the LPF, attenuator and adapters as shown in Figure 4-12.
8. Record the HP 8902A reading in dB. This is the relative error due to mismatch.

   Mismatch Error _______ dB

9. Record the HP 436A reading in dB. This is the relative uncorrected insertion loss of the LPF, attenuator and adapters.

   Uncorrected Insertion Loss _______ dB

10. Subtract the Mismatch Error (step 8) from the Uncorrected Insertion Loss (step 9). This is the Corrected Insertion Loss.

   Corrected Insertion Loss _______ dB

Example: If the Mismatch Error is +0.3 dB and the uncorrected Insertion Loss is -10.2 dB, subtract the Mismatch Error from the insertion loss gives a corrected reading of -10.5 dB.

**Calibrator Amplitude Accuracy**

11. Connect the equipment as shown in Figure 4-13. The analyzer should be positioned so that the setup of the adapters, LPF and attenuator do not bind. It may be necessary to support the center of gravity of the devices.
12. On the HP 436A, press the dBm mode key. Record the HP 436A Reading in dBm.

HP 436A Reading ________ dBm

13. Subtract the Corrected Insertion Loss (step 10) from the HP 436A Reading (step 12) and record as the CAL OUT power. The CAL OUT should be −20 dBm ±0.4 dB.

CAL OUT Power = HP 436A Reading − Corrected Insertion Loss

Example: If the Corrected Insertion Loss is −10.0 dB, and the HP 8902A reading is −30 dB, then −30 dB − (−10.0 dB) = −20 dB.

CAL OUT Power ________ dBm

14. Connect the equipment as shown in Figure 4-14.
11. Calibrator Amplitude and Frequency Accuracy

Figure 4-14. Calibrator Frequency Accuracy Test Setup

15. Set the HP 5343A controls as follows:
   
   SAMPLE RATE .................................................. Midrange
   50Ω/1 MΩ SWITCH ............................................ 50Ω
   10 Hz-500 MHz/500 MHz-26.5 GHz SWITCH ............... 10 Hz-500 MHz

16. Wait for the frequency counter to settle. This may take two or three gate times.

17. Read the frequency counter display. The frequency should be within the following limits:

   CAL OUT Frequency: 299.97 MHz ≤ ___________ ≤ 300.03 MHz
12. Frequency Response

Specification

Frequency Response

(10 dB input attenuation)

<table>
<thead>
<tr>
<th>Absolute Frequency</th>
<th>Preselector</th>
<th>Unpeaked</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 kHz to 2.9 GHz</td>
<td>N/A</td>
<td>±1.5 dB</td>
</tr>
<tr>
<td>2.75 GHz to 6.4 GHz</td>
<td>±2.0 dB</td>
<td>±3.0 dB</td>
</tr>
<tr>
<td>6.0 GHz to 12.8 GHz</td>
<td>±2.5 dB</td>
<td>±3.0 dB</td>
</tr>
<tr>
<td>12.4 GHz to 19.4 GHz</td>
<td>±3.0 dB</td>
<td>±4.0 dB</td>
</tr>
<tr>
<td>19.1 GHz to 22 GHz</td>
<td>±3.0 dB</td>
<td>±4.0 dB</td>
</tr>
</tbody>
</table>

Relative Flatness

<table>
<thead>
<tr>
<th>Absolute Frequency</th>
<th>Preselector</th>
<th>Unpeaked</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 kHz to 2.9 GHz</td>
<td>N/A</td>
<td>±1.0 dB</td>
</tr>
<tr>
<td>2.75 GHz to 6.4 GHz</td>
<td>±1.5 dB</td>
<td>N/A</td>
</tr>
<tr>
<td>6.0 GHz to 12.8 GHz</td>
<td>±2.0 dB</td>
<td>N/A</td>
</tr>
<tr>
<td>12.4 GHz to 19.4 GHz</td>
<td>±2.0 dB</td>
<td>N/A</td>
</tr>
<tr>
<td>19.1 GHz to 22 GHz</td>
<td>±2.0 dB</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Related Adjustment

YTF Adjustment.
Dual Mixer Bias Adjustment.
Frequency Response Adjustment.

Description

The output of the synthesized sweeper is fed through a power splitter to a power sensor and
the HP 8592B. The synthesized sweeper's power level is adjusted at 300 MHz to place the
displayed signal at the analyzer's center horizontal graticule line. The measuring receiver,
used as a power meter, is placed in RATIO mode. At each new sweeper frequency and
analyzer center frequency setting, the sweeper's power level is adjusted to place the signal
at the center horizontal graticule line. The measuring receiver displays the inverse of the
frequency response relative to 300 MHz (CAL OUT frequency).

For bands 1 through 4 two measurements are taken, one with the preselector peaked, one with
the preselector unpeaked (default).
12. Frequency Response

Equipment

Synthesized Sweeper ........................................ HP 8340A/B
Measuring Receiver (used as a power meter) ..................... HP 8902A
Synthesizer/Level Generator .................................. HP 3335A
Power Sensor ................................................ HP 8485A
Power Splitter ................................................ HP 11667B
50Ω Termination .............................................. HP 909D

Adapters

Type N (m) to APC 3.5 (m) ..................................... 1250-1743
SMA (m) to BNC (f) ........................................... 1250-1200
3.5 mm (f) to 3.5 mm (f) ..................................... 5061-5311

Cables

BNC, 122 cm (48 in) ........................................... HP 10503A
APC 3.5, 91 cm (36 in) ....................................... 8120-1921

Procedure

1. Zero and calibrate the HP 8902A and HP 8485A in log mode as described in the HP 8902A Operation Manual.

2. Connect the equipment as shown in Figure 4-15.

![Figure 4-15. Frequency Response Test Setup, ≥50 MHz](image)

3. Press [INSTR PRESET] on the HP 8340A/B. Set the HP 8340A/B controls as follows:
   - CW .................................................. 300 MHz
   - FREQ STEP ............................................ 100 MHz
   - POWER LEVEL ...................................... −4 dBm

4. On the HP 8592B, press [PRESET] and wait for the preset to finish.
12. Frequency Response

Press the following analyzer keys:

SPAN BAND LOCK 0 - 2.9 Gz BAND 0.

Set the analyzer's controls as follows:

CENTER FREQUENCY .............................. 300 MHz
CF STEP ......................................... 100 MHz
SPAN ........................................... 10 MHz
REF LEVEL ...................................... -6 dBm
LOG dB/DIV ..................................... 1 dB
RES BW .......................................... 1 MHz
VIDEO BW ....................................... 10 kHz

5. On the HP 8592B, press PEAK SEARCH, SIGNAL TRACK (ON).

6. Adjust the HP 8340A/B power level for a MKR-TRK amplitude reading of -10 dBm ±0.1 dB.

7. Press RATIO on the HP 8902A.

Frequency Response, Band 0 (≥50 MHz)

8. Set the HP 8340A/B CW to 50 MHz.

9. Set the HP 8592B center frequency to 50 MHz.

10. Adjust the HP 8340A power level for an HP 8592B MKR-TRK amplitude reading of -10 dBm ±0.1 dB.

11. Record the power ratio displayed on the HP 8902A here. Record the negative of the power ratio in Table 4-15.

   HP 8902A Reading at 50 MHz _______ dB

12. Set the HP 8340A/B CW to 100 MHz.

13. Set the HP 8592B center frequency to 100 MHz.

14. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of -10 dBm ±0.1 dB.

15. Record the negative of the power ratio displayed on the HP 8902A in Table 4-15 as the HP 8902A Reading.
12. Frequency Response

16. On the HP 8340A/B, press \texttt{CW}, and \texttt{\uparrow} (step-up key) and on the HP 8592B, press \texttt{FREQUENCY}, \texttt{\uparrow} (step-up key) to step through the remaining frequencies listed in Table 4-15. At each new frequency repeat steps 13 through 15, entering the power sensor’s Cal Factor into the HP 8902A as indicated in Table 4-15.

\textbf{Frequency Response, Band 1}

17. Press the following analyzer keys:

\texttt{SPAN BAND LOCK 2.75 - 6.4 BAND 1}.

Set the controls as follows:

<table>
<thead>
<tr>
<th>Control</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTER FREQUENCY</td>
<td>2.75 GHz</td>
</tr>
<tr>
<td>SPAN</td>
<td>10 MHz</td>
</tr>
<tr>
<td>RES BW</td>
<td>1 MHz</td>
</tr>
<tr>
<td>VIDEO BW</td>
<td>10 kHz</td>
</tr>
</tbody>
</table>

Press \texttt{PEAK SEARCH}, \texttt{SIGNAL TRACK} (ON).

18. Set the HP 8340A/B CW to 2.75 GHz.

19. On the HP 8592B, press \texttt{AMPLITUDE}, \texttt{PRESEL PEAK}.

20. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of $-10$ dBm $\pm 0.1$ dB.

21. Record the negative of the power ratio displayed on the HP 8902A in Table 4-16, column 2.

22. On the HP 8592B, press \texttt{AMPLITUDE}, \texttt{PRESEL DEFAULT}.

23. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of $-10$ dBm $\pm 0.1$ dB.

24. Record the negative of the power ratio displayed on the HP 8902A in Table 4-16, column 3.

25. Set the HP 8340A/B CW and the HP 8592B center frequency to 2.8 GHz. Repeat steps 19 through 24.

26. On the HP 8340A/B, press \texttt{CW}, and \texttt{\uparrow} (step-up key) and on the HP 8592B, press \texttt{FREQUENCY}, \texttt{\uparrow} (step-up key) to step through the remaining frequencies listed in Table 4-16. At each new frequency repeat steps 19 through 24, entering the power sensor’s Cal Factor into the HP 8902A as indicated in Table 4-16.

\textbf{Frequency Response, Band 2}

27. Press the following analyzer keys:

\texttt{SPAN BAND LOCK 6.0 -12.8 BAND 2}.

4-46 Verifying Specified Operation for the HP 8592B
Set the controls as follows:

- CENTER FREQUENCY ........................................ 6.0 GHz
- CF STEP ..................................................... 200 MHz
- SPAN ......................................................... 10 MHz
- RES BW ..................................................... 1 MHz
- VIDEO BW ................................................... 10 kHz

Press **PEAK SEARCH**, **SIGNAL TRACK** (ON).

28. Set the HP 8340A/B CW to 6.0 GHz.

29. On the HP 8592B, press **AMPLITUDE**, **PRESEL PEAK**.

30. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of 
   −10 dBm ±0.1 dB.

31. Record the negative of the power ratio displayed on the HP 8902A in Table 4-17, 
    column 2.

32. On the HP 8592B, press **AMPLITUDE**, **PRESEL DEFAULT**.

33. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of 
   −10 dBm ± 0.1 dB.

34. Record the negative of the power ratio displayed on the HP 8902A in Table 4-17, 
    column 3.

35. On the HP 8340A/B, press **CW**, and ▲ (step-up key) and on the HP 8592B, press 
    **FREQUENCY**, and ▲ (step-up key) to step through the remaining frequencies listed in 
    Table 4-17.

   At each new frequency repeat steps 29 through 34, entering the power sensor's Cal Factor 
   into the HP 8902A as indicated in Table 4-17.

**Frequency Response, Band 3**

36. On the HP 8592B, press the following keys:

   **SPAN** **BAND LOCK** 12.4–19, **BAND 3**.

   Set the controls as follows:

   - CENTER FREQUENCY ........................................ 12.4 GHz
   - SPAN ......................................................... 10 MHz
   - RES BW ..................................................... 1 MHz
   - VIDEO BW ................................................... 10 kHz

   Press **PEAK SEARCH**, **SIGNAL TRACK** (ON).

37. Set the HP 8340A/B CW to 12.4 GHz.

38. On the HP 8592B, press **AMPLITUDE**, **PRESEL PEAK**.

39. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of 
   −10 dBm ±0.1 dB.

40. Record the negative of the power ratio displayed on the HP 8902A in Table 4-18, 
    column 2.
12. Frequency Response

41. On the HP 8592B, press **AMPLITUDE**, **PRESEL DEFAULT**.

42. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of $-10 \text{ dBm} \pm 0.1 \text{ dB}$.

43. Record the negative of the power ratio displayed on the HP 8902A in Table 4-18, column 3.

44. On the HP 8340A/B, press **CW**, and **(step-up key)** and on the HP 8592B, press **FREQUENCY**, **(step-up key)** to step through the remaining frequencies listed in Table 4-18. At each new frequency repeat steps 38 through 43, entering the power sensor's Cal Factor into the HP 8902A as indicated in Table 4-18.

**Frequency Response, Band 4**

45. On the HP 8592B, press the following keys:

```
```

Set the controls as follows:

```
CENTER FREQUENCY ................................. 19.1 \text{ GHz}
CF STEP ........................................... 100 \text{ MHz}
SPAN .................................................. 10 \text{ MHz}
RES BW .............................................. 1 \text{ MHz}
VIDEO BW ........................................... 10 \text{ kHz}
```

Press **PEAK SEARCH**, **SIGNAL TRACK** (ON).

46. Set the HP 8340A/B CW to 19.1 GHz.

47. On the HP 8592B, press **AMPLITUDE**, **PRESEL PEAK**.

48. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of $-10 \text{ dBm} \pm 0.1 \text{ dB}$.

49. Record the negative of the power ratio displayed on the HP 8902A in Table 4-19, column 2.

50. On the HP 8592B, press **AMPLITUDE**, **PRESEL DEFAULT**.

51. Adjust the HP 8340A/B power level for an HP 8592B MKR-TRK amplitude reading of $-10 \text{ dBm} \pm 0.1 \text{ dB}$.

52. Record the negative of the power ratio displayed on the HP 8902A in Table 4-19 column 3.


*4-48 Verifying Specified Operation for the HP 8592B*
12. Frequency Response

through the remaining frequencies listed in Table 4-19. At each new frequency repeat steps 47 through 52, entering the power sensor's Cal Factor into the HP 8902A as indicated in Table 4-19, column 2.

**Frequency Response, Band 0 (<50 MHz)**

54. On the HP 8592B, press **MARKERS OFF**, **SPAN**, **BAND LOCK**, and **BND LOCK ON OFF** (OFF). Set the controls as follows:

- CENTER FREQUENCY ........................................ 50 MHz
- SPAN ......................................................... 10 MHz

Press **PEAK SEARCH**, **SIGNAL TRACK** (ON).

Set the controls as follows:

- RES BW .................................................... 10 kHz
- VIDEO BW ............................................... 300 kHz

55. Connect the equipment as shown in Figure 4-16, with the power sensor connected to power splitter.

![Diagram of Frequency Response Test Setup (<50 MHz)](image)

**Figure 4-16. Frequency Response Test Setup (<50 MHz)**

Set the HP 3335A controls as follows:

- FREQUENCY ........................................... 50 MHz
- AMPLITUDE ........................................... −4 dBm
- AMPTD INCR ....................................... 0.05 dB

56. Enter the power sensor's 50 MHz Cal Factor into the HP 8902A.
12. Frequency Response

57. Adjust the HP 3335A amplitude until the HP 8902A display reads the same value as recorded in step 11. Record the HP 3335A amplitude here and in Table 4-20.

HP 3335A Amplitude Setting (50 MHz) __________ dBm

58. Replace the HP 8485A Power Sensor with the HP 909D 50Ω termination.

59. On the HP 8592B, press [PEAK SEARCH], [SIGNAL TRACK] (ON), [MARKER DELTA], [SIGNAL TRACK] (ON).

60. Set the HP 3335A frequency to 20 MHz.

61. On the HP 8592B, press the following keys:

- [FREQUENCY] CF STEP AUTO MAN 30 MHz
- [FREQUENCY] ◀ (step-down key).

62. Adjust the HP 3335A amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the HP 3335A amplitude setting in Table 4-20 as the HP 3335A amplitude at 20 MHz.

63. Repeat steps 60 through 62 for each of the frequencies listed in Table 4-20. Change the analyzers's center frequency step size to the relative frequency change for each new frequency (for example, use 10 MHz CF STEP size when changing from 20 MHz to 10 MHz).

---

**Note**

When measuring the 50 kHz center frequency flatness, there will be two signals on screen, the LO feed through and the signal from the HP 3335A. Ensure that the marker is on the signal from the HP 3335A (to the right of the LO feed through).

---

64. Set the HP 8592B center frequency and the HP 3335A frequency to the frequencies listed in Table 4-20. At each frequency, adjust the HP 3335A amplitude for a MKR Δ-TRK amplitude reading of 0.00 ±0.05 dB. Record the HP 3335A amplitude setting in Table 4-20 as the HP 3335A amplitude.

65. For each of the frequencies in Table 4-20, subtract the HP 3335A amplitude reading (column 2) from the HP 3335A amplitude setting (50 MHz) recorded in step 57. Record the result as the Response Relative to 50 MHz (column 3) of Table 4-20.

66. Add to each of the Response Relative to 50 MHz entries in Table 4-20 the HP 8902A Reading for 50 MHz listed in Table 4-15. Record the results as the Response Relative to 300 MHz (column 4) in Table 4-20.

---

**Test Results**

67. Frequency Response, Band 0

a. Enter most positive number from Table 4-20, column 4: _______ dB

b. Enter most positive number from Table 4-15, column 2: _______ dB

c. Enter more positive of numbers from (a) and (b): _______ dB

(absolute referenced to 300 MHz).

---

4-50 Verifying Specified Operation for the HP 8592B
12. Frequency Response

d. Enter most negative number from Table 4-20, column 4: ________ dB

e. Enter most negative number from Table 4-15, column 2: ________ dB

f. Enter more negative of numbers from (d) and (e): ________ dB

g. Subtract (f) from (c): (relative flatness).

The result should be less than 2.0 dB.

h. The absolute values in (c) and (f) should be less than 1.5 dB.

68. Frequency Response, Band 1 (Preselector Peaked)

a. Enter most positive number from Table 4-16, column 2: ________ dB

The absolute value of this number should be less than 2.0 dB.

b. Enter most negative number from Table 4-16, column 2: ________ dB

The absolute value of this number should be less than 2.0 dB.

c. Subtract (b) from (a):

The result should be less than 3.0 dB (relative flatness).

69. Frequency Response, Band 1 (Preselector Unpeaked)

a. Enter most positive number from Table 4-16, column 3: ________ dB

The absolute value of this number should be less than 3.0 dB.

b. Enter most negative number from Table 4-16, column 3: ________ dB

The absolute value of this number should be less than 3.0 dB.

70. Frequency Response, Band 2 (Preselector Peaked)

a. Enter most positive number from Table 4-17, column 2: ________ dB

The absolute value of this number should be less than 2.5 dB.

b. Enter most negative number from Table 4-17, column 2: ________ dB

The absolute value of this number should be less than 2.5 dB.

c. Subtract (b) from (a):

The result should be less than 4.0 dB (relative flatness).

71. Frequency Response, Band 2 (Preselector Unpeaked)

a. Enter most positive number from Table 4-17, column 3: ________ dB

The absolute value of this number should be less than 3.0 dB.

b. Enter most negative number from Table 4-17, column 3: ________ dB

The absolute value of this number should be less than 3.0 dB.

72. Frequency Response, Band 3 (Preselector Peaked)

a. Enter most positive number from Table 4-18, column 2: ________ dB

The absolute value of this number should be less than 3.0 dB.

b. Enter most negative number from Table 4-18, column 2: ________ dB

The absolute value of this number should be less than 3.0 dB.

c. Subtract (b) from (a):

The result should be less than 4.0 dB (relative flatness).

73. Frequency Response, Band 3 (Preselector Unpeaked)

a. Enter most positive number from Table 4-18, column 3: ________ dB

The absolute value of this number should be less than 4.0 dB.

b. Enter most negative number from Table 4-18, column 3: ________ dB

The absolute value of this number should be less than 4.0 dB.
12. Frequency Response

74. Frequency Response, Band 4 (Preselector Peaked)

a. Enter most positive number from Table 4-19, column 2:
The absolute value of this number should be less than 3.0 dB.  _____ dB

b. Enter most negative number from Table 4-19, column 2:
The absolute value of this number should be less than 3.0 dB.  _____ dB

c. Subtract (b) from (a):
The result should be less than 4.0 dB (relative flatness).  _____ dB

75. Frequency Response, Band 4 (Preselector Unpeaked)

a. Enter most positive number from Table 4-19, column 3:
The absolute value of this number should be less than 4.0 dB.  _____ dB

b. Enter most negative number from Table 4-19, column 3:
The absolute value of this number should be less than 4.0 dB.  _____ dB
### Table 4-15. Frequency Response Band 0 (≥50 MHz)

<table>
<thead>
<tr>
<th>Column 1 Frequency (MHz)</th>
<th>Column 2 HP 8902A Reading (dB)</th>
<th>Column 3 CAL FACTOR Frequency (GHz)</th>
<th>Column 4 Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td>0.05</td>
<td>0 (Reference)</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>600</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>700</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>800</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>900</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td>0.05</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1100</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1200</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1300</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1400</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1500</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1700</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1800</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>1900</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2100</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2200</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2300</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2400</td>
<td></td>
<td>2.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2500</td>
<td></td>
<td>3.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2600</td>
<td></td>
<td>3.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2700</td>
<td></td>
<td>3.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2800</td>
<td></td>
<td>3.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
<tr>
<td>2900</td>
<td></td>
<td>3.0</td>
<td>+0.29/−0.31 dB</td>
</tr>
</tbody>
</table>
## 12. Frequency Response

### Table 4-16. Frequency Response Band 1

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>Column 2 HP 8902A Reading (dB) Preselector Peaked</th>
<th>Column 3 HP 8902A Reading (dB) Preselector Unpeaked</th>
<th>Column 4 CAL FACTOR Frequency (GHz)</th>
<th>Column 5 Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.75</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>2.8</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>2.9</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.1</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.3</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td></td>
<td>3.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.7</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.8</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>3.9</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.0</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.1</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.2</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.3</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.4</td>
<td></td>
<td></td>
<td>4.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.5</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.6</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.7</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.8</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>4.9</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.1</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.2</td>
<td></td>
<td></td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
</tbody>
</table>
Table 4-16. Frequency Response Band 1 (continued)

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (GHz)</td>
<td>HP 8902A Reading (dB)</td>
<td>HP 8902A Reading (dB)</td>
<td>CAL FACTOR Frequency (GHz)</td>
<td>Measurement Uncertainty</td>
</tr>
<tr>
<td>5.3</td>
<td>______</td>
<td>______</td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.4</td>
<td>______</td>
<td>______</td>
<td>5.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.5</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.6</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.7</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.8</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>5.9</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>6.0</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>6.1</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>6.2</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>6.3</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
<tr>
<td>6.4</td>
<td>______</td>
<td>______</td>
<td>6.0</td>
<td>+0.43/-0.47 dB</td>
</tr>
</tbody>
</table>
### 12. Frequency Response

#### Table 4-17. Frequency Response Band 2

<table>
<thead>
<tr>
<th>Column 1 Frequency (GHz)</th>
<th>Column 2 HP 8902A Reading (dB) Preselector Peaked</th>
<th>Column 3 HP 8902A Reading (dB) Preselector Unpeaked</th>
<th>Column 4 CAL FACTOR Frequency (GHz)</th>
<th>Column 5 Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>_______</td>
<td>_______</td>
<td>6.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>6.2</td>
<td>_______</td>
<td>_______</td>
<td>6.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>6.4</td>
<td>_______</td>
<td>_______</td>
<td>6.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>6.6</td>
<td>_______</td>
<td>_______</td>
<td>7.0</td>
<td>+0.43/−0.48 dB</td>
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<tr>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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<td>_______</td>
<td>_______</td>
<td>8.0</td>
<td>+0.43/−0.48 dB</td>
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<tr>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>_______</td>
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<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>11.2</td>
<td>_______</td>
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<tr>
<td>11.4</td>
<td>_______</td>
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4-56 Verifying Specified Operation for the HP 8592B
## Table 4-17. Frequency Response Band 2 (continued)

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<th>Frequency (GHz)</th>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>HP 8902A Reading (dB)</td>
<td>Preselector Peaked</td>
<td>HP 8902A Reading (dB)</td>
<td>Preselector Unpeaked</td>
<td>CAL FACTOR Frequency (GHz)</td>
</tr>
<tr>
<td>11.6</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>12.0</td>
<td>+0.43/-0.48 dB</td>
</tr>
<tr>
<td>11.8</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>12.0</td>
<td>+0.43/-0.48 dB</td>
</tr>
<tr>
<td>12.0</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>12.0</td>
<td>+0.43/-0.48 dB</td>
</tr>
<tr>
<td>12.2</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>12.0</td>
<td>+0.43/-0.48 dB</td>
</tr>
<tr>
<td>12.4</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>12.0</td>
<td>+0.43/-0.48 dB</td>
</tr>
<tr>
<td>12.6</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>13.0</td>
<td>+0.43/-0.48 dB</td>
</tr>
<tr>
<td>12.8</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>13.0</td>
<td>+0.43/-0.48 dB</td>
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12. Frequency Response

Table 4-18. Frequency Response Band 3

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>Column 1 HP 8902A Reading (dB) Preselector</th>
<th>Column 3 HP 8902A Reading (dB) Preselector</th>
<th>Column 4 CAL FACTOR Frequency (GHz)</th>
<th>Column 5 Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
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<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
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<td>_______</td>
<td>_______</td>
<td>13.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>12.8</td>
<td>_______</td>
<td>_______</td>
<td>13.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>13.0</td>
<td>_______</td>
<td>_______</td>
<td>13.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>13.2</td>
<td>_______</td>
<td>_______</td>
<td>13.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>13.4</td>
<td>_______</td>
<td>_______</td>
<td>13.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>13.6</td>
<td>_______</td>
<td>_______</td>
<td>14.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>13.8</td>
<td>_______</td>
<td>_______</td>
<td>14.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>14.0</td>
<td>_______</td>
<td>_______</td>
<td>14.0</td>
<td>+0.43/−0.48 dB</td>
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<td>14.2</td>
<td>_______</td>
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<td>+0.43/−0.48 dB</td>
</tr>
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<td>14.4</td>
<td>_______</td>
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<td>14.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
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<td>15.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>14.8</td>
<td>_______</td>
<td>_______</td>
<td>15.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>15.0</td>
<td>_______</td>
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<td>15.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>15.2</td>
<td>_______</td>
<td>_______</td>
<td>15.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>15.4</td>
<td>_______</td>
<td>_______</td>
<td>15.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>15.6</td>
<td>_______</td>
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<td>16.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
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<td>_______</td>
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<td>16.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>16.0</td>
<td>_______</td>
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<td>16.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>16.2</td>
<td>_______</td>
<td>_______</td>
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<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>16.4</td>
<td>_______</td>
<td>_______</td>
<td>16.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>16.6</td>
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<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
<td>16.8</td>
<td>_______</td>
<td>_______</td>
<td>17.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
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<td>_______</td>
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<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>17.2</td>
<td>_______</td>
<td>_______</td>
<td>17.0</td>
<td>+0.43/−0.48 dB</td>
</tr>
<tr>
<td>Column 1 Frequency (GHz)</td>
<td>Column 2 HP 8902A Reading (dB) Preselector Peaked</td>
<td>Column 3 HP 8902A Reading (dB) Preselector Unpeaked</td>
<td>Column 4 CAL FACTOR Frequency (GHz)</td>
<td>Column 5 Measurement Uncertainty</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
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<td>17.4</td>
<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
<td>17.6</td>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<td>18.0</td>
<td>_______</td>
<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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<td>18.2</td>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
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<td>+0.43/−0.48 dB</td>
</tr>
<tr>
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<td>_______</td>
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</tr>
<tr>
<td>19.0</td>
<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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<tr>
<td>19.2</td>
<td>_______</td>
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<td>19.0</td>
<td>+0.43/−0.48 dB</td>
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<tr>
<td>19.4</td>
<td>_______</td>
<td>_______</td>
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<td>+0.43/−0.48 dB</td>
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12. Frequency Response

Table 4-19. Frequency Response Band 4

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<tr>
<th>Frequency GHz</th>
<th>Column 2 HP 8902A Reading (dB) Preselector Peaked</th>
<th>Column 3 HP 8902A Reading (dB) Preselector Unpeaked</th>
<th>Column 4 CAL FACTOR Frequency (GHz)</th>
<th>Column 5 Measurement Uncertainty</th>
</tr>
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<tbody>
<tr>
<td>19.1</td>
<td>_______</td>
<td>_______</td>
<td>19.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>19.2</td>
<td>_______</td>
<td>_______</td>
<td>19.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>19.3</td>
<td>_______</td>
<td>_______</td>
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<td>+0.55/−0.59 dB</td>
</tr>
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<td>_______</td>
<td>_______</td>
<td>19.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>19.5</td>
<td>_______</td>
<td>_______</td>
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<td>+0.55/−0.59 dB</td>
</tr>
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<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>19.7</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
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<td>19.8</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>19.9</td>
<td>_______</td>
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<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.0</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.1</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.2</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.3</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.4</td>
<td>_______</td>
<td>_______</td>
<td>20.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.5</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.6</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.7</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.8</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>20.9</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.0</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.1</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
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<tr>
<td>21.2</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.3</td>
<td>_______</td>
<td>_______</td>
<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
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<td>21.4</td>
<td>_______</td>
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<td>21.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.5</td>
<td>_______</td>
<td>_______</td>
<td>22.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.6</td>
<td>_______</td>
<td>_______</td>
<td>22.0</td>
<td>+0.55/−0.59 dB</td>
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### Table 4-19. Frequency Response Band 4 (continued)

<table>
<thead>
<tr>
<th>Column 1 Frequency (GHz)</th>
<th>Column 2 HP 8902A Reading (dB) Preselector Peaked</th>
<th>Column 3 HP 8902A Reading (dB) Preselector Unpeaked</th>
<th>Column 4 CAL FACTOR Frequency (GHz)</th>
<th>Column 5 Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.7</td>
<td></td>
<td></td>
<td>22.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.8</td>
<td></td>
<td></td>
<td>22.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>21.9</td>
<td></td>
<td></td>
<td>22.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
<tr>
<td>22.0</td>
<td></td>
<td></td>
<td>22.0</td>
<td>+0.55/−0.59 dB</td>
</tr>
</tbody>
</table>

### Table 4-20. Frequency Response Band 0 (<50 MHz)

<table>
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<tr>
<th>Column 1 HP 8592B Frequency</th>
<th>Column 2 HP 3335A Amplitude (dBm)</th>
<th>Column 3 Response Relative to 50 MHz (Reference)</th>
<th>Column 4 Response Relative to 300 MHz</th>
<th>Column 5 Measurement Uncertainty</th>
</tr>
</thead>
<tbody>
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<td>50 MHz</td>
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<td>+0.34/−0.37 dB</td>
</tr>
<tr>
<td>20 MHz</td>
<td>0</td>
<td></td>
<td></td>
<td>+0.34/−0.37 dB</td>
</tr>
<tr>
<td>10 MHz</td>
<td>0</td>
<td></td>
<td></td>
<td>+0.34/−0.37 dB</td>
</tr>
<tr>
<td>5 MHz</td>
<td>0</td>
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<td></td>
<td>+0.34/−0.37 dB</td>
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<td>1 MHz</td>
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<td></td>
<td>+0.34/−0.37 dB</td>
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<tr>
<td>200 kHz</td>
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<td></td>
<td>+0.34/−0.37 dB</td>
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<tr>
<td>50 kHz</td>
<td>0</td>
<td></td>
<td></td>
<td>+0.34/−0.37 dB</td>
</tr>
</tbody>
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13. Other Input Related Spurious

Specification

\(-70\ \text{dBc for applied frequencies} \leq 18\ \text{GHz.}\)
\(-60\ \text{dBc for applied frequencies} \leq 22\ \text{GHz.}\)

Description

A synthesized source and the spectrum analyzer are set to the same frequency and the
amplitude of the source is set to 0 dBm. A marker amplitude reference is set on the analyzer.
The source is then tuned to several different frequencies which should generate image,
multiple, and out-of-band responses. At each source frequency, the source amplitude is set
to 0 dBm and the amplitude of the response, if any, is measured using the analyzer’s marker
function. The marker amplitude difference is then compared to the specification.

Equipment

Synthesized Sweeper ................................................. HP 8340A/B
Measuring Receiver (or Power Meter) ............................ HP 8902A
Power Sensor .......................................................... HP 8485A
Power Splitter .......................................................... HP 11667B

Adapters

Type N (m) to APC 3.5 (m) ........................................ 1250-1743
APC 3.5 (f) to APC 3.5 (f) ........................................ 5061-5311

Cable

APC 3.5 male connectors, 91 cm (36 in) .......................... 8120-4921

Procedure

Band 0

1. Zero and calibrate the HP 8902A and HP 8485A in log mode (power reads out in dBm).
Enter the power sensor’s 2 GHz Cal Factor into the HP 8902A.

2. Press [INSTR PRESET] on the HP 8340A/B and set the controls as follows:
   
   CW ................................................................. 2000 MHz
   POWER LEVEL ................................................... \(-4\ \text{dBm}\)

3. Connect the equipment as shown in Figure 4-17.
4. On the HP 8592B, press [Preset] and wait for the preset to finish. Set the controls as follows:

- CENTER FREQUENCY: 2.0 GHz
- SPAN: 10 MHz
- REF LEVEL: -10 dBm
- ATTEN: 0 dB

5. Adjust the HP 8340A/B power level for a -10 dBm ±0.1 dB reading on the HP 8902A.

6. On the HP 8592B, press the following keys:

- PEAK SEARCH
- SIGNAL TRACK (ON)
- SPAN 200 kHz

Wait for the AUTO ZOOM message to disappear. Press the following analyzer keys:

- PEAK SEARCH [MKR->] MARKER -> REF LVL
- SIGNAL TRACK (OFF) [PEAK SEARCH] MARKER DELTA [AMPLITUDE ▼] (step-down key)
- SGL SWP

7. For each of the frequencies listed in Table 4-21 for Band 0, do the following:

a. Set the HP 8340A/B to the listed CW frequency.

b. Enter the appropriate power sensor Cal Factor into the HP 8902A.

c. Set the HP 8340A/B power level for a -10 dBm reading on the HP 8902A.

d. Press [SGL SWP] and wait for completion of a new sweep.

e. On the HP 8592B, press [PEAK SEARCH] and record the MKR △ amplitude reading in Table 4-21 as the Actual MKR △ Amplitude.

The Actual MKR △ Amplitude should be less than the Max MKR △ Amplitude listed in the table.
13. Other Input Related Spurious

**Note**
The Max MKR ∆ Amplitude is 10 dB more positive than the specification. This is due to the 10 dB change in reference level made in step 6.

---


Set the controls as follows:

- **SPAN** ......................................................... 10 MHz
- **REF LEVEL** .................................................. −10 dBm
- **ATTEN** ....................................................... 0 dB
- **SWEEP** ....................................................... CONT

**Band 1**

9. Set the HP 8592B center frequency to 4 GHz.

10. Set the HP 8340A/B CW to 4 GHz.

11. Enter the power sensor’s 4 GHz Cal Factor into the HP 8902A.

12. On the HP 8592B, press the following keys:

    **PEAK SEARCH** **AMPLITUDE** **PRESEL PEAK**

    Wait for the **CAL: PEAKING** message to disappear. Press **MKR**, **MARKERS OFF**.

13. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 4-21 for Band 1.

**Band 2**

14. Set the HP 8592B center frequency to 9 GHz.

15. Set the HP 8340A/B CW to 9 GHz.

16. Enter the power sensor’s 9 GHz Cal Factor into the HP 8902A.

17. On the HP 8592B, press **PEAK SEARCH**, **AMPLITUDE**, **PRESEL PEAK**.

    Wait for the **CAL: PEAKING** message to disappear. Press **MKR**, **MARKERS OFF**.

18. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 4-21 for Band 2.

**Band 3**

19. Set the HP 8592B center frequency to 15 GHz.

20. Set the HP 8340A/B CW to 15 GHz.

21. Enter the power sensor’s 15 GHz Cal Factor into the HP 8902A.

---

4-64 Verifying Specified Operation for the HP 8592B
22. On the HP 8592B, press \texttt{PEAK SEARCH}, \texttt{AMPLITUDE}, \texttt{PRESEL PEAK}. Wait for the \texttt{CAL: PEAKING} message to disappear. Press \texttt{MKR}, \texttt{MARKERS OFF}.

23. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 4-21 for Band 3.

\textbf{Band 4}

24. Set the HP 8592B center frequency to 21 GHz.

25. Set the HP 8340A/B CW to 21 GHz.

26. Enter the power sensor's 21 GHz Cal Factor into the HP 8902A.

27. On the HP 8592B, press \texttt{PEAK SEARCH}, \texttt{AMPLITUDE}, \texttt{PRESEL PEAK}.

Wait for the \texttt{CAL: PEAKING} message to disappear. Press \texttt{MKR}, \texttt{MARKERS OFF}.

28. Repeat steps 5 through 8 for the HP 8340A/B CW frequencies listed in Table 4-21 for Band 4.

\textbf{Specification Summary}

29. Record the maximum Actual MKR $\Delta$ Amplitude from Table 4-21 for Band 0.

Maximum Response Amplitude, 50 kHz to 2.9 GHz:

\[  \text{_________ dBc} \]

30. Record the maximum Actual MKR $\Delta$ Amplitude from Table 4-21 for Bands 1, 2 and 3.

Maximum Response Amplitude, 2.75 to 22 GHz, Applied Frequency $\leq$ 18 GHz:

\[  \text{_________ dBc} \]

31. Record the maximum Actual MKR $\Delta$ Amplitude from Table 4-21 for Band 4.

Maximum Response Amplitude, 2.75 to 22 GHz, Applied Frequency $\leq$ 22 GHz:

\[  \text{_________ dBc} \]
Table 4-21. Other Input Related Spurious

<table>
<thead>
<tr>
<th>Band</th>
<th>HP 8592B Center Frequency</th>
<th>HP 8340A/B CW Frequency</th>
<th>MKR Δ Amplitude</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GHz</td>
<td>MHs</td>
<td>Actual (dBc)</td>
</tr>
<tr>
<td>0</td>
<td>2.0</td>
<td>2042.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>2642.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>9821.4 (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>7331.9 (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>1820.8 (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>278.5 (3)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.0</td>
<td>4042.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>4642.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>8963.9 (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>3742.9 (3)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9.0</td>
<td>9042.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.0</td>
<td>9642.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.0</td>
<td>4682.05 (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.0</td>
<td>9942.5 (3)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>15.0</td>
<td>15042.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>15642.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>4785.8 (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>14700.1 (3)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>21.0</td>
<td>21042.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21.0</td>
<td>21642.8 (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21.0</td>
<td>5009.025 (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21.0</td>
<td>20007.1 (3)</td>
<td></td>
</tr>
</tbody>
</table>

(1) Image Response  
(2) Out-of-Band Response  
(3) Multiple Response
14. Spurious Response Test

Specification

Second Harmonic Distortion:

- 10 MHz to 2.9 GHz: $<-70$ dBc for $-40$ dBm tone at mixer power
- >2.75 GHz: $<-100$ dBc for $-10$ dBm tone at mixer power
  (or below average noise level)

Third Order Intermodulation Distortion:

- >10 MHz: $<-70$ dBc for two $-30$ dBm tones at mixer power and 50 kHz spacing.

Description

This test is performed in two parts. The first part measures second harmonic distortion; the second part measures third order intermodulation distortion. Second harmonic distortion and third order intermodulation distortion is checked in both low band (50 kHz to 2.9 GHz) and high band (2.75 to 22 GHz).

To test second harmonic distortion, 50 MHz and 4.4 GHz low pass filters are used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The distortion products are measured using the analyzer’s marker functions.

For third order intermodulation distortion, two signals are combined in a directional coupler (for isolation) and are applied to the analyzer input. The power level of the two signals is 8 dB higher than specified, so the distortion products should be suppressed by 16 dB less than specified. In this manner, the equivalent Third Order Intercept (TOI) is measured.

With two $-30$ dBm signals at the input mixer and the distortion products suppressed by 70 dBc, the equivalent TOI is $+5$ dBm ($-30$ dBm + 70 dBc/2). However, if two $-22$ dBm signals are present at the input mixer and the distortion products are suppressed by 54 dBc, the equivalent TOI is also $+5$ dBm ($-22$ dBm + 54 dBc/2).

Performing the test with a higher power level maintains the measurement integrity while reducing both test time and the dependency upon the source's noise sideband performance.

Equipment

- Synthesized Sweeper (2 required) .................. HP 8340A/B
- Measuring Receiver (or Power Meter) .................. HP 8902A
- Power Sensor, 50 MHz to 26.5 GHz .................. HP 8485A
- Power Splitter .................................. HP 11667B
- 50 MHz Low Pass Filter .................. 0955-0306
- 4.4 GHz Low Pass Filter (2 required) .................. HP 11689A
- Directional Coupler .................. 0955-0125

Cables

- APC 3.5 Cable 91 cm (36 in) .................. 8120-4921
14. Spurious Response Test

BNC Cable 120 cm (48 in) ........................................ HP 10503A

Adapters

Type N (m) to APC 3.5 (m) ........................................ 1250-1743
APC 3.5 (f) to APC 3.5 (f) (2 required) ....................... 5061-5311
Type N (f) to APC 3.5 (f) ........................................ 1250-1745
Type N (m) to BNC (f) (2 required) ............................ 1250-1476
Type N (m) to APC 3.5 (f) ........................................ 1250-1744
Type N (f) to BNC (m) ........................................... 1250-1477

Procedure

Second Harmonic Distortion, <2.9 GHz

1. Press [Preset] on the HP 8340A/B and set the controls as follows:

   CW ................................................................. 30 MHz
   POWER LEVEL .................................................. -30 dBm

2. Connect the equipment as shown in Figure 4-18.

![Figure 4-18. Second Harmonic Distortion Test Setup]

3. Press [Preset] on the HP 8592B and wait for the preset to finish. Set the controls as follows:

   CENTER FREQUENCY ......................................... 30 MHz
   SPAN .............................................................. 10 MHz
   REF LEVEL ..................................................... -30 dBm

   Press the following keys:
   - [Peak Search] [Signal Track] (ON)
   - [Span] 1 MHz [Signal Track] (OFF)
   - [BW] 30 kHz.

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4. Adjust the HP 8340A/B power level to place the peak of the signal at the reference level (-30 dBm).

5. Set the HP 8592B control as follows:
   
   **RES BW** .................................................. 1 kHz  
   **VIDEO BW** .............................................. 100 Hz  

6. Wait for two sweeps to finish. On the HP 8592B, press [PEAK SEARCH], **MARKER DELTA**,  
   **[FREQUENCY]**, **CF' STEP AUTO MAN 30 (MHz)**, **[FREQUENCY]**.

7. Press the ▲ (step-up key) on the HP 8592B to step to the second harmonic (at 60 MHz). Set the reference level to -50 dBm. Press [PEAK SEARCH].

   Record the MKR △ Amplitude reading in Table 4-22. The MKR △ Amplitude reading  
   should be less than the specified limit.

---

**Note**  
The Max MKR △ Amplitude Reading is 20 dB higher than the specification.  
This is a result of changing the reference level from -30 dBm to -50 dBm.

---

**Second Harmonic Distortion, >2.9 GHz**

8. Zero and calibrate the HP 8902A and HP 8485A combination in log mode (RF Power  
   readout in dBm). Enter the power sensor's 3 GHz Cal Factor into the HP 8902A.

9. Measure the noise level at 5.6 GHz as follows:
   
   a. Remove any cable or adapters from the HP 8592B INPUT 50Ω.
   b. Press [PRESET] on the HP 8592B and set the controls as follows:
      
      **CENTER FREQUENCY** .................................. 5.6 GHz  
      **SPAN** ................................................... 0 Hz  
      **REF LEVEL** ........................................... -40 dBm  
      **RES BW** ................................................ 1 kHz  
      **VID BW** ................................................ 30 Hz  
      **VIDEO AVERAGE** ..................................... 10 Hz  
      **SWEEP TIME** .......................................... 5.0 s  
   c. Press [SGL SWP]. Wait until AVG 10 is displayed along the left side of the CRT display.  
      Press [PEAK SEARCH] on the HP 8592B and record the marker amplitude reading as the  
      noise level at 5.6 GHz:

      Noise Level at 5.6 GHz __________ dBm

10. Press [PRESET] on the HP 8592B. Set the controls as follows:
    
    **BAND LOCK** ............................................. 2.75 - 6.4 BAND 1  
    **CENTER FREQUENCY** .................................. 2.8 GHz  
    **SPAN** .................................................. 10 MHz
14. Spurious Response Test

11. Connect equipment as shown in Figure 4-19, with the output of the HP 8340A/B connected to the input of the power splitter, and the power splitter outputs connected to the HP 8592B and the power sensor.

![Diagram of equipment setup]

**Figure 4-19. Second Harmonic Distortion Test Setup, >2.9 GHz**

12. On the HP 8340A/B, press [Preset] and set the controls as follows:

- CW .................................................. 2.8 GHz
- POWER LEVEL ....................................... 0 dBm

13. On the HP 8592B, press [Peak Search], [Signal Track] (on), [Amplitude], PRESEL PEAK. Wait for the CAL: PEAKING message to disappear. Press [Peak Search], MARKER DELTA.

14. Note the power meter reading:

- Power Meter Reading at 2.8 GHz _______ dBm

15. Set the HP 8340A/B CW to 5.6 GHz.

16. Set the HP 8592B center frequency to 5.6 GHz. Press [Peak Search], [Signal Track] (on), [Amplitude], PRESEL PEAK. Wait for the CAL: PEAKING message to disappear.

17. Adjust the HP 8340A/B power level until the Marker Δ Amplitude reads 0 dB ±0.20 dB.

18. Enter the power sensor's 6 GHz Cal Factor into the power meter. Note the power meter reading:

- Power Meter Reading at 5.6 GHz _______ dBm

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19. Subtract the reading in step 18 from the reading in step 13 and record as the Frequency Response Error. For example, if the reading in step 18 is $-6.45$ dBm and the reading in step 13 is $-7.05$ dBm, the Frequency Response Error would be $-7.05$ dBm $- (-6.45$ dBm) $= -0.60$ dB.

Frequency Response Error (FRE) _________ dB

20. Calculate the desired maximum marker amplitude reading as follows:

a. Add Frequency Response Error, FRE, (step 19) to $-60$ dBC (specification is $-100$ dBC, but reference level will be changed by $40$ dB to yield the required dynamic range) and record below:

Distortion-limited Specification $= -60$ dBC $+$ FRE

Distortion-limited Specification _________ dBC

b. Subtract $-40$ dBm (reference level setting) from Noise Level at 5.6 GHz (step 9) and record below:

Noise-limited Specification $= $ Noise Level at 5.6 GHz $+$ $40$ dBm

Noise-limited Specification _________ dBC

c. Record the more positive of the values recorded in a and b above. For example, if the value in a is $-59$ dBC and the value in b is $-61$ dBC, record $-59$ dBC.

Specification _________ dBC

21. Connect the equipment as shown in Figure 4-19 with the filters in place.

22. Set the HP 8340A/B controls as follows:

- CW ......................................................... 2.8 GHz
- POWER LEVEL ................................................. 0 dBm

23. On the HP 8592B, set the center frequency to 2.8 GHz. Press [MARKERS OFF, PEAK SEARCH, SIGNAL TRACK (ON), AMPLITUDE, PRESEL PEAK]. Wait for the CAL: PEAKING message to disappear. Press [SPAN], 100 kHz.

24. Adjust the HP 8340A/B power level for an HP 8592B marker amplitude reading of 0 dBm $\pm 0.2$ dB.

25. On the HP 8592B, press [SIGNAL TRACK (OFF), PEAK SEARCH, MARKER DELTA]. Set controls as follows:

- CENTER FREQUENCY ........................................... 5.6 GHz
- SPAN .......................................................... 10 MHz

26. Remove the filters and connect the HP 8340A/B output directly to the HP 8592B INPUT 50Ω.
14. Spurious Response Test

27. On the HP 8592B, press [PEAK SEARCH], [SIGNAL TRACK] (ON), [AMPLITUDE], PRESEL PEAK. Wait for the CAL: PEAKING message to disappear. Press [SPAN], 100 kHz.

28. Reinstall the filters between the HP 8340A/B output and the HP 8592B INPUT 50Ω.

29. Set the HP 8592B controls as follows:

   REF LEVEL ................................................................. -40 dBm
   VID BW ................................................................. 30 Hz
   VIDEO AVERAGE ..................................................... 10 Hz

Press [SGL SWP]. Wait until AVG 10 is displayed along the left side of the CRT display. Press [PEAK SEARCH]. Record the Marker Amplitude Reading below:

   Marker Amplitude Reading _______ dBC

30. The Marker Amplitude Reading should be more negative than the Specification recorded in step 20c. Record both the Specification from step 20c and the Marker Amplitude Reading in step 29 in Table 4-22. Also record the Specification from step 20c in the Performance Verification or Operation Verification Test Record.

<table>
<thead>
<tr>
<th>Table 4-22. Second Harmonic Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input CW Frequency</td>
</tr>
<tr>
<td>MHz</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>2800</td>
</tr>
</tbody>
</table>

31. Zero and calibrate the HP 8902A and HP 8485A combination in log mode (RF Power readout in dBm). Enter the power sensor's 3 GHz Cal Factor into the HP 8902A.

32. Connect the equipment as shown in Figure 4-20 with the input of the directional coupler connected to the power sensor.
14. Spurious Response Test

Figure 4-20. Third-Order Intermodulation Distortion Test Setup

33. Press [INSTR PRESET] on each HP 8340A/B. Set each of the HP 8340A/B controls as follows:

   POWER LEVEL .................................................. −15 dBm
   CW (HP 8340A/B #1) ........................................... 2.800 GHz
   CW (HP 8340A/B #2) ........................................... 2.80005 GHz
   RF ............................................................... OFF

34. On the HP 8592B, press [PRESET] and wait until the preset if finished. Set the controls as follows:

   CENTER FREQUENCY ........................................... 2.8 GHz
   SPAN .............................................................. 10 MHz
   REF LEVEL .................................................... −10 dBm

   Press the following analyzer keys:
   
   [PEAK SEARCH], [PEAK EXCURSION 3 (dB)],
   [DISPLAY] THRESHOLD ON OFF (ON) 90 −dBm.

35. On HP 8340A/B # 1, set RF to on. Adjust the power level until the HP 8002A reads −12 dBm ±0.05 dB.

36. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the HP 8592B INPUT 50Ω using an adapter (do not use a cable).

37. On the HP 8592B, press [PEAK SEARCH], [SIGNAL TRACK] (ON), [SPAN], 200 kHz.

   Wait for the AUTO ZOOM message to disappear. Press [SIGNAL TRACK] (OFF), [PEAK SEARCH],
   [Mkr -->], MARKER → REF LVL.

Verifying Specified Operation for the HP 8592B  4-73
14. Spurious Response Test

38. On HP 8340A/B #2, set RF to on. Adjust the power level until the two signals are displayed at the same amplitude.

39. If necessary, adjust the HP 8592B center frequency until the two signals are centered on the display. Set the controls as follows:

   RES BW ......................................................... 1 kHz
   VIDEO BW ...................................................... 100 Hz

40. Press [PEAK SEARCH], MARKER DELTA. Press the following analyzer keys: [DISPLAY], DSP LINE ON OFF (ON). Set the display line to a value 54 dB below the current reference level setting.

41. The third order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 4-21.

![Figure 4-21. Third Order Intermodulation Distortion](image)

42. If the distortion products can be seen, proceed as follows:

   a. On the HP 8592B, press [MKR ->] and PEAK MENU.

   b. Repeatedly press NEXT PEAK until the active marker is on the desired distortion product.

   c. Record the MKR Δ amplitude reading in Table 4-23. The MKR Δ reading should be less than the specified limit.

43. If the distortion products cannot be seen, proceed as follows:

   a. On each HP 8340A/B, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.

   b. On the HP 8592B, press [MKR ->], PEAK MENU.
c. Repeatedly press NEXT PEAK until the active marker is on one of the distortion products.
d. On each HP 8340A/B, reduce the power level by 5 dB and wait for completion of a new sweep.
e. Record the MKR Δ amplitude reading in Table 4.23. The MKR Δ reading should be less than the specified limit.

**Third Order Intermodulation Distortion, >2.9 GHz**

44. Enter the power sensor's 4 GHz Cal Factor into the HP 8902A.

45. Disconnect the directional coupler from the HP 8592B and connect the power sensor to the output of the directional coupler.

46. Set each of the HP 8340A/B controls as follows:

<table>
<thead>
<tr>
<th>Control</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER LEVEL</td>
<td>(-15 \text{ dBm})</td>
</tr>
<tr>
<td>CW (HP 8340A/B #1)</td>
<td>4.000 GHz</td>
</tr>
<tr>
<td>CW (HP 8340A/B #2)</td>
<td>4.00005 GHz</td>
</tr>
<tr>
<td>RF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

47. On the HP 8592B, press [PRESET] and wait until the preset is finished. Set the controls as follows:

<table>
<thead>
<tr>
<th>Control</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTER FREQUENCY</td>
<td>4.0 GHz</td>
</tr>
<tr>
<td>SPAN</td>
<td>10 MHz</td>
</tr>
<tr>
<td>REF LEVEL</td>
<td>(-10 \text{ dBm})</td>
</tr>
</tbody>
</table>

Press the following analyzer keys:

- [PEAK SEARCH], PEAK EXCURSN 3 dB
- [DISPLAY] THRESHLD ON OFF (ON) 90 (dBm).

48. On HP 8340A/B #1, set RF to on. Adjust the power level until the HP 8902A reads \(-12 \text{ dBm} \pm 0.05 \text{ dB}\).

49. Disconnect the power sensor from the directional coupler. Connect the directional coupler directly to the HP 8592B INPUT 50Ω using an adapter (do not use a cable).

50. On the HP 8592B, press [PEAK SEARCH], [AMPLITUDE], PRESEL PEAK. Wait for the CAL: PEAKING message to disappear. Press the following keys:

<table>
<thead>
<tr>
<th>Control</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNAL TRACK</td>
<td>(ON)</td>
</tr>
<tr>
<td>SPAN</td>
<td>200 kHz</td>
</tr>
</tbody>
</table>

Wait for the AUTO ZOOM message to disappear. Press [SIGNAL TRACK] (OFF), [FREQUENCY], ▲ (step-up key), [PEAK SEARCH], [MKR ->], MARKER -> REF LVL.

51. On HP 8340A/B #2, set RF to on. Adjust the power level until the two signals are displayed at the same amplitude.
14. Spurious Response Test

52. If necessary, adjust the HP 8592B center frequency until the two signals are centered on the display. Set the controls as follows:

- **RES BW** ................................................................. 1 kHz
- **VIDEO BW** ......................................................... 100 Hz

53. Press **PEAK SEARCH**, **MARKER DELTA**. Set the **DISPLAY LINE** to a value 54 dB below the current reference level setting.

54. The third order intermodulation distortion products should appear 50 kHz below the lower frequency signal and 50 kHz above the higher frequency signal. Their amplitude should be less than the display line. See Figure 4-21.

55. If the distortion products can be seen, proceed as follows:
   a. On the HP 8592B, press **MKR - >** and **PEAK MENU**.
   b. Repeatedly press **NEXT PEAK** until the active marker is on the desired distortion product.
   c. Record the **MKR Δ** amplitude reading in Table 4-23. The **MKR Δ** reading should be less than the specified limit.

56. If the distortion products cannot be seen, proceed as follows:
   a. On each HP 8340A/B, increase the power level by 5 dB. Distortion products should now be visible at this higher power level.
   b. On the HP 8592B, press **MKR - >** and **PEAK MENU**.
   c. Repeatedly press **NEXT PEAK** until the active marker is on one of the distortion products.
   d. On each HP 8340A/B, reduce the power level by 5 dB and wait for completion of a new sweep.
   e. Record the **MKR Δ** amplitude reading in Table 4-23. The **MKR Δ** reading should be less than the specified limit.

<table>
<thead>
<tr>
<th>HP 8340A/B #1 CW Frequency</th>
<th>HP 8340A/B #2 CW Frequency</th>
<th>MKR Δ Amplitude Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>GHz</td>
<td>(dBc)</td>
</tr>
<tr>
<td>2.80000</td>
<td>2.80005</td>
<td>—</td>
</tr>
<tr>
<td>4.00000</td>
<td>4.00005</td>
<td>—</td>
</tr>
</tbody>
</table>

4-76 Verifying Specified Operation for the HP 8592B
15. Gain Compression

Specification

\[ >10 \text{ MHz} \leq 0.5 \text{ dB} \text{ for } -10 \text{ dBm total power at input mixer.} \]

Description

This test measures gain compression in both low band and high band. Two signals, separated by 3 MHz, are used. First, the test places a \(-30 \text{ dBm}\) signal at the input of the spectrum analyzer (the analyzer’s reference level is also set to \(-30 \text{ dBm}\)). Then, a 0 dBm signal is applied to the analyzer, overdriving its input. The decrease in the first signal’s amplitude (gain compression) caused by the second signal is the measured gain compression.

Equipment

- Synthesized Sweeper (2 required) ................................. HP 8340A/B
- Measuring Receiver (used as a power meter) ...................... HP 8902A
- Power Sensor .............................................................. HP 8485A
- Directional Coupler .................................................... 0955-0125

Cables

- APC 3.5, 91 cm (36 in) (2 required) ......................... 8120-4921

Adapters

- Type N (m) to APC 3.5 (m) ........................................ 1250-1743
- APC 3.5 (f) to APC 3.5 (f) (2 required) ....................... 5061-5311

Procedure

\(<2.9 \text{ GHz}\)

1. Zero and calibrate the HP 8902A and HP 8585A combination in log mode (power reads out in dBm). Enter the power sensor’s 2 GHz Cal Factor into the HP 8902A.

2. Connect the equipment as shown in Figure 4-22, with the output of the directional coupler connected to the power sensor.
15. Gain Compression

Figure 4-22. Gain Compression Test Setup

3. Press **INSTR PRESET** on each HP 8340A/B. Set the HP 8340A/B #1 controls as follows:
   
   CW ......................................................... 2.003 GHz
   POWER LEVEL ........................................... 0 dBm

4. Set the HP 8340A/B #2 controls as follows:
   
   CW ......................................................... 2.0 GHz
   POWER LEVEL ........................................... –14 dBm

5. On the HP 8592B, press **PRESET** and wait for the preset to finish. Set the controls as follows:
   
   CENTER FREQUENCY ...................................... 2.0 GHz
   SPAN .................................................. 20 MHz
   REF LEVEL .......................................... –30 dBm
   LOG dB/DIV ........................................ 1 dB
   RES BW ........................................... 300 kHz
   VID BW ............................................. 1 kHz

6. On HP 8340A/B #1, adjust the power level for a 0 dBm reading on the HP 8902A. Set RF to off.

**Note**

The power level applied to the spectrum analyzer input is 10 dB greater than the specification to account for the 10 dB ATTEN setting. A power level of 0 dBm at the analyzer input yields –10 dBm at the input mixer.

7. Disconnect the power sensor from the directional coupler and connect the directional coupler to the INPUT 50Ω connector of the spectrum analyzer using an adapter. Do not use a cable.

4-78 Verifying Specified Operation for the HP 8592B
8. On the HP 8592B, press the following keys:

\[ \text{PEAK SEARCH} \quad \text{SIGNAL TRACK} \quad \text{(ON)} \]
\[ \text{SPAN} \quad 10 \quad \text{MHz}. \]

Wait for the AUTO ZOOM message to disappear.

9. On HP 8340A/B #2, adjust the power level to place the signal 1 dB below the analyzer's reference level.

10. On the HP 8592B, press \text{PEAK SEARCH}, MARKER DELTA. \text{MARKER DELTA}.

11. On HP 8340A/B #1, set RF to on.

12. On the HP 8592B, press \text{PEAK SEARCH}, NEXT PEAK. The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the analyzer's knob.

13. Read the MKR \( \Delta \) amplitude and record the amplitude in Table 4-24. The absolute value of this amplitude should be less than or equal to 0.5 dB.

\[ > 2.9 \text{ GHz} \]

14. Disconnect the directional coupler from the input to the spectrum analyzer and connect the directional coupler to the power sensor.

15. Set the HP 8592B controls as follows:

\begin{itemize}
  \item CENTER FREQUENCY \quad \ldots \quad 4.0 \text{ GHz}
  \item SPAN \quad \ldots \quad 20 \text{ MHz}
  \item MKR \quad \ldots \quad \text{OFF}
\end{itemize}

16. Set HP 8340A/B #1 controls as follows:

\begin{itemize}
  \item CW \quad \ldots \quad 4.003 \text{ GHz}
  \item POWER LEVEL \quad \ldots \quad 2 \text{ dBm}
\end{itemize}

17. Set HP 8340A/B #2 controls as follows:

\begin{itemize}
  \item CW \quad \ldots \quad 4.0 \text{ GHz}
  \item POWER LEVEL \quad \ldots \quad -14 \text{ dBm}
\end{itemize}

18. Enter the power sensor's 4 GHz Cal Factor into the HP 8902A.

19. Adjust HP 8340A/B #1 power level for a 0 dBm reading on the HP 8902A. Set RF to off.

20. Disconnect the power sensor from the directional coupler and connect the directional coupler to the input of the spectrum analyzer using an adapter. Do not use a cable.

21. On the HP 8592B, press the following keys:

\[ \text{PEAK SEARCH} \quad \text{SIGNAL TRACK} \quad \text{(ON)}. \]

Wait for the signal to be centered on screen. Press \text{AMPLITUDE}, PRESEL PEAK and wait for the CAL: PEAKING message to disappear.
15. Gain Compression

Press **SPAN**, 10 [MHz]. Wait for the **AUTO ZOOM** message to disappear.

22. On HP 8340A/B #2, adjust the power level to place the signal 1 dB below the analyzer’s reference level.

23. On the HP 8592B, press **PEAK SEARCH**, **MARKER DELTA**.

24. Set HP 8340A/B #1 RF to on.

25. On the HP 8592B, press **PEAK SEARCH**, **NEXT PEAK**. The active marker should be on the lower amplitude signal and not on the signal that is off the top of the screen. If it is not on the lower amplitude signal, reposition the marker to this peak using the analyzer’s knob.

26. Read the MKR \( \Delta \) amplitude and record the amplitude in Table 4-24. The absolute value of this amplitude should be less than or equal to 0.5 dB.

<table>
<thead>
<tr>
<th>Band</th>
<th>HP 8592B Center Frequency</th>
<th>HP 8340A/B #1 CW Frequency (GHz)</th>
<th>HP 8340A/B #2 CW Frequency (GHz)</th>
<th>Gain Compression (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.0 GHz</td>
<td>2.003</td>
<td>2.000</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.0 GHz</td>
<td>4.003</td>
<td>4.000</td>
<td></td>
</tr>
</tbody>
</table>
16. Displayed Average Noise Level

Specification
Displayed Average Noise Level:

\[
\begin{array}{ll}
400 \text{ kHz} \text{ to } 2.9 \text{ GHz} & \leq -112 \text{ dBm} \\
2.75 \text{ to } 6.4 \text{ GHz} & \leq -114 \text{ dBm} \\
6.0 \text{ to } 12.8 \text{ GHz} & \leq -102 \text{ dBm} \\
12.4 \text{ to } 19.4 \text{ GHz} & \leq -98 \text{ dBm} \\
19.1 \text{ to } 22 \text{ GHz} & \leq -92 \text{ dBm}
\end{array}
\]

Description
Frequency Response Adjustment
This test measures the displayed average noise level in all five frequency bands. The analyzer's input is terminated in 50Ω. In Band 0 (9 kHz to 2.9 GHz), the test first measures the average noise at 400 kHz and 1 MHz in zero span.

The LO feedthrough is used as a frequency reference for these measurements. For the rest of Band 0 and for all of the remaining bands, the test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

To reduce measurement uncertainty due to input attenuator switching and resolution bandwidth switching, a reference level offset is added. The CAL OUT signal is used as the amplitude reference for determining the amount of offset required. The offset is removed at the end of the test by pressing \textsc{Preset}.

Equipment
Cable
BNC, 23 cm (9 in) .............................................................. HP 10502A

Adapters
50Ω Termination .............................................................. HP 909D
Type N (m) to BNC (f) ......................................................... 1250-1476
Type N (m) to APC 3.5 (f) .................................................. 1250-1744

Procedure
1. Connect a cable from the CAL OUT to the INPUT 50Ω of the HP 8592B as shown in Figure 4-23.
16. Displayed Average Noise Level

![Spectrum Analyzer Diagram]

Figure 4-23. Reference Offset Test Setup

Press **PRESET** and wait for the preset to finish. Set the controls as follows:

- CENTER FREQUENCY ........................................... 300 MHz
- SPAN ......................................................... 10 MHz
- REF LEVEL ................................................. \(-20\) dBm
- ATTEN ...................................................... 0 dB

2. Press the following analyzer keys:

- PEAK SEARCH
- SIGNAL TRACK (ON)
- SPAN 100 kHz

Wait for the AUTO ZOOM message to disappear. Set the controls as follows:

- VIDEO BW ..................................................... 30 Hz
- TRIGGER .................................................... SINGLE
- SIGNAL TRACK .......................................... OFF

3. Press **SGL SWP** and wait for completion of a new sweep. Press the following analyzer keys:

- PEAK SEARCH
- AMPLITUDE MORE 1 of 2
- REF LVL OFFSET

Subtract the MKR amplitude reading from \(-20\) dBm and enter the result as the REF LVL OFFSET. For example, if the marker reads \(-20.21\) dBm, enter \(+0.21\) dB (\(-20\) dBm \(- (-20.21\) dBm) = \(+0.21\) dB).

REF LEVEL OFFSET ______ dB

4-82 Verifying Specified Operation for the HP 8592B
4. Disconnect the cable from the INPUT 50Ω connector of the HP 8592B. Connect the 50Ω
termination to the analyzer INPUT 50Ω connector.

400 kHz

5. Press **VID BW AUTO MAN** (AUTO).

Set the analyzer's controls as follows:

- CENTER FREQUENCY: 0 Hz
- SPAN: 10 MHz
- REF LEVEL: -10 dBm
- TRIGGER: CONT

6. Press the following analyzer keys:

- **PEAK SEARCH**
- **SIGNAL TRACK** (ON)
- **SPAN** 800 kHz

Wait for the **AUTO ZOOM** message to disappear.

Press the following analyzer keys:

- **SIGNAL TRACK** (OFF)
- **RES BW** AUTO MAN 3 kHz
- **FREQUENCY**

7. Adjust the center frequency until the LO feedthrough peak is on the left-most graticule
line. Set the controls as follows:

- SPAN: 50 kHz
- REF LEVEL: -50 dBm
- RES BW: 1 kHz
- VIDEO BW: 30 Hz
- SWEEP TIME: 5 s

8. Press **TRACE**, MORE 1 of 3, **DETECTOR SAMPL PK** (SAMPL), **SGL SWP**.

Wait for completion of a new sweep.

9. Press the following analyzer keys:

- **DISPLAY** DSP LINE ON OFF (ON)

Adjust the display line so that it is centered on the average noise trace, ignoring any
residual responses (refer to Residual Response verification test for any suspected
residuals).
16. Displayed Average Noise Level

Record the display line amplitude setting in Table 4-25 as the Noise Level at 400 kHz. The average noise level should be less than the specified limit.

1 MHz

10. Press the following analyzer keys:

AUTO COUPLE RES BW AUTO MAN (AUTO)
VID BW AUTO MAN (AUTO).

Set the analyzer’s controls as follows:

CENTER FREQUENCY ............................................ 0 MHz
SPAN ............................................................... 10 MHz
REF LEVEL ..................................................... −10 dBm
TRIGGER ......................................................... CONT

11. Press the following analyzer keys:

PEAK SEARCH SIGNAL TRACK (ON)
SPAN 2 (MHz).

Wait for AUTO ZOOM message to disappear. Press SIGNAL TRACK (OFF).

12. Press FREQUENCY, and adjust the center frequency until the LO feedthrough peak is on the left-most graticule line. Set the controls as follows:

SPAN ............................................................. 50 kHz
REF LEVEL ..................................................... −50 dBm
RES BW ........................................................... 1 kHz
VIDEO BW ....................................................... 30 Hz

13. Press SGL SWP.

Wait for completion of a new sweep.

14. Press the following analyzer keys:

DISPLAY DSP LINE ON OFF (ON).

Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses (refer to Residual Response verification test for any suspected residuals).

Record the display line amplitude setting in Table 4-25. The average noise level should be less than the specified limit.

1 MHz to 2.9 GHz

15. Press the following analyzer keys:

SPAN BAND LOCK 0-2.9 Gz BAND 0.

4-84 Verifying Specified Operation for the HP 8592B
16. Displayed Average Noise Level

Set the controls as follows:

RES BW ......................................................... 1 MHz
VIDEO BW ..................................................... 10 kHz
TRIGGER ....................................................... CONT

16. Adjust the START FREQ setting, if necessary, to place the LO feedthrough just off-screen to the left.

17. Press the following analyzer keys:

SGL SWP
TRACE CLEAR WRITE A MORE 1 of 3
VID AVG ON OFF (ON) 10 Hz.

Wait until AVG 10 is displayed to the left of the graticule (the analyzer will take ten sweeps, then stop).

18. Press PEAK SEARCH and record the MKR frequency as the Measurement Frequency in Table 4-25 for Band 0.

19. Press the following analyzer keys:

TRACE MORE 1 of 3 VID AVG ON OFF (OFF) AUTO COUPLE
RES BW AUTO MAN (AUTO)
VID BW AUTO MAN (AUTO) SPAN 50 kHz
FREQUENCY.

Set the center frequency to the Measurement Frequency recorded in Table 4-25 for Band 0. Set the controls as follows:

RES BW ......................................................... 1 kHz
VIDEO BW ..................................................... 30 Hz

20. Press SGL SWP.

Wait for a new sweep to finish. Press the following analyzer keys:

DISPLAY DSP LINE ON OFF (ON).

Adjust the display line so that it is centered on the average noise trace, ignoring any residual responses (refer to Residual Response verification test for any suspected residuals).

Record the display line amplitude setting in Table 4-25. The average noise level should be less than the specified limit.

21. Press MKR MARKERS OFF.

2.75 to 6.4 GHz

22. Press the following analyzer keys:

BAND LOCK 2.75-6.4 BAND 1.

Verifying Specified Operation for the HP 8592B 4-85
16. Displayed Average Noise Level

Set the controls as follows:

RES BW ......................................................... 1 MHz
VIDEO BW ...................................................... 10 kHz
TRIGGER ....................................................... CONT

23. Repeat steps 17 through 21 above for Band 1 (2.75 to 6.4 GHz).

6.0 to 12.8 GHz

24. Press the following analyzer keys:

SPAN BAND LOCK 6.0-12.8 BAND 2.

Set the controls as follows:

RES BW ......................................................... 1 MHz
VIDEO BW ...................................................... 10 kHz
TRIGGER ....................................................... CONT

25. Repeat steps 17 through 21 above for Band 2 (6.0 to 12.8 GHz).

12.4 to 19.4 GHz

26. Press the following analyzer keys:

SPAN BAND LOCK 12.4-19. BAND 3.

Set the controls as follows:

RES BW ......................................................... 1 MHz
VIDEO BW ...................................................... 10 kHz
TRIGGER ....................................................... CONT

27. Repeat steps 17 through 21 above for Band 3 (12.4 to 19.4 GHz).

19.1 to 22 GHz

28. Press the following analyzer keys:


Set the controls as follows:

RES BW ......................................................... 1 MHz
VIDEO BW ...................................................... 10 kHz
TRIGGER ....................................................... CONT

29. Repeat steps 17 through 21 above for Band 4 (19.1 to 22 GHz).

4-86 Verifying Specified Operation for the HP 8592B
<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Measurement Frequency</th>
<th>Displayed Average Noise Level (dBm)</th>
<th>Specification (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 kHz</td>
<td>400 kHz</td>
<td></td>
<td>-112 dBm</td>
</tr>
<tr>
<td>1 MHz</td>
<td>1 MHz</td>
<td></td>
<td>-112 dBm</td>
</tr>
<tr>
<td>1 MHz to 2.9 GHz</td>
<td></td>
<td></td>
<td>-112 dBm</td>
</tr>
<tr>
<td>2.75 to 6.4 GHz</td>
<td></td>
<td></td>
<td>-114 dBm</td>
</tr>
<tr>
<td>6.0 to 12.8 GHz</td>
<td></td>
<td></td>
<td>-102 dBm</td>
</tr>
<tr>
<td>12.4 to 19.4 GHz</td>
<td></td>
<td></td>
<td>-98 dBm</td>
</tr>
<tr>
<td>19.1 to 22 GHz</td>
<td></td>
<td></td>
<td>-92 dBm</td>
</tr>
</tbody>
</table>
17. Residual Responses

Specification
With 0 dB INPUT ATTEN setting and no signal at input:

150 kHz to 2.9 GHz (band 0) < -90 dBm.
2.75 GHz to 6.4 GHz (band 1) < -90 dBm.

Description
The spectrum analyzer’s input is terminated in 50Ω and the analyzer is swept from 150 kHz to 5 MHz. Then the analyzer is swept in 50 MHz spans throughout the 5 MHz to 6.4 GHz range. Any responses above the specification are noted.

Equipment

50Ω Termination ................................................. HP 909D

Adapter

Type N (m) to APC 3.5 (f) ................................. 1250-1744

Procedure

150 kHz to 5 MHz

1. Connect the 50Ω Termination to the analyzer as shown in Figure 4-24.

2. Press [Preset] on the analyzer and wait for the preset to finish. Press the following analyzer keys:

   [Span] Band Lock 0-2.9 GHz Band 0
   [Peak Search] Signal Track (on) [Span] 6 MHz.

4-88 Verifying Specified Operation for the HP 8592B
17. Residual Responses

Wait for the AUTO ZOOM message to disappear.

Press \textit{SIGNAL TRACK} (OFF).

3. Adjust the center frequency until the LO feedthrough peak is on the left-most vertical graticule line. Press the following analyzer keys: \textit{PEAK SEARCH}. Set the controls as follows:

- MARKER DELTA: 150 kHz
- MARKER: NORMAL
- REF LVL: -60 dBm
- ATTN: 0 dB
- RES BW: 3 kHz
- VID BW: 1 kHz
- DISPLAY LINE: -90 dBm

4. Press \textit{SGL SWP} and wait for a new sweep to finish. Look for any residual responses at or above the display line to the right of the marker. If a residual is suspected, press \textit{SGL SWP} again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 4-26.

5 MHz to 2.75 GHz

5. Press \textit{PRESET} on the HP 8592B and wait for the preset to finish. Set the controls as follows:

- BAND LOCK: 0 - 2.9 Gz BAND 0
- CENTER FREQUENCY: 30 MHz
- SPAN: 60 MHz

6. Adjust the center frequency until the LO feedthrough peak is centered at the left-most vertical graticule line. Set the controls as follows:

- SPAN: 50 MHz
- CF STEP SIZE: 45 MHz
- REF LEVEL: -60 dBm
- ATTN: 0 dBm
- RES BW: 10 kHz
- VIDEO BW: 3 kHz
- DISPLAY LINE: -90 dBm

7. Press \textit{SGL SWP} and wait for a new sweep to finish. Look for any residual responses at or above the display line. If a residual is suspected, press \textit{SGL SWP} again. A residual response will persist on successive sweeps, but a noise peak will not. Note the frequency and amplitude of any residual responses above the display line in Table 4-26.

8. Press \textit{FREQUENCY}, \( \uparrow \) (step-up key) to step to the next frequency and repeat step 7.
17. Residual Responses

9. Repeat steps 7 and 8 until the range from 5 MHz to 2.9 GHz has been checked. This requires 60 additional frequency steps. The test for this band requires about 6 minutes to complete if no residuals are found.

2.75 GHz to 6.4 GHz

10. Set the HP 8592B controls as follows:

- **BAND LOCK** ........................................ 2.75-6.4 BAND 1
- **CENTER FREQUENCY** ........................................ 2775 MHz
- **DISPLAY LINE** ........................................ -90 dBm
- **SPAN** ........................................ 50 MHz
- **RES BW** ........................................ 10 kHz
- **VIDEO BW** ........................................ 3 kHz

11. Repeat steps 7 and 8 until the range from 2.75 to 6.4 GHz has been checked. This requires 81 additional frequency steps and takes about 7 minutes to complete if no residuals are found.

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>Amplitude (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4-27. Performance Verification Test Record (Page 1 of 9)

Hewlett-Packard Company
Address: ________________________________
______________________________________
______________________________________

Report No. ______________________________

Date ________________________________
(e.g. 10 SEP 1989)

Model HP 8592B
Serial No. ______________________________
Options ________________________________
Firmware Revision ______________________

Customer ______________________________
Tested by ______________________________

Ambient temperature _____________ °C    Relative humidity _____________ %
Power mains line frequency ___________ Hz (nominal)

Test Equipment Used:

<table>
<thead>
<tr>
<th>Description</th>
<th>Model No.</th>
<th>Trace No.</th>
<th>Cal Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesized Sweeper #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesized Sweeper #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Function Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesizer/Level Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM/FM Signal Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring Receiver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Meter</td>
<td></td>
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<tr>
<td>RF Power Sensor</td>
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<tr>
<td>High-Sensitivity Power Sensor</td>
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<td></td>
</tr>
<tr>
<td>Microwave Power Sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Performance Verification Test Record**

**Hewlett-Packard Company**  
Model HP 8592B  
Report No.  
Serial No.  
Date  

<table>
<thead>
<tr>
<th>Test Equipment Used:</th>
<th>Model No.</th>
<th>Trace No.</th>
<th>Cal Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microwave Frequency Counter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal Frequency Counter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Standard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Splitter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4 GHz Low Pass Filters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 MHz Low Pass Filter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50Ω Termination</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes/Comments

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4-92  Verifying Specified Operation for the HP 8592B
<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Description</th>
<th>Results</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Uncertainty</td>
</tr>
<tr>
<td>1. Comb Generator Frequency Accuracy</td>
<td>Frequency (MHz) Comb Generator Frequency</td>
<td>99.993</td>
<td>100.007 ± 25.0 Hz</td>
</tr>
<tr>
<td>2. Frequency Readout Accuracy</td>
<td>Frequency Readout Accuracy CENTER FREQ SPAN Frequency (GHz)</td>
<td>0.00480 ± 2.5 Hz</td>
<td>0.01520 ± 2.5 Hz</td>
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<td></td>
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<td>0.00498</td>
<td>0.01502 ± 2.5 Hz</td>
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<td>10 MHz 1 MHz</td>
<td>0.0480</td>
<td>0.05521 ± 12.5 Hz</td>
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<td>0.09479</td>
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<td>100 MHz 10 MHz</td>
<td>0.49475</td>
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<td>500 MHz 10 MHz</td>
<td>1.9946</td>
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<td>1 GHz 10 MHz</td>
<td>3.99420</td>
<td>4.00580 ± 1 kHz</td>
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<td>4 GHz 10 MHz</td>
<td>3.99440</td>
<td>4.00560 ± 1 kHz</td>
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<td>4 GHz 1 MHz</td>
<td>3.994580</td>
<td>4.005420 ± 1 kHz</td>
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<td>9 GHz 20 MHz</td>
<td>8.98870</td>
<td>9.01130 ± 2.25 kHz</td>
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<td>9 GHz 10 MHz</td>
<td>8.98890</td>
<td>9.01110 ± 2.25 kHz</td>
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<td>9 GHz 1 MHz</td>
<td>8.988080</td>
<td>9.01092 ± 2.25 kHz</td>
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<td>16 GHz 20 MHz</td>
<td>15.98300</td>
<td>16.01700 ± 4 kHz</td>
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<td>16 GHz 10 MHz</td>
<td>15.98320</td>
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<td>16 GHz 1 MHz</td>
<td>15.98380</td>
<td>16.016620 ± 4 kHz</td>
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<td></td>
<td>21 GHz 20 MHz</td>
<td>20.97750</td>
<td>21.02250 ± 5.25 kHz</td>
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<td></td>
<td>21 GHz 10 MHz</td>
<td>20.97770</td>
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<td></td>
<td>21 GHz 1 MHz</td>
<td>20.977880</td>
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<td>Noise Sideband Suppression</td>
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<tr>
<td>4. System Related Sidebands</td>
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### Performance Verification Test Record

#### Performance Verification Test Record (Page 4 of 9)

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### Test 5: Frequency Span Readout Accuracy

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<td>SPAN Setting</td>
<td>Min</td>
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<tr>
<td>500 MHz</td>
<td>385.00</td>
<td>415.00</td>
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<td>1000 MHz</td>
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<td>830.00</td>
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<td>2000 MHz</td>
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<td>83.00</td>
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<td>50 MHz</td>
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<td>15.40</td>
<td>16.60</td>
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<td>10 MHz</td>
<td>7.80</td>
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<td>5 MHz</td>
<td>3.900</td>
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<td>2 MHz</td>
<td>1.560</td>
<td>1.640</td>
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| SPAN Setting | MKRΔ Reading (kHz) | |
|---------------|---------------------||
| 1 MHz | 780.00 | 820.0 | ±3.54 kHz |
| 500 kHz | 390.0 | 410.0 | ±1.77 kHz |
| 200 kHz | 156.0 | 164.0 | ±708 Hz |
| 100 kHz | 78.0 | 82.0 | ±354 Hz |

### Test 6: Sweep Time Accuracy

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<th>SWEEP TIME Setting</th>
<th>MKRΔ Reading</th>
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<td>50 ms</td>
<td>38.5 ms</td>
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<td>100 ms</td>
<td>77.0 ms</td>
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<td>500 ms</td>
<td>385.0 ms</td>
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<td>1 s</td>
<td>770.0 ms</td>
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<td>7.7 s</td>
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<th>0 (Ref)</th>
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<tr>
<td>-4</td>
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<td>±0.06 dB</td>
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<td>±0.06 dB</td>
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<td>+0.2 dB</td>
<td>±0.06 dB</td>
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<tr>
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<td>-0.2 dB</td>
<td>+0.2 dB</td>
<td>±0.06 dB</td>
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<td>Test Description</td>
<td>Results</td>
<td>Measurement Uncertainty</td>
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<td>Scale Fidelity (continued)</td>
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<td>dB from Ref Level</td>
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<td>% of Ref Level</td>
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<td>Resolution Bandwidth</td>
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</tr>
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<td>+0.07/-0.08 dB</td>
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4-96 Verifying Specified Operation for the HP 8592B
## Performance Verification Test Record

### Hewlett-Packard Company
**Model HP 8592B**

**Serial No.** ____________ **Date** ____________

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<thead>
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<th>Results</th>
<th>Measurement Uncertainty</th>
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<td>Max Negative Response</td>
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<td>Peak-to-Peak Response</td>
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</tr>
<tr>
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<td>Max Negative Response</td>
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<td></td>
<td>Max Positive Response</td>
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</tr>
<tr>
<td></td>
<td>Max Negative Response</td>
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<td>Peak-to-Peak Response</td>
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<td>Max Positive Response</td>
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<td>Max Negative Response</td>
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*Verifying Specified Operation for the HP 8592B  4-97*
### Performance Verification Test Record

**Performance Verification Test Record (Page 8 of 9)**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Description</th>
<th>Min</th>
<th>Measured</th>
<th>Max</th>
<th>Measurement Uncertainty</th>
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<td>Preselector Peaked:</td>
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<tr>
<td></td>
<td>Max Positive Response</td>
<td>+3 0 dB</td>
<td></td>
<td></td>
<td>+0.54/-0.57 dB</td>
</tr>
<tr>
<td></td>
<td>Max Negative Response</td>
<td>-3.0 dB</td>
<td></td>
<td></td>
<td>+0.54/-0.57 dB</td>
</tr>
<tr>
<td></td>
<td>Peak-to-Peak Response</td>
<td>4.0 dB</td>
<td></td>
<td></td>
<td>+0.54/-0.57 dB</td>
</tr>
<tr>
<td></td>
<td>Preselector Unpeaked</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max Positive Response</td>
<td>+4 0 dB</td>
<td></td>
<td></td>
<td>+0.54/-0.57 dB</td>
</tr>
<tr>
<td></td>
<td>Max Negative Response</td>
<td>-4.0 dB</td>
<td></td>
<td></td>
<td>+0.54/-0.57 dB</td>
</tr>
<tr>
<td>13.</td>
<td><strong>Other Input Related</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Spurious Responses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 kHz to 2.9 GHz</td>
<td>-60 dBc</td>
<td></td>
<td></td>
<td>+1.12/-1.21 dB</td>
</tr>
<tr>
<td></td>
<td>≤18 GHz</td>
<td>-60 dBc</td>
<td></td>
<td></td>
<td>+1.13/-1.22 dB</td>
</tr>
<tr>
<td></td>
<td>≤22 GHz</td>
<td>-50 dBc</td>
<td></td>
<td></td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td>14.</td>
<td><strong>Spurious Responses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second Harmonic Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applied Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 MHz</td>
<td>-50 dBc</td>
<td></td>
<td></td>
<td>+1.86/-2.47 dB</td>
</tr>
<tr>
<td></td>
<td>2.8 GHz</td>
<td></td>
<td></td>
<td></td>
<td>+2.24/-2.72 dB</td>
</tr>
<tr>
<td></td>
<td>Third Order Intermodulation Distortion</td>
<td>from step 20c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.80 GHz</td>
<td>-54 dBc</td>
<td></td>
<td></td>
<td>+2.07/-2.42 dB</td>
</tr>
<tr>
<td></td>
<td>4.00 GHz</td>
<td>-54 dBc</td>
<td></td>
<td></td>
<td>+2.07/-2.42 dB</td>
</tr>
<tr>
<td>15.</td>
<td><strong>Gain Compression</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Band 0</td>
<td>0.5 dB</td>
<td></td>
<td></td>
<td>+0.21/-0.22 dB</td>
</tr>
<tr>
<td></td>
<td>Band 1</td>
<td>0.5 dB</td>
<td></td>
<td></td>
<td>+0.21/-0.22 dB</td>
</tr>
<tr>
<td>Test No.</td>
<td>Test Description</td>
<td>Min</td>
<td>Measured</td>
<td>Max</td>
<td>Measurement Uncertainty</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------</td>
<td>-----</td>
<td>----------</td>
<td>-----</td>
<td>-------------------------</td>
</tr>
<tr>
<td>16</td>
<td>Displayed Average Noise Level Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400 kHz</td>
<td></td>
<td></td>
<td>-112 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td></td>
<td>1 MHz</td>
<td></td>
<td></td>
<td>-112 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td></td>
<td>1 MHz to 2.9 GHz</td>
<td></td>
<td></td>
<td>-112 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td></td>
<td>2.75 GHz to 6.4 GHz</td>
<td></td>
<td></td>
<td>-114 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td></td>
<td>6.0 GHz to 12.8 GHz</td>
<td></td>
<td></td>
<td>-102 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td></td>
<td>12.4 GHz to 19.4 GHz</td>
<td></td>
<td></td>
<td>-98 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td></td>
<td>19.1 GHz to 22 GHz</td>
<td></td>
<td></td>
<td>-92 dBm</td>
<td>+1.15/-1.25 dB</td>
</tr>
<tr>
<td>17</td>
<td>Residual Responses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Band 0</td>
<td></td>
<td></td>
<td>-90 dBm</td>
<td>+1.09/-1.15 dB</td>
</tr>
<tr>
<td></td>
<td>Band 1</td>
<td></td>
<td></td>
<td>-90 dBm</td>
<td>+1.09/-1.15 dB</td>
</tr>
</tbody>
</table>
Operation

What You'll Learn in this Chapter

This chapter introduces the basic functions of the spectrum analyzer. In this chapter you will:

- Get acquainted with the front-panel and rear-panel features.
- Get acquainted with the menus and softkeys.
- Measure a signal (the calibration signal).
- Learn screen annotation.
- Improve measurement accuracy using self-calibration routines.
- Save and recall data from analyzer memory.
- Save and recall data from the memory card (Option 003 only).
- Learn about creating limit-line(s).
- Learn about entering amplitude correction factors.
- Learn how to change the power-on state of the analyzer.
- Use the external keyboard (Option 021 or 023 only).

Note

Before using your analyzer, please read Chapter 2, "Installation and Preparation for Use," which describes how to install your analyzer and how to verify that it is operational. It describes many safety considerations that should not be overlooked.

Getting Acquainted with the Analyzer

Front-Panel Feature Overview

The following section provides a brief description of front-panel features. Refer to Figure 5-1.

1. Active function block is the space on the screen that indicates the active function. Most functions appearing in this block can be changed with the knob, step keys, or number/units keypad.

2. Message block is the space on the screen where MEAS UNCAL and the asterisk (•) appear. If one or more functions are manually set (uncoupled), and the amplitude or frequency becomes uncalibrated, MEAS UNCAL appears. (Use AUTO COUPLE, AUTO ALL to recouple functions.) The asterisk indicates that a function is in progress.
3. **Softkey labels** are the annotation on the screen next to the unlabeled keys. Most of the labeled keys on the analyzer’s front panel (also called front-panel keys) access menus of related softkeys.

4. **Softkeys** are the unlabeled keys next to the screen.

5. **FREQUENCY**, **SPAN**, and **AMPLITUDE** are the three large dark-gray keys that activate the primary analyzer functions and access menus of related functions.

6. **INSTRUMENT STATE** functions affect the state of the entire spectrum analyzer. Self-calibration routines and special-function menus are accessed with these keys. The green **Preset** key resets the entire analyzer state and can be used as a “panic” button when you wish to return to a known state. The **Mode** key accesses the current operating mode of the analyzer and allows you to change to any operating mode available for your analyzer. All analyzers have the spectrum analyzer mode of operation (indicated by **SPECTRUM ANALYZER**). If an additional softkey label appears in the softkey label area, a program (also called a downloadable program or personality) has been loaded into the analyzer’s memory. Downloadable programs can be loaded into the analyzer memory if a memory card reader is installed. This manual covers the spectrum analyzer mode of operation only; consult the documentation accompanying the HP 85711A Cable Television

5-2 Operation
Measurements Card, the HP 85712A EMI Diagnostics Measurements Card, or the HP 85713A Digital Radio Measurements Card for other modes of operation.

**SAVE** and **RECALL** save and recall traces, states, limit-line tables, amplitude correction factors, and programs to or from a memory card if Option 003 is installed. **SAVE** and **RECALL** also save and recall traces, states, limit-line tables, and amplitude correction factors to or from the analyzer memory.

---

**Note**

If you wish to reset the analyzer configuration to the state it was in when it was originally shipped from the factory, use **DEFAULT CONFIG**. See "DEFAULT CONFIG" in Chapter 7 for information.

---

7. **COPY** key prints or plots screen data. (This requires Option 021 or 023.) Use **CONFIG**, **PLOT CONFIG** or **PRINT CONFIG**, and **COPY DEV PRNT PLT** before using the **COPY** function.

8. **CONTROL** functions access menus that allow you to adjust the resolution bandwidth, adjust the sweep time, store and manipulate trace data, and control the instrument display.

9. **MARKER** functions control the markers, read out frequencies and amplitudes along the spectrum-analyzer trace, automatically locate the signals of highest amplitude, and keep a signal at the marker position in the center of the screen.

10. **DATA** keys, **STEP** keys, and **knob** allow you to change the numeric value of an active function. **HOLD** deactivates an active function.

11. **INPUT 50Ω** is the signal input for the spectrum analyzer. (**INPUT 75Ω** is the signal input for an Option 001 analyzer.)

---

**Caution**

Excessive signal input will damage the analyzer input attenuator and the input mixer. The maximum power that the spectrum analyzer can tolerate appears on the front panel.

---

12. **PROBE PWR** provides the power for an active probe and other accessories.

13. **CAL OUT** provides a calibration signal of 300 MHz at $-20$ dBm ($29$ dBmV for Option 001 or 011) on the front panel.

14. **INTENSITY** changes the brightness of the screen display.

15. **100 MHz COMB OUT** supplies a 100 MHz signal with harmonics up to 22 GHz for use as a reference signal (for the HP 8592B only).

16. **Memory card reader** reads from or writes to a memory card. The memory card reader is available with Option 003.

---

**Caution**

The tracking generator output may damage the device under test. Do not exceed the maximum power that the device under test can tolerate.

---

17. **RF OUT 50Ω** supplies 100 kHz to 1.8 GHz at the output for the built-in tracking generator (available with Option 010 for the HP 8590B only). (**RF OUT 75Ω** is the...
tracking generator output for Option 011 and it supplies 1 MHz to 1.8 GHz source output.)

18. **LINE** turns the instrument on or off and performs an instrument check.

**Rear-Panel Features**

![Diagram of HP 8590B / HP 8592B Rear-Panel Overview]

1. **LO OUTPUT** is not available.
2. **EARPHONE connector** is not available.
3. **10 MHz REF OUTPUT** is not available.
4. **EXT REF IN** is not available.
5. **SWEEP + TUNE OUTPUT** is not available.
6. **VOLTAGE SELECTOR** adapts the unit to the power source: 115 V or 230 V.
7. **Power input** is the input for the main power cable. Insert the main-power cable plug only into a socket outlet that has a protective ground contact.
8. **MONITOR OUTPUT** drives an external CRT monitor, such as the HP 82913A, with a 19.2 kHz horizontal synchronizing rate.
Caution: Turn off the analyzer before connecting the AUX INTERFACE connector to a device. Failure to do so may result in loss of factory correction constants.

Do not exceed the +5 V supply current limits when using the AUX INTERFACE connector. Exceeding the current limits may result in loss of factory correction constants.

Do not use the AUX INTERFACE as a video monitor interface. Damage to the video monitor will result.

9. AUX INTERFACE provides a nine-pin “D” subminiature connector for control of external devices. See Table 1-2 or Table 1-4 for a detailed description.

10. Interface connectors are optional interfaces for HP-IB and RS-232 interface buses that support remote instrument operation and direct plotting or printing of screen data.

11. AUX IF OUTPUT is a 50Ω, 21.4 MHz IF output that is the down-converted signal of the RF input of the analyzer.

12. AUX VIDEO OUTPUT provides detected video output (before the analog-to-digital conversion) proportional to vertical deflection of the CRT trace. Output is from 0 V to 1 V. Amplitude correction factors are not applied to this signal.

13. EXT TRIG INPUT (TTL) triggers the analyzer’s internal sweep source using the positive edge of an external voltage.

14. HI SWEEP IN/OUT (TTL) indicates sweep or can be grounded to stop sweep.

Caution: Turn off the analyzer before connecting an external keyboard to the analyzer.

15. EXT KEYBOARD connector is provided with the optional interface connector. The external keyboard is not included with the analyzer. The external keyboard allows screen titles, prefixes, and remote commands to be entered using an external keyboard.

16. SWEEP OUTPUT provides a voltage ramp proportional to the sweep and the analyzer span (0 V to 10 V).

17. TV TRIG OUTPUT (TTL) is not available.

18. LEVELING INPUT allows the use of an external detector or power meter for automatic leveling control of the tracking generator. (HP 8590B Option 010 or 011 only.)
Menu and Softkey Overview

The keys labeled FREQUENCY, CAL, and MKR are all examples of front-panel keys. Pressing most front-panel keys accesses menus which are displayed along along the right side of the display. These menus are called softkey menus. These menus list functions other than those accessed directly by the front-panel keys. To activate a function on the menu, press the unlabeled keys immediately to the right of the annotation on the screen. The unlabeled keys next to the annotation on the display screen are called softkeys. In this manual, front-panel keys appear in boldface type within a box, for example, AMPLITUDE. Softkeys appear within a shaded box, for example, REF LEVEL.

If a softkey function’s value can be changed, it is called an active function. The function label of the active function appears in inverse video. For example, press AMPLITUDE. The active function, REF LVL, appears in inverse video and REF LVL is displayed in the active function block of the on-screen display.

A softkey with ON and OFF in its label can turn the softkey function on or off. To turn the function on, press the softkey so that ON is underlined. To turn the function off, press the softkey so that OFF is underlined.

A function with AUTO and MAN in the label can be auto-coupled or have its value manually changed. The function’s value can be changed manually by activating the function with a key press, and changing its value with the numeric keypad, knob, or step keys. To auto-couple a function that had been changed manually, press the softkey so that AUTO is underlined.

To select another menu, press another labeled front-panel key, or choose a softkey such as MORE 1 of 2.

A summary of all softkeys can be found at the end of this manual.

Making a Measurement

Caution

Do not exceed the maximum input power. The maximum input power is +30 dBm (1 watt) continuous, 25 V dc with ≥10 dB attenuation for the HP 8590B. The maximum input power is +30 dBm (1 watt) continuous, 0 V dc. Use input attenuation ≥ 10 dB in bands 1 through 4 for the HP 8592B.

Let’s begin using the spectrum analyzer by measuring an input signal. Since the 300 MHz calibration signal (CAL OUT) is readily available, we will use it as our input signal.

First, turn the instrument on by pressing LINE. Wait for the power-up process to complete.

Press the green [PRESET] key. Connect CAL OUT to the analyzer input using an appropriate cable, then follow the steps below.

• Relax!

You cannot hurt the analyzer by using the calibration signal and pressing any of the keys described in this section. Don’t be afraid to play with the knob, step keys, or number/units keypad. (If you have experimented with other keys and wish to return to a known state, press the green [PRESET] key.)
Set the frequency.

Press the **FREQUENCY** key. CENTER appears on the left side of the screen, indicating that the center-frequency function is active. The CENTER FREQ softkey label appears in inverse video to indicate that center frequency is the active function. The active function block is the space on the screen within the graticule where the center frequency messages appear. Functions appearing in this block are active: their values can be changed with the knob, step keys, or number/units keypad. Set the center frequency to 300 MHz with the DATA keys by pressing 300 MHz. The knob and step keys can also be used to set the center frequency.

Set the span.

Press **SPAN**. SPAN is now displayed in the active function block, and the SPAN softkey label appears in inverse video to indicate it is the active function. Reduce the span to 20 MHz by using the knob, by pressing the down key (▼), or pressing 20 MHz.

Set the amplitude.

When the peak of a signal does not appear on the screen, it may be necessary to adjust the amplitude level on the screen. Press **AMPLITUDE**. REF LEVEL .0 dBm appears in the active function block. The REF LVL level softkey label appears in inverse video to indicate it is the active function. The reference level is the top graticule line on the display and is set to 0.0 dBm. Changing the value of the reference level changes the amplitude level of the top graticule line.

If desired, use the reference level function to place the signal peak on the screen using the knob, step keys, or number/units keypad. (Markers, described earlier, determine the frequency and amplitude of a signal.)

Figure 5-3 demonstrates the relationship between center frequency and reference level. The box in the figure represents the spectrum analyzer screen. Changing the center frequency changes the horizontal placement of the screen. Changing the reference level changes the vertical placement of the screen. Increasing the span increases the frequency range that appears horizontally on the screen.
- Marker

You can place a diamond-shaped marker on the signal peak to find the signal's frequency and amplitude.

To activate a marker, press the [MKR] key (located in the MARKER section of the front panel). The MARKER NORMAL label appears in inverse video to show it is the active function. Turn the knob to place the marker at the signal peak.

You can also use the [PEAK SEARCH] key, which automatically places a marker at the highest point on the trace.

Readouts of marker amplitude and frequency appear in the active function block and in the upper-right corner of the display. Look at the marker readout to determine the amplitude of the signal.

If another function is activated, the frequency and amplitude can still be found from the marker readout in the upper-right corner of the screen.
Measurement Summary

1. Connect CAL OUT to the analyzer input, and press the green PRESET key.
2. Set the center frequency: FREQUENCY 300 MHz.
3. Set the span: SPAN 20 MHz.
4. The calibration signal is 20 dB (two graticule divisions) below the top of the screen in these settings. If desired, adjust the reference level: press AMPLITUDE to activate the reference level and use the knob or step keys to change the reference level.
5. Determine the amplitude and frequency of the signal. You can either press PEAK SEARCH or press MKR and move the marker to the signal peak. Read the amplitude and frequency. The display screen should look like the one in Figure 5-4. Frequency is displayed horizontally, and amplitude (power) is displayed vertically.

![Figure 5-4. Reading the Amplitude and Frequency](image)

Note: HP 8590B analyzers with Option 001 display the amplitude values in dBmV.
Screen Annotation

Figure 5-5 shows annotation as it appears on the screen of the analyzer. Table 5-1 lists the features of the front panel annotation numerically and refers to the annotation in Figure 5-5. The function key column indicates which front-panel key or softkey activates the screen annotation. See Chapter 7 for more information on a specific function key.

![Diagram of Screen Annotation]

**Figure 5-5. Screen Annotation**

In Figure 5-5, index number 21 refers to the trigger and sweep modes of the analyzer. The first letter (“F”) indicates the analyzer is in free-run trigger mode. The second letter (“S”) indicates the analyzer is in single-sweep mode.

Index number 22 refers to the trace modes of the analyzer. The first letter (“W”) indicates the analyzer is in clear-write mode. The second letter is “A,” representing trace A. The next two letters (“SB”) indicate the store-blank mode (“S”) for trace B (“B”). The trace mode annotation for trace C is displayed under the trace mode annotation of trace A. In Figure 5-5, the trace C trace mode is “SC”, indicating trace C (“C”) is in the store blank mode (“S”).

Table 5-2 shows the different screen annotation codes for trace, trigger, and sweep modes.
<table>
<thead>
<tr>
<th>Index Number</th>
<th>Description</th>
<th>Function Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>detector mode</td>
<td>DETECTOR SAMPL PK</td>
</tr>
<tr>
<td>2</td>
<td>reference level</td>
<td>REF LVL</td>
</tr>
<tr>
<td>3</td>
<td>time/date display</td>
<td>TIMEDATE ON OFF</td>
</tr>
<tr>
<td>4</td>
<td>screen title</td>
<td>CHANGE TITLE</td>
</tr>
<tr>
<td>5</td>
<td>RF attenuation</td>
<td>ATTEN AUTO MAN</td>
</tr>
<tr>
<td>6</td>
<td>preamplifier gain</td>
<td>EXT PREAMP</td>
</tr>
<tr>
<td>7</td>
<td>external keyboard entry</td>
<td>See “EXT KEYBOARD” in Chapter 7</td>
</tr>
<tr>
<td>8</td>
<td>marker/signal track readout</td>
<td>(MKR), (MKR -&gt;), (SIGNAL TRACK), or (PEAK SEARCH)</td>
</tr>
<tr>
<td>9</td>
<td>measurement uncalibrated/function-in-progress messages</td>
<td>(AUTO COUPLE)</td>
</tr>
<tr>
<td>10</td>
<td>service request</td>
<td>See Appendix B</td>
</tr>
<tr>
<td>11</td>
<td>remote operation</td>
<td>See “(LOCAL)” in Chapter 7</td>
</tr>
<tr>
<td>12</td>
<td>frequency span or stop frequency</td>
<td>(SPAN), STOP FREQ</td>
</tr>
<tr>
<td>13</td>
<td>sweep time</td>
<td>SWP TIME AUTO MAN</td>
</tr>
<tr>
<td>14</td>
<td>frequency offset</td>
<td>FREQ OFFSET</td>
</tr>
<tr>
<td>15</td>
<td>video bandwidth</td>
<td>VID BW AUTO MAN</td>
</tr>
<tr>
<td>16</td>
<td>resolution bandwidth</td>
<td>RES BW AUTO MAN</td>
</tr>
<tr>
<td>17</td>
<td>center frequency or start frequency</td>
<td>CENTER FREQ, START FREQ</td>
</tr>
<tr>
<td>18</td>
<td>threshold</td>
<td>THRESHOLD ON OFF</td>
</tr>
<tr>
<td>19</td>
<td>correction factors on</td>
<td>CORRECT ON OFF</td>
</tr>
<tr>
<td>20</td>
<td>amplitude correction factors on</td>
<td>See “Entering Amplitude Correction Factors” in this Chapter.</td>
</tr>
<tr>
<td>21</td>
<td>trigger</td>
<td>TRIG</td>
</tr>
<tr>
<td>22</td>
<td>trace mode</td>
<td>TRACE</td>
</tr>
<tr>
<td>23</td>
<td>video average</td>
<td>VID AVG ON OFF</td>
</tr>
<tr>
<td>24</td>
<td>display line</td>
<td>DSP LINE ON OFF</td>
</tr>
<tr>
<td>25</td>
<td>amplitude offset</td>
<td>REF LVL OFFSET</td>
</tr>
<tr>
<td>26</td>
<td>amplitude scale</td>
<td>SCALE LOG LIN</td>
</tr>
<tr>
<td>27</td>
<td>active function block</td>
<td>Refer to the softkey function that was activated</td>
</tr>
</tbody>
</table>

Table 5-2. Screen Annotation for Trace, Trigger, and Sweep Modes

<table>
<thead>
<tr>
<th>Trace Mode</th>
<th>Trigger Mode</th>
<th>Sweep Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>W = clear write (traces A/B/C)</td>
<td>F = free run</td>
<td>C = continuous</td>
</tr>
<tr>
<td>M = maximum hold (traces A/B)</td>
<td>L = line</td>
<td>S = single sweep</td>
</tr>
<tr>
<td>V = view (traces A/B/C)</td>
<td>V = video</td>
<td></td>
</tr>
<tr>
<td>S = store blank (traces A/B/C)</td>
<td>E = external</td>
<td></td>
</tr>
<tr>
<td>M = minimum hold (trace C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Improving Accuracy with Self-Calibration Routines

Self-calibration routines improve the analyzer's frequency and amplitude accuracy. Press the \texttt{CAL} key to view the self-calibration routine menus. The last function on this menu, labeled \texttt{MORE 1 of 3}, provides access to additional self-calibration functions. For a summary of all self-calibration softkeys, see Chapter 7.

The self-calibration routines add correction factors to internal circuitry. The addition of the correction factors is required to meet frequency and amplitude specifications.

When the correction factors are added to internal circuitry, \texttt{CORR} (corrected) appears on the left side of the screen.

Warm-Up Time

To meet spectrum analyzer specifications, allow the analyzer to warm up for 30 minutes after being turned on before attempting to make any calibrated measurements. Be sure to calibrate the analyzer only after the analyzer has met operating temperature conditions.

The spectrum analyzer frequency and amplitude self-calibration routines are initiated by the \texttt{CAL FREQ \& AMPTD} softkey in the \texttt{CAL} menu.

1. To calibrate the instrument, connect CAL OUT to the analyzer input connector, using an appropriate cable.

\begin{center}
\textbf{Note} \\
A low-loss cable should be used for accurate calibration. Use the 50Ω cable shipped with the analyzer (Option 001 or 011: use the 75Ω cable shipped with the analyzer).
\end{center}

2. Press the following analyzer keys: \texttt{CAL}, \texttt{CAL FREQ \& AMPTD}, \texttt{CAL SIGNAL NOT FOUND} will be displayed if CAL OUT is not connected to the analyzer input. The frequency and reference-level self-calibration functions take approximately 9 minutes to finish, at which time the internal adjustment data is in working RAM.

3. To save this data in the area of analyzer memory that is saved when the analyzer is turned off, press \texttt{CAL STORE}.

\begin{center}
\textbf{Note} \\
To interrupt \texttt{CAL FREQ}, \texttt{CAL AMPTD}, or \texttt{CAL FREQ \& AMPTD}, press \texttt{PRESET}. \texttt{CAL}, \texttt{CAL FETCH}. \texttt{CAL FETCH} retrieves the previous correction factors. Improperly interrupting the self-calibration routines may result in corrupt correction factors. (If this occurs, rerun the \texttt{CAL FREQ \& AMPTD} routine.)
\end{center}

The frequency and amplitude self-calibration functions can be done separately by using the \texttt{CAL FREQ} or \texttt{CAL AMPTD} softkeys instead of the \texttt{CAL FREQ \& AMPTD}.

\begin{center}
\textbf{Note} \\
If \texttt{CAL FREQ} and \texttt{CAL AMPTD} self-calibration routines are used, \texttt{CAL FREQ} should be performed before \texttt{CAL AMPTD}, unless the frequency data is known to be accurate.
\end{center}

5-12 Operation
The CAL FREQ softkey starts the frequency self-calibration routine. This routine adjusts the frequency, sweep time, and span accuracy in approximately 2 minutes.

The CAL AMPTD softkey starts the amplitude calibration routine. This routine takes approximately 7 minutes to adjust the bandwidths, log/linear switching, IF gains, IF frequency centering, RF attenuation, and log amplifier. When the amplitude calibration routine has finished, the preset display returns and CAL DONE is displayed.

Although the analyzer stores the correction factors in battery-backed RAM, the data will not be saved if the analyzer power is turned off unless the data has been stored with CAL STORE. Using CAL STORE stores the correction factors in an area of analyzer memory that is accessed when the analyzer is turned on.

CORR (corrected) now appears on the left side of the screen, indicating that the analyzer is using its frequency and amplitude correction factors. Correction factors can be turned off by pressing CORRECT ON OFF. When OFF is underlined, most amplitude correction factors and some frequency correction factors are not used.

If the self-calibration routines cannot be performed, see “Problems” in Chapter 8.

Performing the Tracking Generator Self-Calibration Routine (Option 010 or 011 only)

To meet the tracking generator specifications, allow the analyzer to warm up for 30 minutes after being turned on before attempting to make any calibrated measurements. Be sure to calibrate the analyzer and the tracking generator only after the analyzer has met operating temperature conditions.

---

**Note**

Since the CAL TRK GEN routine uses the absolute amplitude level of the analyzer, the analyzer amplitude should be calibrated prior to using CAL TRK GEN.

---

1. To calibrate the tracking generator, connect the tracking generator output (RF OUT 50Ω) to the analyzer input connector, using an appropriate cable and adapters.

---

**Note**

A low-loss cable should be used for accurate calibration. Use the 50Ω cable shipped with the analyzer (Option 011: use the 75Ω cable shipped with the analyzer).

---

2. Press the following analyzer keys: CAL, MORE 1 of 3, MORE 2 of 3, CAL TRK GEN. TG SIGNAL NOT FOUND will be displayed if the tracking generator output is not connected to the analyzer input.

3. To save this data in the area of analyzer memory that is saved when the analyzer is turned off, press CAL STORE.
Performing the YTF Self-Calibration Routine (HP 8592B Only)

For HP 8592B analyzers only, the CAL YTF self-calibration routine should be performed periodically. See "When Is Self-Calibration Needed?" in this chapter for some helpful guidelines on how often the self-calibration routines should be performed.

1. Connect a low-loss cable (such as HP part number 8120-5148) from 100 MHz COMB OUT to the analyzer input.

2. Press [CAL], CAL YTF. The YTF self-calibration routine completes in approximately 4 minutes.

3. Press [CAL], CAL STORE.

When Is Self-Calibration Needed?

While it is difficult to provide general advice for your specific measurement needs, the following suggestions may help you decide when to use the self-calibration features:

1. Perform CAL FREQ & AMPTD whenever the instrument experiences significant environmental changes such as temperature (±5°C), humidity, shock, or vibration (for example, shipping or transport). This is especially important if CAL FREQ & AMPTD was performed last in a different environment.

2. If the environment is relatively stable (for example, a lab environment), use CAL FREQ & AMPTD monthly. After being turned off overnight, the analyzer will need to warm up, but should not require self-calibration.

3. To achieve optimal amplitude accuracy for relative measurements:
   a. Keep the analyzer in a stable environment.
   b. Use CAL FREQ & AMPTD before beginning the first measurement.
   c. Keep the analyzer turned on between measurements.
   d. Do not use CAL FREQ & AMPTD before subsequent measurements (the amplitude drift is normally smaller than the self-calibration uncertainty).

4. If PRESEL PEAK has more than a 2 dB effect on signal amplitude when in BAND 1 or above and in a single band sweep, perform CAL YTF with the COMB OUT signal, and store the data with CAL STORE. CAL YTF improves the PRESEL DEFAULT values. (HP 8592B only.)

5. If accurate self-calibration is needed temporarily in a different environment, use CAL FREQ & AMPTD but do not press CAL STORE. The temporary correction factors will be used until the analyzer is turned off or until CAL FETCH is pressed.
Saving and Recalling Data from Analyzer Memory

This section explains how to save and recall state, trace, limit line, and amplitude correction factor data to and from analyzer memory.

Analyzer memory can store up to eight states using STATE -> INTRNL, and it can store many traces, limit-line tables, and amplitude correction factors using TRACE -> INTRNL.

Saving state data saves the analyzer settings (but not the trace data). Saving trace data saves the trace data and the state data. Limit-line data and amplitude correction factors are stored in trace registers, but state and trace data are not recalled with the limit-line data or the amplitude correction factors. States, traces, limit-line tables, and amplitude correction factors are saved in analyzer memory even if the instrument is turned off or [Preset] is pressed.

See Chapter 7, “CATALOG INTRNL,” for information about cataloging analyzer memory.

To Save a State

1. Set up the analyzer settings to be saved.

2. Press [Save]. Press INTRNL CRD to select INTRNL if CRD is underlined. Selecting INTRNL selects the analyzer memory as the mass storage device.

3. Press STATE -> INTRNL. SAVE: REG is displayed on the analyzer display.

4. Enter a number from one to eight using the numeric keypad. There is no need to press [Enter]; the state is saved automatically.

To Recall a State

1. Press [Recall]. Press INTRNL CRD to select INTRNL if CRD is underlined.

2. Press CATALOG INTRNL, CATALOG REGISTERS. Use the knob to highlight the state register number to be retrieved. The state registers have a “ST” preceding the register number.

3. Press LOAD FILE.

State data can also be recalled by specifying the register number:

1. Press [Recall]. Press INTRNL CRD to select INTRNL if CRD is underlined.

2. Press INTRNL -> STATE.

3. Enter the register number under which the state was saved. There is no need to press [Enter]; the state is recalled automatically.

Note

Register 9 is a special register which can aid in recovering from inadvertent loss of line power (power failure). Press [ReCall], INTRNL -> STATE 9 to place the analyzer in the state that existed just prior to the loss of power.
To Save a Trace

Saving trace data is very similar to saving state data. Saving trace data saves the trace data and the state data.

1. Enter a screen title using DISPLAY, CHANGE TITLE, if desired.

2. Set up the trace to be stored.

3. Press SAVE. Press INTRNL CRD to select INTRNL if CRD is underlined.

4. Press TRACE -> INTRNL. This accesses a menu displaying TRACE A, TRACE B, and TRACE C.

5. Press the softkey label of the trace that you want to save: TRACE A, TRACE B, or TRACE C. REGISTER # and MAX REG # = are displayed on the analyzer display. The number after MAX REG # = indicates the maximum register number that can be entered for trace storage in analyzer memory.

6. Enter a number from 0 to the maximum register number using the numeric keypad and press ENTER.

To Recall a Trace

1. Press RECALL. Press INTRNL CRD to select INTRNL if CRD is underlined.

2. Press CATALOG INTRNL, CATALOG REGISTER. Use the knob to highlight the trace register number to be retrieved. The trace registers have a “TR” preceding the trace register number.

3. Press LOAD FILE. The recalled trace is placed into trace B and the analyzer state is changed to the state that was saved.

Trace data can also be recalled by specifying the register number:

1. Press RECALL. Press INTRNL CRD to select INTRNL if CRD is underlined.

2. Press INTRNL ->TRACE. INTRNL ->TRACE accesses a menu displaying TRACE A, TRACE B, TRACE C, LIMIT LINES, and AMPLITUDE COR FACT.

3. Select the trace in which you want to place the trace data by pressing TRACE A, TRACE B, or TRACE C.

4. Enter the register number under which the trace was stored.

5. Press ENTER. The recalled trace is placed in the view mode and the analyzer state is changed to the state that was saved.
To Save a Limit-Line Table or Amplitude Correction Factors

The procedure for saving limit-line tables or amplitude correction factors is similar to saving trace data. State and trace data is not recalled with limit-line tables or amplitude correction factors.

Note

SAVE LIMIT and RECALL LIMIT provide an easy way to save and recall limit-lines from the current mass storage device (analyzer memory or, if Option 003 is installed, the memory card). See “Using Limit-Line Functions” later in this chapter for more information.

1. Enter a screen title using DISPLAY, CHANGE TITLE, if desired. The screen title is displayed when cataloging the trace registers with CATALOG REGISTER. The screen title is not recalled with the limit-line table(s) or amplitude correction factors, however.

2. For saving limit-line tables, set up the limit-line table to be stored (see “Using the Limit-Line Functions” in this chapter). For amplitude correction factors, enter the data using the remote programming AMPCOR command or use EXECUTE TITLE. See “Entering Amplitude Correction Factors” in this chapter for more information about entering amplitude correction factors with EXECUTE TITLE.

3. Press SAVE. Press INTRNL CRD to select INTRNL if CRD is underlined.

4. Press TRACE -> INTRNL. This accesses a menu with LIMIT LINES and AMPLTUD COR FACT.

5. Press LIMIT LINES to save limit-line tables. Press AMPLTUD COR FACT to save amplitude correction factors. REGISTER # and MAX REG # are displayed on the analyzer screen. The number after MAX REG # indicates the maximum register number that can be entered for storage in analyzer memory.

6. Enter a number from 0 to the maximum register number using the numeric keypad and press ENTER.

To Recall Limit-Line Tables or Amplitude Correction Factors

1. Press RECALL. Press INTRNL CRD to select INTRNL if CRD is underlined.

2. Press INTRNL ->TRACE. INTRNL ->TRACE accesses a menu with LIMIT LINES and AMPLTUD COR FACT.

3. Press LIMIT LINES to recall a limit-line table, AMPLTUD COR FACT to recall amplitude correction factors.

4. Enter the register number under which the data was stored.

5. Press ENTER.

If you want to protect all the state, trace, limit line, and amplitude correction data from being overwritten, press SAVE, SAV LOCK ON OFF so that ON is underlined.

Table 5-3 summarizes saving and recalling data to and from analyzer memory.
<table>
<thead>
<tr>
<th>Operation</th>
<th>Screen Title Available?</th>
<th>Register Range</th>
<th>Key Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVE STATE</td>
<td>No</td>
<td>1 to 8</td>
<td>SAVE STATE — &gt;INTRNL (register number)</td>
</tr>
<tr>
<td>RECALL STATE</td>
<td>No</td>
<td>1 to 8*</td>
<td>RECALL INTRNL — &gt;STATE (register number)†</td>
</tr>
<tr>
<td>SAVE TRACE</td>
<td>Yes</td>
<td>0 to MAX REG #</td>
<td>SAVE TRACE —&gt; INTRNL (TRACE A, TRACE B, or TRACE C) (register number) ENTER</td>
</tr>
<tr>
<td>RECALL TRACE</td>
<td>Yes</td>
<td>0 to MAX REG #</td>
<td>RECALL INTRNL — &gt;TRACE (TRACE A, TRACE B, or TRACE C) (register number) ENTER†</td>
</tr>
<tr>
<td>SAVE LIMIT LINE</td>
<td>Yes†</td>
<td>0 to MAX REG #</td>
<td>SAVE TRACE —&gt; INTRNL LIMIT LINES (register number) ENTER</td>
</tr>
<tr>
<td>RECALL LIMIT LINES</td>
<td>No</td>
<td>0 to MAX REG #</td>
<td>RECALL INTRNL — &gt;TRACE LIMIT LINES (register number) ENTER</td>
</tr>
<tr>
<td>SAVE AMPLITUDE CORRECTION FACTORS</td>
<td>Yes†</td>
<td>0 to MAX REG #</td>
<td>SAVE TRACE —&gt; INTRNL AMPLTD COR FACT (register number) ENTER</td>
</tr>
<tr>
<td>RECALL AMPLITUDE CORRECTION FACTORS</td>
<td>No</td>
<td>0 to MAX REG #</td>
<td>RECALL INTRNL — &gt;TRACE AMPLTD COR FACT (register number) ENTER</td>
</tr>
</tbody>
</table>

* Registers 1 to 8 are available for the user to save a state. State register 0 contains the current state of the analyzer, state register 9 contains the previous state of the analyzer.

† The alternate method for recalling data uses the key sequence: RECALL, CATALOG INTRNL, CATALOG REGISTER, use the step keys and knob to highlight the item to be recalled, LOAD FILE.

‡ The screen title is displayed when cataloging the trace registers with CATALOG REGISTER. The screen title is not recalled with the limit-line table(s) or amplitude correction factors.
Saving and Recalling Data from the Memory Card (Option 003 Only)

The memory card provides additional memory for saving instrument states, traces, limit-line tables, amplitude correction factors, and programs. Each battery-backed RAM card provides 32 kilobytes of memory. Instrument states, traces, limit-line tables, amplitude correction factors, and programs are easily retrievable without the need for an external controller to transfer data.

The process of saving and recalling data from the memory card is similar to saving and recalling data from the analyzer memory. Due to the expanded capabilities of the memory card, there are some important differences. For example, data is stored in analyzer memory as an item; on the memory card data is stored as a logical interchange file (LIF). Memory card data can be stored and recalled using a prefix. A prefix is an optional user-defined label for states, traces, and programs. The prefix becomes part of the file name. If you do not specify a prefix, a default file name is created. Table 5-4 compares the save and recall operations of analyzer memory and the memory card.

<table>
<thead>
<tr>
<th>Mass Storage Device</th>
<th>Data Stored As</th>
<th>Stored with a Prefix?</th>
<th>Restriction on Register Number</th>
<th>Types of Data That Can Be Stored*</th>
<th>Catalog Functions Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyzer Memory</td>
<td>Item</td>
<td>No</td>
<td>1 to 8 for states, 0 to MAX REG # for traces, limit lines, amplitude correction factors</td>
<td>States, traces, limit-line tables, amplitude correction factors</td>
<td>CATALOG ALL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG REGISTER</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG VARIABLS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG PREFIX</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG DLP LOAD FILE†</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DELETE FILE †</td>
</tr>
<tr>
<td>Memory Card</td>
<td>File</td>
<td>Yes</td>
<td>Prefix + register # ≤ 8 characters</td>
<td>States, traces, limit-line tables, amplitude correction factors, and downloadable programs</td>
<td>CATALOG ALL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG STATES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG TRACES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG PREFIX</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG DLP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG AMP CORR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CATALOG LMT LINE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LOAD FILE DELETE FILE</td>
</tr>
</tbody>
</table>

* Specifies types of data that can be stored through normal front-panel operation.

† When cataloging analyzer memory, LOAD FILE is available for CATALOG REGISTER only

† DELETE FILE is not available for CATALOG REGISTER
Preparing the Memory Card for Use

Note

Improper insertion causes error messages to occur, but generally does not damage the card or instrument. Care must be taken, however, not to force the card into place. The cards are easy to insert when installed properly.

1. Locate the arrow printed on the card's label.
2. Insert the card with its arrow matching the raised arrow on the bezel around the card-insertion slot. See Figure 5-6.

![Figure 5-6. Inserting the Memory Card](image)

3. Press the card into the slot. When correctly inserted, about 19 mm (0.75 in) of the card is exposed.
4. If this is a new memory card, it must be formatted before use. Since formatting a card deletes any data stored on the memory card, catalog the card before using the format card function if you suspect the memory card might contain data.
To format a new card, press (CONFIG), MORE 1 of 2, CARD CONFIG, FORMAT CARD. The message IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE DATA appears on the analyzer screen. Press FORMAT CARD again. (FORMAT CARD requires a double key press).

To catalog a memory card, press (CONFIG), MORE 1 of 2, CARD CONFIG, CATALOG CARD. CATALOG CARD displays any existing data on the memory card (if the memory card has been formatted), or INVALID CARD: DIRECTORY if the card has not been formatted. Use the BLANK CARD if you wish to delete the files from the memory card.

To Enter a Prefix

Memory card data can be stored and recalled using a prefix. To enter a prefix, press (DISPLAY) or (CONFIG), CHANGE PREFIX.

Pressing CHANGE PREFIX accesses a menu containing the letters of the alphabet, the underscore symbol (_), the number symbol (#), a space, and the clear function. To select a character, press the softkey that displays the group of characters that contains the desired character. The softkey menu changes to allow you to select an individual character. If you make a mistake, press (BK SP) to space back over the incorrect character. Additional characters are available by pressing YZ_# SPC CLEAR, MORE 1 of 2. Numbers may be selected with the numeric keypad.

The prefix can be from one to seven characters long. The longer the prefix, the shorter the register number must be. The total length of the prefix and register number cannot exceed eight characters. The prefix can be any character; however, the underscore should not be the first character of the prefix.

An existing prefix can be cleared with the clear function. Press (CONFIG) or (DISPLAY), CHANGE PREFIX, YZ_# SPC CLEAR, CLEAR to clear the current prefix. To change a prefix, clear the existing prefix and then enter a new prefix.

To Save a State

1. Press (DISPLAY) or (CONFIG), CHANGE PREFIX. Use the softkeys to enter a prefix under which you want the state saved. A prefix can be one to seven characters long.

Note

If there is not an existing prefix and you do not enter a prefix, the state data will be stored under a default file name consisting of "s," the underscore character (_), and the register number you enter. If a prefix has been entered, the state data is saved under a file name which uses the prefix displayed on the analyzer screen.

2. Press (SAVE). Press INTRNL CRD to select CRD if INTRNL is underlined. Selecting CRD selects the memory card as the mass storage device.

3. Press STATE -> CARD. REGISTER # and PREFIX= is displayed on the analyzer display.

4. Enter a register number using the numeric keypad and press (ENTER).

The state data is saved with a file name consisting of an "s," the prefix that was entered, an underscore (_), and the register number. The "s" denotes that the file contains state data.
To Recall a State

1. Press \textbf{SAVE} or \textbf{RECALL}. Press \textbf{INTRNL CRD} to select CRD if INTRNL is underlined.

2. Press \textbf{CATALOG CARD}, \textbf{CATALOG STATES}. Use the knob to highlight the state data to be retrieved.

3. Press \textbf{LOAD FILE}.

State data can also be recalled by specifying the prefix and the register number:

1. Press \textbf{RECALL}. Press \textbf{INTRNL CRD} to select CRD if INTRNL is underlined.

2. Press \textbf{CARD} \rightarrow \textbf{STATE}.

3. Enter the register number the state was saved under, and \textbf{ENTER}.

\textbf{Note} If you want to recall a state saved under a different prefix, clear the existing prefix, use \textbf{CHANGE PREFIX} to enter the prefix, and then recall the state.

To Save a Trace

Saving trace data saves the trace data and the state data.

1. Press \textbf{DISPLAY} or \textbf{CONFIG}, \textbf{CHANGE PREFIX} to enter a new prefix or change the existing prefix.

\textbf{Note} If you do not enter a new prefix, the existing prefix will be used. If there is not an existing prefix, the trace will be saved under t\_.(register number).

2. Enter a screen title with \textbf{DISPLAY}, \textbf{CHANGE TITLE}, if desired.

3. Set up the trace to be stored.

4. Press \textbf{SAVE}. Press \textbf{INTRNL CRD} to select CRD if INTRNL is underlined. \textbf{TRACE} \rightarrow \textbf{CARD}.

This accesses a menu displaying \textbf{TRACE A}, \textbf{TRACE B}, \textbf{TRACE C}.

5. Press the softkey label of the trace that you want to save: \textbf{TRACE A}, \textbf{TRACE B}, or \textbf{TRACE C}. \textbf{REGISTER \#} and \textbf{PREFIX=} are displayed on the analyzer display.

6. Enter a register number using the numeric keypad and press \textbf{ENTER}.

The trace data is saved with a file name consisting of a "t," the prefix that was entered, an underscore (\_), and the register number. The "t" denotes that the file contains trace data.

5-22 Operation
To Recall a Trace

1. Press **SAVE** or **RECALL**. Press **INTRNL CRD** to select CRD if INTRNL is underlined.

2. Press **CATALOG CARD**, **CATALOG TRACES**. Use the knob to highlight the trace data to be retrieved.

3. Press **LOAD FILE**. The trace data is placed in trace B.

Trace data can also be recalled by specifying the prefix and the register number:

1. Press **RECALL**. Press **INTRNL CRD** to select CRD if INTRNL is underlined.

2. Press **CARD -> TRACE**. **CARD -> TRACE** accesses the menu displaying **TRACE A**, **TRACE B**, and **TRACE C**.

3. Select the trace in which you want the trace data stored trace by pressing **TRACE A**, **TRACE B**, or **TRACE C**.

4. Enter the register number the trace was saved under and press **ENTER**. The recalled trace is placed in view mode.

**Note**
If you want to recall a trace saved under a different prefix, use **CHANGE PREFIX** to enter the prefix and then recall the trace.

---

To Save Limit-Line Tables or Amplitude Correction Factors

The procedure for saving limit-line tables or amplitude correction factors is similar to saving trace data. State and trace data is not recalled with limit-line table(s) or amplitude correction factors.

1. Press **DISPLAY** or **CONFIG**, **CHANGE PREFIX** to enter a new prefix or change the existing prefix.

**Note**
If you do not enter a new prefix, the existing prefix will be used. If there is not an existing prefix, the limit-line table(s) will be saved under L.(register number). Amplitude correction factors will be saved under a..(register number).

2. For saving limit-line tables, set up the limit-line table to be stored (see "Using the Limit-Line Functions" in this chapter). For amplitude correction factors, enter the data using the remote programming AMPCOR command or use **EXECUTE TITLE**. See "Entering Amplitude Correction Factors" in this chapter for more information about entering amplitude correction factors with **EXECUTE TITLE**.

3. Press **SAVE**. Press **INTRNL CRD** to select CRD if INTRNL is underlined. **TRACE -> CARD**. This accesses a menu with **LIMIT LINES** and **AMPLTUD COR FACT**.

4. Press **LIMIT LINES** to save limit-line table(s), or **AMPLTUD COR FACT** to save amplitude correction factors. **REGISTER #** and **PREFIX** are displayed on the analyzer display.

*Operation 5-23*
5. Enter a register number using the numeric keypad and press [ENTER].

The data is saved with a file name consisting of a "l" (for limit-line tables), or "a" (for amplitude factors), the prefix that was entered, an underscore (.), and the register number.

To Recall Limit-Line Tables or Amplitude Correction Factors

1. Press [RECALL]. Press INTRNL CRD to select CRD if INTRNL is underlined.

2. Press CARD -> TRACE. CARD -> TRACE accesses the menu with LIMIT LINES and AMPLTUD COR FACT.

3. Press LIMIT LINES to recall limit-line table(s), or AMPLTUD COR FACT to recall amplitude correction factors.

4. Enter the register number the limit-line data or amplitude correction factors was saved under and press [ENTER].

Note
If you want to recall limit-line data or amplitude correction factors saved under a different prefix, use CHANGE PREFIX to enter the prefix and then recall the trace.

Note
If LOAD FILE is used to recall limit-line files or amplitude correction factor files, the traces are set to the store-blank mode. Press TRACE, CLEAR WRITE A to view trace A data. Press MEAS/USER, LIMITS ON OFF (so that ON is underlined) to view limit lines.

Saving and Recalling Programs with a Memory Card

Programs (also called downloadable programs or DLPs) can be loaded into analyzer memory by loading a program from a memory card, or defining a function with remote programming commands (remote programming ability is available with Option 021 or 023).

The process of saving and recalling programs from the memory card is similar to saving state data. To save program information to the memory card use ALL DLP -> CARD.

Note
ALL DLP -> CARD saves an image of the analyzer memory. This means a program cannot be saved selectively if several programs are present in the analyzer memory at the time. Use CATALOG INTRNL, DELETE FILE to delete the items in user memory that you do not wish to be saved on the memory card. ALL DLP -> CARD saves all programs and key definitions in analyzer memory on the memory card.
To Save Programs

1. Press (CONFIG) or (DISPLAY). CHANGE PREFIX to enter a new prefix or change the existing prefix.

Note
If you do not enter a new prefix, the existing prefix will be used. If there is not an existing prefix, the program will be saved under d.(register number).

2. Press (SAVE). Press INTRNL CRD to select CRD if INTRNL is underlined.

3. Press ALL DLP ->CARD . REGISTER # and PREFIX= are displayed on the analyzer display.

4. Enter a register number using the numeric keypad and press (ENTER).

The data is saved with a file name consisting of a “d,” the prefix that was entered, an underscore ( _ ), and the register number. The “d” denotes that the file contains downloadable program data.

To Recall Programs

1. Press (SAVE) or (RECALL). Press INTRNL CRD to select CRD if INTRNL is underlined. (CRD is underlined when the memory card is selected).

2. Press CATALOG CARD, MORE 1 of 2, CATALOG DLP. Use the knob to highlight the trace data to be retrieved.

3. Press LOAD FILE.

Programs can also be recalled by specifying the prefix and the register number:

1. Press (RECALL). Press INTRNL CRD to select CRD if INTRNL is underlined.

2. Press CARD -> DLP, and enter the register number the program was saved under, and (ENTER).

Note
If you want to recall a program saved under a different prefix, use CHANGE PREFIX to enter the prefix and then recall the program.

Table 5-5 summarizes the save and recall functions using the memory card.
<table>
<thead>
<tr>
<th>Operation</th>
<th>Screen Title Available?</th>
<th>Default File Name</th>
<th>Register Range</th>
<th>Key Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAVE STATE</td>
<td>No</td>
<td>s(current prefix) -(register #)</td>
<td>Prefix + register # ≤ 8 characters</td>
<td>![](SAVE STATE -&gt; CARD (register #) ENTER)</td>
</tr>
<tr>
<td>RECALL STATE</td>
<td>No</td>
<td>N/A</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="RECALL" alt="" /> CARD -&gt; STATE (register #) ENTER*</td>
</tr>
<tr>
<td>SAVE TRACE</td>
<td>Yes</td>
<td>t(current prefix) -(register #)</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="SAVE" alt="" /> TRACE -&gt; CARD (TRACE A, TRACE B, or TRACE C) (register #) ENTER*</td>
</tr>
<tr>
<td>RECALL TRACE</td>
<td>Yes</td>
<td>N/A</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="RECALL" alt="" /> CARD -&gt; TRACE (TRACE A, TRACE B, or TRACE C) (register #) ENTER*</td>
</tr>
<tr>
<td>SAVE LIMIT LINES</td>
<td>No</td>
<td>l(current prefix) -(register #)</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="SAVE" alt="" /> TRACE -&gt; CARD LIMIT LINES (register #) ENTER</td>
</tr>
<tr>
<td>RECALL LIMIT LINES</td>
<td>No</td>
<td>N/A</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="RECALL" alt="" /> CARD -&gt; TRACE LIMIT LINES (register #) ENTER</td>
</tr>
<tr>
<td>SAVE AMPLITUDE</td>
<td>No</td>
<td>a(current prefix) -(register #)</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="SAVE" alt="" /> TRACE -&gt; CARD AMPLITUDE COR FACT (register #) ENTER</td>
</tr>
<tr>
<td>CORRECTION FACTORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECALL AMPLITUDE</td>
<td>No</td>
<td>N/A</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="RECALL" alt="" /> CARD -&gt; TRACE AMPLITUDE COR FACT (register #) ENTER</td>
</tr>
<tr>
<td>CORRECTION FACTORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAVE DLP</td>
<td>No</td>
<td>d(current prefix) -(register #)</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="SAVE" alt="" /> ALL DLP -&gt; CARD (register #) ENTER</td>
</tr>
<tr>
<td>RECALL DLP</td>
<td>No</td>
<td>N/A</td>
<td>Prefix + register # ≤ 8 characters</td>
<td><img src="RECALL" alt="" /> CARD -&gt; DLP (register #) ENTER*</td>
</tr>
</tbody>
</table>

* An alternate method for recalling a file uses the key sequence ![](RECALL) CATALOG CARD

CATALOG ALL (use knob to highlight file) LOAD FILE.
Using Limit-Line Functions

This section provides an overview of limit-lines, a procedure for creating an upper limit-line, and descriptions of the limit-line functions. A procedure for creating an upper and a lower limit-line is at the end of this section. See Chapter 7 for more information on a specific limit-line function.

Limit lines provide an easy way to compare trace data to a set of amplitude and frequency parameters while the spectrum analyzer is sweeping the measurement range. An upper and a lower limit-line can be displayed. Every measurement sweep of trace A is compared to the limit lines. If trace A is at or within the bounds of the limit lines, LIMI PASS is displayed. If trace A is out of the limit-line boundaries, LIMI FAIL is displayed. Figure 5-7 shows a sample limit-line display.

Note The upper limit-line is stored in trace B and the lower limit-line is stored in trace C; traces B and C are not available for active trace data. Trace A is available for active trace data.

Figure 5-7. Typical Limit-Line Display

<table>
<thead>
<tr>
<th>Index Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Upper limit-line.</td>
</tr>
<tr>
<td>2</td>
<td>Lower limit-line.</td>
</tr>
<tr>
<td>3</td>
<td>Screen message.</td>
</tr>
</tbody>
</table>
Procedure for Creating an Upper Limit-Line

This procedure demonstrates how to create an upper limit-line and activate testing. Detailed descriptions of the limit-line functions follow this procedure.

1. Press **PRESET**.

2. Set the center frequency to 300 MHz, the span to 500 MHz by pressing **FREQUENCY**, 300 MHz, **SPAN** 500 MHz.

3. Connect CAL OUT to the analyzer input using an appropriate cable. (The calibration signal is used as the “test” signal for this demonstration.)

---

**Note**

For Option 001 or 011, change the amplitude units to dBm. Press **AMPLITUDE**, MORE 1 of 2, AMP TD UNITS, dBm.

---

4. Press **MEAS/USER** to access the limit-line menus.

5. To clear an existing limit-line table, press LIMIT LINES, NEW LIMIT, NEW LIMIT. Or, if no limit-line table exists or you wish to edit an existing limit-line table, press LIMIT LINES, EDIT LIMIT.

6. Press LIMITS FIX REL so that FIX is underlined. LIMITS FIX REL specifies whether or not the limit line is relative to the analyzer’s center frequency and reference level settings.

7. Press EDIT UPPER. EDIT UPPER allows you to edit or create an upper limit-line.

8. Press SELECT SEGMENT, 1 **ENTER**.

9. Press SELECT FREQ, 50 MHz.

10. Press SELECT AMPLITUDE, 60 **dBm**.

11. Press SELECT TYPE, then FLAT.

Steps 8 through 11 specified the first limit-line point. The first limit-line segment begins at 50 MHz and has an amplitude value of −60 dBm.

---

**Note**

The coordinates for the second point must be entered before the first and second limit-line segments are displayed.

---

To enter the second limit-line segment:

12. Press SELECT SEGMENT, 2 **ENTER**.

13. Press SELECT FREQ, 250 MHz.

14. Press SELECT AMPLITUDE, 60 **dBm**.

15. Press SELECT TYPE, then SLOPE.

Steps 12 through 15 specified the second limit-line segment.

---

5-28 Operation
Note

The table entries can be edited if you make mistake. To edit an existing segment, use SELECT SEGMENT to specify the segment, and SELECT FREQ, SELECT AMPLITUDE, or SELECT TYPE to specify the column you wish to edit.

Steps 16 through 23 specify the third and fourth limit-line segments.

16. Press SELECT SEGMENT, 3 ENTER.

17. Press SELECT FREQ, 400 MHz.

18. Press SELECT AMPLITUDE, 15 dBm.

19. Press SELECT TYPE, then FLAT.

You may notice that the end coordinate of segment three is drawn to off the top of the analyzer display. To avoid this, the frequency coordinate of the last segment should exceed the stop frequency of the analyzer display. Since the limit line in this procedure has only four segments specified, the frequency value of segment four (the last segment) is set to 600 MHz, greater than the stop frequency of the display (see step 21).

20. Press SELECT SEGMENT, 4 ENTER.

21. Press SELECT FREQ, 600 MHz.

22. Press SELECT AMPLITUDE, 15 dBm.

23. Press SELECT TYPE, then POINT.

Figure 5-8. The Completed Limit-Line Table

24. Press MORE 1 of 2, EDIT DONE, when all the segments have been entered.

Operation 5-29
25. Press LIMITS ON OFF. LIMITS ON OFF turns the limit testing on. LIMI FAIL is displayed because the calibration signal exceeds the limit line.

26. Disconnect CAL OUT from the analyzer input. LIMI PASS is displayed since no signal exceeds the limit line.

**Limit-Line Functions**

This section describes the limit-line functions in the order that they are usually used.

**Editing or Viewing the Limit-Line Tables**

Pressing MEAS/USER, then LIMIT LINES accesses the softkey menus for creating a limit line.

Pressing NEW LIMIT, NEW LIMIT clears an existing limit-line table.

---

**Note**

PRESET turns limit-line testing off (if it is on), but does not clear an existing limit-line table. Use NEW LIMIT or PURGE LIMITS to clear an existing limit-line table.

---

Press EDIT LIMIT instead of NEW LIMIT to edit an existing limit line table or, if no limit-line table currently exists, create a limit-line table.

**Selecting the Type of Limit-Line Table**

Pressing LIMITS FIX REL select the type of limit line. There are two types of limit lines: fixed and relative. Fixed limit-lines contain only absolute amplitude and frequency values. Relative limit-lines consist of frequency values referenced to the analyzer’s center frequency, and amplitude values relative to the analyzer’s reference level. For example, if a limit line is specified as fixed, entering a limit-line segment with a frequency coordinate of 300 MHz displays the limit-line segment at 300 MHz. If the same limit-line table is specified as relative, it is be displayed relative to the analyzer’s center frequency and reference level. If the center frequency is at 1.2 GHz, a relative limit-line segment with a frequency coordinate of 300 MHz will display the limit-line segment at 1.5 GHz. If the amplitude component of the relative limit-line segment is −10 dB, then −10 dB is added to the reference level value to obtain the amplitude of the given component.

RELATIVE is displayed in the limit-line table when the limit line type is relative; FIXED is displayed when limit-line type is fixed.

A limit line entered as fixed may be changed to relative, and one entered as relative may be changed to fixed. When changing between fixed and relative limit-lines, the frequency and amplitude values in the limit-line table change so that the limit line remains in the same position for the current frequency and amplitude settings of the spectrum analyzer.

**Selecting the Limit-Line Table Format**

Press EDIT UPPER, EDIT LOWER, EDIT UP/LOW, or EDIT MID/DELT to edit or create a limit-line table. Each of the EDIT softkeys represents a different type of limit-line table format. The choice of EDIT softkey depends upon whether you want an upper limit-line only, a lower limit-line only, an upper and lower limit-line, and the characteristics of the limit-line being entered.
The four limit-line table formats are described below:

- The upper limit-line table format (accessed by EDIT UPPER). With the upper limit-line table format, the coordinates of the upper limit-line are specified (but not for the lower limit-line). Even if lower limit-line values exist or the values had been entered as an upper and lower limit-line table, the upper limit-line values are treated as a separate table from the lower limit-line values. The upper limit-line entries can have independent frequency and amplitude coordinates from lower limit-line table entries.

- The lower limit-line table format (accessed by EDIT LOWER). With the lower limit-line table format, the coordinates for the lower limit-line are specified (but not for the upper limit-line). Even if upper limit-line values exist or the values had been entered as an upper and lower limit-line table, the lower limit-line values are treated as a separate table from the upper limit-line values. The lower limit-line entries can have independent frequency and amplitude coordinates from upper limit-line table entries.

- The upper and lower limit-line table format (accessed by EDIT UP/LOW). With the upper and lower limit-line table format, the upper and lower limit-lines can be entered at the same time. With the upper and lower limit-line format, the frequency, upper amplitude, and lower amplitude are specified. The frequency and upper amplitude comprise the coordinate point for the upper limit-line, the frequency and lower amplitude value comprise the coordinate point for the lower limit-line. It is not necessary to specify both an upper and lower amplitude component for every frequency component. Three asterisks indicate no amplitude value has been entered for the segment.

- The mid/delta limit-line table format (accessed by EDIT MID/DELT). Like the upper and lower limit-line table format, the mid/delta limit-line table format provides a means of specifying the upper and lower limit-lines at the same time. Unlike the upper and lower table format, the amplitude values are specified as a middle amplitude value with a delta (the upper and lower limit-lines are drawn an equal positive and negative distance from the middle amplitude). With the mid/delta format, the frequency and the mid-amplitude plus the delta comprise the upper limit-line; the frequency and the mid-amplitude minus the delta comprise the lower limit-line. The difference between the mid/delta and the upper/lower format is the way the amplitude values are entered; the frequency coordinate begins a segment regardless of the format chosen. The mid/delta format can be used if the upper and lower limit-lines are symmetrical (with respect to the amplitude axis).

---

**Note**

Regardless of which limit-line table format was used to enter the limit-line values, it is possible to edit the same limit-line values with any of the formats.

---

**Selecting the Segment Number**

Pressing SELECT SEGMENT specifies the segment number to be entered or edited. Limit lines are created by entering frequency and amplitude values into a limit-line table. The frequency and amplitude values specify a coordinate point from which a limit-line segment is drawn. See Figure 5-9.

The coordinate point is the lowest frequency point of the line segment. Limit lines are constructed from left to right.
Figure 5-9. Limit-Line Segments

<table>
<thead>
<tr>
<th>Index Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frequency and amplitude coordinate that starts the first segment</td>
</tr>
<tr>
<td>2</td>
<td>First segment.</td>
</tr>
<tr>
<td>3</td>
<td>Frequency and amplitude coordinate that starts the second segment.</td>
</tr>
<tr>
<td>4</td>
<td>Second segment.</td>
</tr>
<tr>
<td>5</td>
<td>Frequency and amplitude coordinate that starts the third segment.</td>
</tr>
<tr>
<td>6</td>
<td>Third segment</td>
</tr>
<tr>
<td>7</td>
<td>Frequency and amplitude coordinate that starts the fourth segment.</td>
</tr>
<tr>
<td>8</td>
<td>Fourth segment.</td>
</tr>
<tr>
<td>9</td>
<td>Frequency and amplitude coordinate that starts the fifth segment.</td>
</tr>
<tr>
<td>10</td>
<td>Fifth segment.</td>
</tr>
<tr>
<td>11</td>
<td>Frequency and amplitude coordinate that starts the sixth segment.</td>
</tr>
</tbody>
</table>

Up to 20 segments can be specified for the upper or lower limit-line tables.

Selecting the Frequency Coordinate

Press SELECT FREQ, then enter a frequency value for the segment. Regardless of the table format, a frequency coordinate must be specified.

Note

There can be only one entry per frequency. Entering two segments with the same frequency in the same limit-line table overwrites the first entry.
When entering a limit-line segment, the frequency, and amplitude values will be listed as asterisks (***), until new values are entered. The new segment will be listed last until both the frequency and amplitude values have been entered. Once the frequency and at least one amplitude value are entered, the segment will be sorted into the limit-line table according to frequency.

Selecting the Amplitude Coordinate
In the previous procedure pressing SELECT AMPLITUd, then entering an amplitude value, specified the amplitude coordinate for the upper limit line. The limit-line table formats dictate how the amplitude values are treated:

- With the upper limit-line table format, one amplitude component (representing an upper limit-line segment) is specified per frequency component. The amplitude value is entered by pressing SELECT AMPLITUd, entering an amplitude value, and pressing a units key.

- With the lower limit-line table format, one amplitude component (representing a lower limit-line segment) is specified per frequency component. The amplitude value is entered by pressing SELECT AMPLITUd, entering an amplitude value, and pressing a units key.

- With the upper/lower limit-line table format, two amplitude components (one representing an upper limit-line segment and one representing a lower limit-line segment) can be specified per frequency component. It is not necessary to specify both an upper and lower amplitude value. For example, specifying only upper amplitude value results in an upper limit-line, but not a lower limit-line. The amplitude of the upper limit-line is entered by pressing SELECT UPR AMPL, entering an amplitude value, and pressing a units key. The amplitude of the lower limit-line is entered by pressing SELECT LWR AMPL, entering an amplitude value, and pressing a units key.

- With the mid/delta limit-line table format, two amplitude components (one representing a mid-amplitude value, one representing a deviation [positive and negative values] from either side of this value) is specified per frequency component. If no deviation is entered, the deviation defaults to zero. The middle amplitude value is entered by pressing SELECT MID AMPL, entering an amplitude value, and pressing a units key. The delta is entered by pressing SELECT DLT AMPL, entering an amplitude value, and pressing a units key.

Frequency or amplitude values that are not within limit-line range will be modified. For example, a frequency value of 60 GHz will be modified to 30 MHz.

Selecting the Segment Type
Press SEGMENT TYPE, then FLAT, SLOPE, or POINT, to specify the segment type. The segment type determines how to connect the coordinate point of the current line segment with the coordinate point of the next line segment. The segment type determines whether the line segment is horizontal or vertical, sloped, or a single point. The three segment types are:

- FLAT draws a zero-slope line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values equal in amplitude for all
frequencies between the two points. If the amplitude values of the two segments differ, the limit-line will "step" to the value of the second segment. See Figure 5-10.

- SLOPE draws a straight line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values for all frequencies between the two points.

- POINT specifies a limit value for the coordinate point, and no other frequency points, so that a POINT segment specifies a limit value for a single frequency. For an upper limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the top of screen. For a lower limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the bottom of screen. The POINT segment type should be used as the last segment in the limit-line table. However, if the last segment in the table is not specified as the POINT segment type, an implicit point is automatically used. If a visible POINT segment at the right-hand edge of the display is not desired, add an explicit last point segment to the limit-line table that is higher in frequency than the stop frequency.

Figure 5-10 demonstrates the different segment types.

Figure 5-10. Segment Types
### Completing Table Entry and Activating Limit-Line Testing

Pressing **EDIT DONE** blanks the limit-line table from the screen and accesses the menu with **LIMITS ON OFF**.

Pressing **LIMITS ON OFF** turns the limit-line testing on or off.

### Saving or Recalling Limit-Line Tables with SAVE LIMIT and RECALL LIMIT

Pressing (MEAS/USER), LIMIT LINES accesses SAVE LIMIT and RECALL LIMIT. These softkey functions provide an easy way to save or recall current limit-line table(s). SAVE LIMIT saves the current limit-line table(s) in the current mass storage device (analyzer memory or, if Option 003 is installed, the memory card). To verify the current mass storage device, press SAVE LIMIT. If **MAX REG #** appears on the analyzer display, the current mass storage device is analyzer memory. If **PREFIX=** is displayed, the memory card is the mass storage device. (Press **SAVE** or **RECALL**, INTRNL CRD to change the current mass storage device.) Press SAVE LIMIT, enter a register number, then press **ENTER** to save the current limit-line table in analyzer memory or on the memory card.

RECALL LIMIT recalls limit-line table(s) from the current mass storage device (analyzer memory or, if Option 003 is installed, the memory card). To verify the current mass storage device, press RECALL LIMIT. If **MAX REG #** appears on the analyzer display, the current mass storage device is analyzer memory. If **PREFIX=** is displayed, the memory card is the mass storage device. (Press **SAVE** or **RECALL**, INTRNL CRD to change the current mass storage device.) To recall a limit line, enter the register number the limit-line table(s) was saved under, then press **ENTER**. When recalling a limit line from the memory card, it may be necessary the change the current prefix to the prefix the limit line was stored with. Use CHANGE PREFIX to change the current prefix.

### Procedure for Entering an Upper and Lower Limit-Line

This is a basic procedure for entering an upper and lower limit-line.

1. Press **PRESET**.

2. Since this procedure uses the calibration signal as the “test” signal, connect CAL OUT to the analyzer input with an appropriate cable.

3. Change the analyzer settings—center frequency at 300 MHz, span to 50 MHz, resolution bandwidth to 3 MHz by pressing (FREQUENCY), 300 (MHz), SPAN 50 (MHz), BW 3 (MHz).
4. Press **MEAS/USER** to access the limit-line menus.

5. To clear an existing limit-line table, press **LIMIT LINES, NEW LIMIT, NEW LIMIT**. Or, use **SAVE LIMIT** to save the current limit-line table in the current mass storage device before clearing the limit-line table. To save the current limit-line table, press **SAVE LIMIT**, enter the register number, then press **ENTER**. Or, if no limit-line table exists or you wish to edit an existing limit-line table, press **LIMIT LINES, EDIT LIMIT**.

6. Press **LIMITS FIX REL** so that **FIX** is underlined (fixed type of limit line).

7. Press **EDIT UP/LOW** to create upper and lower limit-lines simultaneously.

8. Press **SELECT SEGMENT**, 1 **ENTER**.

9. Press **SELECT FREQ, 275 MHz**.

10. Press **SELECT UPR AMPL, 60 dBm**.

11. Press **SELECT LWR AMPL, 75 dBm**.

12. Press **SELECT TYPE**, then **FLAT**.

   Repeat steps 8 through 11, entering the following values:

<table>
<thead>
<tr>
<th>Segment Number</th>
<th>Frequency</th>
<th>Upper Amplitude</th>
<th>Lower Amplitude</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>290 MHz</td>
<td>-60 dBm</td>
<td>-75 dBm</td>
<td>Slope</td>
</tr>
<tr>
<td>3</td>
<td>295 MHz</td>
<td>-15 dBm</td>
<td>-75 dBm</td>
<td>Slope</td>
</tr>
<tr>
<td>4</td>
<td>297 MHz</td>
<td>-15 dBm</td>
<td>-75 dBm</td>
<td>Slope</td>
</tr>
<tr>
<td>5</td>
<td>300 MHz</td>
<td>-15 dBm</td>
<td>-29 dBm</td>
<td>Slope</td>
</tr>
<tr>
<td>6</td>
<td>303 MHz</td>
<td>-15 dBm</td>
<td>-75 dBm</td>
<td>Slope</td>
</tr>
<tr>
<td>7</td>
<td>305 MHz</td>
<td>-15 dBm</td>
<td>-75 dBm</td>
<td>Slope</td>
</tr>
<tr>
<td>8</td>
<td>310 MHz</td>
<td>-60 dBm</td>
<td>-75 dBm</td>
<td>Flat</td>
</tr>
<tr>
<td>9</td>
<td>400 MHz</td>
<td>-60 dBm</td>
<td>-75 dBm</td>
<td>Point</td>
</tr>
</tbody>
</table>

**Note**

When entering a limit-line segment, the frequency, and amplitude values will be listed as asterisks (**•••**) until new values are entered. The new segment will be listed last until both the frequency and amplitude values have been entered. Once the frequency and at least one amplitude value are entered, the segment will be sorted into the limit-line table according to frequency.

To edit an existing segment, use **SELECT SEGMENT** to specify the segment, and **SELECT FREQ, SELECT AMPLITUDE**, or **SELECT TYPE** to specify the column you wish to edit.

13. Press **MORE 1 of 2, EDIT DONE** when all values have been entered into the limit-line table.

**5-36 Operation**
14. Press **LIMITS ON OFF** so that **ON** is underlined. **LIMIT PASS** is displayed on the analyzer screen if the measurement sweep is within the limit line(s). **LIMIT FAIL** is displayed if the measurement sweep is not within the limit line(s).

![Figure 5-11. Upper and Lower Limit-Line Testing](image)

To turn the limit-line testing on or off, use **LIMITS ON OFF**. Use **NEW LIMIT** or **PURGE LIMITS** to clear the limit-line tables. To remove the limit lines from the display, use **BLANK B** to blank the upper limit-line or **BLANK C** to blank the lower limit-line.

---

**Entering Amplitude Correction Factors**

Amplitude correction factors provide a convenient way to compensate for the gain or loss of the measuring system. Amplitude correction factors can be entered into analyzer memory in three ways:

- For Option 021 or 023, use the remote programming command AMPCOR. See *HP 8590 Series Spectrum Analyzer Programming Manual* for more information.

- Load amplitude correction factors stored on a memory card into analyzer memory if Option 003 is installed. See “To Recall Limit-Line Tables or Amplitude Correction Factors” in this chapter.

- For analyzers without Option 021 or 023, the frequencies and amplitude values are entered as the screen title and executed using **EXECUTE TITLE**. The frequency values must be entered in increasing order. To enter amplitude correction factors into analyzer memory using **EXECUTE TITLE**:

  1. Press **DISPLAY**, **CHANGE TITLE**.
2. If necessary, clear the current screen title by pressing YZ_,# SPC CLEAR, CLEAR.
3. Use the softkeys to enter AMPCOR as the screen title.
4. Use the keypad to enter the frequency value.
5. Use the softkeys to enter the frequency units. Use GZ for GHz, MZ for MHz, KZ for kHz, and HZ for Hz.
6. Use the softkeys to enter a comma.
7. Use the keypad to enter the amplitude value. If necessary, use the softkeys to enter a minus sign (use +−<− , − SUB ) before the amplitude value. It is not necessary to enter the amplitude units.
8. Use the softkeys to enter a comma.
9. Repeat steps 4 through 8 to enter the frequency and amplitude pairs. The frequency values must be in ascending order. The number of frequency and amplitude pairs that can be entered is restricted by the length of the screen title. Up to 53 characters can be entered in the screen title if the markers are off.
10. Terminate with a semicolon. Press MORE 1 of 2, (),::; ; SEMI to enter a semicolon.
11. Press CAL, MORE 1 of 3, MORE 2 of 3, SERVICE CAL, EXECUTE TITLE to enter the amplitude correction factors into analyzer memory.

An “A” is displayed before “CORR” on the screen annotation when amplitude correction factors are in use.

For example, executing the screen title AMPCOR 100MZ, 5, 1GZ, −5, 1.5GZ, 10; adds the correction points (5 dB at 100 MHz, −5 dB at 1 GHz, and 10 dB at 1.5 GHz) across the active measurement range. Between points, the correction values are interpolated. When measuring at frequencies outside the first and last correction points, these values are used as the correction value.

Once amplitude correction factors have been loaded into analyzer memory, they remain in use until the analyzer is turned off, (RESET) is pressed, or AMPCOR OFF is executed. Execute AMPCOR ON to turn the amplitude correction factors back on. To execute AMPCOR OFF or AMPCOR ON, use CHANGE TITLE to enter AMPCOR OFF or AMPCOR ON in the screen title. Press CAL, MORE 1 of 3, MORE 2 of 3, SERVICE CAL, EXECUTE TITLE to execute the screen title.

If desired, save the amplitude correction factors in analyzer memory or on the memory card. See “To Save Limit-Line Tables or Amplitude Correction Factors” in this chapter.
Changing the Analyzer's Power-On State

When the analyzer is turned on, it recalls the last analyzer state it was in when it was turned off. The turned-on state can be changed so that the last state of the analyzer is not recalled, and it is in the same state as it was after [PRESET] is pressed. The POWERON command is used to change the turned-on state of the analyzer. POWERON command can be executed remotely (Option 021 or 023 only; see HP 8590 Series Spectrum Analyzer Programming Manual), or with [EXECUTE TITLE].

To execute POWERON using [EXECUTE TITLE]:

1. Press [DISPLAY], [CHANGE TITLE].

2. If necessary, clear the current screen title by pressing [YZ_# SPC CLEAR], [CLEAR].

3. Use the softkeys to enter POWERON as the screen title.

4. Press [YZ_# SPC CLEAR], [SPACE] to enter a blank space.

5. Use the softkeys to enter IP to select instrument preset as the turned-on state of the analyzer. To select the last state of the analyzer (before it was turned off) as the turned-on state, enter LAST.

6. Press [MORE 1 of 2], [()'], [;], [;], [SEMI] to enter a semicolon. The screen title should read POWERON IP; or POWERON LAST.;

7. Press [CAL], [MORE 1 of 3], [MORE 2 of 3], [SERVICE CAL], [EXECUTE TITLE] to execute the POWERON command. The selected POWERON state can only be changed by the POWERON command.

Using the External Keyboard

The external keyboard connector (available with Option 021 or 023) provides the capability of using an external keyboard with the analyzer. The external keyboard is not supplied with the analyzer. The external keyboard is a convenient way to enter screen titles, to enter remote programming commands, or to access the softkey functions.

To Enter a Screen Title

1. Turn off the analyzer.

Caution

The analyzer must be turned off before connecting an external keyboard to the analyzer. Failure to do so may result in loss of factory correction constants.

2. Connect an HP C1405 Option 2 cable from the rear-panel connection (marked EXT KEYBOARD) to the HP C1405A Option ABA keyboard.

3. Press [LINE] to turn the analyzer on. The keyboard is now ready for entry of a screen title.

4. Type in a screen title using the external keyboard. The entry appears at the top line of the analyzer display.

Operation 5-39
5. Press \texttt{ENTER} on the external keyboard. Pressing \texttt{ENTER} moves the characters to the position for the screen title annotation.

\begin{center}
\begin{tabular}{|l|l|}
\hline
\textbf{Note} & To view more than 31 characters per line, turn off the time/date display with \texttt{CONFIG}, \texttt{TIMEDATE}, \texttt{TIMEDATE ON OFF} (OFF). \\
\hline
\end{tabular}
\end{center}

\textbf{To Enter Programming Commands}

1. Press \texttt{F8} on the external keyboard. This puts the keyboard in the execute remote command mode.

2. Type in a programming command (for example, type \texttt{IP}).

3. Press \texttt{ENTER} on the external keyboard.

\texttt{ENTER} causes the analyzer to perform the command.

\begin{center}
\begin{tabular}{|l|l|}
\hline
\textbf{Note} & Unlike entering a remote programming command using an external controller, entering the remote programming commands with the external keyboard does not include the analyzer address. Also, semicolons are not required to terminate the programming line. Semicolons are necessary for separating the programming commands. For example, a program line is entered via the external controller as: \texttt{OUTPUT 718;"CF 300MHZ;SP 1MHZ;"}. The same programming line is entered using the external keyboard as: \texttt{CF 300MHZ;SP 1MHZ \texttt{ENTER}}.
\\
\hline
\end{tabular}
\end{center}

After \texttt{F8} is pressed, the analyzer remains in command mode. To return to the title entry mode, press \texttt{PRESET} (on the analyzer) or \texttt{ESC} (on the external keyboard).

\textbf{To Enter a Prefix}

The external keyboard can also be used to enter a prefix.

1. Press \texttt{F7} on the external keyboard. This puts the keyboard in the mode to enter a prefix.

2. Type in the prefix.

3. Press \texttt{ENTER} on the external keyboard.

See "External Keyboard Connector" in Chapter 7 for more information on the external keyboard functions.
Analyzer Measurements and Applications

What You'll Learn in This Chapter

This chapter demonstrates analyzer measurement techniques with examples of typical applications; each application focuses on different features. The measurement procedures covered in this chapter are listed below.

- Resolving signals of equal amplitude with resolution bandwidth.
- Resolving small signals hidden by large signals with the resolution bandwidth function.
- Decreasing the frequency span using the signal track function.
- Peaking signal amplitude with preselector peak (HP 8592B only).
- Tracking unstable signals with signal track while using maximum hold and minimum hold.
- Comparing signals with delta markers.
- Measuring low-level signals with attenuation, video bandwidth, and video averaging.
- Identifying distortion products using the RF attenuator and traces.
- Using the comb generator to perform more accurate frequency measurements (HP 8592B only).
- Using the analyzer as a receiver in zero frequency span.
- Measuring amplitude modulation with the fast Fourier transform function.
- Measuring signals near band boundaries with harmonic lock (HP 8592B only).
- Stimulus-response measurements with the built-in tracking generator (Option 010 or 011).

To find descriptions of specific analyzer functions, turn to Chapter 7, “Analyzer Functions,” or look in the index.
Resolving Signals of Equal Amplitude with Resolution Bandwidth

In responding to a continuous-wave signal, a swept-tuned spectrum analyzer traces out the shape of the spectrum analyzer’s intermediate frequency (IF) filters. As we change the filter bandwidth, we change the width of the displayed response. If a wide filter is used and two equal-amplitude input signals are close enough in frequency, then the two signals appear as one. Thus, signal resolution is determined by the IF filters inside the analyzer.

The resolution bandwidth (RES BW) function selects an IF filter setting for a measurement. Resolution bandwidth is defined as the 3 dB bandwidth of the filter. The 3 dB bandwidth tells us how close together equal amplitude signals can be and still be distinguished from each other.

Generally, to resolve two signals of equal amplitude, the resolution bandwidth must be less than or equal to the frequency separation of the two signals. A dip of approximately 3 dB is seen between the peaks of the two equal signals, and it is clear that more than one signal is present. See Figure 6-2.

In order to keep the analyzer calibrated, sweep time is automatically set to a value that is inversely proportional to the square of the resolution bandwidth. So, if the resolution bandwidth is reduced by a factor of 10, the sweep time is increased by a factor of 100 when sweep time and bandwidth settings are coupled. (Sweep time is proportional to 1/BW²).

For fastest measurement times, use the widest resolution bandwidth that still permits discrimination of all desired signals. The analyzer allows you to select from 1 kHz to 3 MHz resolution bandwidth in a 1, 3, 10 sequence, plus 5 MHz, for maximum measurement flexibility.

Example:

Resolve two signals of equal amplitude with a frequency separation of 100 kHz.

1. To obtain two signals with a 100 kHz separation, connect the calibration signal and a signal source to the analyzer input as shown in Figure 6-1. (If available, two sources can be used.)

![Figure 6-1. Set-Up for Obtaining Two Signals](image-url)
2. If you are using the 300 MHz calibration signal, set the frequency of the source 100 kHz greater than the calibration signal (that is, 300.1 MHz). The amplitude of both signals should be approximately -20 dBm.

3. On the analyzer, press [Preset]. Set the center frequency to 300 MHz, the span to 2 MHz, and the resolution bandwidth to 300 kHz. Press [Frequency], 300 [MHz], 2 [MHz], 300 [kHz]. A single signal peak is visible.

\[ \text{Note} \] If the signal peak cannot be found, increase the span to 20 MHz by pressing [Span], 20 [MHz]. The signal should be visible. Press [Peak Search], [Signal Track], [Span], 2 [MHz] to bring the signal to center screen. Press [Signal Track] to turn the signal track function off.

4. Since the resolution bandwidth must be less than or equal to the frequency separation of the two signals, a resolution bandwidth of 100 kHz must be used. Change the resolution bandwidth to 100 kHz. Two signals are now visible as in Figure 6-2. Use the knob or step keys to further reduce the resolution bandwidth and better resolve the signals.

![Diagram showing signal resolution](image)

**Figure 6-2. Resolving Signals of Equal Amplitude**

As the resolution bandwidth is decreased, resolution of the individual signal is improved and the sweep time is increased. For fastest measurement times, use the widest possible resolution bandwidth. Under preset conditions, the resolution bandwidth is “coupled” (or linked) to span.

Since the resolution bandwidth has been changed from the “coupled” value, a “#” mark appears next to RES BW in the lower corner of the screen, indicating it is uncoupled. (Also see “AUTO COUPLE” in Chapter 7.)
Resolving Small Signals Hidden by Large Signals with the Resolution Bandwidth Function

When dealing with resolution of signals that are not equal in amplitude, you must consider the shape of the IF filter as well as its 3 dB bandwidth. The shape of the filter is defined by the shape factor, which is the ratio of the 60 dB bandwidth to the 3 dB bandwidth. (Generally, the IF filters in this spectrum analyzer have shape factors of 15:1 or less.)

If a small signal is too close to a larger signal, the smaller signal can be hidden by the skirt of the larger signal. To view the smaller signal, you must select a resolution bandwidth such that k is less than a. See Figure 6-3.

![Diagram showing resolution bandwidth requirements for resolving small signals](image)

**Figure 6-3. Resolution Bandwidth Requirements for Resolving Small Signals**

The separation between the two signals must be greater than half the filter width of the larger signal at the amplitude level of the smaller signal.

**Example:** Resolve two input signals with a frequency separation of 200 kHz and an amplitude separation of 60 dB.

1. To obtain two signals with a 200 kHz separation, connect the equipment as shown in the previous section, “Resolving Signals of Equal Amplitude.”
2. Set the center frequency to 300 MHz and the span to 2 MHz.
3. Set the source to 300.2 MHz, so that the signal is 200 kHz higher than the calibration signal. Set the amplitude of the signal to −80 dBm (60 dB below the calibration signal).

4. Set the 300 MHz signal to the reference level by pressing [PEAK SEARCH], [MARKER -> REF LVL].

If a 10 kHz filter with a typical shape factor of 15:1 is used, the filter will have a bandwidth of 150 kHz at 60 dB. The half-bandwidth (75 kHz) is narrower than the frequency separation, so the input signals will be resolved.

---

**Figure 6-4. Signal Resolution with a 10 kHz Resolution Bandwidth**

If a 30 kHz filter is used, the 60 dB bandwidth will be 450 kHz. Since the half-bandwidth (225 kHz) is wider than the frequency separation, the signals most likely will not be resolved. See Figure 6-5. (To determine resolution capability for intermediate values of amplitude level differences, consider the filter skirts between the 3 dB and 60 dB points to be approximately straight. In this case, we simply used the 60 dB value.)
Decreasing the Frequency Span Using the Signal Track Function

Using the spectrum analyzer's signal track function, you can quickly decrease the span while keeping the signal at center frequency.

Example: Examine a carrier signal in a 200 kHz span.

1. Press [Preset] and tune to a carrier signal and place a marker at the peak. (If you are using the CAL OUT signal, place the marker on the 300 MHz calibration signal. Press [Frequency], 300 MHz, [Span], 200 MHz, and [Peak Search].)

2. Press [Signal Track] and the signal will move to the center of the screen, if it is not already positioned there (note that the marker must be on the signal). Because the signal track function automatically maintains the signal on the center of the screen, you can reduce the span quickly for a closer look. If the signal drifts off of the screen as you decrease the span, use a wider frequency span.

3. Press [Span], 200 kHz. The span decreases in steps as automatic zoom is completed. You can also use the knob or step keys to decrease the span. See Figure 6-6.

Press [Signal Track] again to turn off the tracking function.

**Note**

When you are finished with the example, turn off the signal tracking function. (Signal track must be off for zero span). [Span Zero] sets the span to zero and turns off the signal track function automatically.
Peaking Signal Amplitude with Preselector Peak (HP 8592B Only)

Preselector peak automatically adjusts the preselector tracking to peak the signal at the active marker. Using preselector peak prior to measuring a signal yields the most accurate amplitude reading at the specified frequency. To maximize the peak response of the preselector and adjust the tracking, tune the marker to a signal and press AMPLITUDE, PRESEL PEAK.

Note

PRESEL PEAK maximizes the peak response of the signal of interest but may degrade the frequency response at other frequencies. Use PRESEL DEFAULT or PRESET to clear PRESEL PEAK before measuring another frequency.

PRESEL DEFAULT provides best full single-band flatness for viewing several signals simultaneously.

Note

PRESEL PEAK works in harmonic bands only (bands 1 through 4).

Example: Using the knob, step keys, or PEAK SEARCH, place the marker on your signal, and press PRESEL PEAK. The message CAL: PEAKING appears in the active function block while the routine is working.
Tracking Unstable Signals with Signal Track while Using Maximum Hold and Minimum Hold

The signal track function is useful for tracking unstable signals that drift with time. Maximum hold and minimum hold are useful for displaying modulated signals which appear unstable, but have an envelope that contains the information-bearing portion of the signal.

**SIGNAL TRACK** may be used to track these unstable signals. Use **PEAK SEARCH** to place a marker on the highest signal on the display. Use **SIGNAL TRACK** to bring that signal to the center frequency of the graticule and adjust the center frequency every sweep to bring the selected signal point back to the center. **SPAN 200X** is a quick way to perform the **PEAK SEARCH**, **SIGNAL TRACK**, **SPAN** key sequence.

Note that the primary function of the signal track function is to track unstable signals, not to track a signal as the center frequency of the analyzer is changed. If you choose to use the signal track function when changing center frequency, check to ensure that the signal found by the tracking function is the correct signal.

**Example:** Use signal track to keep a drifting signal at the center of the display and monitor its change.

This example requires a modulated signal which can be easily found by connecting an antenna to the analyzer input and tuning to the FM broadcast band (88 to 108 MHz), nominally 100 MHz with a span of 20 MHz, an attenuator setting of 0 dB, and reference level of approximately -40 dBm. Your circumstances may be slightly different, depending on building shielding and proximity to transmitters.

1. Connect an antenna to the analyzer input.
2. Press [PRES Et], [FREQUENCY], 100 MHz. Press [SPAN], 20 MHz.

**Note** Use a different signal frequency if no signal is available at 100 MHz in your area.

3. Press [AMPLITUDE], 40 dBm. Press [ATTEN AUTO MAN], 0 dBm.

4. Press [SPAN], [SPAN ZOOM], 500 kHz.

Notice that the signal has been held in the center of the display.

**Note** If the signal you selected drifts too quickly for the analyzer to keep up with, use a wider span.

5. The signal frequency drift can be read from the screen if both the signal track and marker delta functions are active. Press [MARKER], [MARKER DELTA], [SIGNAL TRACK]; the marker readout indicates the change in frequency and amplitude as the signal drifts. (See Figure 6-8.)

---

![Figure 6-8. Using Signal Tracking to Track an Unstable Signal](image)

The spectrum analyzer can measure the short- and long-term stability of a source. The maximum amplitude level and the frequency drift of an input signal trace can be displayed and held with the maximum-hold function. The minimum amplitude level can be displayed with minimum hold (available for trace C only).
You can use the maximum-hold and minimum-hold functions if, for example, you want to determine how much of the frequency spectrum an FM signal occupies.

**Example:** Using the maximum-hold and minimum hold functions, monitor the envelopes of a signal.

1. Connect an antenna to the analyzer input.
2. Press **Preset**, **Frequency**, 100 **MHz**. Press **Span**, 20 **MHz**.
3. Press **Amplitude**, 40 **dBm**. Press **Attenu Auto Man**, 0 **dBm**. Press **Span**, **Span Zoom**, 500 **kHz**.

Notice that the signal has been held in the center of the display.

4. Turn off the signal track function by pressing **Signal Track**.

5. To measure the excursion of the signal, press **Trace**, **Max Hold A**. As the signal varies, maximum hold maintains the maximum responses of the input signal, as shown in Figure 6-9.

![Figure 6-9. Viewing an Unstable Signal Using Max Hold A](image)

Annotation on the left side of the screen indicates the trace mode. For example, **MA SMB SC** indicates trace A is in maximum-hold mode, trace B and trace C are in store-blank mode. (See "Screen Annotation" in Chapter 5.)

6. Press **Trace**, **Trace A B C** to select trace B. (Trace B is selected when B is underlined.)

Press **Clear Write** B to place trace B in clear-write mode, which displays the current measurement results as it sweeps. Trace A remains in maximum-hold mode, showing the frequency shift of the signal.
7. Press **TRACE A B C** to select trace C (C should be underlined). Press **MIN HOLD C**. Trace C is in the minimum-hold mode and displays the minimum amplitude of the frequency drift of the signal.

![Figure 6-10. Viewing an Unstable Signal With Max Hold, Clear Write, and Min Hold](image)

**Comparing Signals with Delta Markers**

With the spectrum analyzer, you can easily compare frequency and amplitude differences between signals, such as radio or television signal spectra. The spectrum analyzer's delta marker function lets you compare two signals when both appear on the screen at one time or when only one appears on the screen.

**Example:** Measure the differences between two signals on the same display screen.

1. Connect the CAL OUT to the analyzer input on the front panel. Press **PRESET**. For the HP 8592B only, set the center frequency to 900 MHz and the span to 1.8 GHz.

   The calibration signal and its harmonics appear on the display.

2. Press **PEAK SEARCH** to place a marker at the highest peak on the display. The **NEXT PK RIGHT** and **NEXT PK LEFT** softkeys move the marker from peak to peak. Press **NEXT PK RIGHT** to move the marker to the 300 MHz calibration signal. See Figure 6-11.
Figure 6-11. Placing a Marker on the CAL OUT Signal

The signal that appears at the left edge of the screen is the spectrum analyzer's local oscillator (LO) and represents 0 Hz.

3. Press MARKER DELTA to activate a second marker at the position of the first marker. Move the second marker to another signal peak with the NEXT PK RIGHT or NEXT PK LEFT softkeys.

You may also use the knob to move the second marker.

4. The amplitude and frequency difference between the markers is displayed in the active function block and in the upper-right corner of the screen. See Figure 6-12.
Press **MKR**, **MARKERS OFF** to turn the markers off.

5. The **DELTA MEAS** softkey also finds and displays the frequency and amplitude difference between the two highest-amplitude signals. To use this automatic function, first remove the local oscillator (LO) signal from the display by pressing **FREQUENCY**, **START FREQ**, and turning the knob until the LO signal at 0 Hz is off the screen. Press **MEAS/USER**, **MORE 1 of 2**, **DELTA MEAS**. See Figure 6-13.
The frequency and amplitude differences between the signals appear in the active function block. In addition, the softkeys accessed by **PEAK SEARCH** appear on the screen.

**Example:** Measure the frequency and amplitude difference between two signals that do not appear on the screen at one time. (This technique is useful for harmonic distortion tests when narrow span and narrow bandwidth are necessary to measure the low-level harmonics.)

1. Connect the CAL OUT to the analyzer input (if you have not already done so). Press **PRESET**, **FREQUENCY**, 300 MHz, **SPAN** and the step down key (**▼**) to narrow the frequency span until only one signal appears on the screen.

2. Press **PEAK SEARCH** to place a marker on the peak.

3. Press **MARKER DELTA** to identify the position of the first marker.

4. Press **FREQUENCY** to activate center frequency. Turn the knob clockwise slowly to adjust the center frequency until a second signal peak is placed at the position of the second marker. It may be necessary to pause occasionally while turning the knob to allow a sweep to update the trace. The first marker remains on the screen at the amplitude of the first signal peak.

**Note** Changing the reference level changes the marker delta amplitude readout.

The annotation in the upper-right corner of the screen indicates the amplitude and frequency difference between the two signals. See Figure 6-14.

To turn the markers off, press **MKR** and **MARKERS OFF**.
Measuring Low-Level Signals with Attenuation, Video Bandwidth, and Video Averaging

Spectrum analyzer sensitivity is the ability to measure low-level signals and is limited by the noise generated inside the analyzer. The analyzer input attenuator and bandwidth settings affect the sensitivity by changing the signal-to-noise ratio. The attenuator affects the level of a signal passing through the instrument, whereas the bandwidth affects the level of internal noise without affecting the signal. In the first two examples in this section, the attenuator and bandwidth settings are adjusted to view low-level signals.

If, after adjusting the attenuation and resolution bandwidth, a signal is still near the noise, visibility can be improved with the video-bandwidth and video-averaging functions, as demonstrated in the third and fourth examples.

**Example:** If a signal is very close to the noise floor, reducing input attenuation brings the signal out of the noise. Reducing the attenuation to 0 dB maximizes signal power in the analyzer.

**Note**  
The total power of all input signals at the analyzer must not exceed the maximum power level for the analyzer.

1. Connect an antenna to the analyzer’s input. Press [Preset].
2. Reduce the frequency range to view a low-level signal of interest. For example, narrow the frequency span from 88 MHz to 108 MHz by pressing **FREQUENCY**, START FREQ, 88 (MHz), STOP FREQ, 108 (MHz).

3. Place a marker on the low-level signal of interest. Press **MKR** and use the knob to position the marker at the signal's peak.

4. Place the signal at center frequency by pressing **MKR ->**, MARKER -> CF.

5. Reduce the span to 10 MHz. Press **SPAN**, and then use the step down key (**▼**). See Figure 6-15.

![Figure 6-15. Low-Level Signal](image)

6. Press **AMPLITUDE**, ATTEN AUTO MAN. Press the step up key once to select 20 dB attenuation. Increasing the attenuation moves the noise floor closer to the signal.

   A “#” mark appears next to ATTEN, indicating the attenuation is no longer coupled.

7. To see the signal more clearly, press 0 (dBm). Zero attenuation makes the signal more visible. (As a precaution to protect the spectrum analyzer's input mixer, 0 dB RF attenuation can be selected only with the number/units keypad.)

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Before connecting other signals to the analyzer input, increase the RF attenuation to protect the analyzer's input mixer by pressing ATTEN AUTO MAN so that AUTO is underlined, or press AUTO COUPLE, AUTO ALL.

**Example:** The resolution bandwidth can be decreased to view low-level signals.

1. As in the previous example, connect an antenna to the analyzer input. Set the analyzer to view a low-level signal.

2. Press \( \text{BW}, \text{V} \). The low-level signal appears more clearly because the noise level is reduced. See Figure 6-17.
A "#" mark appears next to RES BW on the left corner of the screen, indicating that the resolution bandwidth is uncoupled.

As the resolution bandwidth is reduced, the sweep time is increased to maintain calibrated data.

Example: The video-filter control is useful for noise measurements and observation of low-level signals close to the noise floor. The video filter is a post-detection low-pass filter that smooths the displayed trace. When signal responses near the noise level of the analyzer are visually masked by the noise, the video filter can be narrowed to smooth this noise and improve the visibility of the signal. (Reducing video bandwidths requires slower sweep times to keep the analyzer calibrated.)

Using the video bandwidth function, measure the amplitude of a low-level signal.

1. As in the first example, connect an antenna to the analyzer input. Set the analyzer to view a low-level signal.

2. Narrow the video bandwidth by pressing \textbf{BW}, \textbf{VID BW AUTO MAN}, and press the step down key (\textbf{\u23d2}). This clarifies the signal by smoothing the noise, which allows better measurement of the signal amplitude.

A "#" mark appears next to VBW on the screen, indicating that the video bandwidth is not coupled to the resolution bandwidth.

Instrument preset conditions couple the video bandwidth to the resolution bandwidth so that the video bandwidth is equal to or narrower than the resolution bandwidth. If the bandwidths are uncoupled when video bandwidth is the active function, pressing \textbf{VID BW AUTO MAN} (so that AUTO is underlined) recouples the bandwidths. See Figure 6-18.
The video bandwidth must be set wider than the resolution bandwidth when measuring impulse noise levels.

**Figure 6-18. Decreasing Video Bandwidth**

**Example:** If a signal level is very close to the noise floor, video averaging is another way to make the signal more visible.

**Note**

The time required to construct a full trace averaged to the desired degree is approximately the same using either the video-bandwidth or video-averaging technique. The video bandwidth technique completes the averaging as the sweep is taken slowly, whereas the video averaging technique takes many sweeps to complete the average. Characteristics of the signal being measured such as drift and duty cycle determine which technique is appropriate.

Video averaging is a digital process in which each trace point is averaged with the previous trace-point average. Selecting video averaging changes the detection mode from PEAK to SAMPLE. The result is a sudden drop in the displayed noise level. The sample mode displays the instantaneous value of the signal at the end of the time/frequency interval represented by each display point, rather than the value of the peak during the interval. It is not used to measure signal amplitudes accurately because it may not find the true peak of the signal.

Video averaging clarifies low-level signals in wide bandwidths by averaging the signal and the noise. As the analyzer takes sweeps, you can watch video averaging smooth the trace.

1. Position a low-level signal on the analyzer screen.
2. Press [TRACE], MORE 1 of 3, VID AVG ON OFF. When ON is underlined, the
video-averaging routine is initiated. As the averaging routine smooths the trace, low-level
signals become more visible. VID AVG 100 appears in the active function block.

The number represents the number of samples (or sweeps) taken to complete the averaging
routine.

To set the number of samples, use the number/units keypad. For example, press
VID AVG ON OFF (so that ON is underlined), 25 [Hz]. Turn video averaging off and on again
by pressing VID AVG ON OFF (OFF), VID AVG ON OFF (ON).

The number of samples equals the number of sweeps in the averaging routine.

During averaging, the current sample appears at the left side of the graticule. Changes in
active functions settings, such as the center frequency or reference level, will also restart the
sampling, or turning video averaging off and then on again will restart sampling.

![Figure 6-19. Using the Video Averaging Function](image)

Once the set number of sweeps has been completed, the analyzer continues to provide a
running average based on this set number.
Identifying Distortion Products Using the RF Attenuator and Traces

Distortion from the Analyzer

High-level input signals may cause spectrum analyzer distortion products which could mask the real distortion measured on the input signal. Using trace B and the RF attenuator, you can determine which signals, if any, are internally generated distortion products.

Example:

1. Connect a signal generator to the analyzer input connector on the spectrum analyzer. Set the frequency of the signal to 200 MHz and set the amplitude to 0 dBm.

Set the center frequency of the spectrum analyzer to 400 MHz and set the span to 500 MHz. The signal shown in Figure 6-20 produces harmonic distortion products in the analyzer’s input mixer.

![Diagram](image)

Figure 6-20. Harmonic Distortion

2. Change the span to 200 MHz. Press [SPAN], 200 MHz.

3. Change the attenuation to 0 dB, press [AMPLITUDE], ATTEN AUTO MAN , 0 dBm).

4. To determine whether the harmonic distortion products are generated by the analyzer, first save the screen data in trace B.

Press [TRACE], TRACE A B C (select trace B), CLEAR WRITE B. Allow the trace to update (two sweeps) and press VIEW B , [PEAK SEARCH], MARKER DELTA. The analyzer shows the stored data in trace B and the measured data in trace A on the display.
5. Next, increase the RF attenuation by 10 dB, press **AMPLITUDE**, **ATTEN AUTO MAN**, and the step up key (▲) once. (See Figure 6-21.)

![Graph showing RF attenuation of 10 dB](image)

**Figure 6-21. RF Attenuation of 10 dB**

6. Compare the response in trace A to the response in trace B. If the distortion product decreases as the attenuation increases, distortion products are caused by the analyzer's input mixer. This is shown by the marker delta value. The high-level signals causing the overload conditions must be attenuated to eliminate the interference caused by the internal distortion.

If the responses in trace A and trace B differ, as in Figure 6-21, attenuation is required. If the distortion was not caused internally, there would be no change in the signal level. For example, the signal amplitude in Figure 6-22 is not high enough to cause internal distortion in the analyzer.

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Figure 6-22. No Harmonic Distortion

**Third-Order Intermodulation Distortion**

Two-tone, third-order intermodulation is a common problem in communication systems. When two signals are present in a system, they can mix with the second harmonics generated and create third-order intermodulation distortion products, which are located close to the original signals. These distortion products are generated by system components such as amplifiers and mixers.

**Example:** Test a device for third-order intermodulation. This example uses two sources set to 300 and approximately 301 MHz. (Other source frequencies may be substituted, but try to maintain a frequency separation of approximately 1 MHz.)

1. Connect the equipment as shown in Figure 6-23.
2. Set one source to 300 MHz and the other source to 301 MHz for a frequency separation of 1 MHz. Set the sources equal in amplitude (in this example, the sources are set to \(-5 \text{ dBm}\)).

3. Tune both signals onto the screen by setting the center frequency between 300 and 301 MHz. Then, using the knob, center the two signals on the display. Reduce the frequency span to 5 MHz for a span wide enough to include the distortion products on the screen. To be sure the distortion products are resolved, reduce the resolution bandwidth until the distortion products are visible. Press [BW], [RES BW], and then use the step down key to reduce the resolution bandwidth until the distortion products are visible.

4. For best dynamic range, set the mixer input level to \(-40 \text{ dBm}\) and move the signal to the reference level: press [AMPLITUDE], MORE 1 of 2, MAX MXR LEVEL, 40 [dBm].

   The analyzer automatically sets the attenuation so that a signal at the reference level will be a maximum of \(-40 \text{ dBm}\) at the input mixer.

5. To measure a distortion product, press [PEAK SEARCH] to place a marker on a source signal.

   To activate the second marker, press [MARKER DELTA]. Using the knob, adjust the second marker to the peak of the distortion product that is beside the test tone. The difference between the markers is displayed in the active function block.

   To measure the other distortion product, press [PEAK SEARCH], NEXT PEAK. This places a marker on the next highest peak, which, in this case, is the other source signal.

   To measure the difference between this test tone and the second distortion product, press [MARKER DELTA] and, using the knob, adjust the second marker to the peak of the second distortion product. (See Figure 6-24.)
Using the Comb Generator to Perform More Accurate Frequency Measurements (HP 8592B Only)

The spectrum analyzer has a built-in comb generator that can be connected temporarily to verify frequency accuracy. To identify a signal with the best frequency accuracy provided by the analyzer, use \texttt{CORRECT TO COMB}.

Example:

1. Set the analyzer to a state where your signal is displayed in a span $>17$ MHz and $\leq 400$ MHz. The span should be wide enough to include a comb tooth; however, the narrowest span assures the best accuracy.

   In Figure 6-25, the known signal is 4050.0 MHz, and is measured as being 4050.8 MHz.
2. Disconnect the input signal, and connect the 100 MHz COMB OUT to the analyzer input.

3. Press \textbf{AUX CTRL}, COMB GEN ON OFF (ON), CORRECT TO COMB. The marker is activated and the menu for the correct to comb routine is displayed. The message \textit{SET MARKER ON COMB TOOTH THEN PRESS CONTINUE SOFTKEY TO CORRECT FREQ OFFST} is displayed. See Figure 6-26.

4. Use \textbf{PEAK SEARCH}, \textbf{NEXT PK RIGHT} or \textbf{NEXT PK LEFT}, or use the knob to place the marker on the comb tooth that is nearest to the location of the input signal.
5. Press CONTINUE or you may end the routine at this point by pressing ABORT.

6. If you pressed CONTINUE, the analyzer automatically calculates and puts in a frequency offset. The frequency offset in the analyzer is automatically set for the best accuracy available in the current span and center frequency.

7. Reconnect the input signal and use the marker to read the corrected frequency.

The frequency offset is displayed at the bottom center of the screen. The known signal is measured as being 4050.0 MHz. See Figure 6-27.
Figure 6-27. Frequency Readout with a Frequency Offset

**Note**
If you change the center frequency or span, you must recorrect the frequency. Note that the analyzer’s frequency offset has been used to help calibrate the display, and remember to reset the offset before making other measurements. To clear the offset, use CLEAR OFFSET, or press the [PRESET] key.

**Note**
For center frequencies less than 50 MHz, the local oscillator can be used as a referenced signal rather than a comb tooth to obtain better accuracy.

The Correct to Comb function is recommended for spans 17 to 400 MHz, and is not useable in multibands. Refer to Table 1-3 for more information.

When using the **CORRECT TO COMB** function in band 0, 20 dB of attenuation or greater should be used; otherwise the comb generator’s power level overloads the first converter.
Using the Analyzer As a Receiver in Zero Frequency Span

The spectrum analyzer operates as a fixed-tuned receiver in zero span. The zero span mode can be used to recover modulation on a carrier signal.

Center frequency in the swept-tuned mode becomes the tuned frequency in zero span. The horizontal axis of the screen becomes calibrated in time. Markers display amplitude and time values.

The following functions establish a clear display of the video waveform:

TRIGGER stabilizes the waveform trace on the display by triggering on the modulation envelope. If the signal's modulation is stable, VIDEO TRIGGER synchronizes the sweep with the demodulated waveform.

LINEAR mode should be used in amplitude modulation (AM) measurements to avoid distortion caused by the logarithmic amplifier when demodulating signals.

SWEEP TIME adjusts the full sweep time from 20 ms (20 μs in zero span with Option 101), to 100 s. The sweep time readout refers to the full 10-division graticule. Divide this value by 10 to determine sweep time per division.

RESOLUTION and VIDEO BANDWIDTH are selected according to the signal bandwidth.

Each of the coupled function values remains at its current value when zero span is activated. Video bandwidth is coupled to resolution bandwidth. Sweep time is not coupled to any other function.

Example: View the modulation waveform of an AM signal in the time domain.

1. To obtain an AM signal, you can connect an antenna to the analyzer input and tune to a commercial AM broadcast station, or you can connect a source to the analyzer input and set the percent modulation of the source. (A headset can be used with the VIDEO OUT connector, and the spectrum analyzer will operate as a radio.)

2. First, center and zoom in on the signal in the frequency domain. (See "Decreasing the Frequency Span Using the Signal Track Function.") Be sure to turn off the signal track function, since the signal track function must be off for zero span. See Figure 6-28.
3. To demodulate the AM, press **BW**. Increase the resolution bandwidth to include both sidebands of the signal within the passband of the spectrum analyzer. Be sure to set the resolution bandwidth wide enough to account for spectrum analyzer drift.

4. Next, position the signal peak near the reference level and select a linear voltage display. Press **AMPLITUDE** and change the reference level, then press **SCALE LOG LIN** to underline LIN.

5. To select zero span, press **SPAN**, 0 Hz or **ZERO SPAN**. See Figure 6-29. If the modulation is a steady tone (for example, from a signal generator), use video trigger to trigger on the waveform and stabilize the display. Adjust the sweep time to change the horizontal scale.
Figure 6-29. Measuring Modulation in Zero Span

Use markers and delta to measure time parameters of the waveform.

Measuring Amplitude Modulation with the Fast Fourier Transform Function

The fast Fourier transform (FFT) function of the spectrum analyzer allows measurements of amplitude modulation (AM). FFT transforms demodulated AM data from the time domain (zero span) to the frequency domain. The FFT function calculates the magnitude of each frequency component from a block of time-domain samples of the input signal. It is commonly used to measure AM at rates that cannot be measured in the normal frequency domain. The FFT is a post-detection fast Fourier transform function and cannot be used to resolve continuous wave or carrier signals.

The FFT function requires a specific analyzer configuration. First, an AM signal is demodulated in the time domain. In order to do this, the resolution bandwidth is widened to include the signal sidebands within the passband of the spectrum analyzer. Next, zero span is selected so that the spectrum analyzer operates as a fixed-tuned receiver. Tuning is centered about the AM carrier.

When MEAS USER. FFT MEAS is pressed, the function sets sample-detection mode and takes a sweep to obtain a sample of the input signal. Then the spectrum analyzer executes a series of computations on the time data to produce the frequency-domain results.
Note: After the FFT function is used, the markers are still in FFT mode for use in evaluating data. Turn off the markers before attempting to use markers in the normal fashion.

Example: Measure the sidebands on a signal using the fast Fourier transform function.

1. Connect a signal generator to the analyzer input on the front panel of the spectrum analyzer. Adjust the signal generator to produce an AM signal. (For example, set the modulation rate to 60 Hz.)

2. Center the signal on the frequency scale of the analyzer screen. For the HP 8592B, decrease the span to 200 kHz.

3. Press BW, 3 kHz. The resolution bandwidth should be about 10 times greater than the highest modulation frequency of interest. (In this case, the fourth harmonic of 60 Hz is 240 Hz.)

4. Press VID BW AUTO MAN, 1 kHz. The video bandwidth should be about two times greater than the highest modulation frequency of interest. If the video bandwidth is too large, "alias" signals may appear in the FFT if signals above the highest modulation frequency of interest are present.

5. Change the amplitude scale to linear by pressing AMPLITUDE, SCALE LOG LIN so that LIN is underlined.

6. Change the reference level to place the signal peak within the top two divisions of the screen by pressing REF LVL and turning the knob. The signal must be below the reference level.

Press SPAN, 0 Hz. The spectrum analyzer now operates as a fixed-tuned receiver.

7. See Figure 6-30, which shows maximum modulation frequency (fm) in Hz versus sweep time (Ts) in seconds. Set the sweep time less than Ts(max) for that maximum modulation frequency (FM) including the harmonics of the signal. The upper curve relates the sweep time to the maximum modulation frequency that can be observed (that is, the modulation frequency represented by the right edge of the graticule). The lower curve represents the modulation frequency one division from the left side of the graticule.

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Figure 6-30. Maximum Modulation Frequency versus Sweep Time

Set the sweep time to fall in the shaded area between the two lines and closer to the lower line to avoid the effects of aliasing. Note that the upper line (marked fm AT 10th DIVISION) represents sampling at exactly the Nyquist rate, and some aliasing may be seen when a value for sweep time is close to the upper line. (Frequencies greater than the maximum modulation frequency for a specific sweep time will not be displayed accurately.) Press **Sweep** to set the sweep time according to the figure. (For a right edge graticule limit of 250 Hz, use 800 ms.)

8. Press **Save**, **INTRNL CRD** (INTRNL should be underlined), **STATE -> INTRNL**, then 2 to save the current analyzer settings in instrument state 2. If the measurement is repeated later, retrieve the analyzer settings with **Recall**, **INTRNL -> STATE**, 2.

**Note**

If you want to prevent the analyzer from taking a sweep before executing the FFT function, place trace A in the view mode.

10. A marker is automatically placed on the carrier at the 0 Hz reference (at the left edge of the graticule). Press MARKER DELTA and turn the knob to the modulation to determine the frequency and amplitude difference from the carrier. See Figure 6-31.

![FFT Function Graph](image)

**Figure 6-31. Using the FFT Function**

The results of the FFT function are displayed on the analyzer screen. The carrier appears at the left edge of the graticule with the modulation sidebands, and any distortion appearing along the horizontal graticule. The left edge of the graticule represents 0 Hz relative to the carrier. The right edge represents the maximum FFT frequency calculated, which is 200 divided by the sweep time, or 250 Hz in Figure 6-31. The amplitude relationships among the carrier, sidebands, and distortion components are the same as they would be if the components were displayed with swept-tuned operation in log mode, 10 dB per division.

---

**Note**

The graticule annotation describes the settings before the FFT (linear mode, center frequency 300 MHz, span 0 Hz), and the marker annotation describes the settings after the FFT (log mode, signal at 60 Hz, maximum frequency is 250 Hz).

---

11. Press **MKR, MARKERS OFF** to turn off markers before proceeding with other tests.

**Note**

If the markers are not turned off after using FFT MEAS, they will not work as expected in other settings.

---

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12. To repeat the test, you must first clear the screen data by pressing \textit{TRACE}.
CLEAR WRITE A. Recall the instrument state by pressing \textit{RECALL}, INTRNL -> STATE, 2.
Then repeat step 9.

\textbf{Measuring Signals Near Band Boundaries with Harmonic Lock (HP 8592B Only)}

When measuring signals at or near a band crossing, use the lowest band having a specified upper frequency limit that will include the signal of interest. See Table 1-3 for harmonic band specifications. Using harmonic lock, and choosing the lowest possible band to analyze a signal, guarantees the best specified measurement accuracy.

To lock onto a specific harmonic, press \textit{[SPAN]}, \textit{BAND LOCK}, \textit{BND LOCK ON OFF} (ON should be underlined), or select a band (see Table 1-3 in Chapter 1 for band specifications). After setting the harmonic lock, only center frequencies and spans within the frequency band of the harmonic may be entered. The span is automatically reduced to accommodate a center frequency specified near the end of the band range.

\textbf{Example:}

1. Connect 100 MHz COMB OUT to the analyzer input.

2. Press the following keys:

\texttt{PRESET AUX CT} \texttt{COMB GEN ON OFF} (ON should be underlined) \texttt{FREQUENCY} 12.9 GHz.

Press \texttt{SPAN}, 350 MHz, \texttt{BAND LOCK}, \texttt{BND LOCK ON OFF} (turn the harmonic lock on).

3. Place a marker on the leftmost peak by using the \texttt{PEAK SEARCH} keys.

4. Press \texttt{MARKER DELTA}, \texttt{NEXT PK RIGHT}, \texttt{NEXT PK RIGHT} to show the frequency and amplitude difference between the two comb teeth.

You will see three comb teeth on your display. The analyzer is locked in band 3 and will not allow multiband sweeps. See Figure 6-32.
To see a multiband sweep, press the following keys:

MKR, MARKERS OFF, SPAN, BAND LOCK, BND LOCK ON OFF (OFF should be underlined).

Place a marker on the leftmost peak.

Press MARKER DELTA. Use NEXT PK RIGHT to place a marker on the rightmost peak. The marker readout displays the frequency and amplitude difference between the two comb teeth. See Figure 6-33.
Figure 6-33. Harmonic Locking Off

Note The comb frequencies have a 100 MHz spacing.

Stimulus-Response Measurements (HP 8590B with Option 010 or 011 Only)

What Are Stimulus-Response Measurements?

Stimulus-response measurements require a source to stimulate a device under test (DUT), a receiver to analyze the frequency-response characteristics of the DUT, and, for return-loss measurements, a directional coupler. Characterization of a DUT can be made in terms of its transmission or reflection parameters. Examples of transmission measurements include flatness and rejection. A reflection measurement is return loss.

A spectrum analyzer combined with a tracking generator forms a stimulus-response measurement system. With the tracking generator as the swept source and the spectrum analyzer as the receiver, operation is analogous to a single-channel scalar network analyzer. Being a narrow-band system results in a wide dynamic measurement range, but the tracking generator’s output frequency must be made to precisely track the spectrum analyzer’s input frequency. This wide dynamic range will be illustrated in the following example. Figure 6-34 shows the block diagram of a spectrum-analyzer/tracking-generator system.
Figure 6-34. Block Diagram of a Spectrum-Analyzer/Tracking-Generator Measurement System

Spectrum Analyzer Functions Used

The procedure below describes how to use the HP 8590B Option 010 Spectrum Analyzer with built-in tracking generator system to measure the rejection of a low-pass filter, which is a type of transmission measurement. Illustrated in this example are the functions in the tracking-generator menu, such as adjusting the tracking-generator output power, source calibration, and normalization. Conducting a reflection measurement is similar and will not be covered. Refer to the HP Spectrum Analyzer Seminar, or Application Note 150-7, for more information.

Stepping Through the Measurement

There are four basic steps in performing a stimulus-response measurement, whether it be a transmission or reflection measurement: set up the spectrum analyzer settings, calibrate, normalize, and measure.

1. If necessary, perform the self-calibration routine for the tracking generator described in “Performing the Tracking Generator Self-Calibration Routine” in Chapter 5.

2. To measure the rejection of a low-pass filter, connect the equipment as shown in Figure 6-35. This example uses a filter with a cut-off frequency of 300 MHz as the DUT.
3. Activate the tracking generator menu by pressing **AUX CTRL**, **TRACK GEN**. To activate the tracking-generator power level, press **SRC PWR ON OFF** until ON is underlined. See Figure 6-36.

**Caution** Excessive signal input may damage the DUT. Do not exceed the maximum power that the device under test can tolerate.

4. Put the sweep time of the analyzer into stimulus-response auto-coupled mode by pressing **MORE 1 OF 2**, then **SWP CPLG SR SA** until SR is underlined. In stimulus-response mode, the auto-coupled sweep times are usually much faster for swept-response measurements.
In the stimulus-response mode, the Q (reactance versus resistance) of the DUT can determine the fastest rate at which the analyzer can be swept. To determine if the analyzer is sweeping too fast, slow the sweep time and note whether there is a frequency or amplitude shift of the trace. Continue to slow the sweep time until there is no longer a frequency or amplitude shift.

5. Since we are only interested in the rejection of the low-pass filter, tune the spectrum analyzer’s center frequency and span so that the rolloff of the filter comprises the majority of the trace on the display (see Figure 6-37).

![Figure 6-37. Spectrum Analyzer Settings According to the Measurement Requirement](image)

6. Decrease the resolution bandwidth to increase sensitivity, and narrow the video bandwidth to smooth the noise. In Figure 6-38, the resolution bandwidth has been decreased to 10 kHz.
Figure 6-38. Decrease the Resolution Bandwidth to Improve Sensitivity

Adjusting the resolution bandwidth may result in a decrease in amplitude of the signal. This is known as a tracking error. Tracking errors occur when the tracking generator’s output frequency is not exactly matched to the input frequency of the spectrum analyzer (the input to the spectrum analyzer is not at the center of the resolution bandwidth filter). Tracking errors are most notable when using narrow resolution bandwidths. Tracking error can be compensated manually or automatically. In narrow bandwidths, the manual method of adjusting the tracking is usually faster than the automatic tracking adjustment. To compensate for the tracking error manually, press **AUX CTRL**, **TRACK GEN**, **MAN TRK ADJUST**, then use the knob to adjust the trace for the highest amplitude. To compensate for the tracking error automatically, press **AUX CTRL**, **TRACK GEN**, **TRACKING PEAK**.
Figure 6-39. Manual Tracking Adjustment Compensates for Tracking Error

Note
If the automatic tracking routine is activated in a narrow resolution bandwidth, it usually is not necessary to use the tracking adjust again when increasing the resolution bandwidth.

7. To make a transmission measurement accurately, the frequency response of the test system must be known. To measure the frequency response of the test system, connect the cable (but not the DUT) from the tracking generator output to the analyzer input. Press TRACE. TRACE A B C (so B is underlined), CLEAR WRITE B, BLANK B. The frequency response of the test system is now stored in trace B.

8. Normalization eliminates the frequency response error of the test system. When normalization is on, trace math is being performed on the active trace. The trace math performed is trace A minus trace B plus the display line, with the result placed into trace A. Remember that trace A contained the measurement trace, trace B contained the stored calibration trace, and DL represents the normalized reference position. Note that the units of the reference level, dB, reflect this relative measurement.

To normalize, reconnect the DUT to the analyzer. Press TRACE, MORE 1 of 3, NORMALIZE ON OFF until ON is underlined. Press NORMALIZE POSITION to activate the display line. This display line marks the normalized reference position, or the position where 0 dB insertion loss (transmission measurements) or 0 dB return loss (reflection measurements) will normally reside. Using the knob results in a change in the position of the normalized trace, within the range of the graticule.
9. To measure the rejection of the filter at a given frequency, press **MARK** and enter the frequency. For example, enter 350 MHz. The marker readout displays the rejection of the filter at 350 MHz (see Figure 6-41).
When using the tracking generator, the message TG UNLVL may appear. The TG UNLVL message indicates that the tracking generator source power (SRC PWR ON OFF) could not be maintained at the user-selected level during some portion of the sweep. If the unlevel condition exists at the beginning of the sweep, the message will be displayed immediately. If the unlevel condition occurs after the sweep begins, the message will be displayed after the sweep is completed. A momentary unlevel condition may not be detected when the sweep time is small. The message will be cleared after a sweep is completed with no unlevel conditions.

The unlevel condition may be caused by any of the following:

- Start frequency is too low or the stop frequency is too high. The unlevel condition is likely to occur if the true frequency range exceeds the tracking generator frequency specification (especially the low frequency specification). The true frequency range being swept may be significantly different than the start or stop frequency annotations indicate, depending on other settings of the analyzer, especially the span (see Table 1-1). For better frequency accuracy, use a narrower span.

- Tracking peak may be required (use TRACKING PEAK).

- The source power (SRC PWR ON OFF) may be set too high or too low.
Analyzer Functions

What You'll Learn in This Chapter

This chapter describes functions, controls, and connectors of the spectrum analyzer. The front-panel keys and softkey functions are listed alphabetically (except for the service diagnostic functions which are listed after Table 7-1). Use Table 7-1 to find the page number of the function's description. Table 7-1 is divided into the functional blocks of the analyzer:

- Amplitude.
- Control.
- Copy.
- Frequency.
- Instrument state.
- Marker.
- Span.

The controls and connectors are covered at the end of the chapter:

- Data controls.
- Front-panel controls and fine focus control.
- Front-panel and rear-panel connectors.

Note: All analyzer functions are listed in the index at the end of this manual. In addition, all softkeys are shown in the menu diagram inside the rear cover of this manual.
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The service diagnostic functions are designed for service use only. Descriptions of the service diagnostic functions are available in the service documentation. You can order the service documentation, HP 8590B Option 915 or HP 8592B Option 915, through your HP Sales and Service office. The package is described under “Service Documentation for the HP 8590B (Option 915)” or “Service Documentation for the HP 8592B (Option 915)” in Chapter 1 of this manual.

SERVICE DIAG access the following service diagnostic routines:

DISPLAY CAL DATA

DACS

STP GAIN ZERO

AUX A
AUX B (for the HP 8590B only)

2V REF DETECTOR

GND REF DETECTOR

MAIN COIL DR

FM COIL DRIVE

FM SPAN

MAIN SPAN

SWEEP RAMP

SWEEP TIME DAC

COARSE TUNE DAC

BINARY SPAN (HP 8590B only)

YTF SPAN (HP 8592B only)

FINE TUNE DAC

X FINE TUNE DAC

+10V REF DETECTOR

-10V REF DETECTOR

DROOP

YTF TUNE COARSE (HP 8592B only)

YTF TUNE FINE (HP 8592B only)

YTF DRIVER (HP 8592B only)

MIXER BIAS (HP 8592B only)

PRESEL DAC (HP 8592B only)

ALC TEST (HP 8590B with Option 010 or 011 only).
Analyzer Functions

% AM determines the percent of amplitude modulation of a signal with amplitude modulation only. % AM finds the amplitude difference between the two highest peaks on the screen and computes the percent modulation for the calculated dB difference.

0-2.9 GHz BAND 0 is available for HP 8592B only. It locks onto harmonic band 0. Harmonic band 0 uses low-pass filtering instead of bandpass preselection. It has a specified tuning range of 0 to 2.9 GHz.

2.75-6.4 GHz BAND 1 is available for HP 8592B only. It locks onto harmonic band 1. Harmonic band 1 is preselected and has a specified tuning range of 2.75 to 6.4 GHz.

3 dB POINTS automatically places two markers at points 3 dB from the highest point on the highest on-screen signal, and determines the frequency differences between the two markers. Thus, the 3 dB bandwidth of a signal is determined. The amplitude scale must be logarithmic.

3rd ORD MEAS finds the third-order product and measures the frequency and amplitude differences relative to the fundamental signal. Three signals must be on screen. 3rd ORD MEAS performs the following routine: [PEAK SEARCH], MARKER DELTA, NEXT PEAK, NEXT PEAK.

6.0-12.8 GHz BAND 2 is available for HP 8592B only. It locks onto harmonic band 2. Harmonic band 2 is preselected and has a specified tuning range of 6.0 to 12.8 GHz.

6 dB POINTS automatically places two markers at points 6 dB from the highest point on the highest on-screen signal, and determines the frequency differences between the two markers. Thus, the 6 dB bandwidth of a signal is determined. The amplitude scale must be logarithmic.

9 kHz EMI BW allows a 6 dB resolution bandwidth of 9 kHz. This bandwidth is useful when performing electromagnetic interference (EMI) measurements.

12.4-19.1 kHz BAND 3 is available for HP 8592B only. It locks onto harmonic band 3. Harmonic band 3 is preselected and has a specified tuning range of 12.4 to 19.4 GHz.

19.1-22 kHz BAND 4 is available for HP 8592B only. It locks onto harmonic band 4. Harmonic band 4 is preselected and has a specified tuning range of 19.1 to 22 kHz.

99% PWR BW computes the power of all signal responses and returns the bandwidth under which 99% of total power is found.

120 kHz EMI BW allows a 6 dB resolution bandwidth of 120 kHz. This bandwidth is useful when performing electromagnetic interference (EMI) measurements.

A<---B exchanges the contents of the trace A register with the trace B register and puts trace A in view mode.

A - B -> A ON OFF, when ON, subtracts the data in trace B from the measured data in trace A. The resulting trace (trace A) is displayed, the input minus stored data. A minus sign (−) appears between the trace A status and the trace B status in the screen annotation while the function is active.
To deactivate this function, press $A - B \rightarrow A$ ON OFF so that OFF is underlined.

$A - B \rightarrow A$ ON OFF and $B - DL \rightarrow B$ are math functions. Unlike operations on dBm units, math functions operate on measurement units. Measurement units are used to format trace data for data within the graticule limits. The displayed amplitude of each element falls on one of 8000 vertical points with 8000 equal to the reference level. For log scale data, each point is equal to 0.01 dB. The peak of a signal equal to $-10$ dBm, or one division below the reference level, is equal to 7000 measurement units ($8000 - 1000 = 7000$). In linear mode, each point has a resolution of [reference level in volts/8000].

For example, if trace A contains amplitude values of $-10$ dBm and trace B contains amplitude values of $-40$ dBm, the result of the $A - B \rightarrow A$ function would be $-10.004$ dBm if dBm units were used. Since measurement units are used for the $A - B \rightarrow A$ function, the result of $A - B \rightarrow A$ is $-50$ dBm ($-10$ dBm = 7000 measurement units, $-40$ dBm = 4000 measurement units; the result is 3000 measurement units, which is equal to $-50$ dBm).

accesses the softkey menu for selecting screen title characters A through F.

is available with HP 8592B. It allows you to exit the correct to comb routine if you do not wish to add an offset frequency. Pressing ABORT returns you to the (AUX CTRL) menu.

moves trace A into trace C.

is available for HP 8590B with Option 010 or 011 only. Automatic leveling control (ALC) activates internal (INT) leveling or external (XTAL or MTR) leveling. The external leveling input (located on the rear panel of the analyzer) can be used with a power meter or crystal, with positive or negative voltage output. See Table 1-2 for the leveling input characteristics. External leveling increases the amplitude accuracy by improving the effective source match. The meter (MTR) position narrows ALC loop bandwidth so an HP power meter can be used.

is available with Option 003. It saves all the downloadable programs and key definitions in the analyzer memory on the memory card. If the downloadable program was stored using a prefix, the file name for the downloadable program consists of (prefix)_(register number). If no prefix was specified, the data is stored with the file name d_(register number).

activates the reference level function and accesses the amplitude menu. The softkeys accessed by AMPLITUDE change reference level, input attenuation, vertical scale, mixer level, amplitude units, input impedance, and amplitude offset. For the HP 8592B, AMPLITUDE accesses the preselector peaking and preselector default functions also.

saves or recalls amplitude correction factors from analyzer memory or the memory card (if Option 003 is installed). Amplitude correction factors are saved with an “a” before the memory card file name. Screen titles are not recalled with the data. See “Entering Amplitude Correction Factors,” “To Save a Limit-Line Table or Amplitude Correction Factors,” and “To Recall a Limit-Line Table or Amplitude Correction Factors” in Chapter 5 for more
information. Amplitude correction factor memory card files can be catalogued using **CATALOG AMP CORR**.

**AMPTD UNITS**

accesses the softkeys that change the amplitude units. The amplitude units can be changed by pressing dBM, dBV, dBUV, Volts, or Watts.

**ANALYZER ADDRESS**

allows you to change the HP-IB address of the analyzer. The analyzer address is set to 18 by **DEFAULT CONFIG**.

**ANNOTATN ON OFF**

turns the screen annotation on and off. However, softkey annotation will remain on the screen. The annotation may not be required for prints or plots, or during remote operation.

**ATTEN AUTO MAN**

sets the input attenuation from 0 to 60 dB (for the HP 8590B) or 0 to 70 dB (for the HP 8592B), in 10 dB increments. The analyzer input attenuator, which is normally coupled (linked) to the reference level control, reduces the power level of the analyzer input signal at the input mixer. The attenuator is recoupled when AUTO is underlined.

---

**Caution**

To prevent damage to the input mixer, the power level at the input mixer must not exceed +30 dBM. To prevent signal compression, power at the input to the input mixer must be kept below –10 dBM.

---

**Note**

To protect the mixer from possible damage, 0 dB RF attenuation (no input power reduction to the mixer) can be selected only from the number/units keypad.

**AUTO ALL**

couples the following functions: resolution bandwidth, video bandwidth, attenuation, sweep time, center frequency step, video bandwidth, and video-bandwidth/resolution-bandwidth ratio.

**AUTO COUPLE**

accesses the softkey menu of functions that can be coupled. (Coupled functions are functions that are linked: if one function is changed, the other function is changed.)

The functions that can be auto-coupled are listed below:

- Resolution bandwidth couples to span.
- Video bandwidth couples to resolution bandwidth when using the video-bandwidth to resolution-bandwidth ratio with the video bandwidth to resolution bandwidth ratio set to 0.3.
- Sweep time couples to span, resolution bandwidth, and video bandwidth.
- RF attenuation couples to reference level.
- Center frequency step size couples to 10% of span.

During normal operation, the sweep time, resolution bandwidth, and video bandwidth are coupled to yield optimum performance. If any of these functions becomes uncoupled (that is, is manually set), a "#" will appear next to it on the screen.

If one or more function(s) is manually set so that the amplitude or frequency becomes uncalibrated, **MEAS UNCAL** appears on the right side of the graticule.

---

7-12 Analyzer Functions
Recouple a single function by pressing the function label (to activate the function), and pressing the function again so that AUTO is underlined.

**AUTO COUPLE. AUTO ALL** couples all coupled functions listed.

**AUX CONN CONTROL** accesses the softkey menu to control the auxiliary outputs and input. The auxiliary outputs are controlled by CNTL A 0 1, CNTL B 0 1, CNTL C 0 1, and CNTL D 0 1. The status of the auxiliary input (control line 1), can be displayed on the analyzer screen with DISPLAY CNTL 1.

**AUX CTRL** accesses the menu to control the tracking generator (if Option 010 or 011 is installed), the auxiliary connector, and, for the HP 8592B, the comb generator and the correct to comb routine.

**B & W PRINTER** is available for Option 021 or 023 only. It selects a black and white print. Use this function if you have a black and white printer, or if you are using an HP PaintJet printer, but want to have a black and white print. **DEFAULT CONFIG** selects **B & W PRINTER**.

**BAND LOCK** is available for the HP 8592B only. It accesses the harmonic band menu and the band lock function.

Selecting a harmonic band causes the analyzer to lock onto the specified harmonic band and automatically select the settings shown.

### Table 7-2. Center Frequency and Span Settings for Harmonic Bands

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<th>Center Frequency</th>
<th>Span</th>
<th>Description</th>
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<td>0-2.9 GHz BAND 0</td>
<td>1.45 GHz</td>
<td>2.9 GHz</td>
<td>Low-pass filtered, first harmonic mixing.</td>
</tr>
<tr>
<td>2.75-6.4 BAND 1</td>
<td>4.475 GHz</td>
<td>3.6 GHz</td>
<td>Preselected, first harmonic mixing.</td>
</tr>
<tr>
<td>6.0-12.8 BAND 2</td>
<td>9.4 GHz</td>
<td>6.8 GHz</td>
<td>Preselected, second harmonic mixing.</td>
</tr>
<tr>
<td>12.4-19. BAND 3</td>
<td>15.9 GHz</td>
<td>7 GHz</td>
<td>Preselected, third harmonic mixing.</td>
</tr>
<tr>
<td>19.1-22 BAND 4</td>
<td>20.55 GHz</td>
<td>2.9 GHz</td>
<td>Preselected, fourth harmonic mixing.</td>
</tr>
</tbody>
</table>

The band lock function, **BND LOCK ON OFF**, locks the analyzer on a selected frequency band (local oscillator harmonic number). When only one frequency band is being swept the corresponding softkey will be underlined, even if band lock is off.

**Note**

When using the analyzer in a band lock mode, the span is limited to 3.6 GHz in band 0 and 1, and to 7 GHz in bands 2 through 4. To select the maximum span in a given band, use the start frequency, stop frequency, or span function.

**BAUD RATE** is shown if you have an Option 023 (RS-232 interface). This softkey allows you to set the data transmission speed. (Also see “Copy.”) The baud rate is set to 1200 by **DEFAULT CONFIG**.

**B -> C** moves trace B into trace C.

**B <-> C** exchanges trace B and trace C. Trace B is set to the view mode.
B - DL -> B subtracts the display line from trace B and places the result in trace B. B - DL -> B is a math operation. See “A - B -> A ON OFF” for information about math operations.

BLANK A stores the amplitude data for trace A and removes it from the screen. The trace A register will not be updated as the analyzer sweeps.

BLANK B stores the amplitude data for trace B and removes it from the screen. The trace B register will not be updated as the analyzer sweeps.

BLANK C stores the amplitude data for trace C and removes it from the screen. The trace C register will not be updated as the analyzer sweeps.

BLANK CARD is available with Option 003. It deletes all the files from the memory card. Pressing BLANK CARD causes a message to appear on the analyzer screen, IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE DATA. Press BLANK CARD again if you want to delete all files from the memory card.

BND LOCK ON OFF is available for HP 8592B only. BND LOCK ON OFF (ON) locks the analyzer to the lowest frequency band (local oscillator harmonic number) containing the correct center frequency. Start and stop frequencies will be changed if necessary. When the band lock function is off, band(s) will be swept to their highest frequency (when possible), even though the start and stop frequencies allow single band sweeping. Executing a band lock limits the analyzer’s tuning range to the selected harmonic number.

Selecting the softkeys for band 0 through band 4 turns on the band lock function automatically. When band lock is on, the band will be swept to its highest frequency (when possible), even though the start and stop frequencies allow single band sweeping only. If the start frequency is well within a lower band, turning band lock off will result in a multiband sweep. Changing to a multiband sweep removes the underlining of the band. Sweep of a single band is indicated by the underlining of the band.

Note Before changing the frequency range to another harmonic, unlock the band with BND LOCK ON OFF. The harmonic band is unlocked when OFF is underlined.

BW activates the bandwidth function and accesses the softkeys that control the bandwidth functions: RES BW AUTO MAN, VID BW AUTO MAN, VBW/REBW RATIO, VID AVG ON OFF, 9 kHz EMI BW, and 120 kHz EMI BW. (Also see “RES BW AUTO MAN.”)

CAL accesses the softkey menus for the self-calibration, service diagnostics, and service calibration functions. For more information about self-calibrating the analyzer, see “Improving Accuracy with Self-Calibration Routines” in Chapter 5.

CAL AMPTD initiates an amplitude self-calibration routine. Connect CAL OUT to the analyzer input before initiating CAL AMPTD.
<table>
<thead>
<tr>
<th>Note</th>
<th>If <strong>CAL FREQ</strong> and <strong>CAL AMPTD</strong> self-calibration routines are used, the <strong>CAL FREQ</strong> routine should always be performed before the <strong>CAL AMPTD</strong> routine.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAL FETCH</strong></td>
<td>retrieves stored self-calibration correction factors. You can retrieve previously stored correction factors by pressing <strong>CAL FETCH</strong>.</td>
</tr>
<tr>
<td><strong>CAL FREQ</strong></td>
<td>initiates a frequency self-calibration routine. Connect <strong>CAL OUT</strong> to the analyzer input before initiating <strong>CAL FREQ</strong>.</td>
</tr>
<tr>
<td><strong>CAL FREQ &amp; AMPTD</strong></td>
<td>initiates both the frequency and amplitude self-calibration routines. Connect <strong>CAL OUT</strong> to the analyzer input before initiating <strong>CAL FREQ &amp; AMPTD</strong>.</td>
</tr>
<tr>
<td><strong>CAL MXR</strong></td>
<td>is a service function, available for HP 8592B only. Refer to the Service Manual for more information.</td>
</tr>
<tr>
<td><strong>CAL STORE</strong></td>
<td>copies the correction factors from working RAM to a memory area that allows the stored correction factors to be automatically retrieved when the analyzer is turned on. If correction factors are not stored, they will be retained until the analyzer is turned off.</td>
</tr>
<tr>
<td><strong>CAL TRK GEN</strong></td>
<td>is available for the HP 8590B with Option 010 or 011. It performs absolute amplitude, vernier, and tracking peak self-calibration routines. The analyzer should be calibrated with <strong>CAL AMPTD</strong> prior to using <strong>CAL TRK GEN</strong>. Connect the tracking generator output to the analyzer input before initiating <strong>CAL TRK GEN</strong>.</td>
</tr>
<tr>
<td><strong>CAL YTF</strong></td>
<td>is available for the HP 8592B only. <strong>CAL YTF</strong> generates the best slope and offset adjustment for the YIG-tuned preselector filter for each harmonic band. Connect <strong>COMB OUT</strong> to the analyzer input before initiating <strong>CAL YTF</strong>. (The <strong>CAL YTF</strong> function turns on the comb generator.) The frequency self-calibration routine should be performed before running the <strong>CAL YTF</strong> routine. <strong>CAL YTF</strong> should be performed before using <strong>PRESEL DEFAULT</strong>.</td>
</tr>
<tr>
<td><strong>CARD CONFIG</strong></td>
<td>is available with Option 003. It accesses the softkey menu that allows you to catalog, format, and delete data from a memory card.</td>
</tr>
<tr>
<td><strong>CARD -&gt; DLP</strong></td>
<td>is available with Option 003. It recalls a downloadable program (DLP) saved on the memory card into the analyzer memory. To recall program data saved with a prefix, change the current prefix to the prefix the data was saved under before recalling the data. <strong>LOAD FILE</strong> is an alternate way to load program data from the memory card into analyzer memory. See “Saving and Recalling Data from the Memory Card” in Chapter 5 for more information. See also “CHANGE PREFIX.”</td>
</tr>
<tr>
<td><strong>CARD -&gt; STATE</strong></td>
<td>is available with Option 003. It recalls a state saved on the memory card into the analyzer memory. <strong>CARD -&gt; STATE</strong> also displays the time and date when the state data was stored. To recall a state saved with a prefix, change the current prefix to the prefix the state was saved under before recalling the state data. <strong>LOAD FILE</strong> is an alternate way to load state data from the memory card.</td>
</tr>
</tbody>
</table>

**Analyzer Functions 7-15**
card into analyzer memory. See “Saving and Recalling Data from the Memory Card” in Chapter 5 for more information.

CARD

-> TRACE

is available with Option 003. It recalls a trace saved on the memory card into the analyzer memory. Limit lines and amplitude correction factors are recalled by pressing CARD -> TRACE , LIMIT LINES or AMPLITUDE COR FACT. If the screen title does not exceed 34 characters, time and date when the trace data was stored is also displayed. The screen title and date are not recalled with limit-line files or amplitude correction factor files. To recall a trace, limit-line file, or amplitude correction factors file saved with a prefix, change the current prefix to the prefix the data was saved under before recalling the data. LOAD FILE is an alternate way to load trace data (but not recommended for recalling limit-line files or amplitude correction factor files) from the memory card into analyzer memory. If LOAD FILE is used to recall limit-line files or amplitude correction files, the traces are set to the store-blank mode. Use CLEAR WRITE A to view trace A data; use LIMITS ON OFF (ON) to view limit lines. See “Saving and Recalling Data from the Memory Card” in Chapter 5 for more information.

CATALOG

ALL

catalogs all the programs and variables stored in analyzer memory when cataloging analyzer memory. Use CATALOG REGISTER to catalog states, traces, limit-line table(s), and amplitude correction factors saved in analyzer memory. CATALOG ALL catalogs all traces, states, amplitude correction factors, programs, and limit-line tables stored on the memory card (if Option 003 is installed).

CATALOG

AMP CORR

is available with Option 003. It catalogs the amplitude correction factor files on the memory card. Use CATALOG REGISTER to catalog amplitude factors saved in analyzer memory (amplitude correction factors saved in analyzer memory are stored in trace registers). Amplitude correction factors are saved with an “a” before the memory card file name. Amplitude factors can be saved in analyzer memory by loading in amplitude correction factors from a memory card, defining amplitude correction factors using a remote programming command (AMPCOR), or using EXECUTE TITLE. See “Entering Amplitude Correction Factors” in Chapter 5 for more information.

CATALOG

CARD

is available with Option 003. It accesses a menu with the cataloging functions for the memory card: CATALOG ALL , CATALOG STATES , CATALOG TRACES , CATALOG PREFIX , CATALOG DLP , CATALOG AMP CORR , and CATALOG LMT LINE . Each catalog function displays catalog information and accesses LOAD FILE and DELETE FILE . The catalog contains information about the data stored on the memory card. (See Figure 7-1.)

Use the step keys to view different sections of the directory, and the knob to select a file. Use LOAD FILE to load the selected file into analyzer memory. Use DELETE FILE to delete the selected file from the memory card.

Unlike saving to the internal memory, data is saved as a file on the memory card. The files stored on the memory card are in the logical interchange format (LIF).
## Table 7-3. Memory Card Catalog Information

<table>
<thead>
<tr>
<th>Index Number</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Volume Label</td>
<td>A label to identify the memory card. <strong>FORMAT CARD</strong> automatically assigns the volume label &quot;HP859X&quot; to the card.</td>
</tr>
<tr>
<td>2</td>
<td>Number of kilobytes</td>
<td>Displays the size of the memory card. 128 is the number of 256-byte blocks or records. It indicates it is a 32-kilobyte memory card (128 blocks x 256 bytes/block)/1024 bytes/kilobyte.</td>
</tr>
<tr>
<td>3</td>
<td>Data Type</td>
<td>Indicates the type of data—trace, state, downloadable program (DLP), limit line (LIMIT), amplitude factors (AMP). The data type is determined by the letter preceding the filename (t, s, d, l, or a).</td>
</tr>
<tr>
<td>4</td>
<td>Starting Address</td>
<td>Indicates the physical record number of the start of the file.</td>
</tr>
<tr>
<td>5</td>
<td>File Length</td>
<td>Indicates number of records in the file.</td>
</tr>
<tr>
<td>6</td>
<td>Time of Creation</td>
<td>Indicates the time and date of file creation.</td>
</tr>
<tr>
<td>7</td>
<td>File name</td>
<td>The letter preceding the file name indicates the type of data of the file. <strong>t</strong> = trace data, <strong>s</strong> = state data, <strong>d</strong> = program data (downloadable program), <strong>l</strong> = limit line, <strong>a</strong> = amplitude factors. If the data was saved using a prefix, the prefix follows the first character in the file name. An underscore and the register number follow the prefix.</td>
</tr>
</tbody>
</table>
CATALOG DLP catalogs all of the DLPs (downloadable programs) in analyzer memory or, if Option 003 is installed, on the memory card. Downloadable programs can be saved in analyzer memory by loading in a downloadable program from the memory card or defining a function using remote programming commands (FUNCDEF or ACTDEF).

CATALOG INTRNL accesses a menu with the cataloging functions for analyzer memory: CATALOG ALL, CATALOG REGISTER, CATALOG VARIABLS, CATALOG PREFIX, and CATALOG DLP. Each catalog function displays catalog information. The catalog contains information about the data stored in internal memory. See Figure 7-2.

![Figure 7-2. Analyzer Memory Catalog Information](image)

**Table 7-4. Analyzer Memory Catalog Information**

<table>
<thead>
<tr>
<th>Index Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name of the catalog source.</td>
</tr>
<tr>
<td>2</td>
<td>Bytes of analyzer memory used</td>
</tr>
<tr>
<td>3</td>
<td>Bytes of analyzer memory available.</td>
</tr>
<tr>
<td>4</td>
<td>Bytes used by item.</td>
</tr>
<tr>
<td>5</td>
<td>Name of item.</td>
</tr>
</tbody>
</table>

* This table is not applicable when cataloging CATALOG REGISTER

Unlike saving to the memory card, data is saved as an item in analyzer memory.
Use the step keys to view different sections of the directory, and the knob to select a file. The selected file is highlighted in inverse video.

Except for CATALOG REGISTER, each of the catalog functions access the menu with the DELETE FILE function. Use DELETE FILE to delete the item from analyzer memory.

CATALOG REGISTER accesses a menu with the LOAD FILE function. Use LOAD FILE to load a state or trace from analyzer memory. Do not use LOAD FILE to load limit-line table and amplitude correction factor items.

Also see “CATALOG ALL,” “CATALOG VARIABLES.”

CATALOG LMT LINE is available with Option 003. It catalogs the limit-lines on the memory card. Use CATALOG REGISTER to catalog limit-line tables stored in analyzer memory (limit-line tables saved in analyzer memory are stored in trace registers).

CATALOG PREFIX catalogs all of the saved data on the memory card (if Option 003 is installed) or analyzer memory with the specified prefix. The entire prefix does not have to be specified. For example, if you want to catalog all the files beginning with the prefix S, specify S as the prefix and then use CATALOG PREFIX. Prefixed items can be saved in analyzer memory by loading in a downloadable program from the memory card or defining a function using remote programming commands.

CATALOG REGISTER displays the status of state and trace registers in analyzer memory. States 1 through 8 are displayed with the center frequency (denoted by CF) and span (denoted by SP). The status of trace registers 0 to the maximum number of traces is displayed also. If a trace, limit-line table(s), or amplitude correction factors have been saved in the trace register, the screen title (denoted by TL:) is displayed. If the screen title length allows, or if no title is saved with the trace, the time and date are displayed. To load the contents of the state or trace register into analyzer memory, use the knob or step keys to select the register and press LOAD FILE.

Note: Do not use LOAD FILE to load the contents of a trace register containing limit-line tables or amplitude correction factors.

CATALOG STATES is available with Option 003. It catalogs all of the states stored on the memory card.

CATALOG TRACES is available with Option 003. It catalogs all of the traces stored on the memory card.

CATALOG VARIABLES catalogs all of the variables saved in analyzer memory. Variables can be saved in analyzer memory by loading in a downloadable program from the memory card (requires Option 003), or defining a function using remote programming commands (VARDEF or TRDEF).
Note

Variables beginning with an underscore are used by the analyzer firmware. Modifying these is not recommended and may give unexpected results.

CENTER FREQ

changes the center frequency.

CF STEP AUTO MAN

changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is activated, the step keys change center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the analyzer's current frequency span. When auto-coupled, the center frequency step size is set to one graticule (10% of the span).

CHANGE PREFIX

allows you to enter a prefix that can be used for saving and recalling data to and from the memory card (if Option 003 is installed), and for cataloging by the prefix. The prefix can be from one to seven characters long. The longer the prefix, the shorter the register number must be. The total length of the prefix and register number cannot exceed eight characters. The prefix can be any character; however, the underscore should not be the first character of the prefix.

Pressing CHANGE PREFIX accesses a menu containing the letters of the alphabet, the underscore symbol (\_), the number symbol (\#), a space, and the clear function. To select a character, press the softkey that displays the group of characters that contains the desired character. The softkey menu changes to allow you to select an individual character. If you make a mistake, press [BK SP] to space back over the incorrect character. Additional characters are available by pressing YZ_# SPC CLEAR, MORE 1 of 2. Numbers may be selected with the numeric keypad.

A prefix can be cleared with the clear function. Press [CONFIG] or [DISPLAY], CHANGE PREFIX, YZ_# SPC CLEAR, CLEAR to clear the current prefix. The current prefix is set to blank by DEFAULT CONFIG.

CHANGE TITLE

allows you to write a 53-character screen title across the top of the screen. The marker readout may interfere with the last 26 characters. The markers can be turned off by pressing [MKR], MARKERS OFF. CHANGE TITLE accesses the softkey menus which contain the characters and symbols available. The screen title will remain on the screen until CHANGE TITLE is activated again, [RESET] is pressed, the screen title is cleared with the clear function, or a trace that has been saved with a screen title is recalled.

Pressing CHANGE TITLE accesses a menu containing the letters of the alphabet, the underscore symbol (\_), the number symbol (\#), a space, and the clear function. To select a character, press the softkey that displays the group of characters that contains the desired character. The softkey menu changes to allow you to select an individual character. If you make a mistake, press [BK SP] to space back over the incorrect character. Additional characters are available by pressing YZ_# SPC CLEAR, MORE 1 of 2. Numbers may be selected with the numeric keypad.
A screen title can be cleared by using the clear function. Pressing [DISPLAY], CHANGE TITLE, YZ_# SPC CLEAR, CLEAR to clear the current screen title.

RPG TITLE provides additional characters for CHANGE TITLE. RPG TITLE provides lowercase letters, numbers, Greek letters, and punctuation symbols. To access these additional characters, press RPG TITLE. When RPG TITLE is pressed, a character table appears on the screen. To select a character, turn the rotary-pulse generator (RPG) knob to position the cursor under the desired character and press the ENTER key. The step keys move the cursor between rows. When all characters have been entered, press HOLD. All other analyzer functions are inoperative until HOLD is pressed.

CLEAR clears the current screen title or prefix.

CLEAR OFFSET is available for HP 8592B. It clears the frequency offset added by the correct to comb routine. See “CORRECT TO COMB.”

CLEAR WRITE A erases any data previously stored in trace A and continuously displays any signals detected in the frequency range of the analyzer. This function is activated by [PRESET] and power on.

CLEAR WRITE B erases any data previously stored in trace B and continuously displays any signals detected in the frequency range of the analyzer. [PRESET] and power on selects BLANK B.

CLEAR WRITE C erases any data previously stored in trace C and continuously displays any signals detected in the frequency range of the analyzer. [PRESET] and power on selects BLANK C.

Note Using CLEAR WRITE C with trace A or trace B in the clear-write or max hold mode causes trace A or trace B to be blanked. If you want to use trace A or trace B in the clear-write or max hold mode and do not want trace C to blank it, use min hold C or view C only. Using trace A or trace B in the clear-write mode changes trace C to the min hold mode.

CNTL A makes the auxiliary interface control line A output high or low (TTL).
0 1

CNTL B makes the auxiliary interface control line B output high or low (TTL).
0 1

CNTL C makes the auxiliary interface control line C output high or low (TTL).
0 1

CNTL D makes the auxiliary interface control line D output high or low (TTL).
0 1

COMB GEN is available for the HP 8592B only. This function turns the internal comb generator on (when ON is underlined) or off (when OFF is underlined). Connect a cable between 100 MHz COMB OUT and the analyzer input.
ON OFF

CONFIG accesses the softkey menu for printer and plotter configuration, the time and date display functions, changing the current prefix, memory card configuration

Analyzer Functions 7-21
functions (if Option 003 is installed), disposing of user-defined variables and programs from analyzer memory, changing the analyzer address or the baud rate, and displaying the installed option on screen. Pressing [CONFIG] (LOCAL) after the analyzer has been placed in the remote mode places the analyzer in the local mode and enables front-panel control. During remote operation, R appears in the lower-right corner of the screen indicating remote mode. Pressing [CONFIG] removes the R symbol in the lower-right corner.

[CONF TEST]

initiates a variety of tests to check the major functions of the analyzer. It checks that the video bandwidths change, the noise floor level decreases as the resolution bandwidth narrows, the step gains switch, and the 3 dB bandwidths of the resolution bandwidths. [CNF TEST PASS] is displayed if the confidence test passes.

[CONTINUE]

is available with HP 8592B. [CONTINUE] makes the frequency of the marker the frequency offset and exits the correct to comb routine. See “CORRECT TO COMB.”

[COPY]

initiates an output of the screen data, without an external controller, to the graphics printer or plotter specified under [CONFIG], PLOT CONFIG or PRINT CONFIG.

To obtain a print, press [CONFIG]. COPY PRNT PLT (so that PRNT is underlined), PRINT CONFIG. For Option 021, use PRINTER ADDRESS to change the HP-IB address of the printer, if necessary. For Option 023, use BAUD RATE to change the baud rate of the analyzer, if necessary.

If the analyzer is connected to an HP PaintJet printer and you want a color printout, press PAINTJET PRINTER. If the analyzer is connected to an HP PaintJet printer and you want a black and white printout, press B & W Printer.

If you want the softkey labels to be printed with the analyzer display printout, press PRT MENU ON OFF so that ON is underlined.

Press [COPY] and the process will begin. The screen remains frozen (no further sweeps taken) until the data transfer to the printer is complete. The analyzer works with many Hewlett-Packard printers.

The plotting process is similar to the printing process. On the analyzer, press [CONFIG], PLOT CONFIG. For Option 021, use PLOTTER ADDRESS to change the HP-IB address for the plotter, if necessary. For Option 023, use BAUD RATE to change the baud rate of the analyzer, if necessary.

With PLTS/PG 1 2 4, you can choose a full-page, half-page, or quarter-page plot. Press PLTS/PG 1 2 4 to underline the number of plots per page desired. If two or four plots per page are chosen, a function is displayed that allows you to select the location of the plotter output on the paper. If two plots per page are selected, PLT [ ]LOC _ _ function is displayed. If four plots per page are selected PLT [ ]LOC _ _ is displayed. Press the softkey until the rectangular marker is in the desired section of softkey label. The upper and lower sections of the softkey label graphically represent where the plotter output will be located.
For a multipen plotter, the pens of the plotter draw the different components of the screen as follows:

<table>
<thead>
<tr>
<th>Pen Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Draws the annotation and graticule.</td>
</tr>
<tr>
<td>2</td>
<td>Draws trace A.</td>
</tr>
<tr>
<td>3</td>
<td>Draws trace B.</td>
</tr>
<tr>
<td>4</td>
<td>Draws trace C and the display line.</td>
</tr>
<tr>
<td>5</td>
<td>Draws user-generated graphics</td>
</tr>
</tbody>
</table>

Press `PREV MENU`, `COPY DEV PRNT PLT` (PLT should be underlined), and `COPY`.

Printing is usually faster than plotting, but plotting provides higher resolution output. The analyzer works with plotters such as the HP 7440A.

Figure 7-3 shows the rear view of a typical printer/spectrum-analyzer configuration.

![Figure 7-3. Connecting a Printer to the Analyzer](image)

**Note**

Printing and plotting require an optional interface. Generally, spectrum analyzers with HP-IB set the plotter address to 5 and the printer address to 1. Analyzers with RS-232 must have the baud rate set according to the printer or plotter being used. The programming manual that comes with the optional interfaces detail peculiarities of the different interfaces. Refer to the *HP 8590 Series Programming Manual* for more information.

`COPY DEV PRNT PLT` is available for Option 021 or 023 only. `COPY DEV PRNT PLT` changes between a printer and plotter (if you have an Option 021 or 023). For example, if you have been printing and want to do a plot, press `COPY DEV PRNT PLT` to underline PLT before pressing `COPY`.
controls use of some of the correction factors. When ON is underlined, correction factors are used and CORR appears on the display. When OFF is underlined, correction factors are not used. Turning the correction factors off degrades amplitude accuracy.

Note: Correction factors must be on for the analyzer to meet its specified performance.

**CORRECT TO COMB**

is available with HP 8592B. The correct to comb routine increases the frequency accuracy by adding a frequency offset to correct the frequency readout to the comb frequency. **CORRECT TO COMB** accesses a soft key menu with **PEAK SEARCH**, **NEXT PK LEFT**, **NEXT PK RIGHT**, **CLEAR OFFSET**, **ABORT**, and **CONTINUE**. A message, **SET MARKER ON COMB TOOTH THE PRESS 'CONTINUE' SOFTKEY TO CORRECT FREQ OFFSET** is displayed on the analyzer screen. Place the marker on the nearest comb signal and press **CONTINUE** if you want to add a frequency offset, or press **ABORT** if you want to exit the correct to comb routine without adding a frequency offset. The span should be greater than 17 MHz and ≤400 MHz before using the correct to comb routine.

**CRT HORIZ POSITION**

changes the horizontal screen position of the analyzer display. Press **CAL STORE** if you want the analyzer to use this position when power is turned on.

**CRT VERT POSITION**

changes the vertical position of the analyzer's screen. Press **CAL STORE** if you want the analyzer to use this position when power is turned on.

**DATEMODE MDY DMY**

changes the display of the date from a month-day-year format to a day-month-year format. It is set to month-day-year format by **DEFAULT CONFIG**.

**dBm**

changes the amplitude units to dBm for the current setting (log or linear).

**dBmV**

changes the amplitude units to dBmV for the current setting (log or linear).

**dBuV**

changes the amplitude units to dBuV for the current setting (log or linear).

**DEFAULT CAL DATA**

accesses the predetermined correction factors. A special pass code is required for use. See Chapter 8 for more information.

**DEFAULT CONFIG**

resets the analyzer configuration to the state it was in when it was originally shipped from the factory. See Table 7-5 for the default user-configuration values set be **DEFAULT CONFIG**.
### Table 7-5. Default Configuration Values

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyzer address (Option 021)</td>
<td>18</td>
</tr>
<tr>
<td>Copy device</td>
<td>printer</td>
</tr>
<tr>
<td>CRT position (Horizontal and Vertical)</td>
<td>cal store values</td>
</tr>
<tr>
<td>Printer address (Option 021 or 023)</td>
<td>1</td>
</tr>
<tr>
<td>Plotter address (Option 021 or 023)</td>
<td>5</td>
</tr>
<tr>
<td>Baud rate (Option 023)</td>
<td>1200</td>
</tr>
<tr>
<td>External preamp</td>
<td>0 dB</td>
</tr>
<tr>
<td>Save lock (internal states or traces)</td>
<td>Off</td>
</tr>
<tr>
<td>Printer</td>
<td>black and white printer</td>
</tr>
<tr>
<td>Prt menu</td>
<td>on</td>
</tr>
<tr>
<td>Plots per page</td>
<td>1</td>
</tr>
<tr>
<td>Time/date display</td>
<td>on</td>
</tr>
<tr>
<td>Date mode</td>
<td>month-day-year format</td>
</tr>
<tr>
<td>Prefix</td>
<td>(blank)</td>
</tr>
<tr>
<td>Analyzer state</td>
<td>PRESET</td>
</tr>
</tbody>
</table>

### DELETE FILE

The `DELETE FILE` function allows you to delete an item from analyzer memory or a file from the memory card (requires Option 003). `DELETE FILE` is not available for deleting state or trace data from analyzer memory (see `CATALOG REGISTER`). Use the step keys to view different sections of the directory and use the knob to select the file or item to delete. Pressing `DELETE FILE` causes a message to appear on the analyzer screen, **IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE DATA.** Press `DELETE FILE` again if you want to delete the memory item.

### Note

Deleting items from analyzer memory beginning with an underscore is not recommended and may have unexpected results. Items beginning with an underscore are used by the analyzer.

### DELETE SEGMENT

`DELETE SEGMENT` deletes limit-line entry with the segment number highlighted. Press `SELECT SEGMENT` then enter the segment number to select the limit-line entry for deletion.

### DELTA MEAS

`DELTA MEAS` finds and displays the frequency and amplitude differences between the two highest-amplitude signals. `DELTA MEAS` performs the following key sequence: `PEAK SEARCH`, `MARKER DELTA`, `NEXT PEAK`.

### DETECTOR SAMPL PK

`DETECTOR SAMPL PK` selects between sample and peak detection. When sample detection is selected, `SMPL` appears in the upper-left corner of the screen. When peak detection is selected, `PEAK` appears in the upper-left corner of the screen.

In sample mode, the instantaneous signal value at the present display point is placed in memory. Sample detection is activated automatically for noise level markers, during video averaging, and for FFT measurements. Peak detection obtains the maximum video signal between the last display point and the present display point and stores this value in the trace memory address. `PRESET` and power-on select peak detection.
DISPLAY
accesses softkeys that activate the display line and threshold, allow title and
prefix entry, and control the display of the graticule and screen annotation.
DISPLAY
CNTL I
displays the status (high = 1 or low = 0 in TTL) of the auxiliary connector
input (control line 1), on the analyzer screen.
DISPOSE
USER MEM
allows you to dispose of all the user programs and variables in analyzer
memory. Pressing DISPOSE USER MEM causes a message to appear
on the analyzer screen, IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE
DATA. Press DISPOSE USER MEM again if you want to dispose of all the
user-defined programs and variables. If you do not want to dispose of
all the user programs, press a function other than DISPOSE USER MEM.
DISPOSE USER MEM does not dispose of limit-line tables or amplitude
correction factors in analyzer memory.

Note
Use DELETE FILE to delete stored programs or variables from analyzer
memory selectively.

Using DISPOSE USER MEM may change the printer or plotter configuration.
DISPOSE USER MEM sets the printer output B & W PRINTER,
COPY DEV PRNT PLT to PRNT, and PRT MENU ON OFF to on. Use
PRINT CONFIG to change any of these functions.

DSP LINE
ON OFF
activates an adjustable horizontal line that is used as a visual reference line.
The line, which can be used for trace arithmetic, has amplitude values that
correspond to its vertical position when compared to the reference level. The
value of the display line appears in the active function block and on the left
side of the screen. The display line can be adjusted using the step keys, knob,
or numeric keypad. To deactivate the display line, press DSP LINE ON OFF so
that OFF is underlined. (Also see “VIDEO.”)

EDIT
DONE
erases the limit-line table from the analyzer's screen and restores the menu
accessed by LIMIT LINES. Use EDIT DONE when all the limit-line values
have been entered.

EDIT
FLATNESS
allows you to view the flatness data. This is a service calibration function and
is designed for service use only.

EDIT
LIMIT
allows you to edit the current limit-line table(s) by accessing EDIT UPPER,
EDIT LOWER, EDIT UP/LOW, and EDIT MID/DELTA. Use NEW LIMIT to
dispose of the current limit-line table.

EDIT
LOWER
allows you to view or edit the lower limit-line table. Up to 20 entries are
allowed for the lower limit-line table. With the lower limit-line table format,
the coordinates for the lower limit-line are specified (but not for the upper
limit-line). Even if upper limit-line values exist or the values had been entered
as an upper and lower limit-line table, the lower limit-line values are treated
as a separate table from the upper limit-line values. The lower limit-line
entries can have independent frequency and amplitude coordinates from upper
limit-line table entries.
EDIT MID/DELT allows you to view or edit the upper and lower limit-line tables by entering a middle amplitude value and an amplitude deviation. Up to 20 entries are allowed for the upper and lower limit-line tables. Like the upper and lower limit-line table format, the mid/delta limit-line table format provides a means of specifying the upper and lower limit-lines at the same time. Unlike the upper and lower table format, the amplitude values are specified as a middle amplitude value with a delta (the upper and lower limit-lines are drawn an equal positive and negative distance from the middle amplitude). With the mid/delta format, the frequency and the middle amplitude plus the delta comprise the upper limit-line; the frequency and the middle amplitude minus the delta comprise the lower limit-line. The difference between the mid/delta and the upper/lower format is the way the amplitude values are entered; the frequency coordinate begins a segment regardless of the format chosen. The mid/delta format can be used if the upper and lower limit-lines are symmetrical (with respect to the amplitude axis).

EDIT UP/LOW allows you to view or edit the upper and lower limit-line tables. Up to 20 entries are allowed for the upper and lower limit-line tables. With the upper and lower limit-line table format, the upper and lower limit-lines can be entered at the same time. With the upper and lower limit-line format, the frequency, upper amplitude, and lower amplitude are specified. The frequency and upper amplitude comprise the coordinate point for the upper limit-line, the frequency and lower amplitude value comprise the coordinate point for the lower limit-line. It is not necessary to specify both an upper and lower amplitude component for every frequency component.

EDIT UPPER allows you to view or edit the upper limit-line table. Up to 20 entries are allowed for the upper limit-line table. With the upper limit-line table format, the coordinates of the upper limit-line are specified (but not for the lower limit-line). Even if lower limit-line values exist or the values had been entered as an upper and lower limit-line table, the upper limit-line values are treated as a separate table from the lower limit-line values. The upper limit-line entries can have independent frequency and amplitude coordinates from lower limit-line table entries.

EDIT UPR LWR selects upper or lower limit-line tables.

EXECUTE TITLE executes the remote commands that appear in the screen title. See “Entering Amplitude Correction Factors” in Chapter 5 for information about using EXECUTE TITLE to enter amplitude correction factors.

EXIT FLATNESS. EXIT FLATNESS is a service calibration function and is designed for service use only.

EXIT CATALOG returns the analyzer to the state it was in before the current catalog function was invoked.

EXIT SHOW removes the screen annotation left by SHOW OPTIONS.
EXTERNAL activates the trigger condition that allows the next sweep to start when an external voltage (connected to the EXT TRIG INPUT on the rear panel) passes through approximately 1.5 volts, becoming positive. The external trigger signal must be a 0 V to +5 V TTL signal.

EXT PREAMP is similar to REF LVL OFFSET. It adds a positive or negative preamplifier gain value, which is subtracted from the displayed signal. Unlike REF LVL OFFSET, attenuation may be changed depending on the preamplifier gain entered. A preamplifier gain offset is used for measurements that require an external preamplifier or long cables. The offset is subtracted from the amplitude readout so that the displayed signal level represents the signal level at the input of the preamplifier. The preamplifier gain offset is displayed at the top of the screen and is removed by entering zero. The preamplifier gain offset is entered using the numeric keypad.

Press CAL STORE if you want the analyzer to use the current preamplifier gain offset when power is turned on. Preamplifier gain offset is set the zero by DEFAULT CONFIG.

FFT MEAS transforms zero span data into the frequency domain using a fast Fourier transform. After using the FFT function, the display is always in log mode, 10 dB per division and in single sweep triggering. After using the FFT function, the markers are still in FFT mode for use in evaluating the data. The markers must be turned off before attempting to use them in the usual manner. See Chapter 6, "Measuring Amplitude Modulation with the Fast Fourier Transform Function," for more information.

FLAT draws a zero-slope line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values equal in amplitude for all frequencies between the two points. If the amplitude values of the two segments differ, the limit line “steps” to the value of the second segment.

FLATNESS DATA accesses EDIT FLATNESS, which allows you view the flatness and gain correction factors stored in the analyzer's memory. This is a service calibration function and is designed for service use only.

FORMAT CARD is available with Option 003. It formats a card in logical interchange format (LIF). The memory card is formatted with the volume label “HP859X.” Pressing FORMAT CARD causes a message to appear on the analyzer screen, IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE DATA. Press FORMAT CARD again if you want to format the memory card. FORMAT CARD deletes data stored on the memory card.

FREE RUN activates the trigger condition that allows the next sweep to start as soon as possible after the last sweep.

FREQ OFFSET adds an offset value to the frequency readout to account for pre-analyzer frequency conversions. Offset entries are added to all frequency readouts including marker, start frequency, and stop frequency. Entering an offset does not affect the trace. Offsets are not added to the span. Frequency offsets are entered with the numeric keypad.

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When a frequency offset is entered, its value is displayed on the bottom of the screen (as opposed to reference level offsets, which are displayed on the left side of the screen). To eliminate an offset, press FREQ OFFSET, 0 ENTER. [PRESET] also sets the offset to zero.

[FREQUENCY] activates the center frequency or start frequency function and accesses the menu with the frequency functions. The center frequency or start frequency value appears below the graticule on the screen.

Although the spectrum analyzer allows entry of frequencies greater than the specified frequency range, using frequencies greater than the frequency span of the analyzer is not recommended and is not guaranteed to meet specifications.

**Note**

When changing both the center frequency and span, change the frequency first since the span can be limited by the frequency value.

- **FULL SPAN** changes the analyzer span to full span. For the HP 8590B, full span is 0 to 1.8 GHz. For the HP 8592B, full span is 2.75 to 22 GHz. For the HP 8592B, FULL SPAN keeps span within the current harmonic band if harmonic band lock is on.

- **GHIJKL** accesses the softkey menu for selecting screen title or prefix characters G through L.

- **GRAT ON OFF** turns the screen graticule on and off. This is helpful when alternative graphics are drawn on the screen through a remote controller and during plotting, when a graticule is not required.

- **INPUT Z 50 75** sets the input impedance for voltage-to-power conversions. The impedance you select is for computational purposes only, since the actual impedance is set by internal hardware of 50Ω (except for Option 001). The preset value is configurable with a service function. Select the computational input impedance by pressing INPUT Z 50 75, or entering 75 or 50 using the numeric keypad.

- **INTRNL CRD** is available with Option 003. It selects between analyzer memory and the memory card for the save and recall functions.

- **INTRNL -> STATE** recalls the saved analyzer state from the selected state register. Recalling a state from the analyzer memory displays the time and date when the state data was stored. To recall a state, press INTRNL -> STATE, and use the numeric keypad to enter a state register number (valid state register numbers are 1 through 9). State register 9 contains a previous state, state register 0 contains the current state.

- **INTRNL -> TRACE** accesses a softkey menu which allows you to select the trace in which the trace data is to be recalled (trace A, trace B, or trace C), recall the current limit-line tables, or recall amplitude correction factors. When recalling a trace, select the trace in which the trace data is to be recalled, enter the trace register number, and press [ENTER]. When recalling limit-line tables or amplitude correction factors, press LIMIT LINES or AMPLITUDE COR FACT respectively, enter the trace register number, and press [ENTER]. Valid
trace registers numbers are 0 through the maximum register number. The maximum register number is the number displayed after MAX REG # = during a save or recall operation. If a screen title is present, it is recalled with the trace data (but not limit lines or amplitude correction factors). If the screen title does not exceed 34 characters, the time and date when the data was stored will also be displayed.

INVALID SAVEREG is displayed if data has not been stored in the trace register.

LIMIT LINES

When accessed by [MEAS/USER], LIMIT LINES accesses the limit-line menus. When accessed by [SAVE], LIMIT LINES stores the current limit-line table(s) in analyzer memory or on the memory card (if Option 003 is installed). When accessed by [RECALL], LIMIT LINES recalls limit-line table(s) from analyzer memory or the memory card. See “To Save a Limit-Line Table or Amplitude Correction Factors” or “To Recall Limit-Line Tables or Amplitude Correction Factors” in Chapter 5 for more information.

LIMITS FIX REL

allows you to choose fixed or relative type of limit lines. The fixed (FIX) type uses the current limit-line as a reference for fixed frequency and amplitude values when activated. The relative (REL) setting causes the current limit-line value to be relative to the displayed center frequency and reference-level amplitude values. For example, if a limit line is specified as fixed, entering a limit-line segment with a frequency coordinate of 300 MHz displays the limit-line segment at 300 MHz. If the same limit-line table is specified as relative, it is displayed relative to the analyzer’s center frequency and reference level. If the center frequency is at 1.2 GHz, a relative limit-line segment with a frequency coordinate of 300 MHz will display the limit-line segment at 1.5 GHz. If the amplitude component of the relative limit-line segment is −10 dB, then −10 dB is added to the reference level value to obtain the amplitude of the given component (reference level offset included).

RELATIVE is displayed in the limit-line table when the limit-line type is relative; FIXED is displayed when limit-line type is fixed.

A limit line entered as fixed may be changed to relative, and one entered as relative may be changed to fixed. When changing between fixed and relative limit-lines, the frequency and amplitude values in the limit-line table change so that the limit line remains in the same position for the current frequency and amplitude settings of the spectrum analyzer.

LIMITS ON OFF

turns the limit-line testing and the limit lines on or off. When limit-line testing is enabled, every measurement sweep of trace A is compared to the limit lines. If trace A is at or within the bounds of the limit lines, LIMIT PASS is displayed. If trace A is out of the limit-line boundaries, LIMIT FAIL is displayed.

LINE

activates the trigger condition that allows the next sweep to be synchronized with the next cycle of the line voltage.

LOAD FILE

If Option 003 is installed and the memory card is selected, any of the catalog functions (CATALOG ALL, CATALOG STATES, CATALOG TRACES, CATALOG PREFIX, CATALOG DLP, CATALOG AMP CORR, or CATALOG LMT LINE) accesses LOAD FILE. LOAD FILE loads a file from the memory card into analyzer memory. When recalling limit-line files or
amplitude correction factor files, the traces are set to the store-blank mode. Press [TRACE], CLEAR WRITE A to view trace A data. Press [MEAS/USER]. LIMIT LINES, LIMITS ON OFF (ON) to view limit lines. When cataloging analyzer memory with CATALOG REGISTER, LOAD FILE can be used to recall the contents of a state or trace register into analyzer memory. To use LOAD FILE, use the step keys to view sections of the directory, and use the knob to select a file for the load file function. Trace data is loaded into trace B. See "CATALOG CARD" and "CATALOG REGISTER."

**Note**

Use of LOAD FILE is not recommended for recalling limit-line tables or amplitude correction factors stored in analyzer memory.

(LOCAL) Pressing [CONFIG] (LOCAL) after the analyzer has been placed in the remote mode places the analyzer in the local mode and enables front-panel control. During remote operation, R appears in the lower-right corner of the screen indicating remote and talk. A T or L may appear during remote operation, indicating talk or listen. Pressing the [CONFIG] key removes the R symbol in the lower-right corner.

**MAN TRK**

allows the user to adjust the frequency of the tracking-generator oscillator manually using the step keys or knob. The tracking adjust is tuned to maximize the amplitude of the trace.

Tracking error occurs when the output frequency of the tracking generator is not exactly matched to the input frequency of the spectrum analyzer. The resulting mixing product from the spectrum analyzer input mixer is not at the center of the IF bandwidth. Any tracking errors may be compensated for through manual adjustments of the tracking generator's oscillator, or through an automatic tracking routine, TRACKING PEAK.

**MARKER AMPTD**

keeps the active marker at the requested amplitude on the screen. Once activated, the marker remains at the amplitude selected by the step keys, knob, or numeric keypad, even as the signal frequency is changed. The marker will be placed at the leftmost signal at that amplitude. If no signal exists at that amplitude it will be placed above the highest signal amplitude (or below the lowest trace element if it is below all trace elements). When a marker delta is active in addition to marker amplitude, the behavior of the active marker is useful for measuring signal bandwidths. For example, place a marker 20 dB below the peak of a signal, press MARKER DELTA, MARKER AMPTD. The marker readout shows the 20 dB bandwidth.

**MARKER**

changes the analyzer settings so that the frequency at the marker becomes the center frequency.

**MARKER**

-> CF assigns the frequency value of the active marker to the center frequency step size. Press [FREQUENCY], CF STEP AUTO MAN to view the step size. If marker delta is active, the step size will be set to the frequency difference between the markers.
MARKER DELTA activates a second marker at the position of the first marker. (If no marker is present, two markers appear at the center of the display.) The amplitude and frequency of the first marker is fixed, and the second marker is under your control. Annotation in the active function block and in the upper-right corner of the screen indicates the frequency and amplitude differences between the two markers.

Note: If there are already two markers when MARKER DELTA is pressed, the nonactive marker disappears, the active marker becomes a reference marker, and the delta marker becomes the active marker.

MARKER NORMAL activates a single frequency marker at the center frequency on the active trace if there is no on-screen marker. If there is an on-screen marker before the MARKER NORMAL function is enabled, a frequency marker is enabled at the position of the first marker. Use the data controls to position the marker. Annotation in the active function block and in the upper-right corner indicates the frequency and amplitude of the marker. The marker stays on the trace at the horizontal screen position where it was left unless SIGNAL TRACK, MARKER AMPTD, or a “marker to” function (MARKER -> CF, MARKER -> REF LVL, MARKER -> CF STEP, MKR Δ -> SPAN, or MINIMUM -> MARKER) is engaged. MARKER NORMAL turns off MARKER DELTA.

MARKER -> REF LVL changes the analyzer settings so that the amplitude at the active marker becomes the reference level.

MARKERS OFF turns off all markers, including signal track. Marker annotation is removed.

MAX HOLD A updates each trace point of trace A with the maximum level detected at each point during successive sweeps.

MAX HOLD B updates each trace point of trace B with the maximum level detected at each point during successive sweeps.

MAX MXR LEVEL lets you change the maximum input mixer level in 10 dB steps from –10 dBm to –100 dBm. The mixer level is equal to the reference level minus the attenuator setting. As the reference level changes, the input attenuator setting is changed to keep the power levels less than the selected level at the input mixer. (PRES) resets the maximum input mixer level to –10 dBm.

MEAS/USER switches between the menu containing USER MENU(S), FFT MEAS, 3DB POINTS, 6 DB POINTS, LIMIT LINES, MORE 1 of 2 and the user menu. If no keys have been defined in the user menu, NO USER MENU is displayed. See HP 8590 Series Spectrum Analyzer Programming Manual for more information about defining keys in the user menu.

MIN HOLD C updates each trace point of trace C with the minimum level detected at each point during successive sweeps.

MINIMUM -> MARKER moves the active marker to the minimum detected amplitude value.
MKNOISE
ON OFF
reads out the average noise level referenced to a 1 Hz noise power bandwidth at the marker position. If no marker is present, a marker appears at the center of the screen. The root-mean-square noise level, normalized to a 1 Hz noise power bandwidth, is read out. The sample detector is activated.

MKPAUSE
ON OFF
stops the analyzer sweep at the marker position for the duration of the dwell time.

The dwell time can be set from 2 milliseconds to 100 seconds.

MKR
accesses the marker functions. Markers are diamond-shaped characters that identify points of traces and allow the traces to be manipulated and controlled on the screen. During manual operation, two markers may appear on the display simultaneously; only one can be controlled at a time. The marker that is controlled is called the “active” marker. \textit{MKR} activates the \textbf{MARKER NORMAL} function.

MKR ->
(read “marker to”) calls up the softkeys for the transfer of marker information directly into other functions.

MKR \Delta
-> SPAN
sets the start and stop frequencies to the values of the delta markers. The start and stop frequencies will not be set if the delta marker is off.

MNOPQR
accesses the softkey menu for selecting screen title or prefix characters M through R.

MODE
changes the softkey menus for the \textbf{SPECTRUM ANALYZER} and other modes of operation with the \textbf{PRESET SPECTRUM} function. Consult the documentation accompanying the HP 85711A Cable Television Measurements Card, the HP 85712A EMI Diagnostics Measurements Card, or the HP 85713A Digital Radio Measurements Card for information about these other modes of operation.

NEW LIMIT
clears the limit-line table. Pressing \textit{NEW LIMIT} causes the message to be displayed \textbf{IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE DATA}. Press \textit{NEW LIMIT} again to clear the limit-line table. Use \textit{SAVE LIMIT} to save the limit-line table, then use \textit{NEW LIMIT} to clear the limit-line table.

NEXT PEAK
places the marker on the next highest peak. The signal peak must exceed the threshold value. (Also see “PEAK EXCURSN” and “THRESHLD ON OFF.”)

NEXT PK LEFT
moves the marker to the next peak to the left of the current marker. The signal peak must exceed the threshold value. If there is no peak to the left, the marker will not move. (Also see “PEAK EXCURSN” and “THRESHLD ON OFF.”)

NEXT PK RIGHT
moves the marker to the next peak to the right of the current marker. The signal peak must exceed the threshold value. If there is no peak to the right, the marker will not move. (Also see “PEAK EXCURSN” and “THRESHLD ON OFF.”)
| **NORMALIZE** |
| **ON OFF** |
| subtracts trace B from trace A and adds the result to the display line. The result is displayed in trace A. The trace data is normalized with respect to the display line even if the value of the display line is changed. This function is executed on all subsequent sweeps until it is turned off. A minus sign (−) appears between the trace A status and the trace B status in the screen annotation while the function is active. To deactivate **NORMALIZE ON OFF**, press **NORMALIZE ON OFF** so that **OFF** is underlined. |

**NORMALIZE ON OFF** is useful for applying correction data to a trace. For example, store a measurement sweep of the response of a system in trace B. Trace A can be used to measure the response of the system after a device is added. Use **NORMALIZE ON OFF** to subtract the system response from the response with the device under test in order to characterize the response of a device under test.

| **NORMALIZE POSITION** |
| displays the display line and makes the display line function active. The trace data is normalized with respect to the display line even if the value of the display line is changed. |

| **NO USER MENU(S)** |
| is displayed if key number 1 has not been defined by the user. Key number 1 can be defined by remote programming commands (KEYCMD or KEYDEF). |

| **PAINTJET PRINTER** |
| is available for Option 021 or 023 only. **PAINTJET PRINTER** allows a printer output to an HP PaintJet printer. The traces are displayed in orange (trace A), blue (trace B), and red (trace C). The graticule, annotation, and user information are displayed in black. |

| **PEAK EXCURSN** |
| sets the minimum amplitude variation of signals that the marker can identify as a peak. If a value of 10 dB is selected, the marker moves only to peaks that rise and fall more than 10 dB above the threshold line (or the noise floor of the display). Pushing **RESET** or turning on power resets the excursion to 6 dB, and the threshold to 70 dB below the reference level. |

**Note**

When a peak has a lump on its skirt that is peak excursion above the threshold, it is considered a peak in its own right only if it has a peak excursion drop on both sides. Two peaks that are so close that only a valley divides them are not differentiated if the valley is not peak-excursion deep.

When the peak excursion value is less than 6 dB, the marker-peaking functions may not recognize signals less than 6 dB above the noise floor. To correct this, when measuring signals near the noise floor, the excursion value can be reduced even further. To prevent the marker from identifying noise as signals, reduce the noise floor variance to a value less than the peak excursion by reducing the video bandwidth or using video averaging.

| **PEAK MENU** |
| accesses the softkeys under **PEAK SEARCH** (see "PEAK SEARCH"). Pressing **PEAK MENU** instead of **PEAK SEARCH** lets you use the peak search functions without initiating a new peak search. |
automatically places a marker on the highest amplitude of a trace, displays the marker's amplitude and frequency. (PEAK SEARCH) accesses MARKER \( \rightarrow \) CF, MARKER DELTA, NEXT PEAK, NEXT PK RIGHT, NEXT PK LEFT, and PEAK EXCURSN.

PK-PK MEAS finds and displays the frequency and amplitude differences between the highest and lowest signals. PK-PK MEAS performs the following routine: (PEAK SEARCH), MARKER DELTA, and then moves the second marker to the lowest detected signal.

PLOT CONFIG is available for Option 021 or 023 only. PLOT CONFIG accesses the menu to address the plotter and select from plotter options. (Option 021 or 023 only.)

PLOTTER ADDRESS is available for Option 021 only. PLOTTER ADDRESS changes the HP-IB address of the plotter. The plotter address is set to 5 by DEFAULT CONFIG.

PLT LOC selects the position of the plotter output. The highlighted portion of the softkey label indicates where the plot is to be output on the page. This function appears only if two or four plots per page are selected using PLTS/PG 1 2 4.

PLTS/PG 1 2 4 is available for Option 021 or 023 only. PLTS/PG 1 2 4 allows you to plot a full-page, half-page, or quarter-page. Selecting two plots per page requires a plotter that has the rotate command (RO). It will be set to a full-page output by DEFAULT CONFIG.

POINT specifies a limit value for the coordinate point, and no other frequency points, so that a POINT segment specifies a limit value for a single frequency. For an upper limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the top of screen. For a lower limit-line, a POINT segment is indicated by a line drawn from the coordinate point, vertically off the bottom of screen. The POINT segment type is generally used as the last segment in the limit-line table. However, if the last segment in the table is not of the POINT segment type, an implicit point is automatically added at the right-hand side of the screen. If a visible POINT segment at the right-hand edge of the display is not desired, add an explicit last point segment to the limit-line table that is higher in frequency than the stop frequency.

PRESEL DEFAULT is available for HP 8592B only. It enables default preselector data for bands 1 through 4 to allow maximum frequency response without peaking the preselector.

To meet the response specifications of Table 1-3, the CAL YTF routine should be performed before using PRESEL DEFAULT.

PRESEL PEAK is available for HP 8592B only. It optimally centers the preselector on a given signal for the most accurate measurement of amplitude. The maximum response found for the frequency at the marker determines the future adjustment values provided to the preselector.
provides a convenient starting point for making most measurements. Pressing (Preset) displays the operating modes available for your analyzer as softkey functions. (See "Modes" for more information.) See Table 7-6 for the conditions established by pressing (Preset).

The (Preset) key performs a processor test, but does not affect CAL data. (Preset) clears both the input and output buffers, but does not clear trace B. The amplitude values of trace C are set to the reference level. Amplitude correction factors are turned off. Limit-line testing is turned off, but the limit-line tables remain in analyzer memory. The status byte is set to 0. (Preset) affects all operating modes. (See "Modes" for more information about other operating modes.)

(Preset) erases all "on time" functions—ONCYCLE, ONDELAY, ONEOS, ONMKR, ONSRQ, ONSWP, ONTIME, and TRMATH. These are remote programming commands. See HP 8590 Series Spectrum Analyzer Programming Manual for more information.

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**Note**

Turning the analyzer on performs an instrument preset. In addition to performing an instrument preset, turning on the analyzer fetches (CAL) data, completes a processor test; clears trace B, trace C, and both the input and output buffers; turns off amplitude correction factors; turns off limit-line testing; and sets the status byte to 0. The last state of the analyzer (before it was switched off) is recalled, unless POWERON IP has been executed. See "Changing the Analyzer’s Power-On State" in Chapter 5 for more information.

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**Table 7-6. Preset Conditions**

<table>
<thead>
<tr>
<th>Preset Condition</th>
<th>HP 8590B</th>
<th>HP 8592B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A → B → A</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Amplitude correction factors</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Amplitude units</td>
<td>default values</td>
<td>default values</td>
</tr>
<tr>
<td>Annotation and graticule</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>Attenuation</td>
<td>10 dB (auto-coupled)</td>
<td>10 dB (auto-coupled)</td>
</tr>
<tr>
<td>Center frequency</td>
<td>900 MHz</td>
<td>12.38 MHz</td>
</tr>
<tr>
<td>CF step size</td>
<td>10% of span</td>
<td>10% of span</td>
</tr>
<tr>
<td>Coupled functions</td>
<td>all set to AUTO</td>
<td>all set to AUTO</td>
</tr>
<tr>
<td>CRD INTRNL</td>
<td>INTRNL</td>
<td>INTRNL</td>
</tr>
<tr>
<td>Detector</td>
<td>positive peak</td>
<td>positive peak</td>
</tr>
<tr>
<td>Display line level</td>
<td>2.5 graticule divisions below reference level, display off</td>
<td>2.5 graticule divisions below reference level, display off</td>
</tr>
<tr>
<td>Frequency offset</td>
<td>0 Hz</td>
<td>0 Hz</td>
</tr>
<tr>
<td>Limit-line testing</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Log scale</td>
<td>10 dB/division</td>
<td>10 dB/division</td>
</tr>
<tr>
<td>Markers</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Mixer level</td>
<td>−10 dBm</td>
<td>−10 dBm</td>
</tr>
<tr>
<td>Preset Condition</td>
<td>HP 8590B</td>
<td>HP 8592B</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Operating mode</td>
<td>spectrum analyzer</td>
<td>spectrum analyzer</td>
</tr>
<tr>
<td>Preselector peak</td>
<td>reset</td>
<td>reset</td>
</tr>
<tr>
<td>Reference level</td>
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<td>0 dBm</td>
</tr>
<tr>
<td>Reference level offset</td>
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<td>0</td>
</tr>
<tr>
<td>Resolution bandwidth</td>
<td>3 MHz (auto-coupled)</td>
<td>3 MHz (auto-coupled)</td>
</tr>
<tr>
<td>Span</td>
<td>1.8 GHz</td>
<td>19.25 GHz</td>
</tr>
<tr>
<td>SRQ mask</td>
<td>octal 50</td>
<td>octal 50</td>
</tr>
<tr>
<td>Start frequency</td>
<td>0 Hz</td>
<td>2.75 GHz</td>
</tr>
<tr>
<td>Stop frequency</td>
<td>1.8 GHz</td>
<td>22 GHz</td>
</tr>
<tr>
<td>State registers 1—8</td>
<td>unaffected</td>
<td>unaffected</td>
</tr>
<tr>
<td>Sweep</td>
<td>continuous</td>
<td>continuous</td>
</tr>
<tr>
<td>Sweep time</td>
<td>20 ms (auto-coupled)</td>
<td>385 ms, full span (auto-coupled)</td>
</tr>
<tr>
<td>Threshold level</td>
<td>one graticule above baseline, display off</td>
<td>one graticule above baseline, display off</td>
</tr>
<tr>
<td>Title</td>
<td>cleared</td>
<td>cleared</td>
</tr>
<tr>
<td>Trace A</td>
<td>clear-write</td>
<td>clear-write</td>
</tr>
<tr>
<td>Trace B</td>
<td>store-blank</td>
<td>store-blank</td>
</tr>
<tr>
<td>Trace C</td>
<td>store-blank, at reference level</td>
<td>store-blank, at reference level</td>
</tr>
<tr>
<td>Trace registers</td>
<td>unaffected</td>
<td>unaffected</td>
</tr>
<tr>
<td>Tracking generator (Option 010 or 011 only)</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Trigger</td>
<td>free run</td>
<td>free run</td>
</tr>
<tr>
<td>VBR/RBW ratio</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Video averaging</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Video bandwidth</td>
<td>1 MHz (auto-coupled)</td>
<td>1 MHz (auto-coupled)</td>
</tr>
</tbody>
</table>

**PRESET SPECTRUM** allows the spectrum analyzer mode only to be preset; it will not affect the other operating modes. **PRESET SPECTRUM** performs a subset of the following **PRESET** functions:

<table>
<thead>
<tr>
<th>Preset Spectrum Condition</th>
<th>HP 8590B</th>
<th>HP 8592B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A — B -&gt; A</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Annotation and graticule</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>Center frequency</td>
<td>900 MHz</td>
<td>12.38 MHz</td>
</tr>
<tr>
<td>Coupled functions</td>
<td>all set to AUTO</td>
<td>all set to AUTO</td>
</tr>
<tr>
<td>Detector</td>
<td>positive peak</td>
<td>positive peak</td>
</tr>
<tr>
<td>Display line</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Limit-line testing</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Log scale</td>
<td>10 dB/div</td>
<td>10 dB/div</td>
</tr>
</tbody>
</table>
Table 7-7. Preset Spectrum Conditions (continued)

<table>
<thead>
<tr>
<th>Preset Spectrum Condition</th>
<th>HP 8590B</th>
<th>HP 8592B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markers</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Reference level</td>
<td>0 dBm</td>
<td>0 dBm</td>
</tr>
<tr>
<td>Resolution bandwidth</td>
<td>3 MHz</td>
<td>3 MHz</td>
</tr>
<tr>
<td>Span</td>
<td>1.8 GHz</td>
<td>19.25 GHz</td>
</tr>
<tr>
<td>Start frequency</td>
<td>0 Hz</td>
<td>2.75 GHz</td>
</tr>
<tr>
<td>Stop frequency</td>
<td>1.8 GHz</td>
<td>22 GHz</td>
</tr>
<tr>
<td>State registers 1 to 8</td>
<td>unaffected</td>
<td>unaffected</td>
</tr>
<tr>
<td>Sweep</td>
<td>continuous</td>
<td>continuous</td>
</tr>
<tr>
<td>Sweep time</td>
<td>20 ms</td>
<td>385 ms, full span</td>
</tr>
<tr>
<td>Threshold</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Trace A</td>
<td>clear-write</td>
<td>clear write</td>
</tr>
<tr>
<td>Trace B</td>
<td>store-blank</td>
<td>store-blank</td>
</tr>
<tr>
<td>Trace C</td>
<td>store-blank</td>
<td>store-blank</td>
</tr>
<tr>
<td>Trace registers</td>
<td>unaffected</td>
<td>unaffected</td>
</tr>
<tr>
<td>Trigger</td>
<td>free</td>
<td>free</td>
</tr>
<tr>
<td>Video averaging</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Video bandwidth</td>
<td>1 MHz</td>
<td>1 MHz</td>
</tr>
</tbody>
</table>

In addition, **Preset Spectrum** erases user-generated graphics and blanks the active function block on the analyzer screen. If the analyzer is an HP 8592B, the harmonic band lock is turned off.

**Preset Spectrum** erases ONEOS, ONSWP, and TRMATH. These are remote programming commands; see *HP 8590 Series Spectrum Analyzer Programming Manual* for more information.

**PRINT CONFIG**

is available for Option 021 or 023 only. It accesses the softkey functions that address the printer, select from a black and white print or a color print (a color print requires an HP PaintJet printer), and reset the printer. (Option 021 or 023 only.)

**PRINTER ADDRESS**

is available for Option 021 only. **PRINTER ADDRESS** allows you to change the HP-IB address of the printer. The printer address is set to 1 by **DEFAULT CONFIG**.

**PRINTER SETUP**

is available for Option 021 or 023 only. **PRINTER SETUP** resets the printer, sets the printer to 60 lines per page, and skips line perforations. **PRINTER SETUP** enables you to obtain up to three printouts per page. The printer paper should be at the top of the form before using this function. This function may not work with printers that are not recommended (see “Accessories” in Chapter 1 for recommended printers).
is available for Option 021 or 023 only. PRT MENU ON OFF allows you to print the softkey labels along with the analyzer display when using COPY in a print configuration. PRT MENU ON OFF is set to on with DEFAULT CONFIG.

PURGE LIMITS clears the limit-line table. Pressing PURGE LIMITS causes the message to be displayed IF YOU ARE SURE, PRESS KEY AGAIN TO PURGE DATA. Press PURGE LIMITS again if you wish to clear the current limit-line table. Use SAVE LIMIT if you wish to save the current limit-line table, and then use NEW LIMIT or PURGE LIMITS to clear the current limit-line table.

PWR SWP ON OFF activates (ON) or deactivates (OFF) the power-sweep function, where the output power of the tracking generator is swept over the power-sweep range chosen. The value of the power-sweep range is displayed in the active function block when PWR SWP ON OFF is turned on.

The output power of the tracking generator is swept according to the sweep rate of the spectrum analyzer. The output power is always swept from the source power setting to a higher power setting (negative source power sweep values are not allowed). Refer to Table 1-2 for more information regarding source power.

Power-sweep measurements are particularly useful in making gain compression or output power versus frequency measurements.

RECALL accesses softkey menus that allow you to recall data from the memory card (if Option 003 is installed) or analyzer memory. When INTRNL is selected, states, traces, limit-line tables, amplitude correction factor can be recalled from analyzer memory. When CRD is selected, states, traces, limit-line tables, and amplitude correction factors, and downloadable programs can be recalled from the memory card (if Option 003 is installed).

In addition, RECALL accesses the cataloging functions to catalog the saved data in analyzer memory or the memory card.

RECALL LIMIT recalls limit-line table(s) from the current mass storage device (analyzer memory or, if Option 003 is installed, the memory card).

To verify the current mass storage device, press RECALL LIMIT. If MAX REG # appears on the analyzer display, the current mass storage device is analyzer memory. If PREFIX= is displayed, the memory card is the mass storage device. Press SAVE or RECALL, INTRNL CRD to change the current mass storage device. To recall a limit line, enter the register number the limit-line table(s) was saved under, then press ENTER. When recalling a limit line from the memory card, it may be necessary the change the current prefix to the prefix with which the limit line was stored. Use CHANGE PREFIX to change the current prefix. When saved in analyzer memory, the register number is restricted to 0 and the number indicated by MAX REG # =. The screen title is not recalled with the limit-line tables.
The upper limit-line is stored in trace B and the lower limit-line is stored in trace C. When saving or recalling limit lines, both the upper and lower limit-lines are saved or recalled, regardless of the status of trace B and trace C.

**Note**

REF LVL is activated when [AMPLITUDE] is pressed. The reference level is the amplitude power or voltage represented by the top graticule line on the screen. Changing the value of the reference level changes the absolute amplitude level (in dBm) of the top graticule line.

REF LVL OFFSET adds an offset value to the displayed reference level. Offsets are entered with the number/units keypad. Entering an offset does not affect the trace or the attenuation value. Reference level offsets are used when gain or loss occurs between a device under test and the spectrum analyzer input. Thus, the signal level measured by the analyzer is the level at the input of an external amplitude conversion device. When an amplitude offset is entered, its value is displayed on the left side of the screen (as opposed to frequency offsets which are displayed at the bottom of the screen). To eliminate an offset, press REF LVL OFFSET, 0 [–dBm] or [+dBm] [PRESET] also sets the offset to zero. Reference level offsets are entered using the numeric keypad. See also “PREAMP GAIN.”

RES BW AUTO MAN changes the analyzer’s 3 dB IF bandwidth to 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3 MHz, or 5 MHz. As the RES BW is decreased, the sweep time is increased to maintain amplitude calibration. To indicate that it is not coupled, a “#” mark appears next to RES BW on the screen. To recouple the RES BW, press RES BW AUTO MAN so that AUTO is underlined. The resolution bandwidth can be changed using the step keys, the knob, or the numeric keypad.

RPG TITLE provides additional characters for CHANGE TITLE. RPG TITLE provides lowercase letters, numbers, Greek letters, and punctuation symbols. To access these additional characters, press RPG TITLE. When RPG TITLE is pressed, a character table appears on the screen. To select a character, turn the rotary-pulse generator (RPG) knob to position the cursor under the desired character and press the [ENTER] key. The step keys move the cursor between rows. When all characters have been entered, press [HOLD]. All other analyzer functions are inoperative until [HOLD] is pressed.

SAVE accesses softkey menus that allow you to store state data, trace data, limit-line tables, and amplitude correction factors in analyzer memory; state data, trace data, limit-line tables, amplitude correction factors, and program data are saved on the memory card if Option 003 is installed. In addition, SAVE accesses the softkey menus to catalog the saved data in the analyzer memory or the memory card. To select saving or cataloging analyzer memory, press INTRNL CRD so that INTRNL is underlined. To save to or catalog from the memory card, press INTRNL CRD so that CRD is underlined.

7-40 Analyzer Functions
Saving state data saves the analyzer settings (but not the trace data). Saving trace data saves the trace data and the state data. Programs (also called downloadable programs or DLPs), can only be saved to or recalled from the memory card.

States and traces are saved in analyzer memory even if the instrument is turned off or [Preset] is pressed. Eight analyzer memory state registers and many trace registers are available for the user.

**SAVE LIMIT**

saves the current limit-line table(s) in the current mass storage device (analyzer memory or, if Option 003 is installed, the memory card). To verify the current mass storage device, press **SAVE LIMIT**. If **MAX REG #** appears on the analyzer display, the current mass storage device is analyzer memory. If **PREFIX=** is displayed, the memory card is the mass storage device. Press [SAVE] or [RECALL], INTRNL CRD to change the current mass storage device. Press **SAVE LIMIT**, enter a register number, then press [ENTER] to save the current limit-line table in analyzer memory or on the memory card. When saved on the memory card, limit-line tables are stored with "L", the prefix, and the register number entered. When saved in analyzer memory, the register number is saved in a trace register. Trace register values are restricted to 0 and the number indicated by **MAX REG # =**.

**Note**

The upper limit-line is stored in trace B and the lower limit-line is stored in trace C. When saving or recalling limit lines, both the upper and lower limit-lines are saved or recalled, regardless of the status of trace B and trace C.

**SAV LOCK ON OFF**

locks all the current internal state and trace registers against further data storage, when ON is underlined. With the state and trace memory locked, STATE -> INTRNL, and TRACE -> INTRNL functions are no longer accessible; **MEM LOCKED** is displayed instead. **SAV LOCK ON OFF** is set to off by [DEFAULT CONFIG] and [Preset].

**SCALE LOG LIN**

scales the vertical graticule divisions in logarithmic units when LOG is underlined. When **SCALE LOG LIN** is the active function, the logarithmic units per division can be changed. Values may range from 1 to 20 dB per division. When LIN is underlined, the vertical scale is in linear mode. The reference level value is set to the top of the screen and the bottom graticule becomes zero volts. (Each division of the graticule is one-eighth of the reference level in volts.)

Pressing **SCALE LOG LIN** always sets the units specified for the current amplitude scale. Pressing [Preset] or powering on the analyzer sets the default units.
SELECT AMPLITUDE allows you to enter the amplitude value for the displayed (upper or lower) limit-line segment. Enter the amplitude value for the frequency using the knob or data keys of the analyzer. Use [BK SP] to correct errors.

SELECT DLT AMPL allows you to enter the delta amplitude value. The middle amplitude value and the delta amplitude value create an upper and lower limit-line segment. Enter the delta amplitude value for the frequency using the knob or data keys of the analyzer. Use [BK SP] to correct errors. The default value is 0.

SELECT FREQ allows you to enter the frequency value for a limit-line segment. Enter the frequency value for the frequency using the knob or data keys of the analyzer. Use [BK SP] to correct errors. Regardless of the table format, a frequency coordinate must be specified.

Note There can be only one entry per frequency. Entering two segments with the same frequency in the same limit-line table is not allowed.

Limit-line data is sorted in frequency order in the limit-line table. The sorting occurs after you have entered the frequency and at least one amplitude value.

SELECT LWR AMPL allows you to enter the amplitude value for the lower limit-line segment. Enter the amplitude value for the frequency using the knob or data keys of the analyzer. Use [BK SP] to correct errors.

SELECT MID AMPL allows you to enter the middle amplitude value. The middle amplitude value and the delta amplitude value create upper and lower limit-line segments. Enter the amplitude value for the frequency using the knob or data keys of the analyzer. Use [BK SP] to correct errors.

SELECT SEGMENT allows you to create or edit a limit-line segment. Limit lines are created by entering frequency and amplitude values into a limit-line table. The frequency and amplitude values specify a coordinate point from which a limit-line segment is drawn. The coordinate point is the lowest frequency point of the line segment. Limit lines are constructed from left to right. To select a segment, press SELECT SEGMENT, the segment number you wish to specify, then a units key.

Up to 20 segments can be specified per limit-line table.

SELECT TYPE accesses the softkey menu to select the type of line—a flat line ([FLAT]), a sloped line ([SLOPE]), or a point ([POINT]).

SELECT UPR AMPL allows you to enter the amplitude value for the upper limit-line segment. Enter the amplitude value for the frequency using the knob or data keys of the analyzer. Use [BK SP] to correct errors.
SERVICECAL

accesses several service calibration functions. The service calibration functions are designed for service use only. Descriptions of the service functions are available in the service documentation. You can order the service documentation, HP 8590B Option 915 or HP 8592B Option 915, through your HP Sales and Service office. The package is described under “Service Documentation for the HP 8590B (Option 915)” or “Service Documentation for the HP 8592B (Option 915)” in Chapter 1 of this manual.

SET ATTN ERROR

sets the calibration attenuator error factors (this is not the same as the input attenuator). This is a service calibration function and designed for service use only.

SET DATE

sets the date of the real-time clock. Enter the date in the YYMMDD format using the number keypad and press ENTER. Valid year (YY) values are 00 through 99. Valid month (MM) values are from 01 to 12, and valid day values are from 01 to 31.

SET TIME

sets the time of the real-time clock. Enter the time in 24 hour, HHMMSS format, using the number keypad and enter the time by pressing ENTER. Valid hour (HH) values are from 00 to 23. Valid minute (MM) and second (SS) values are from 00 to 59.

SGL SWP

changes the sweep control to single sweep if the analyzer is in the continuous sweep mode. It sets up a sweep for the trigger conditions.

SHOW OPTIONS

displays the number and description of the option(s) installed in your analyzer, the model number of the analyzer, and the last five digits of the analyzer’s serial number. Pressing SHOW OPTIONS changes the softkey label to EXIT SHOW. Press EXIT SHOW to erase SHOW OPTIONS information.

SIGNAL TRACK

moves the signal nearest to the active marker to the center of the screen and fixes the signal there. MKR-TRK or CNTR-TRK appears in the upper-right corner of the display.

(SIGNAL TRACK), (PRESET), MARKER NORMAL, or MARKERS OFF turn the signal track function off.

When signal track is on and the span is reduced, an automatic zoom is performed: the span is reduced in steps so that the signal remains at the center of the screen. If the span is zero, signal track cannot be activated.

SLOPE

draws a straight line between the coordinate point of the current segment and the coordinate point of the next segment, producing limit-line values for all frequencies between the two points.

SPAN or SPAN

activates SPAN and accesses the frequency span functions. SPAN changes the frequency range symmetrically about the center frequency. The frequency span readout describes the total displayed frequency range; to determine frequency span per horizontal graticule division, divide the frequency span by 10.

SPAN

finds the highest signal peak on-screen (if an on-screen marker is not present), places a marker on it, turns on the signal track function, and activates the span function. SPAN ZOOM performs the following routine: PEAK SEARCH, (SIGNAL TRACK), SPAN.

Analyzer Functions 7-43
SPECTRUM ANALYZER sets the analyzer to the spectrum analyzer operating mode and accesses a softkey function, PRESET SPECTRUM.

SRC PWR OFFSET offsets the displayed power of the source (SRC), the tracking generator. Offset values may range from −100 dB to +100 dB.

Using the source-power-offset capability of the tracking generator allows you to take system losses or gains into account, thereby displaying the actual power delivered to the device under test.

SRC PWR ON OFF is available for HP 8590B with Option 010 or 011 only. SRC PWR ON OFF activates (ON) or deactivates (OFF) the output power of the source (SRC), the tracking generator. The power level can then be adjusted using the data keys, step keys, or knob. The specified output power level is −15 to 0 dBm (50Ω), and +27.8 dBmV to +42.8 dBmV (75Ω), with 0.1 dB resolution.

SRC PWR STP SIZE allows the user to set the step size of the source power level, source power offset, and power-sweep range functions. The step size may be values from −32.7 dB to 32.7 dB. Default is one vertical scale division.

START FREQ sets the frequency at the left side of the graticule. The left and right sides of the graticule sides correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of center frequency and span.

STATE -> CARD is available with Option 003. It saves the current analyzer state on the memory card. To save the current state, press STATE -> CARD, use the numeric keypad to enter a number, and press ENTER. If you want the file name of the stored data to contain a prefix, use CHANGE PREFIX to enter a prefix before storing the data. If the state data was stored using a prefix, the file name for the state data consists of s(prefix).(register number). If no prefix was specified, the file name is s.(register number).

STATE -> INTRNL saves the current analyzer state in the selected state register. To save the current state, press STATE -> INTRNL, and use the numeric keypad to enter a state register number (valid state register numbers are 1 through 9).

STOP FREQ sets the frequency at the right side of the graticule. The left and right sides of the graticule sides correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of center frequency and span.

STU V W X accesses the softkey menu for selecting screen title or prefix characters S through X.

SWEEP accesses the functions that control the sweep time and the sweep control: SWP TIME AUTO MAN and SWEEP CONT SGL.

SWEEP CONT SGL switches the analyzer between the continuous sweep mode and the single sweep mode. If the analyzer is in the single sweep mode, SGL is underlined. Use (SGL SWP) to enable a sweep when in single-sweep mode. When continuous-sweep mode is in use, one sweep follows another as soon as it is triggered. PRESET, power on, and PRESET SPECTRUM select continuous sweep.

7-44 Analyzer Functions
SWP CPLG selects stimulus-response (SR) or spectrum-analyzer (SA) auto-coupled sweep time. In stimulus-response mode, auto-coupled sweep times are usually much faster for swept-response measurements. Stimulus-response auto-coupled sweep times are typically valid in stimulus-response measurements when the system's frequency span is less than 20 times the bandwidth of the device under test.

SWP TIME selects the length of time in which the analyzer sweeps the displayed frequency span. In all nonzero frequency spans, the sweep time varies from 20 milliseconds to 100 seconds. In zero frequency span, the fastest sweep time is 15 milliseconds. Reducing the sweep time increases the rate of sweeps. The sweep time can be changed using the step keys, the knob, or the numeric keypad.

AUTO MAN THRESHLD sets a lower boundary to the active trace. The threshold line “clips” signals that appear below the line when on. The boundary is defined in amplitude units that correspond to its vertical position when compared to the reference level.

ON OFF The value of the threshold appears in the active function block and on the lower-left side of the screen. The threshold level does not influence the trace memory or marker position. The peaks found by the markers must be the peak excursion value above the threshold level. The value of the threshold level can be changed using the step keys, the knob, or the numeric keypad.

If a threshold is active, press THRESHLD ON OFF to turn the threshold display off. The threshold value affects peak searching even when THRESHLD ON OFF is off.

TIMEDATE accesses the softkey menu to set and display the real-time clock.

TIMEDATE turns the display of the real-time clock on and off. TIMEDATE ON OFF will be set to on by DEFAULT CONFIG.

ON OFF

TRACE accesses the trace softkeys that allow you to store and manipulate trace information. Each trace is comprised of a series of data points that form a register where amplitude information is stored. The analyzer updates the information for any active trace with each sweep. If two traces are being written to, they are updated on alternating sweeps. (Also see “Screen Annotation” in Chapter 5.)

TRACE A sets up trace A for recalling previously saved trace data into trace A or saving trace data from trace A.

TRACE A B C

TRACE A B C until the letter of the desired trace is underlined.

TRACE B sets up trace B for recalling previously saved trace data into trace B or saving trace data from trace B.

TRACE C sets up trace C for recalling previously saved trace data into trace C or saving trace data from trace C.

Analyzer Functions 7-45
is available with Option 003. It begins the process to save trace data, limit-line tables, or amplitude correction factors on the memory card. Pressing TRACE -> CARD accesses a softkey menu which allows you to select the trace to be saved (trace A, trace B, or trace C), LIMIT LINES, or AMPLITUDE COR FACT. To save a trace, press TRACE A, TRACE B, or TRACE C, use the numeric keypad to enter a trace register number, and press [ENTER]. To save limit-line tables or amplitude correction factors, press LIMIT LINES or AMPLITUDE COR FACT, use the numeric keypad to enter a trace register number, and press [ENTER]. If you want the file name of the stored data to contain a prefix, use CHANGE PREFIX to enter a prefix before storing the data. If the trace data was stored using a prefix, the file name is t(prefix)_r(register number). If no prefix was available, the data is stored under t_r(register number). File names for limit-line tables and amplitude correction factors are treated the same way as file names for trace data, except “I” or “a” is used instead of “t.” If a screen title is present, it is saved with the trace data. The time and date that the data was stored is appended to the screen title.

TRACE -> INTRNL accesses a softkey menu which allows you to select the item to be stored in analyzer memory: the trace to be saved (trace A, trace B, or trace C), limit-line tables, or amplitude correction factors. To save a trace, select the trace to be saved, enter the trace register number and press [ENTER]. To save limit-line table(s) or amplitude correction factors, press LIMIT LINES (to save limit-line tables) or AMPLITUDE COR FACT (to save amplitude correction factors), enter the trace register number and press [ENTER]. Valid trace registers numbers are 0 through the maximum register number. The maximum register number is the number displayed after MAX REG # = during a save or recall operation. If a screen title is present, it is saved with the trace data. The time and date that the trace was stored is appended to the screen title.

TRACK GEN is available for HP 8590B with Option 010 or 011 only. TRACK GEN displays softkey menus for use with a built-in tracking generator.

TRACKING PEAK is available for HP 8590B with Option 010 or 011 only. TRACKING PEAK activates a routine which automatically adjusts the tracking adjustment to obtain the peak response of the tracking generator on the spectrum-analyzer display.

Note
The tracking generator must be connected to the spectrum analyzer in order for tracking peak to function properly.

Before making a stimulus-response measurement, care must be taken to maximize the tracking adjustment of the tracking generator to ensure amplitude accuracy.

TRIG accesses softkeys that let you select the sweep mode and trigger mode. (Also see “Screen Annotation” in Chapter 5.)

7-46 Analyzer Functions
| Note | With some delayed trigger functions (for example, external triggering), the softkey menu is not updated until after the trigger has occurred. |
| USER MENU(S) | accesses a menu available for your use for user-defined programs and key functions. |
| VBW/ RBW RATIO | selects the ratio between the video and resolution bandwidths. If signal responses near the noise level are visually masked by the noise, the ratio can be set to less than 1 to smooth this noise. The knob and step keys change the ratio in a 1, 3, 10 sequence. [Preset] and AUTO ALL sets the ratio to 0.300 X. The ratio can be changed using the step keys or the knob. |
| VID AVG ON OFF | initiates a digital averaging routine that averages displayed signals and noise. It does not affect the sweep time, bandwidth, or other analog characteristics of the analyzer. Annotation on the left side of the screen indicates the current number of sweeps averaged. The default number of sweeps is 100. Increasing the number of sweeps smooths the trace. To turn off the video averaging function, press VID AVG ON OFF so that OFF is underlined. The number of sweeps can be entered with the numeric keypad. |
| VID BW AUTO MAN | changes the analyzer's post-detection filter from 30 Hz to 3 MHz in a 1, 3, 10 sequence. As the video bandwidth is decreased, the sweep time is increased to maintain amplitude calibration. To indicate that it is not coupled, a "#" mark appears next to VBW displayed on the bottom of the analyzer screen. To couple the VID BW, press VID BW AUTO MAN so that AUTO is underlined. |
| Note | Coupling VID BW AUTO MAN also couples VBW/RBW RATIO. If you want to auto-couple the video bandwidth to a nonstandard ratio, you must set the video bandwidth to auto-couple before setting the video-bandwidth/resolution-bandwidth ratio. |

The video bandwidth can be changed using the step keys, the knob, or the numeric keypad.

VIDEO | activates the trigger condition that allows the next sweep to start if the detected RF envelope voltage rises to a level set by the display line. When VIDEO is pressed, the display line appears on the screen. For example, connect the CAL OUT signal to the analyzer input, change the trigger mode to video, and lower the display line. The analyzer triggers when the display line reaches the noise floor. |

VIEW A | holds and displays the amplitude data in the trace A register. The trace A register is not updated as the analyzer sweeps. If trace A is deactivated with STORE BLANK A, the stored data can be retrieved with VIEW A. |

VIEW B | holds and displays the amplitude data in the trace B register. The trace B register is not updated as the analyzer sweeps. If trace B is deactivated with STORE BLANK B, the stored data can be retrieved with VIEW B. |
VIEW C

holds and displays the amplitude data in the trace C register. The trace C register is not updated as the analyzer sweeps. If trace C is deactivated with STORE BLANK C, the stored data can be retrieved with VIEW C.

Volts

changes the amplitude units to volts for the current setting (log or linear).

Watts

changes the amplitude units to watts for the current setting (log or linear).

YZ,# SPC CLEAR

accesses the softkey menu for selecting the characters Y, Z, underscore (_), #, space, or for clearing the screen title.

ZERO SPAN

changes the frequency span to zero and turns off signal track if it is on.

Data Controls

Data controls are used to change values for functions such as center frequency, start frequency, resolution bandwidth, and marker position.

The data controls will change the active function in a manner prescribed by that function. For example, you can change center frequency in fine steps with the knob, in discrete steps with the step keys, or to an exact value with the number/units keypad. For example, resolution bandwidth, which can be set to discrete values only, is changed to predetermined values with any of the data controls.

Hold Key

Deactivate functions with the [HOLD] key. The active function readout is blanked, indicating that no entry will be made inadvertently by using the knob, step keys, or keypad. (Pressing a function key reenables the data controls.)

Knob

The knob allows continuous change of functions such as center frequency, reference level, and marker position. It also changes the values of many functions that change in increments only.

Clockwise rotation of the knob increases values. For continuous changes, the extent of alteration is determined by the size of the measurement range; the speed at which the knob is turned does not affect the rate at which the values are changed.

The knob enables you to change the center frequency, start or stop frequency, or reference level in smooth scrolling action. The smooth scrolling feature is designed to move the trace display to the latest function value as the knob is turned. When center frequency or reference level is adjusted, the signal will shift right or left or up or down with the rotation of the knob before a new sweep is actually taken. An asterisk is placed in the message block (the upper right-hand corner of the analyzer display) to indicate that the data on-screen does not reflect data at the current setting.
Note

When using the knob to change frequency or amplitude settings, the trace data is shifted. Therefore, when using MAX HOLD A, MAX HOLD B, or MIN HOLD C, moving the center frequency with the knob will not simulate a drifting signal.

Number/Units Keypad

The number/units keypad allows entry of exact values for many of the analyzer functions. You may include a decimal point in the number portion. If not, the decimal point is placed at the end of the number.

Numeric entries must be terminated with a unit key. The unit keys change the active function in a manner prescribed by that function. For example, the units keys for frequency span are GHz, MHz, kHz, Hz, whereas the units for reference level are dBm, −dBm, mV, µV.

Note

If an entry from the number/units keypad does not coincide with an allowed function value (for example, that of a 12 MHz bandwidth), the analyzer defaults to the nearest allowable value.

Step Keys

The step keys allow discrete increases or decreases of the active function value. The step size depends upon the analyzer’s measurement range or on a preset amount. Each press results in a single step change. For those parameters with fixed values, the next value in a sequence is selected each time a step key is pressed. Changes are predictable and can be set for some functions. Out-of-range values or out-of-sequence values will not occur using these keys.

Front-Panel Controls and Fine-Focus Control

Front-Panel Controls

INTENSITY

The intensity knob allows you to change the brightness of the writing on the screen.

Line Power

LINE turns on the instrument and starts an instrument check. After applying power, allow the temperature of the instrument to stabilize for best measurement results.

Note

The instrument draws power when it is plugged into the ac power line, even if the line power switch is off.
**Fine Focus Control**

The fine-focus control is located on the side of the analyzer. To adjust the fine-focus control:

1. Adjust the front-panel intensity control for a comfortable viewing intensity.
2. Use an adjustment tool or small screwdriver to access the fine-focus adjustment. See Figure 7-4. Adjust for a focused display.

![Fine Focus Adjustment](image)

*Figure 7-4. Adjusting the Fine Focus*

---

**Front-Panel Connectors**

**100 MHz COMB OUT** is available for HP 8592B only. It supplies a 100 MHz signal with harmonics up to 22 GHz for use as a reference signal. 100 MHz COMB OUT is connected to the analyzer input during CAL YTF.

**CAL OUT** provides the calibration signal of 300 MHz at $-20$ dBm ($29$ dBmV for Option 001 or 011). It is connected to the analyzer input during amplitude and frequency self-calibration routines. (See “Improving Accuracy with Self-Calibration Routines.”)

**INPUT 50Ω** is the signal input for the spectrum analyzer. It has a $50Ω$ impedance (or $75Ω$ impedance for Option 001).

---

**Caution**

Since the male center pin of a $50Ω$ connector is larger than the center pin of a $75Ω$ connector, connecting a $50Ω$ connector to the input of an HP 8590B Option 001 could damage the Option 001 input connector. Do not connect a $50Ω$ connector directly to the Option 001 input connector.
Caution
Excessive signal input power will damage the analyzer input attenuator and the input mixer. Use extreme caution when using the spectrum analyzer around high-power RF sources and transmitters. The spectrum analyzer's maximum total input power rating should not be exceeded.

PROBE POWER
provides power for high-impedance ac probes and certain other accessories.

Caution
The tracking generator output may damage the device under test. Do not exceed the maximum power that the device under test can tolerate.

RF OUT 50Ω
supplies 100 kHz to 1.8 GHz the output for the built-in tracking generator (available with Option 010 for the HP 8590B only). (RF OUT 75Ω is the 1 MHz to 1.8 GHz tracking generator output for Option 011.)

Rear-Panel Connectors
The rear panel of your instrument may contain the following connectors, depending on the options ordered with the instrument.

See Chapter 1, “Options and Accessories Available,” for more information on options.

LO OUTPUT is not available.
EARPHONE is not available.
10 MHz REF OUTPUT is not available.
EXT REF IN is not available.
SWEEP + TUNE OUTPUT is not available.
VOLTAGE SELECTOR adapts the unit to the power source: 115 V or 230 V.
Power input is the input for the main power cable. Insert the main power cable plug only into a socket outlet that has a protective ground contact.
MONITOR OUTPUT drives an external CRT monitor, such as the HP 82913A, with a 19.2 kHz horizontal synchronizing rate.
<table>
<thead>
<tr>
<th><strong>Caution</strong></th>
<th>Turn off the analyzer before connecting the AUX INTERFACE connector to a device. Failure to do so may result in loss of factory correction constants.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not exceed the +5 V supply current limits when using the AUX INTERFACE connector. Exceeding the current limits may result in loss of factory correction constants.</td>
<td></td>
</tr>
<tr>
<td>Do not use the AUX INTERFACE as a video monitor interface. Damage to the video monitor will result.</td>
<td></td>
</tr>
</tbody>
</table>

| **AUX INTERFACE** | provides a nine-pin “D” subminiature connector with four output lines and one input line. See Table 1-2 or Table 1-4 for a detailed description. |
| **Interface connectors** | are optional interfaces for HP-IB and RS-232 interface buses that allow remote instrument operation and direct plotting or printing of screen data. |
| **AUX IF OUTPUT** | is a 50Ω, 21.4-MHz IF uncorrected output that is the down-converted signal from the RF input of the analyzer. Output bandwidth is controlled by the spectrum-analyzer resolution-bandwidth setting. Output amplitude is controlled by input attenuation and reference level. Output level is approximately −10 dBm into 50Ω with a signal displayed at the reference level. |
| **AUX VIDEO OUTPUT** | provides detected, uncorrected video output (before analog-to-digital conversion) proportional to vertical deflection of the CRT trace. Output voltage is from 0 to 1 V. Amplitude corrections are not applied to this output. |
| **EXT TRIG INPUT (TTL)** | triggers the analyzer’s internal sweep source using the positive edge of an external voltage. |
| **HI SWEEP IN/OUT** | indicates sweep or can be grounded to stop sweep. Input: accepts input signal from open collector circuit. Use low input to stop sweep; otherwise leave open. Output: high TTL indicates sweep; low TTL indicates retrace. |
| **EXT KEYBOARD** | is provided with Option 021 or 023. |

| **Caution** | The analyzer must be turned off before connecting an external keyboard to the analyzer. Failure to do so may result in loss of factory correction constants. |
This connector allows screen titles to be entered using an external keyboard. The function keys of the external keyboard control the analyzer as follows:

Table 7-8. Functions of the External Keyboard Keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1—F6</td>
<td>Softkeys 1 through 6 (respectively) of the current analyzer menu.</td>
</tr>
<tr>
<td>F7</td>
<td>Enter prefix mode.</td>
</tr>
<tr>
<td>F8</td>
<td>Enter remote commands mode.</td>
</tr>
<tr>
<td>F9</td>
<td>Accesses the [FREQUENCY] menu.</td>
</tr>
<tr>
<td>F10</td>
<td>Accesses the [SPAN] menu.</td>
</tr>
<tr>
<td>F11</td>
<td>Accesses the [AMPLITUDE] menu.</td>
</tr>
<tr>
<td>F12</td>
<td>Retrieves the present screen title for editing.</td>
</tr>
<tr>
<td>ESC</td>
<td>Returns to the enter title mode.</td>
</tr>
<tr>
<td>PRINT SCREEN</td>
<td>Copies the analyzer screen display to the active copy device.</td>
</tr>
<tr>
<td>DELETE</td>
<td>Deletes the character over the cursor.</td>
</tr>
<tr>
<td>ALT+DELETE</td>
<td>Clears the keyboard line.</td>
</tr>
<tr>
<td>CTRL+DELETE</td>
<td>Clears to end of line.</td>
</tr>
<tr>
<td>&amp;</td>
<td>Moves the cursor to the left.</td>
</tr>
<tr>
<td>©</td>
<td>Moves the cursor to the right.</td>
</tr>
<tr>
<td>▼</td>
<td>Moves from later items to earlier items in the recall buffer.</td>
</tr>
<tr>
<td>▲</td>
<td>Moves from earlier items to later items in the recall buffer.</td>
</tr>
<tr>
<td>CTRL+C</td>
<td>End-of-text</td>
</tr>
<tr>
<td>CTRL+J</td>
<td>Line feed.</td>
</tr>
<tr>
<td>CTRL+M</td>
<td>Carriage return</td>
</tr>
<tr>
<td>CTRL+N</td>
<td>Turns on inverse video.</td>
</tr>
<tr>
<td>CTRL+O</td>
<td>Turns enhancements (inverse video, underlining) off.</td>
</tr>
<tr>
<td>CTRL+P</td>
<td>Turns off underlining.</td>
</tr>
<tr>
<td>CTRL+I</td>
<td>Escape.</td>
</tr>
</tbody>
</table>

*The dash between keys indicates that both keys should be pressed at the same time

The external keyboard operation with the analyzer is similar to its operation with a computer except for the following:

SCROLL LOCK and NUM LOCK are fixed and cannot be changed. Pressing [NUM LOCK] displays the keyboard mode on the analyzer screen. The analyzer will not recognize the control characters or function keys.
The keyboard supports a 244 character recall buffer. The longest single item is limited to 243 characters; subsequent characters are ignored. Using the $\uparrow$ or $\downarrow$ keys of the external keyboard to recall an item does not change the buffer contents. Recalling an item and then pressing the [ENTER] key does not store a new copy of the item in the recall buffer. If an item is recalled and then modified, a new copy will be made in the recall buffer. Adding new data into the keyboard line deletes the oldest data automatically.

When in command mode, the active line will append a semicolon to the keyboard entry if the line does not end with a semicolon and it is fewer than 243 characters long.

**LEVELING INPUT** allows the use of an external positive- or negative-polarity detector or power meter for automatic leveling control of the tracking generator. (HP 8590B Option 010 or 011 only.)

**SWEEP OUTPUT** provides a voltage ramp proportional to the sweep and the analyzer span (0 to 10 V).

**TV TRIG OUTPUT** (TTL) is not available.
Problems

What You'll Find in This Chapter

Your spectrum analyzer is built to provide dependable service. It is unlikely that you will experience a problem with the HP 8590B or HP 8592B. However, if you do, or if you desire additional information or wish to order parts, options, or accessories, Hewlett-Packard's worldwide sales and service organization is ready to provide the support you need.

In general, a problem can be caused by a hardware failure, a software error, or a user error. Follow these general steps to determine the cause and to resolve the problem:

1. Perform the quick checks listed in the “Check the Basics” paragraph; these checks may eliminate the problem altogether, or may give a clearer idea of its cause.

2. If the problem is a hardware problem, you have several options:
   a. Repair it yourself; see the “Service Options” paragraph.
   b. Return the analyzer to Hewlett-Packard for repair; if the analyzer is still under warranty or is covered by an HP maintenance contract, it will be repaired under the terms of the warranty or plan (the warranty is at the front of this manual).

   If the analyzer is no longer under warranty or is not covered by an HP maintenance plan, Hewlett-Packard will notify you of the cost of the repair after examining the unit. See “How to Call Hewlett-Packard” and “How to Return Your Analyzer for Service” for more information.

Before You Call Hewlett-Packard

Check the Basics

A problem often can be solved by rechecking what was being done when the problem occurred. A few minutes spent in performing some simple checks may save waiting for your instrument to be repaired. Before calling Hewlett-Packard or returning the analyzer for service, please make the following checks:

1. Is the rear-panel voltage selector switch set correctly? Is the line fuse good?
2. Does the line socket have power?
3. Is the analyzer plugged in to the proper ac power source?
4. Is the analyzer turned on? Check that the green light above [LINE] is on, indicating that the power supply is on.
5. If other equipment, cables, and connectors are being used with the HP 8590B or HP 8592B, are they connected properly and operating correctly?
6. Review the procedure for the test being performed when the problem appeared. Are all the settings correct?

7. If the display is dark or dim, turn the intensity knob clockwise.

8. If the display focus is poor, reduce the brightness with the intensity knob, or adjust the focus as described in Chapter 7.

9. If the display position is offset, press [CAL], MORE 1 of 3, CRT VERT POSITION and use the knob or step keys to adjust the vertical position. Press [CAL], MORE 1 of 3, CRT HORZ POSITION to adjust the horizontal position. Press [CAL], CAL STORE to save the new vertical and horizontal display position.

10. If you wish to reset the analyzer configuration to the state it was in when it was originally shipped from the factory, use DEFAULT CONFIG. To access DEFAULT CONFIG, press [CONFIG], MORE 1 of 2, DEFAULT CONFIG, DEFAULT CONFIG (DEFAULT CONFIG requires a double key press). See “DEFAULT CONFIG” in Chapter 7 for more information.

11. Is the test being performed, and the results that are expected, within the specifications and capabilities of the spectrum analyzer? See Chapter 1, Table 1-1 (for the HP 8590B), or Table 1-3 (for the HP 8592B), for analyzer specifications.

12. Are the analyzer’s measurements obviously inaccurate? If so, the analyzer’s correction factors may have been removed from the measurement results. If this occurs, perform the frequency and amplitude self-calibration routines given in “Turning the Analyzer On for the First Time” in Chapter 2. After running these routines, press CAL STORE, then perform the confidence test. Perform the confidence test by pressing [CAL], MORE 1 of 3, CONF TEST. The analyzer performs a self-test by cycling through its major functions. The confidence test is performed within 1 to 2 minutes. If the unit does not function properly, messages appear on the screen. See Appendix A for explanations of error messages. If error messages appear, record the messages and refer to the analyzer’s service manual or contact the nearest Hewlett-Packard Sales and Service Office listed in Table 8-1.

13. For an HP 8592B with low signal amplitudes above 2.75 GHz, connect a low-loss cable (such as HP part number 8120-5148) from 100 MHz COMB OUT to the analyzer input. Press [CAL], CAL YTF. The YTF self-calibration routine completes in approximately 4 minutes. Press [CAL], CAL STORE.

14. If the error message “FREQ UNCAL” stays on screen, run the CAL FREQ self-calibration routine and press CAL STORE.

15. Is the analyzer displaying an error message? If so, refer to Appendix A.

16. If the calibration routines cannot be performed or the calibration data is corrupt, use CAL FETCH to retrieve the correction data that has previously been saved. If the fetched correction data is corrupt, the procedure in step 18 can be used to set the correction data back to predetermined values.

17. If the display is garbled or filled with snow, first try adjusting the horizontal position by pressing [CAL], the bottom softkey, and the fifth softkey from the top. Turn the knob counterclockwise. The vertical position will not cause this symptom.
18. If the display is still garbled, use **DEFAULT CAL DATA** per the following procedure to reinitialize the memory area for correction factors, instrument configuration, and miscellaneous constants. This procedure will not erase factory-installed calibration factors.

a. Press **FREQUENCY**, \(-37 \text{ Hz}\), **CAL**, the bottom softkey, the bottom softkey again, the third softkey from the top. A readable display should appear.

b. Perform the **CAL FREQ** and **CAL AMPTD** routines, or the **CAL FREQ & AMPTD** routine. Be sure **CAL OUT** is connected to the analyzer input.

---

**Note**

If the **CAL OUT** signal cannot be found, press **FREQUENCY**, \(-37 \text{ Hz}\) before performing the **CAL FREQ** or **CAL FREQ & AMPTD**.

---

c. For the HP 8592B, connect a low-loss cable, such as HP part number 8120-5148, from 100 MHz COMB OUT to the analyzer input. Press **CAL**, **CAL YTF**. The YTF self-calibration routine completes in approximately 4 minutes.

d. Set the display position using **CAL**, **MORE 1 of 3**, **CRT VERT POSITION** and **CAL**
   **MORE 1 of 3**, **CRT HORIZ POSITION**.

e. Press **CAL**, **CAL STORE**.

---

**Note**

Some user configurations may need to be reset.

---

**DEFAULT CAL DATA** can only be accessed by entering a center frequency of \(-37 \text{ Hz}\). The center frequency \(-37 \text{ Hz}\) acts as a pass code for **DEFAULT CAL DATA**.

19. If a program in user memory is suspected of causing problems, use **CONFIG**,
   **MORE 1 of 2**, **DISPOSE USER MEM**, **DISPOSE USER MEM** (**DISPOSE USER MEM** requires a double key press). **DISPOSE USER MEM** erases all user programs, variables, personalities (DLPs), and user-defined traces in analyzer memory.

20. If the necessary test equipment is available, perform the Performance Verification tests given in Chapter 3 (for the HP 8590B), or Chapter 4 (for the HP 8592B). Record all results on an Performance Verification Test Record form provided at the end of Chapter 3 (for the HP 8590B) or Chapter 4 (for the HP 8592B).

---

**Read the Warranty**

The warranty for your analyzer is at the front of this manual. Please read it and become familiar with its terms.

If your analyzer is covered by a separate maintenance agreement, please be familiar with its terms.
Service Options

Hewlett-Packard offers several optional maintenance plans to service your analyzer after the warranty has expired. Call your Hewlett-Packard Sales and Service office for full details.

If you want to service the analyzer yourself after the warranty expires, you can purchase the service documentation that provides all necessary test and maintenance information.

You can order the service documentation, HP 8590B Option 915 or HP 8592B Option 915, through your Hewlett-Packard Sales and Service office. The package is described under “Service Documentation for the HP 8590B (Option 915)” or “Service Documentation for the HP 8592B (Option 915)” in Chapter 1 of this manual.

How to Call Hewlett-Packard

Hewlett-Packard has Sales and Service offices around the world to provide you with complete support for your analyzer. To obtain servicing information or to order replacement parts, contact the nearest Hewlett-Packard Sales and Service Office listed in Table 8-1. In any correspondence or telephone conversations, refer to the instrument by its model number and full serial number.
<table>
<thead>
<tr>
<th>IN THE UNITED STATES</th>
<th>IN AUSTRALIA</th>
<th>IN JAPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>California</strong></td>
<td>Hewlett-Packard Australia Ltd 31-41 Joseph Street Blackburn, Victoria 3130 895-2895</td>
<td>Yokogawa-Hewlett-Packard Ltd. 29-21 Takaido-Higashi, 3 Chome Suginami-ku Tokyo 168 (03) 331-6111</td>
</tr>
<tr>
<td>Hewlett-Packard Co.</td>
<td>1421 South Manhattan Ave. P.O. Box 4230 Fullerton, CA 92631 (714) 999-6700</td>
<td><strong>IN CANADA</strong></td>
</tr>
<tr>
<td>301 E. Evelyn</td>
<td>Hewlett-Packard (Canada) Ltd. 17500 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 (514) 697-4232</td>
<td><strong>IN PEOPLE'S REPUBLIC OF CHINA</strong></td>
</tr>
<tr>
<td>Mountain View, CA 94039 (415) 694-2000</td>
<td><strong>IN FRANCE</strong></td>
<td></td>
</tr>
<tr>
<td><em>Colorado</em></td>
<td>Hewlett-Packard France F-91947 Les Ulis Cedex Orsay (6) 907-78-25</td>
<td>China Hewlett-Packard, Ltd. P.O. Box 9610, Beijing 4th Floor, 2nd Watch Factory Main Bldg. Shuang Yu Shu, Bei San Huan Rd Beijing, PRC 256-6888</td>
</tr>
<tr>
<td>Hewlett-Packard Co.</td>
<td>24 Inverness Place, East Englewood, CO 80112 (303) 649-5000</td>
<td><strong>IN GERMANY FEDERAL REPUBLIC</strong></td>
</tr>
<tr>
<td>2000 South Park Place P.O. Box 105005 Atlanta, GA 30339 (404) 955-1500</td>
<td>Hewlett-Packard GmbH Vertriebszentrale Frankfurt Berner Strasse 117 Postfach 500 140 D-6000 Frankfurt 56 (0611) 50-04-1</td>
<td><strong>IN SINGAPORE</strong></td>
</tr>
<tr>
<td><strong>Georgia</strong></td>
<td><strong>IN GREAT BRITAIN</strong></td>
<td></td>
</tr>
<tr>
<td>Hewlett-Packard Co.</td>
<td>Hewlett-Packard Ltd. King Street Lane Winnersh, Wokingham Berkshire RG11 5AR 0734 784774</td>
<td><strong>IN TAIWAN</strong></td>
</tr>
<tr>
<td>5201 Tollview Drive</td>
<td><strong>IN OTHER EUROPEAN COUNTRIES</strong></td>
<td></td>
</tr>
<tr>
<td>Rolling Meadows, IL 60008 (312) 255-9800</td>
<td>Hewlett-Packard (Schweiz) AG Allmend 2 CH-8967 Widen (Zurich) (0041) 57 31 21 11</td>
<td>Hewlett-Packard Taiwan 8th Floor, Hewlett-Packard Building 337 Fu Hsing North Road Taipei (02) 712-0404</td>
</tr>
<tr>
<td><strong>New Jersey</strong></td>
<td><strong>IN ALL OTHER LOCATIONS</strong></td>
<td></td>
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<tr>
<td>Hewlett-Packard Co.</td>
<td>Hewlett-Packard (Schweiz) AG Allmend 2 CH-8967 Widen (Zurich) (0041) 57 31 21 11</td>
<td><strong>IN ALL OTHER LOCATIONS</strong></td>
</tr>
<tr>
<td>120 W. Century Road</td>
<td><strong>IN ALL OTHER LOCATIONS</strong></td>
<td></td>
</tr>
<tr>
<td>Paramus, NJ 07653 (201) 265-5000</td>
<td><strong>IN ALL OTHER LOCATIONS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Texas</strong></td>
<td><strong>IN ALL OTHER LOCATIONS</strong></td>
<td></td>
</tr>
<tr>
<td>Hewlett-Packard Co.</td>
<td>930 E. Campbell Rd. Richardson, TX 75081 (214) 231-6101</td>
<td><strong>IN ALL OTHER LOCATIONS</strong></td>
</tr>
</tbody>
</table>

**Problems 8-5**
How to Return Your Analyzer for Service

Service Tag
If you are returning the analyzer to Hewlett-Packard for servicing, fill in and attach a blue service tag. Several service tags are supplied at the rear of this manual. Please be as specific as possible about the nature of the problem. If you have recorded any error messages that appeared on the screen, or have completed a Performance Test Record, or have any other specific data on the performance of the analyzer, please send a copy of this information with the unit.

Original Packaging
Before shipping, pack the unit in the original factory packaging materials if they are available. If the original materials were not retained, identical packaging materials are available through any Hewlett-Packard office. Descriptions of the packaging materials are listed in Table 2-1.

Other Packaging

| Caution | Analyzer 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 equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the analyzer fan. |

You can repackage the instrument with commercially available materials, as follows:

1. Attach a completed service tag to the instrument.
2. If you have a front-panel cover, install it on the instrument; if not, protect the control panel with cardboard.
3. Wrap the instrument in antistatic plastic to reduce the possibility of damage caused by electrostatic discharge.
4. Use a strong shipping container. A double-walled, corrugated cardboard carton with 159 kg (350 lb) bursting strength is adequate. The carton must be both large enough and strong enough to accommodate the analyzer. Allow at least 3 to 4 inches on all sides of the analyzer for packing material.
5. Surround the equipment with three to four inches of packing material and prevent the equipment from moving in the carton. If packing foam is not available, the best alternative is S.D.-240 Air Cap.T.M from Sealed Air Corporation (Commerce, California, 90001). Air Cap looks like a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink-colored Air Cap to reduce static electricity. Wrapping the equipment several times in this material should both protect the equipment and prevent it from moving in the carton.
6. Seal the shipping container securely with strong nylon adhesive tape.
7. Mark the shipping container “FRAGILE, HANDLE WITH CARE” to assure careful handling.
8. Retain copies of all shipping papers.
Analyzer Error Messages

The analyzer can generate various messages that appear on its screen during operation to indicate a problem.

There are three types of messages: hardware error messages (H), user-created error messages (U), and informational messages (M).

- **Hardware error messages** indicate the analyzer hardware is probably broken. Refer to Chapter 8 for more information.

- **User-created error messages** appear when the analyzer is used incorrectly. They are usually generated during remote operation (entering programming commands using a controller or the external keyboard). See the *HP 8590 Series Spectrum Analyzer Programming Manual* for more information.

- **Informational messages** indicate the analyzer's progress within a specific procedure.

The messages are listed in alphabetical order on the following pages; each message is defined, and its type is indicated by an (H), (U), or (M).

**ADC-GND FAIL**
Indicates a failure in the processor. (H)

**ADC-TIME FAIL**
Indicates a failure in the processor. (H)

**ADC-2V FAIL**
Indicates a failure in the processor. (H)

**CAL:**
During the self-calibration routine, messages may appear on the display indicating the routine is progressing: SWEEP, FREQ, SPAN, AMPTD, 3dB BW, ATTN, LOG AMP, PEAKING, YTF. FREQ UNCAL appears briefly during CAL FREQ. This is normal and does not indicate a problem. (M)

**CAL: DATA NOT STORED**
**CAL AMP NEEDED**
The correction factors are corrupt and cannot be stored. Perform the CAL FREQ & AMPTD routine. (U) (H)

**CAL: cannot execute CALAMP**
**enter: 0 dB PREAMP GAIN**
The preamp gain should be set to 0 dB before the CAL AMPTD routine is performed. The preamp gain is set by using EXT PREAMP. (U) (H)

**CAL: FM SPAN SENS FAIL**
The analyzer could not set up span sensitivity of the FM coil. (H)
CAL: GAIN FAIL
Indicates the signal amplitude is too low during the CAL AMPTD routine. (H)

CAL: LOST COMB SIGNAL
Indicates the amplitude of the comb generator signal is insufficient to complete the CAL YTF. Be sure to use a low-loss cable (SMA-to-type N cable) to connect the comb generator output the analyzer input before when using CAL YTF. (U) (H)

CAL: NO YTF IN 8590/1
The CAL YTF programming command is available for the HP 8592B and the HP 8593A only. (U)

CAL: NO YTO AVAILABLE
The CAL DLY programming command is no longer necessary. (U)

CAL: PASSCODE NEEDED
Indicates that the function cannot be accessed without the pass code. (M)

CAL: RES BW AMPL FAIL
The relative insertion loss of the resolution bandwidth is incorrect. (H)

CAL SIGNAL NOT FOUND
Indicates the CAL OUT signal cannot be found. Check that the CAL OUT is connected to the analyzer input connector using an appropriate cable. If the CAL OUT signal is connected to the analyzer input but cannot be found, press [FREQUENCY], -37 [Hz] before performing the CAL FREQ or CAL FREQ & AMPTD. (U) (H)

CAL: SPAN SENS FAIL
The self-calibration span sensitivity routine failed. (H)

CAL: USING DEFAULT DATA
Indicates the calibration data is corrupt and default correction factors are being used. Interruption of the self-calibration routines or an error can cause this problem. (M)

COMB SIGNAL NOT FOUND
The comb signal cannot be found. Check that 100 MHz COMB OUT is connected to the analyzer input. The comb generator is available with the HP 8592B or HP 8593A only. (U) (H)

COMMAND ERROR:__ __
The specified programming command is not recognized by the analyzer. (U)

CONFLICT TABLE OVERFLOW
Indicates that too many two-letter compatible commands have been used. See Table 4-3 in the HP 8590 Series Spectrum Analyzer Programming Manual for information about substituting alternate commands for two-letter compatible commands. (U)

CONF TEST FAIL
Indicates that the confidence test failed. (H)

FAIL:__ __
An error was discovered during the power-up check. The 4-digit by 10-digit code indicates the type of error. Error codes are described in the analyzer Service Manual. (H).

FREQ UNCAL
Indicates a YTO-tuning failure. This may occur when using default correction factors. Performing the CAL FREQ routine may eliminate the failure. The FREQ UNCAL message
appears briefly during the CAL FREQ routine or when changing the frequency value with the knob (it does not indicate a problem). (U) (H)

INVALID ACTDEF: . . .
The specified ACTDEF name is not valid. See the ACTDEF programming command. (U)

INVALID AMPCOR: FREQ
For the AMPCOR command, the frequency data must be in increasing order. See the AMPCOR programming command. (U)

INVALID AUNITs: . .
The amplitude units are not valid. See the AUNITS programming command. (U)

INVALID BLOCK FORMAT: IF STATEMENT
An invalid block format appeared within the IF statement. (U)

INVALID CARD: DIRECTORY
Indicates the memory card has not been formatted. (U)

INVALID CARD: NO CARD
Indicates a memory card has not been inserted. (U)

INVALID CARD
Indicates a card reader is not installed, the memory card is write-protected, the memory card is a read-only card, or a memory card has not been inserted. This message can occur if remote programming commands for the memory card capability are executed with an HP 8590B or HP 8592B without Option 003. (U)

INVALID CARD: TYPE
Indicates a card reader is not installed, the memory card is write-protected, the memory card is a read-only card, or a memory card has not been inserted. This message can occur if remote programming commands for the memory card capability are executed with an HP 8590B or HP 8592B without Option 003. (U)

INVALID CHECKSUM: USTATE
The user-defined state does not follow the expected format. (U)

INVALID COMARE OPERATOR
An IF/THEN or REPEA UNTIL routine is improperly constructed. Specifically, the IF or UNTIL operands are incorrect. (U)

INVALID DETECTOR: . . .
The specified detector is not valid. See the DET programming command. (U)

INVALID ENTER FORMAT
The enter format is not valid. See the appropriate programming command description to determine the correct format. (U)

INVALID FILE: NO ROOM Indicates that there is not enough available space on the memory card to store the data. (U)

INVALID HP-IB ADDRESS/OPERATION
An HP-IB operation was aborted due to an incorrect address or invalid operation. Check that there is only one controller (the analyzer) connected to the printer. (U)

INVALID HP-IB OPERATION REN TRUE
The HP-IB operation is not allowed. (This is usually caused by print/plot when a controller is on the interface bus.) (U)
INVALID ITEM:
Indicates an invalid parameter has been used in a programming command. (U)

INVALID KEYNAME:_ _
The specified key name is not allowed. (The key name may have conflicted with an analyzer programming command.) Use an underscore as the second character in the key name, or avoid beginning the key name with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

INVALID OUTPUT FORMAT
The output format is not valid. See the appropriate programming command description to determine the correct format. (U)

INVALID REGISTER NUMBER
The specified trace register number is invalid. (U)

INVALID REPEAT MEM OVFL
Memory overflow occurred due to a REPEAT routine. This occurs if the repeat statements are too long. (U)

INVALID REPEAT NEST LEVEL
The nesting level in the REPEAT routine is improperly constructed. This can occur if too many REPEAT routines are nested. (U)

INVALID RS-232 ADDRESS/OPERATION
An RS-232 operation was aborted due to an incorrect address or invalid operation. (U)

INVALID SAVEREG
Data has not been saved in the specified state or trace register, or the data is corrupt. (U)

INVALID STORE DEST:_ _
The specified destination field is invalid. (U)

INVALID SYMTAB ENTRY: SYMTAB OVERFLOW
There is a symbol table overflow. This can occur if there are too many user-defined items (functions, variables, key definitions) or downloadable programs in analyzer memory. Use DELETE FILE or DISPOSE USER MEM to delete unnecessary items. This can also occur when the processor board has failed. See the analyzer’s Service Manual for more information. (U)

INVALID TRACE:_ _
The specified trace is invalid. (U)

INVALID TRACE NAME:_ _
The specified trace name is not allowed. Use an underscore as the second character in the trace name, or avoid beginning the trace name with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

INVALID TRIGGER MODE:_ _
The specified trigger mode is invalid. See the TM programming command. (U)

INVALID VALUE PARAMETER:_ _
The specified value parameter is invalid. (U)

INVALID VARDEF:_ _
The specified variable name is not allowed. Use an underscore as the second character in the variable label, or avoid beginning the variable label with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)
INVALID WINDOW TYPE: ____
The specified window is invalid. See the TWNDOW programming command. (U)

MEAS UNCAL
The measurement is uncalibrated. Check the sweep time, span, and bandwidth settings. (U)

NO CARD FOUND
Indicates that the memory card is not inserted. (U)

NO COUNTERLOCK AVAILABLE
The programming command is available for the HP 8591A or the HP 8593A only. (U)

PARAMETER ERROR: ____
The specified parameter is not recognized by the analyzer. See the appropriate programming command description to determine the correct parameters. (U)

POS-PK FAIL
Indicates the positive-peak detector has failed. (H)

RES-BW SHAPE FAIL
Indicates the 3 dB bandwidth is not within specifications. (H)

RES-BW NOISE FAIL
Indicates the noise floor level is too high at the indicated bandwidth. (H)

SAMPLE FAIL
Indicates the sample detector has failed. (H)

SOFTKEY OVFL
Softkey nesting exceeds the maximum number of levels. (U)

SRQ ____
The specified service request is active. Service requests are a form of informational message and are explained in Appendix B. (M)

STEP GAIN ATTEN FAIL
Indicates the step gain has failed. (H)

TABLE FULL
Indicates the upper or lower table of limit lines contains the maximum number of entries allowed. Additional entries to the table are ignored. (U)

TG SIGNAL NOT FOUND
Indicates the tracking generator output signal cannot be found. Check that the tracking generator output (RF OUT 50Ω or RF OUT 75Ω) is connected to the analyzer input connector using an appropriate cable. (U)

TG UNLVL
Indicates that the source power is set higher or lower than the analyzer can provide (HP 8590B with Option 010 or 011 only). See “Stimulus-Response Measurements” in Chapter 6 for more information.

UNDEF KEY
A softkey referred to is not recognized by the analyzer. (U)

VID-BW FAIL
Indicates the video bandwidth(s) have failed. (H)
Service Requests

This appendix describes the analyzer service request (SRQ) capability. A service request is an analyzer output that tells the operator or computer that a specific event has taken place in the analyzer.

When writing programs, service requests can be used to interrupt the computer program sequence, causing the program to branch to a subroutine. For example, by using service requests, the computer can perform other operations while the analyzer is sweeping. When the sweep is completed, the computer can service the analyzer by changing the analyzer state or reading data from the display memory.

Note

Service requests do not work with computers that have an RS-232 interface. Not all service requests are available with some HP-IB computers. Refer to the manuals supplied by your computer's manufacturer.

When making a service request, the analyzer places the I/O interface SRQ line true and the analyzer CRT display reads out SRQ with a number. Setting the SRQ line true announces to the computer that the analyzer requires attention. The computer can then command the analyzer to send its “status byte.” The status byte indicates the type of service request.

Note

If the CRT display annotation has been blanked, the service request notation will not appear.

A serial polling technique must be used by the computer to test for service requests. The analyzer does not respond to parallel polling.

Status Byte Definition

The status byte sent by the analyzer determines the nature of the service request. The meaning of each bit of the status byte is explained in Table B-1.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Message</th>
<th>CRT Display Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (LSB)</td>
<td>Unused</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Unit Key Pressed</td>
<td>SRQ 102</td>
</tr>
<tr>
<td>2</td>
<td>End of sweep</td>
<td>SRQ 104</td>
</tr>
<tr>
<td>3</td>
<td>Hardware broken</td>
<td>SRQ 110</td>
</tr>
<tr>
<td>4</td>
<td>Command complete</td>
<td>SRQ 120</td>
</tr>
<tr>
<td>5</td>
<td>Illegal analyzer command</td>
<td>SRQ 140</td>
</tr>
<tr>
<td>6</td>
<td>Universal HP-IB service request HP-IB RQS bit</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Unused</td>
<td>-</td>
</tr>
</tbody>
</table>
The CRT display message is an octal number based on the binary value of the status byte. This octal number always begins with a "1" since this is translated from bit 6, the universal service request bit. The status byte for an illegal analyzer command (SRQ 140) is as follows:

<table>
<thead>
<tr>
<th>bit number</th>
<th>7 6 5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>status byte</td>
<td>0 1 1 0 0 0 0 0</td>
</tr>
</tbody>
</table>

The CRT displays the octal equivalent of the status byte binary number: SRQ 140

The octal equivalent is based on the whole binary number:

01100000 (binary) = 140 (octal)

One simple way to determine the octal equivalent of the binary number is to partition the binary number three bits at a time from the least significant bit, and treat each part as a single binary number:

<table>
<thead>
<tr>
<th>binary</th>
<th>0 1 1 0 0 0 0 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>octal</td>
<td>1 4 0</td>
</tr>
</tbody>
</table>

The decimal equivalent of the octal number is determined as follows:

140 (octal) = 1 × (8) + 4 × (8) + 0 × (8) = 96 (decimal)

More than one service request can be sent at the same time. For example, if an illegal analyzer command (SRQ 140) and the end of a sweep (SRQ 104) occurred at the same time, SRQ 144 appears on the CRT display, because both bit 5 and bit 2 are set as shown below:

<table>
<thead>
<tr>
<th>bit number</th>
<th>7 6 5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>status byte</td>
<td>0 1 1 0 0 1 0 0</td>
</tr>
<tr>
<td>octal value</td>
<td>1 4 4</td>
</tr>
</tbody>
</table>

= SRQ 144

**Service Request Activating Commands**

With the exceptions of SRQ 140 and SRQ 110, service requests can only be activated from a computer. (SRQ 140 and SRQ 110 are always activated.) Your *HP 8590 Series Programming Manual* describes service request activating commands in Chapter 4 under RQS and SRQ.
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MARKER, DELTA
-- --
MARKER, ON OFF
MARKER, AMP TD
-- --
PE-PF, M EAS
-- --
MORE, 1 of 2

MARKER, ->CF
MARKER, ->PREV LVL
MARKER, ->H STEP
MARKER, ->SPAN
MINIMUM, ->MARKER
PREV, MENU*

PRESET, SPECTRUM*
* Switches to the PRESET menu

PEAK SEARCH
MARKER, ->CF
MARKER, DELTA
NEXT, PEAK
NEXT P H., RIGHT
NEXT P H., LEFT
PEAK, EXCURP

PEAK SEARCH
MARKER, ->CF
MARKER, DELTA
NEXT, PEAK
NEXT P H., RIGHT
NEXT P H., LEFT
PEAK, EXCURP

RECALL *
SAVE *
INTRNL, ->STATE
-- --
INTRNL, ->TRACE
-- --
CATALOG, INTRNL
INTRNL, CPD

RECALL *
SAVE *
CARD, ->STATE
-- --
CARD, ->TRACE
-- --
CARD, ->DLP
CATALOG, CARD
INTRNL, CPD

CATALOG, DLP
-- --
CHANGE, PREFIX
EXIT, CATALOG
MORE, 2 of 2

CATALOG, ALL
CATALOG, REGIST E R
CATALOG, V A R I A B L E S
-- --
CATALOG, PREFIX
MORE, 1 of 2

CATALOG, ALL
CATALOG, STATES
CATALOG, TRACES
-- --
CATALOG, PREFIX
MORE, 1 of 2

CATALOG, AMP COPR
CATALOG, LMT LINE
CHANGE, PREFIX
EXIT, CATALOG
MORE, 2 of 2

ABCD E F
CHJL
MNOPR
STU VW
YZ# SPC, CLEAR
MORE, 2 of 2

* For saving and recalling data from analyzer memory.

† Becomes MEM, LOCKED when SAV LOCK is on.

‡ CATALOG, REGISTER accesses LOAD, FILE instead of DELETE, FILE

* For saving and recalling data from the memory card, available with Option 003 only.

HP 8590B/8592B Menus
**SIGNAL TRACK**

- SPAN
- SPAN, ZOOM
- FULL SPAN
- ZERO SPAN
- BAND LOC

- 0-2.9 GHz, BAND 0
- 2.75-6 GHz, BAND 1
- 6-12 GHz, BAND 2
- 12-45 GHz, BAND 3
- 19-72 GHz, BAND 4

*HP 8592B only*

**SWEEP**

- SWP TIME, AUTO MAN
- SWEEP, CONT SGL

**TRACE**

- CLEAR, WRITE A
- MAX, HOLD A
- VIEW, A
- BLANK, A
- TRACE, A BC
- MORE, 1 of 3

- VID AVG, ON OFF
- DETECTOR, SAMPL P
- NORMALIZE, ON OFF
- POSITION
- A <-> B
- B <-> C
- MORE, 2 of 3

*Changes to MIN. HOLD C when trace C is selected*

**TRIG**

- SWEEP, CONT SGL
- FREE RUN
- VIDEO
- LINE
- EXTERNAL

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**HP 8590B/8592B Menus**