



Agilent N9340A Handheld Spectrum Analyzer

User's Guide



Agilent Technologies

Notices

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A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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Documentation Conventions:

1. A pair of curly brackets { } indicates a softkey, for example **{Start}** refers to the Start softkey.
2. A pair of square brackets [] indicates a hardkey, for example, **[ENTER]** refers to the ENTER hardkey.
3. "Analyzer" refers to Agilent N9340A handheld spectrum analyzer in the following chapters.
4. "DUT" refers to a device under test.



Agilent N9340A Handheld Spectrum Analyzer

1 Overview



Introduction

The Agilent N9340A is a handheld spectrum analyzer with a frequency range from 100 kHz to 3 GHz, tunable to 9 kHz. The analyzer provides ultimate measurement flexibility in a ruggedized package for demanding field use and is convenient for mobile applications.

Functionality

The Agilent N9340A provides you with a comprehensive functionality set and measurement convenience, including:

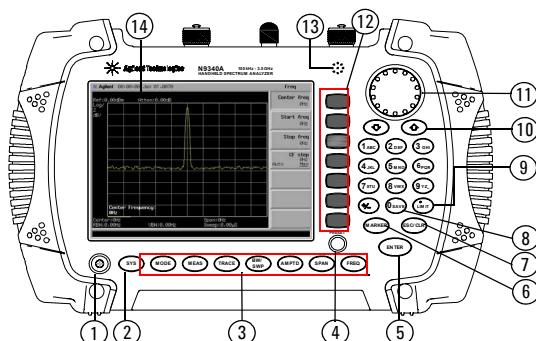
- 1 Pass/Fail judgement**
User definable limit lines for quick and easy Pass/Fail measurements.
- 2 Four-trace detection display**
Displays as many as four independent traces simultaneously, in any of four selectable detection modes: POS, NEG, Sample, or Normal.
- 3 Marker frequency readout**
Provides fine resolution down to 1 Hz, with a built-in frequency counter.
- 4 Power Suite**
Provides one-button measurement functionality on OBW (Occupied Bandwidth), channel power, and ACPR (Adjacent Channel Power Ratio).
- 5 High-sensitivity measurement**
Includes a 3 GHz pre-amplifier (Option N9340A-PA3) enabling highly sensitivity measurements, useful in the analysis of low-level signals.

Optimized Usability

The Agilent N9340A handheld spectrum analyzer provides enhanced usability:

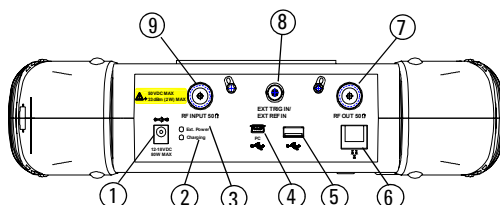
- The 7.2-inch sunlight viewable screen (640 × 480 pixels) enables you to read the scans easily and clearly in sun light.
- An arc-shaped handle and rugged rubber casing ensure a comfortable and firm hold to withstand tough environments.
- One-button measurement function provides easy, fast access to several measurements, including power.
- A USB port interface for easy and fast file saving to PC or memory stick.
- Instant screen control for power saving: pressing and holding the **[Preset]** hardkey for over two seconds turns off the screen. Pressing any front panel key re-activates the screen.

Front Panel Overview



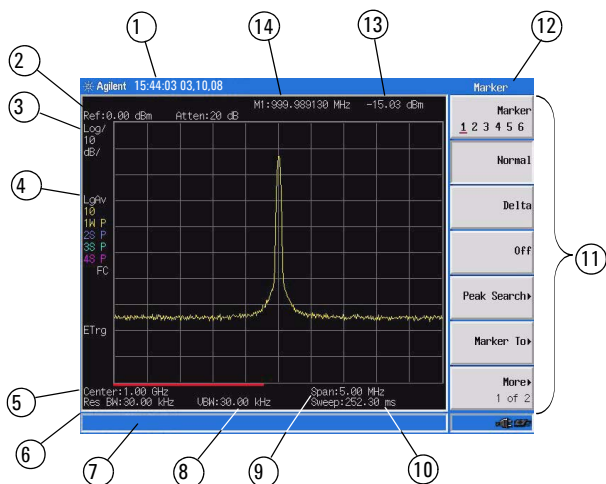
Caption	Function
1 Power Switch	Toggles the analyzer between on and off
2 SYS	Brings up a submenu for system setup
3 Function keys	Includes hardkeys: FREQ, SPAN, AMP/DB, BW/SWP, TRACE, MEAS, and MODE
4 Preset	Returns the analyzer to a known state, also turns on/off Power save feature (press for 2 sec.)
5 Enter	Confirms a parameter selection or configuration
6 MARKER	Activates the marker function
7 ESC/CLR	Exits and closes the dialog box or clears the character input
8 Save	Quick saves the current trace
9 LIMIT	Sets limit lines for quick Pass/Fail judgement
10 Arrow keys	Increases or decreases a parameter step by step
11 Knob	Selects an option item or edits a numerical parameter
12 Softkeys	Indicates current menu functions
13 Speaker	Active when in demodulation mode
14 Screen	Displays measured traces and status

Top Panel Overview



Caption	Function
1 External DC power connector	Provides input for the DC power source via an AC-DC adapter, or Automotive type DC adapter.
2 LED indicator (Charging)	Lights (On) when the battery is charging
3 LED indicator	Lights (On) when external DC power is connected to the tester
4 USB interface Type B (Device)	Connects to a PC
5 USB interface Type A (Host)	Connects to a USB memory stick or disk
6 LAN Interface	(Reserved for future expansion)
7 RF OUT Connector	(Reserved for future expansion)
8 EXT TRIG IN/REF IN (BNC, Female)	Connects to an external TTL signal or a 10 MHz reference signal. The TTL signal is used to trigger the analyzer's internal sweep
9 RF IN Connector (Type N, Female)	Accepts an external input with a frequency range from 100 kHz to 3 GHz, tunable to 9 kHz.

Display Annotations



	Description	Associated Function Key
1	Time and Date	[SYS] > {Setting} > {General}
2	Reference Level	[AMPTD]
3	Amplitude Scale	[AMPTD]
4	Detector Mode	[TRACE] > {More} > {Detector}
5	Center Frequency	[FREQ] > {Center Freq}
6	Resolution Bandwidth	[BW/SWP] > {RBW}
7	Display Status Line	Displays status and error messages.
8	Video Bandwidth	[BW/SWP] > {VBW}
9	Frequency Span	[SPAN]
10	Sweep Time	[BW/SWP] > {Sweep Time}
11	Key Menu	See key label description in the key reference for more information.
12	Key Menu Title	Refers to the current activated function
13	Marker Amplitude	[Marker]
14	Marker Frequency	[Marker]

Instrument Markings



The CE mark shows that the product complies with all relevant European Legal Directives
(If accompanied by a year, it signifies when the design was proven).



The CSA mark is a registered trademark of the Canadian Standards Association.



N10149

The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.

ISM1-A

This symbol is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4)



The instruction manual symbol: indicates that the user must refer to specific instructions in the manual.



The standby symbol is used to mark a position of the instrument power switch.



indicates this product complies with the **WEEE Directive** (2002/96/EC) marking requirements and you must not discard this equipment in domestic household waste. Do not dispose in domestic household waste. To return unwanted products, contact your local Agilent office, or refer to

<http://www.agilent.com/environment/product/>

1 Overview



Agilent N9340A
Handheld Spectrum Analyzer

2

Getting Started

Information on checking the analyzer when received, Preparation for use, basic instrument use, familiarity with controls, defining preset conditions, updating firmware, and contacting Agilent Technologies.



Checking the Shipment and Order List

Check the shipment and order list when you receive the shipment.

- Inspect the shipping container for damages. Signs of damage may include a dented or torn shipping container or cushioning material that indicates signs of unusual stress or compacting.
- Carefully remove the contents from the shipping container, and verify if the standard accessories and your ordered options are included in the shipment, according to checklist and "AC Power Cords" on page 14.
- For any question or problems, contact Agilent Technologies for consultation and service at: <http://www.agilent.com/find/assist>

Safety Considerations

Agilent has designed and tested the N9340A handheld spectrum analyzer for Measurement, Control and Laboratory Use in accordance with Safety Requirements IEC 61010-1: 2001, UL 61010-1 (2004), and CSA C22.2 No.61010-1-04. The tester is supplied in a safe condition. The N9340A is also designed for use in Installation Category II and Pollution Degree 2 per IEC 61010 and IEC 60664 respectively.

Read the following safety notices carefully before you start to use a N9340A handheld spectrum analyzer to ensure safe operation and to maintain the product in a safe condition.

WARNING

Personal injury may result if the analyzer's cover is removed. There are no operator-serviceable parts inside. Always contact Agilent qualified personnel for service. Disconnect the product from all voltage sources while it is being opened.

WARNING

This product is a Safety Class I analyzer. The main plug should be inserted in a power socket outlet only if provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

WARNING

Electrical shock may result when cleaning the analyzer with the power supply connected. Do not attempt to clean internally. Use a dry soft cloth to clean the outside case only.

1 Getting Started

WARNING

Always use the three-pin AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause personal injury and product damage.

WARNING

Danger of explosion if the battery is incorrectly replaced. Replace only with the same type recommended.

Do NOT dispose of batteries in a fire.

Do NOT place batteries in the trash. Batteries must be recycled or disposed of properly.

CAUTION

Recharge the battery only in the analyzer. If left unused, a fully charged battery will discharge itself over time.

Never use a damaged or worn-out adapter or battery. Charging the batteries internally, even while the analyzer is powered off, the analyzer may become warm. To avoid overheating, always disconnect the analyzer from the AC adapter before storing the analyzer into the soft carrying case.

CAUTION

The VxWorks operating system requires full conformity to USB 1.1 or USB 2.0 standards from a USB disk. Not all the USB disk are built that way. If you have problems connecting a particular USB disk, please reboot the analyzer before inserting the next.

NOTE

Temperature extremes will affect the ability of the battery to charge. Allow the battery to cool down or warm up as necessary before use or charging.

Storing a battery in extreme hot or cold temperatures will reduce the capacity and lifetime of a battery. Battery storage is recommended at a temperature of less than 45 °C.

Power Requirements

The AC power supplied to the instrument must meet the following requirements:





Voltage:	100 VAC to 240 VAC
Frequency:	50 Hz to 60 Hz
Power:	Maximum 62 W

The AC/DC power supply charger adapter supplied with the analyzer is equipped with a three-wire power cord, in accordance with international safety standards. This power cord grounds the analyzer cabinet when it is connected to an appropriate power line outlet. The power cable appropriate to the original product shipping location is included with the analyzer.

Various AC power cables are available from Agilent that are unique to specific geographic areas. You can order additional AC power cables that are correct for use in different areas. The AC Power Cords table provides a list of the available AC power cables, the plug configurations, and identifies the geographic area in which each cable is typically used.

The detachable power cord is the product disconnecting device. It disconnects the main AC circuit from the DC supply before the other parts of the product. The front-panel switch is only a standby switch and does not disconnect the instrument from AC LINE power.

AC Power Cords

Plug Type	Cable Part Number	Plug ^a Description	For use in Country & Region
 250V 10A	8121-1703	BS 1363/A	Option 900 United Kingdom, Hong Kong, Singapore, Malaysia
 250V 10A	8120-0696	AS 3112:2000	Option 901 Australia, New Zealand
 250V 16A	8120-1692	IEC 83 C4	Option 902 Continental Europe, Korea, Indonesia, Italy, Russia
 125V 10A	8120-1521	CNS 10917-2 / NEMA 5-15P	Option 903 United States, Canada, Taiwan, Mexico
 250V 10A	8120-2296	SEV 1011	Option 906 Switzerland
 230V 15A	8120-4600	SABS 164-1	Option 917 South Africa, India
 125V 15A	8120-4754	JIS C8303	Option 918 Japan
 250V 16A	8120-5181	SI 32	Option 919 Israel
 250V 10A	8120-8377	GB 1002	Option 922 China

Environmental Requirements

The N9340A is designed for use under the following conditions:

- Operating temperature:
–10°C to +50°C (with battery)
0°C to +40°C (with adapter)
- Storage temperature: –40°C to +70°C
- Humidity: 95% or less
- Altitude: 9200 m

Electrical Requirements

The analyzer allows the use of either a lithium battery pack (internal), AC-DC adapter shipped with the analyzer, or optional Automotive +12VDC adapter for its power supply.

Electrostatic Discharge (ESD) Precautions

The analyzer was constructed in an ESD protected environment. This is because most of the semiconductor devices used in this analyzer are susceptible to damage by static discharge.

Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity of a damaging static charge. The result can cause degradation of device performance, early failure, or immediate destruction.

These charges are generated in numerous ways, such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction. Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service circuitry with these devices.

Working with Batteries

Always use the original battery type, as supplied with the analyzer.

Installing a Battery



Step	Notes
1 Open the battery cover	Use a phillips type screwdriver, loosen the retaining screw, then pull the battery cover open.
2 Insert the battery	Observe correct battery polarity orientation when installing.
3 Close the battery cover	Push the cover closed, then re-fasten the cover with the retaining screw.

Viewing Battery Status

Determine the battery status using either of the following methods:

- Check the battery icon in the lower right corner of the front-panel screen: it indicates the approximate level of charge.
- Press **[SYS] > {More} > {Show System} > {Page down}** to check the current battery information.

Charging a Battery

Only charge the battery when it is installed in the analyzer. Fully charge the battery before first using the analyzer. This typically takes about four hours.

- 1 Install the battery in the analyzer.
- 2 Attach the AC-DC adapter and switch on external power.
- 3 The charge indicator lights, indicating that the battery is charging. When the battery is fully charged, the green charging indicator turns off.

During charging and discharging, the battery voltage, current, and temperature are monitored. If any of the monitored conditions exceed their safety limits, the battery will terminate any further charge or discharge until the error condition is corrected.

Powering on the Analyzer for the First Time

The N9340A is fitted with a transfective screen, which is viewable under all lighting conditions. In bright lighting conditions, the display is brighter and easier to read when you allow light to fall directly on the screen.

CAUTION

Use only the original AC-DC adapter or originally supplied battery for the power source.

The maximum RF input level of an average continuous power is 33 dBm (or ± 50 VDC signal input). Avoid connecting a signal into the analyzer that exceeds the maximum level.

Power on your N9340A

Insert the battery into the analyzer or connect the analyzer to an external line power supply via the AC-DC adapter, then press the power switch on the front panel of your N9340A to power on the analyzer.

Allow the analyzer to warm-up for 30 minutes before making a calibrated measurement. To meet its specifications, the analyzer must meet operating temperature conditions.



Preparation for Use

Use the **[SYS]** hardkey to check or access the system settings of your analyzer.

Setting up your N9340A

- 1 Press **[SYS] > {Setting} > {General}** to set the time and power saving mode:
 - Press **{Time/Date}** to set the time and date for your analyzer.
 - Press **{Power Manager}** to select a power-saving mode from the following three modes:
 - turn off backlight
 - turn off screen display
 - turn off both backlight and screen display
- 2 Press **[SYS] > {Setting} > {Language}** to select the language option displayed on screen.
- 3 To manually adjust the display brightness and contrast.
 - Press **[SYS] > {Brightness}** and then rotate the knob to adjust display brightness.
 - Press **[SYS] > {Contrast}** and then rotate the knob to adjust display contrast.
- 4 Press **[SYS] > {More} > {Key Beep}** to toggle the buzzer beep function between on and off.

Testing buttons and screen pixel

- 1 Press **[SYS] > {More} > {Diagnostics} > {Front Panel}** to test all the front panel keys except the **[PRESET]** hardkey and power switch.
- 2 Press **[SYS] > {More} > {Diagnostics} > {Black Pixel}** or **{White Pixel}** to test the basic display ability of the LCD.

Checking Instrument Information

- 1 Press **[SYS] > {More} > {Show System}** to display the system information.
- 2 Press **[SYS] > {More} > {Option}** to display the option information.
- 3 Press **[SYS] > {More} > {Show Error}** to display the error information.

Making a Basic Measurement

This section provides information on basic analyzer operations. It assumes that you are familiar with the front and top panel buttons and keys, and display annotations of your analyzer. If you are not, please refer to [“Front Panel Overview”](#) on page 4 and [“Top Panel Overview”](#) on page 5, and [“Display Annotations”](#) on page 6

For more information on making measurements, please refer to [“Making Measurements”](#) on page 41”.

Entering Data

When setting measurement parameters, there are several ways to enter or modify active function values:

1 Using the Front Panel Knob

Increases or decreases the current parameter value.

2 Using the Arrow Keys

Increases or decreases the current value by the step unit defined.

Press **[FREQ] > {CF Step}** to set the frequency by an auto-coupled step ($\text{Step} = \text{Span}/10$, when **{CF Step}** mode is set to **Auto**).

3 Using the Numeric Keypad

Enters a specific value. Then press a terminator key (either a specified unit softkey or **[ENTER]**) to confirm input.

4 Using the Unit Softkeys

Terminates a parameter value which requires a unit input.

5 Using the Enter Key

Terminates an entry or confirms a selection.

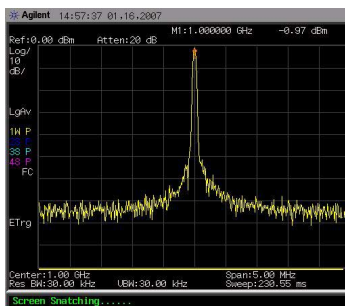
Viewing a Signal on the Analyzer

- 1 Using an RF signal generator to provide a CW signal of 1.0 GHz, at a power level of 0.0 dBm.
- 2 Press **[SYS] > {More} > {Preset}** and select **Default** to toggle the preset settings to default, factory-defined status.
- 3 Press the green **[Preset]** key to restore the analyzer measurement settings to factory defaults.
- 4 Connect the RF OUT of the generator to the analyzer's **RF IN** connector.
- 5 Press **[FREQ.] > {Center Freq} > 1 > {GHz}** to set the analyzer center frequency to 1 GHz.
- 6 Press **[SPAN] > 5 > {MHz}** to set the analyzer frequency span to 5 MHz.
- 7 Press **[MARKER] > {Peak Search} > {Peak}** to place a marker (M1) at the highest peak (1 GHz) on the display.

The Marker amplitude and frequency values appear in the function block and in the upper-right corner of the screen.

Use the front-panel knob, arrow keys, or the soft-keys in the Peak Search menu to move the marker and read out the value of both the frequency and amplitude displayed on the screen.

Figure 1 View a signal (1 GHz, 0 dBm)



Some Helpful Tips

Performing a time-base calibration

The N9340A provides a manual calibration function to calibrate the time base.

The analyzer should warm up for approximately 30 minutes before calibration.

Use a BNC cable to connect a 10 MHz reference signal to the **EXT TRIG IN** connector of your N9340A, then press **[SYS] > {More (2 of 3)} > {Calibration} > {Time Base}** to initiate a calibration.

Selecting a preset type

The N9340A has two Preset options. Power On Preset, and the Preset hardkey function. Each can be defined by the user using the System menu. The analyzer has two types of preset setting for you to choose from:

- **Default** Restores the analyzer to its factory-defined setting. The factory default settings can be found, "[Factory Default Settings](#)" on page 39
- **User**
Restores the analyzer to a user-defined setting. See "[Saving a User-defined Preset](#)" on page 23.

NOTE

The Analyzer will always use the factory-default settings when powering on.

Saving a User-defined Preset

If you frequently use system settings that are not the factory defaults, refer to the following steps to create a user-defined system settings that can be easily recalled at the power up state:

- 1 Set analyzer parameters by the knob, the arrow keys or the numeric keypad.

1 Getting Started

- 2 Press **[SYS] > {More} > {Preset} > {Save User}** to save the current parameters as the user preset setting.
- 3 Press **[SYS] > {More} > {Preset} (User)** to set the preset mode to user defined system setting.

Saving Multiple Test Setups

Test Setups that are unique and are necessary to recall frequently can be saved as an Instrument **State**, File Type. Other File Types are described on "[File Types](#)" on page 32.

Upgrading Firmware

CAUTION

When updating firmware, there must be a constant power supplied to the instrument for at least 10 minutes. If power fails during the updating process it can cause damage to the instrument.

The N9340A allows firmware updating quickly and easily. Perform the following steps for updating the firmware in your instrument:

- 1 Set up a folder named “N9340DATA” in the root directory of a USB memory stick, that is to be used for transferring the firmware to the instrument.
- 2 Store the firmware update application into the folder named N9340DATA on the memory stick.
- 3 Insert the USB memory stick into the correct USB connector on the top panel of the analyzer.
- 4 Press **[SYS] > {More} > {Update} > {Firmware}** to activate the firmware updating procedure. The instrument will then perform the update automatically.

Adding an option

Pressing **[SYS] > {More} > {Option} > {Add}** brings up a dialog box for entering the option license code. Use the numeric keypad to input the option license code and then press the **[ENTER]** key as a terminator. If the analyzer recognizes the option license code, a message “*Option install successfully*” will appear in the status line. If the code is not recognized, a message “*Invalid option license*” will appear in the status line.

Contacting Agilent Technologies

Agilent has Sales and Service Offices around the world to provide you with complete support.

Go to <http://www.agilent.com/find/assist>, for help with:

- product selection, configuration, and purchases.
- technical and application assistance, and consulting.
- rental and leasing options, and refurbished equipment.
- repair, calibration, education and training.

If you do not have access to the internet, call the appropriate number shown below. Or contact your local Agilent Technologies Sales and Service Office.

United States	(tel) 800 829 4444
	(fax) 800 829 4433
Canada	(tel) 877 894 4414
	(fax) 800 746 4866
Latin America	(tel) +1 (305) 269 7500
China	(tel) 800 810 0189
	(fax) 800 820 2816
Korea	(tel) 080 769 0800
	(fax) 080 769 0900
Japan	(tel) +81 426 56 7832
	(fax) +81 426 56 7840
Taiwan	(tel) 0800 047 866
	(fax) 0800 286 331
Europe	(tel) +31 20 547 2111
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	(fax) +65 6755 0042
	Email: tm_ap@agilent.com



Agilent N9340A
Handheld Spectrum Analyzer

3

System Setting

Information on System Settings, File types, Saving a file, Quick save a Trace/Screen, Instrument Default settings.



Visual and Audio Adjustment

Quick Display Adjustment

The analyzer provides you a quick adjustment for both brightness and contrast.

Press **[SYS] > {Display}** to toggle the screen display status between **Normal** and **Light**.

Manual Display Adjustment

Adjusting Brightness

Press **[SYS] > {Brightness}** then rotate the knob to adjust the screen brightness.

Adjusting Contrast

Press **[SYS] > {Contrast}** then rotate the knob to adjust the screen contrast.

Setting Key Beep

To activates the key beep function as an indicator of key operation:

Press **[SYS] > {More (1 of 3)} > {Key Beep}** On/Off

System Setting

Includes general system settings, displayed language setting, and external input setting.

General system settings

Provides the following system setting options:

Time/Date

Press **[SYS] > {Setting} > {General} > {Time/Date}** to set the date and time of the analyzer.

The analyzer requires you to input the time in a HHMMSS format, and the date in a YYYYMMDD format.

Power Manager

Press **[SYS] > {Setting} > {General} > {Power manager}** to select a power saving mode from the followings. The three idle time limit choices are either 5, 15, 30 minutes or as 4 hours.

- **Backlight**
The analyzer turns off the backlight of the LCD screen after the pre-defined idle time. Pressing any key will re-activate the backlight after the backlight power-saving mode has been triggered.
- **LCD**
The analyzer turns off the LCD display after the pre-defined idle time. Pressing any key will re-activate the LCD display after the LCD display power-saving mode has been triggered.
- **Backlight & LCD**
The analyzer turns off the both the LCD display and the backlight after a pre-defined idle time. Pressing any key will re-activate the backlight and LCD display after the backlight and LCD power-saving mode has been triggered.

Ext Input

NOTE

The external **Ref** and **Trig** functions cannot be used simultaneously.

Toggles the channel for external input between Ref and Trig. Ref refers to an external 10 MHz reference signal. Trig refers to an external TTL signal.

Key Access: **[SYS] > {Setting} > {Ext Input}**

External Reference (Ref)

Use the external reference function as follows:

- 1 Input a 10 MHz signal to the **EXT TRIG IN/REF IN** connector.
- 2 Press **[SYS] > {Setting} > {Ext Input} > {Ref}** to enable the external reference signal input.

The analyzer then turns off its internal reference.

External Trigger (Trig)

When an external TTL signal is used for the triggering function, the analyzer uses the instruments reference signal as the default.

Use the external trigger function as follows:

- 1 Press **[SYS] > {Setting} > {Ext Input} > {Trig}** to enable the external TTL signal input.
- 2 Press **[SPAN] > {Zero Span}** to activate the **Trigger** function.
- 3 Access the associated softkeys to select the rising edge (**Ext Rise**) or the falling edge (**Ext Fall**) as the trigger threshold

NOTE

The trace will halt in external trigger mode until the trigger threshold is met or the free run function is activated.

Quick saving or loading a system setup

Quick saving a setup

Press **[SYS] > {Setting} > {Save Setup}** to save the current system settings. This does not include the test parameters, such as, Frequency, BW, and Amplitude settings.

Refer to “**File Types**” on page 32 for more information about file types.

NOTE

This quick saving utility of the system state is the same as the system state saving utility under the **[SYS] > {File}**.

Quick recalling a setup

- **Load default**

Press **[SYS] > {Setting} > {Recall Setup} > {Load default}** to recall the factory default setup.

- **User Setup**

Press **[SYS] > {Setting} > {Recall Setup} > {User Setup}** to recall a customized setup that has been saved previously.

Saving or Recalling a Measurement State (Test Parameters)

Press **[SYS] > {File} > {File Setup} > {File Type} > {State}** to select the correct filetype State (.STA), used for saving specific measurement parameter information. The filetype, **State**, saves frequency, bandwidth, and amplitude information.

- **Recalling a saved Measurement State:**

Press **[SYS] > {File} > {File Setup} > {File Type} > {State}**
This displays a list of files of the type selected.
Select from the list to recall a customized test instrument parameter that had been previously saved to a “State” filetype.

File

Pressing **[SYS] > {File}** accesses a menu that allows you to manage file saving and loading.

NOTE

A USB memory stick of FAT32 or FAT16 format and with only one memory zone is required when using a USB memory stick for file saving and loading.

File Types

Each file type has a specific purpose as defined below. Pressing **[SYS] > {File} > {File Setup} > {File type}** allows the user to select a file type from one of the following:

- Trace (*.DAT)
A trace file records trace data and controls.
- Screen (*.JPG)
A screen file records graphic information of the current screen.
- State (*.STA)
A state file records the current controls and test parameter settings of the analyzer. Use this filetype for saving test parameters for future recall, such as Frequency, Amplitude and BW settings.
- Pattern (*.PTN)
A pattern file records the limit line settings.
- Spectrum Mask (*.MSK)
A mask file records the spectrum mask settings. You can use the *N9340A PC software* to edit a mask file and transfer the mask to your N9340A.
- Setup (*.SET)
A setup file records the system setting information, such as language, date/time, and power saving mode. This filetype is not used for test parameter setup information.

Saving Path

Pressing **[SYS] > {File} > {File Setup} > {Save Path}** allows you to select a path from one of the following:

- Local memory
- External USB memory stick

Saving a file

NOTE

When selecting a file type, you can edit a file name by pressing the numeric and alphabetic hardkeys on the right side of the analyzer's front panel.

Refer to the following three steps to save a file:

- 1 Press **[SYS] > {File} > {File setup}** to select the save path and file type.
- 2 Edit a file name.
A file name can consist of letters and digits. A single key stroke on the numerical keypad inputs a digital number; and consecutive key stroke selects and inputs a letter.
- 3 Press **{Save}** to save the file.

When a file saving completes, the message "File Saved" displays on the bottom line of the screen.

NOTE

When the saving path is to the USB, files are automatically saved into a folder named as N9340DATA in the root directory of the USB memory stick.
If the USB memory stick connection can not be updated, remove the USB memory stick, then cycle the power and re-insert the USB memory stick.

Quick saving a trace or a screen

Pressing **[ESC/CLR]** > **[Save]** allows the user to quickly save a trace or a screen to either the local memory or an external USB device. For more information about file setup, refer to “[File Types](#)” on page 32 and “[Saving Path](#)” on page 33.

Three steps for saving a trace or a screen:

- 1 Press **[SYS]** > **{File}** > **{File Setup}** > **{Shortcut Type}** to indicate the shortcut type to either a trace or a screen copy.
- 2 Press **[SYS]** > **{File}** > **{File Setup}** > **{Save Path}** to either local memory or an external USB device.
- 3 Press **[ESC]**, **[Save]** to save a trace or a screen copy to the pre-defined memory location. The trace or screen will be automatically assigned with a default file name. A trace will be assigned a file name, such as HYTRACE, HYTRACE_1, and consecutive decimal numbers appended. A screen copy will be assigned file name, such as HYSCREEN, HYSCREEN_1 and consecutive decimal numbers appended to the alphabetic file name.

To quick save or load a setup, refer to “[Quick saving or loading a system setup](#)” on page 31.

Viewing file list

Refer to the following two steps to view a file list:

- 1 Select the directory to view from.
Press **[SYS]** > **{File}** > **{View}** to toggle the displayed file list from **local** memory or an external **USB** memory stick.
- 2 Select the file type to view.
Press **[SYS]** > **{File}** > **{File setup}** > **{File type}** to select a file type.

Deleting a file

CAUTION

Once a file is deleted, it CANNOT be recovered. Carefully decide whether to delete a file(s) before proceeding.

- 1 Press **[SYS] > {File} > {View}** to select a directory.
- 2 Press **[SYS] > {File} > {File setup} > {File type}** to select a file type.
- 3 Rotate the knob to highlight a file.
- 4 Press **{Delete}** to delete a selected file.

Loading a file

NOTE

A screen file (*.JPG) cannot be loaded onto the analyzer.

- 1 Press **[SYS] > {File} > {View}** to select a directory.
- 2 Press **[SYS] > {File} > {File setup} > {File type}** to select a file type.
- 3 Rotate the knob to highlight a file.
- 4 Press **{Load Now}** to recall a pre-saved file.

Show System

Displays the following hardware, software and battery information of your analyzer:

Machine Model	Battery Info
MCU Firmware Version	Name
DSP Firmware Version	Serial NO.
FPGA Firmware Version	Capacity
RF Firmware Version	Temperature
RF Module S/N	Charge Cycles
KeyBoard Module S/N	Voltage
This Run Time	Current
Temperature	Charge Status
Source Voltage	Remain Time
Power Source	Host ID

Key Access: **[SYS] > {More} > {Show system}**

Show Error

Accesses a list of the 30 most recent error messages as reported by the analyzer. The most recent error appears at the bottom of the list. If the error list is longer than 30 entries, the analyzer reports an error message [-350, Query overflow]. When in remote control, and the error list is greater than 30 entries, the error display is halted and a message at the bottom of the list informs the user that errors exceed 30.

Key Access: **[SYS] > {More} > {Show Error}**

For more information, refer to [“Error Messages”](#) on page 157.

Perform a Time Base Calibration

When the calibration function is triggered, the current measurement is interrupted and a gauge displays on the LCD. The gauge indicates calibration action rather than calibration course, as the calibration time is unpredictable. When the calibration is finished, the LCD displays a calibration, and the interrupted measurement restarts.

NOTE

Time base calibration takes only a short time when the inner temperature is stable. When the inner temperature is increasing, calibration may take a long-time or will fail. If the input reference signal is abnormal, the calibration cycle will take a long and unpredictable time to exit, and the LCD will display an error message.

Key Access: **[SYS] > {More} > {Calibration}**

Factory Default Settings

Parameter	Default Setting
Center Frequency	1.5 GHz
Start Frequency	0.0 Hz
Stop Frequency	3.0 GHz
Span	3.0 GHz
Reference Level	0.0 dBm
Attenuation	Auto (20 dB)
Scale/DIV	10 dB/DIV
Scale Type	Log
RBW	Auto (1 MHz)
VBW	Auto (1 MHz)
Average Type	Log Power
Sweep time	Auto
Sweep Mode	Normal
Trace 1	Clear write
Trace 2	Blank
Trace 3	Blank
Trace 4	Blank
Trace 1 Detection	Pos Peak
Trace 2 Detection	Pos Peak
Trace 3 Detection	Pos Peak
Trace 4 Detection	Pos Peak
Trace Average	All Off
Marker	All Off
File Type	Trace
Save Path	Local
Mode	Spectrum Analyzer
External Input type	Trigger in (TTL signal input)

For more information about saving a user-defined preset, refer to [“Selecting a preset type”](#) and [“Saving a User-defined Preset”](#) on page 24.

4 System Setting



Agilent N9340A
Handheld Spectrum Analyzer

4 Making Measurements

Measuring Multiple Signals

This section provides information on measuring multiple signals.

Comparing Signals on the Same Screen

The N9340A can easily compare frequency and amplitude signal differences. For example, measuring radio or television signal spectra. The **Delta Marker** function allows two signals to be compared when both appear on the screen at the same time.

In the following example, a 50 MHz input signal is used to measure frequency and amplitude differences between two signals on the same screen. The **Delta Marker** function is demonstrated in this example.

- 1 Press [**PRESET**] to set the analyzer to a factory default setting.
- 2 Input a signal (0 dB, 50 MHz) to the **RF IN** connector of the analyzer.
- 3 Set the analyzer start frequency, stop frequency and reference level to view the 50 MHz signal and its harmonics up to 100 MHz:
 - Press [**FREQ**] > {**Start Freq**} > **40** > {**MHz**}
 - Press [**FREQ**] > {**Stop Freq**} > **110** > {**MHz**}
 - Press [**AMPTD**] > {**Ref Level**} > **0** > {**dBm**}
- 4 Press [**MARKER**] > {**Peak search**} to place a marker on the highest peak on the display (50 MHz). The {**Next Left PK**} and {**Next Right PK**} softkeys are available to move the marker from peak to peak.
- 5 Press [**MARKER**] > {**Delta**} to anchor the first marker (labeled as M1) and activate a delta marker:

The label on the first marker now reads 1R, indicating that it is the reference point.

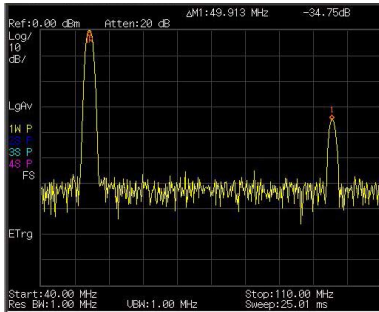
- 6 Move the second marker to another signal peak using the front panel knob or by using the **{Peak Search}** softkey. In this example the next peak is 100MHz, a harmonic of the 50MHz signal:

- Press **[MARKER] > {Peak Search} > {Next Right PK}** or **{Next Left PK}**.

NOTE

To increase marker reading resolution, turn on the frequency count function. For more information, refer to ["Improving Frequency Resolution and Accuracy"](#) on page 52

Figure 2 Delta pair marker with signals on the same screen



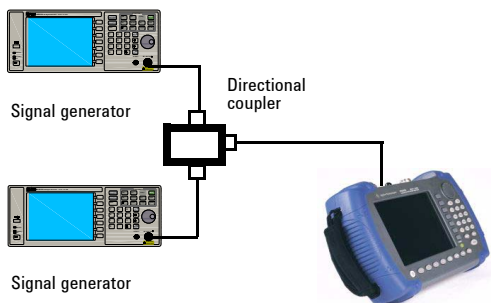
Resolving Signals of Equal Amplitude

In this example a decrease in resolution bandwidth is used in combination with a decrease in video bandwidth to resolve two signals of equal amplitude with a frequency separation of 100 kHz.

Note that the final RBW selected is the same width as the signal separation while the VBW is slightly narrower than the RBW.

- 1 Connect two sources to the analyzer input as shown below.

Figure 3 Setup for obtaining two signals



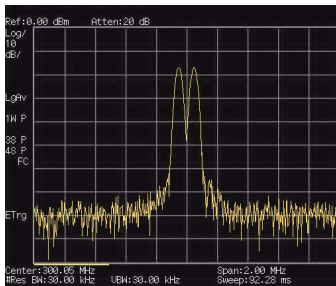
- 2 Set one source to 300 MHz. Set the frequency of the other source to 300.1 MHz. Set both source amplitudes to -20 dBm.
- 3 Set up the analyzer to view the signals:
 - Press [PRESET].
 - Press [FREQ] > {Center Freq} > 300.05 > {MHz}.
 - Press [SPAN] > {Span} > 2 > {MHz}.
 - Press [BW/SWP] > {RBW} > 30 > {kHz}.

Use the knob or the arrow keys to further reduce the resolution bandwidth and better resolve the signals.

As you decrease the resolution bandwidth, you improve the resolution of the individual signals and it also increases the sweep timing. For faster measurement times, use the widest possible resolution bandwidth.

Under factory preset conditions, the resolution bandwidth is coupled to the span.

Figure 4 Resolving signals of equal amplitude

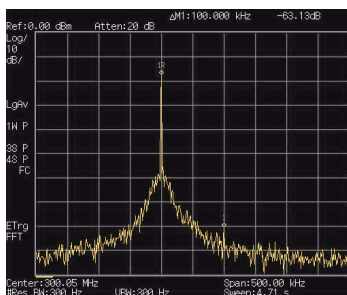


Resolving Small Signals Hidden by Large Signals

This example uses narrow resolution bandwidths to resolve two input signals with a frequency separation of 50 kHz and an amplitude difference of 60 dB.

- 1 Connect two sources to the analyzer input connector as shown in [Figure 3](#) on page 44.
- 2 Set one source to 300 MHz at -10 dBm. Set the other source to 300.05 MHz at -70 dBm.
- 3 Set the analyzer as follows:
 - Press **[PRESET]**
 - Press **[FREQ] > {Center Freq} > 300.05 > {MHz}**
 - Press **[SPAN] > [500] > kHz**.
 - Press **[BW/SWP] > {RBW} > 300 > {Hz}**
- 4 Reduce the resolution bandwidth filter to view the smaller hidden signal. Place a delta marker on the smaller signal:
 - Press **[MARKER] > {Peak Search}**
 - Press **[MARKER] > {Delta}**
 - Press **[MARKER] > {Peak Search} > {Next Right PK}** or **{Next Left PK}**.

Figure 5 Resolving small signal hidden by a large signal



Measuring a Low-Level Signal

This section provides information on measuring low-level signals and distinguishing them from spectrum noise. There are four main useful techniques to measure a low-level signal:

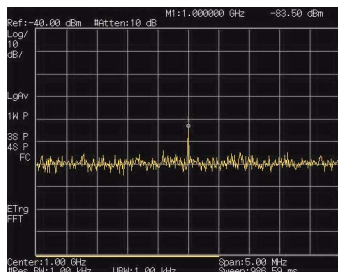
Reducing Input Attenuation

The ability to measure a low-level signal is limited by the internally generated noise in the spectrum analyzer.

The input attenuator affects the level of a signal passing through the analyzer. If a signal is very close to the noise floor, reducing input attenuation will bring the signal out of the noise.

- 1 Preset the analyzer:
- 2 Input a signal (1 GHz, -80 dBm) to the analyzer RF input connector.
- 3 Set the center frequency, span and reference level:
 - Press **[FREQ]** > {Center Freq} > 1 > {GHz}
 - Press **[SPAN]** > 5 > {MHz}
 - Press **[AMPTD]** > {Ref Level} > -40 > {dBm}
- 4 Move the desired peak (in this example, 1 GHz) to the center of the display:
 - Press **[MARKER]** > {Peak Search}
 - Press **[MARKER]** > {Marker To} > {To Center}

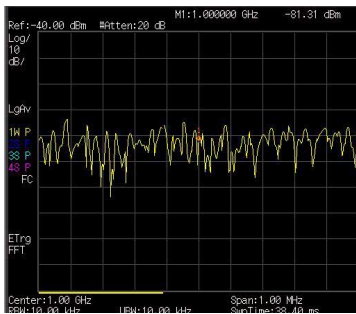
Figure 6 A signal closer to the noise level (Atten:10 dB)



4 Making Measurements

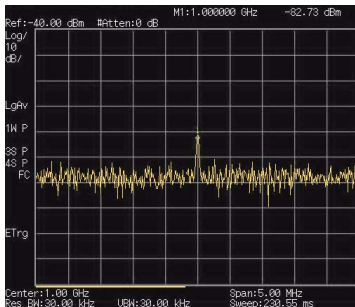
- 5 Reduce the span to 1 MHz, and if necessary, re-center the peak.
 - Press **[SPAN] > [1] > {MHz}**.
- 6 Set the attenuation to 20 dB. Note that increasing the attenuation moves the noise floor closer to the signal level.
 - Press **[AMPTD] > {Attenuation} > 20 > {dB}**.

Figure 7 A signal closer to the noise level (Atten: 20 dB)



- 7 Press **[AMPTD] > Attenuation > 0 > {dB}** to set the attenuation to 0 dB.

Figure 8 A signal closer to the noise level (Atten: 0 dB)



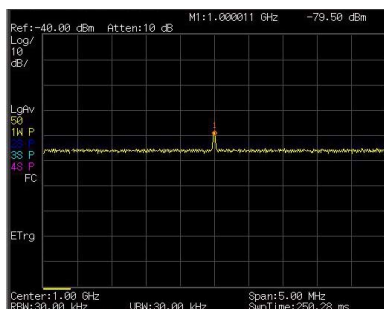
Decreasing the Resolution Bandwidth

Resolution bandwidth settings affect the level of internal noise without affecting the amplitude level of continuous wave (CW) signals. Decreasing the RBW by a decade reduces the noise floor by 10 dB.

- 1 Refer to [“Reducing Input Attenuation”](#) on page 47, and follow steps 1, 2 and 3.
- 2 Decrease the resolution bandwidth:
 - Press **[BW/SWP] > {RBW}**, and toggle the RBW setting to **Man (manual)**, then decrease the resolution bandwidth using the knob, the arrow keys or the numeric keypad.

The low level signal appears more clearly because the noise level is reduced.

Figure 9 Decreasing resolution bandwidth

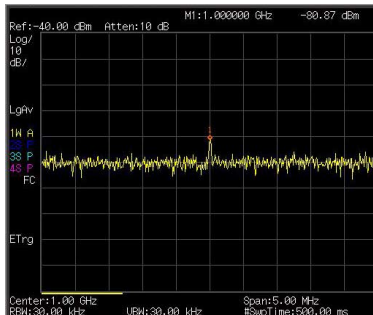


Using the Average Detector and Increased Sweep Time

The analyzer's noise floor response may mask low-level signals. Selecting the instruments averaging detector and increasing the sweep time will smooth the noise and improves the signal's visibility. Slower sweep times are necessary to average noise variations.

- 1 Refer to [“Reducing Input Attenuation”](#) on page 47, and follow steps 1, 2 and 3.
- 2 Press **[TRACE] > {More (1 of 2)} > {Detector} > {Average}** to select the average detector.
- 3 Press **[BW/SWP] > {Sweep Time}** to set the sweep time to 500 ms.
Note how the noise appears to smooth out. The analyzer has more time to average the values for each of the displayed data points.
- 4 Press **[BW/SWP] > {Avg Type}** to change the average type.

Figure 10 Using the average detector



Trace Averaging

Averaging is a digital process in which each sweeps trace point is averaged with the previous sweeps data average for the same trace point.

Selecting averaging, when the analyzer is auto coupled, changes the detection mode to sample, smoothing the displayed noise level.

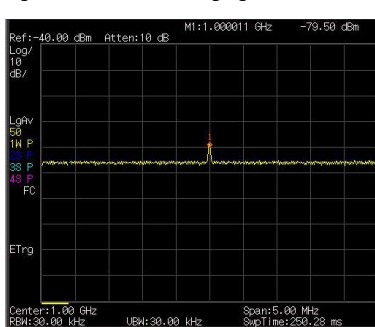
NOTE

This is a trace processing function and is not the same as using the average detector (as described on [page 50](#)).

- 1 Refer to the first procedure “[Reducing Input Attenuation](#)” on page 47, and follow steps 1, 2 and 3.
- 2 Press [TRACE] > {Average} (On) to turn average on.
- 3 Press 50 > [ENTER] to set the average number to 50.

As the averaging routine appears to smooth the trace, low level signals become more visible.

Figure 11 Trace averaging



Improving Frequency Resolution and Accuracy

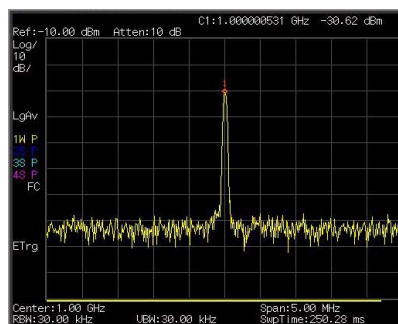
Using the frequency counter to improve frequency resolution and accuracy.

NOTE

Marker count will properly function only on CW signals or discrete spectral components. The marker must be > 40 dB above the displayed noise level.

- 1 Press **[PRESET]**. (Factory Preset)
- 2 Input a signal (1 GHz, -30 dBm) to the analyzer's **RF IN** connector.
- 3 Set the center frequency to 1 GHz and the span to 5 MHz:
- 4 Press **[MARKER] > {More (1 of 2)} > {Mode} > {Freq Count}** to turn the frequency counter on.
- 5 Move the marker by rotating the knob, to a point half-way down the skirt of the signal response.
- 6 Press **[MARKER] > {More (1 of 2)} > {Mode} > {Normal}** to turn off the marker counter.

Figure 12 Using the frequency counter



Making Distortion Measurements

This section provides information on measuring and identifying signal distortion.

Identifying Analyzer Generated Distortion

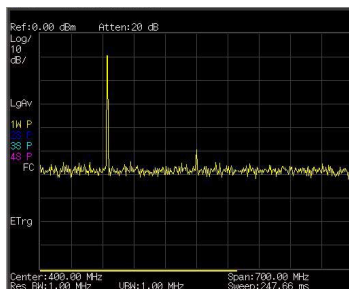
High level input signals may cause analyzer distortion products that could mask the real distortion present on the measured signal. Use trace and the RF attenuator to determine which signals, if any, may be internally generated distortion products.

In this example, a signal from a signal generator is used to determine whether the harmonic distortion products are generated by the analyzer.

- 1 Input a signal (200 MHz, -10 dBm) to the analyzer **RF IN** connector.
- 2 Set the analyzer center frequency and span:
 - Press **[PRESET]**. (Factory Preset)
 - Press **[FREQ] > {Center Freq} > 400 > {MHz}**.
 - Press **[SPAN] > 700 > {MHz}**.

The signal produces harmonic distortion products (spaced every 200 MHz from the original 200 MHz signal)

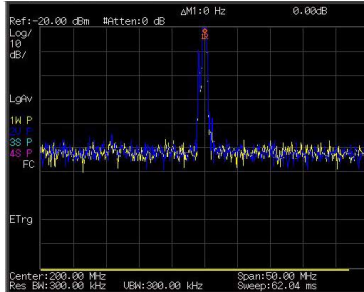
Figure 13 Harmonic distortion



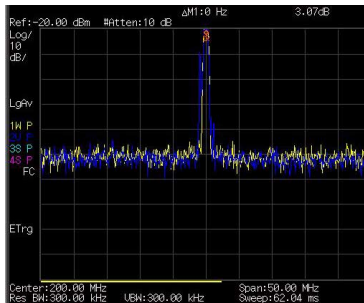
4 Making Measurements

- 3 Change the center frequency to the value of the second (400MHz) harmonic:
 - Press **[MARKER] > {Peak Search}**.
 - Press **[MARKER] > {Marker To} > {To Center}**.
- 4 Change the span to 50 MHz and re-center the signal:
 - Press **[SPAN] > 50 > {MHz}**.
 - Press **[MARKER] > {Peak Search}**.
- 5 Set the attenuation to 0 dB:
 - Press **[AMPTD] > {Attenuation} > 0 > {dB}**.
 - Press **[MARKER] > {Marker To} > {To Ref}**.
- 6 To determine whether the harmonic distortion products are generated by the analyzer, first save the trace data in trace 2 as follows:
 - Press **[TRACE] > {Trace (2)}**.
 - Press **[TRACE] > {Clear Write}**.
- 7 Allow trace 2 to update (minimum two sweeps), then store the data from trace 2 and place a delta marker on the harmonic of trace 2:
 - Press **[TRACE] > {View}**.
 - Press **[MARKER] > {Peak Search}**.
 - Press **[Marker] > {Delta}**.

The figure below shows the stored data in trace 2 and the measured data in trace 1. The Marker Delta indicator reads the difference in amplitude between the reference and active trace markers.

Figure 14 Identifying Analyzer Distortion (0 dB atten)

8 Press [AMPTD] > {Attenuation} > 10 > {dB} to increase the RF attenuation to 10 dB.

Figure 15 Identifying Analyzer Distortion (10 dB atten)

The marker amplitude readout comes from two sources:

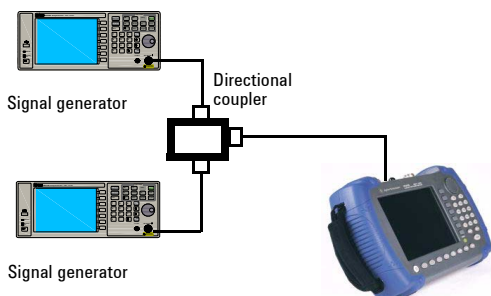
- Increased input attenuation causes poorer signal-to-noise ratio. This causes the marker delta value to be positive.
- Reduced contribution of the analyzer circuits to the harmonic measurement causes the marker delta value to be negative.

A large marker delta value readout indicates significant measurement errors. Set the input attenuator at a level to minimize the absolute value of marker delta.

Third-Order Intermodulation Distortion

Two-tone, third-order intermodulation (TOI) distortion is a common test in communication systems. When two signals are present in a non-linear system, they may interact and create third-order intermodulation distortion products that are located close to the original signals. System components such as amplifiers and mixers generate these distortion products. In this example we test a device for third-order intermodulation using markers. Two sources are used, one set to 300 MHz and the other to 301 MHz.

- 1 Connect the equipment as shown in figure below.



This combination of signal generators, low pass filters, and directional coupler (used as a combiner) results in a two-tone source with very low intermodulation distortion.

Although the distortion from this setup may be better than the specified performance of the analyzer, it is useful for determining the TOI performance of the source/analyzer combination. After the performance of the source/analyzer combination has been verified, the DUT (Device under test, for example, an amplifier) would be inserted between the directional coupler output and the analyzer input.

NOTE

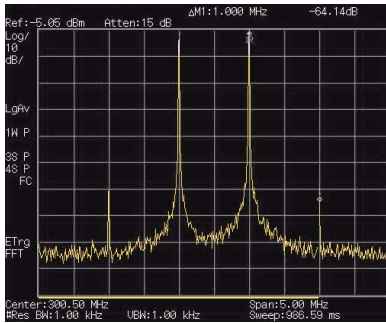
The coupler used should have a high isolation between the two input ports to limit the source intermodulation.

- 2 Set one source (signal generator) to 300 MHz and the other source to 301 MHz. This will define the frequency separation at 1 MHz. Set both sources equal in amplitude, as measured by the analyzer. In this example, they are both set to -5 dBm.
- 3 Set the analyzer center frequency and span:
 - Press **[PRESET]**. (With Preset Type of Default)
 - Press **[FREQ] > {Center Freq} > 300.5 > {MHz}**.
 - Press **[SPAN] > 5 > {MHz}**.
- 4 Reduce the analyzer RBW until the distortion products are visible:
 - Press **[BW/SWP] > {RBW}**, and reduce the RBW using the knob, the arrow keys or the numeric keypad.
- 5 Move the signal to the reference level:
 - Press **[MARKER] > {Peak Search}**.
 - Press **[MARKER] > {Marker To} > {To Ref}**.
- 6 Reduce the RBW until the distortion products are visible:
 - Press **[BW/SWP] > {RBW}**, and reduce the RBW using the knob, the arrow keys or the numeric keypad.
- 7 Activate the second marker and place it on the peak of the distortion product (beside the test signal) using the **Next Peak**:
 - Press **[MARKER] > {Delta}**.
 - Press **[MARKER] > {Peak Search} > {Next Left (Right) PK}**.
- 8 Measure the other distortion product:
 - Press **[MARKER] > {Normal}**.

4 Making Measurements

- Press [MARKER] > {Peak Search} > {Next Left (Right) Peak}.
- 9 Measure the difference between this test signal and the second distortion product.
- Press [Marker] > {Normal}.
 - Press [MARKER] > {Peak Search} > {Next Left (Right) Peak}.

Figure 16 TOI test screen



One-button Power Measurement

The N9340A provides one-button measurement functionality on OBW (Occupied Band Width), Channel Power and ACPR (Adjacent Channel Power Ratio) as an easy-to-use access for these measurements.

Measuring OBW

Occupied Bandwidth (OBW) integrates the power of the spectrum in the displayed green frame. The measurement defaults to 99% of the occupied bandwidth power.

Occupied bandwidth measurements are made in either single or continuous sweep mode.

Selecting a Method

Press **[MEAS] > {OBW} > {Method}** to toggle the occupied bandwidth measurement mode between **percentage (%)** and **dBc**.

- **Setting Percentage (%)**

Press **{OBW} > {Method} > {Percent}** to edit the percentage of signal power used when determining the occupied bandwidth. Press **{%}** to set the percentage ranging from 10.00% to 99.99%.

- **Setting dBc**

Press **{OBW} > {Method} > {dBc}** to specify the power level used to determine the emission bandwidth as the number of dB down from the highest signal peak, within the occupied bandwidth span. This function is an independent calculation from the OBW calculation. The x dB Bandwidth result is also called the emissions bandwidth (EBW). This sets the green frame (f1 and f2 are the two cross points of the signal and the pair of vertical lines of the displayed green frame) to your specified dB value below the maximum power, and compute the total power in the frame. The emission bandwidth is then calculated ranging from 0.1 dB to 100 dB (the default value is set to 26 dB).

Measuring ACPR

The adjacent channel power ratio (ACPR) measures the power ratio between the main channel power and the adjacent channel power.

Center Frequency

Sets the center frequency of the main channel power.

Key Access: **[MEAS] > {ACPR} > {Center Freq}**

Main Channel

Specifies the range of integration used in calculating the power in the main channel. Use the knob, the arrow keys, or the numeric keypad to set the bandwidth.

Key Access: **[MEAS] > {ACPR} > {Main Channel}**

Adjacent Channel

Specifies the range of integration used in calculating the power in the adjacent channel. Use the knob, the arrow keys, or the numeric keypad to set the bandwidth.

Key Access: **[MEAS] > {ACPR} > {Adj Channel}**

Channel Space

Sets the space value between the center frequency of main channel power and that of the adjacent channel power.

Key Access: **[MEAS] > {ACPR} > {Channel Space}**

Measuring Channel Power

Measures the power and power spectral density in the channel bandwidth specified. One pair of vertical lines of the displayed green frame indicates the edges of the channel bandwidth. The center frequency, reference level, and channel bandwidth must be set by the user.

The power calculation method used to determine the channel power is a traditional method known as the integration bandwidth (IBW) method. A swept spectrum is used as the basis for this calculation. Therefore, it is important to set the resolution bandwidth correctly before making this measurement using the following formula:

$$RBW = k \times \frac{Span}{n}$$

Where k is a value between 1.2 and 4.0 and n is the number of trace points.

Center Frequency

Sets the center frequency of the display.

Key Access: **[MEAS] > {Channel Power} > {Center Freq}**

Integration Bandwidth

Specifies the bandwidth of integration bandwidth, which can range from 100 Hz to 3 GHz to calculate the power in a channel. For example, set the main (center) channel bandwidth. Note that the green frame indicates the integration bandwidth. Change the integration bandwidth using the knob, the arrow keys, or the numeric keypad.

Key Access: **[MEAS] > {Channel Power} > {Int BW}**

Channel Bandwidth

Sets the analyzer span for the channel power measurement using the knob, the arrow keys or the numeric keypad. Be sure the span is set between 1 and 10 times the integration bandwidth.

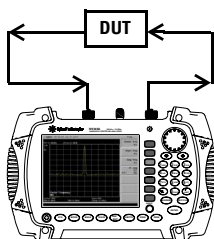
Key Access: **[MEAS] > {Channel Power}**

Making a Stimulus Response Transmission Measurement

The procedure below describes how to use a built-in tracking generator to measure the rejection of a low pass filter, a type of transmission measurement.

- 1 To measure the rejection of a low pass filter, connect the equipment as shown below. A 370 MHz low-pass filter is used as a DUT in this example.

Figure 17 Transmission Measurement Test Setup



- 2 Press **[Preset]** to perform a factory preset.
- 3 Set the start and stop frequencies and resolution bandwidth:
 - Press **[FREQ] > {Start Freq} > 100 > {MHz}**
 - Press **[FREQ] > {Stop Freq} > 1 > {GHz}**
 - Press **[BW/SWP] > {RBW} > 1 > {MHz}**
- 4 Turn on the tracking generator and if necessary, set the output power to -10 dBm:

Press **[Mode] > {Track Generator} > {Amplitude (On)} > -10 > {dBm}**.

CAUTION

Excessive signal input may damage the DUT. Do not exceed the maximum power that the device under test can tolerate.

4 Making Measurements

- 5 Press **[Sweep] > {Sweep Time (Auto)}** to put the sweep time into stimulus response auto coupled mode.

- 6 Increase measurement sensitivity and smooth the noise:

Press **[BW/SWP] > {RBW} > 30 > {kHz}**

Press **[BW/SWP] > {VBW} > 30 > {kHz}**

A decrease in the displayed amplitude is caused by tracking error.

- 7 Connect the cable from the tracking generator output to the analyzer input. Store the frequency response in trace 4 and normalize:

Press **[MEAS] > {Normalize} > {Store Ref} (1->4) > {Normalize (On)}**

- 8 Reconnect the DUT to the analyzer and change the normalized reference position:

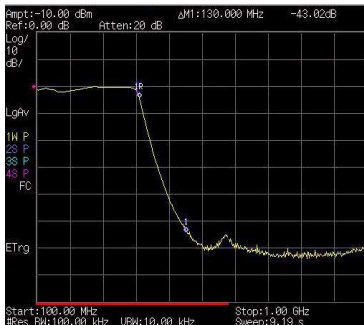
Press **[MEAS] > {Normalize} > {Norm Ref Posn} > 8 > [ENTER]**

- 9 Measure the rejection of the low-pass filter:

Press **[Marker] > {Normal} > 370 > MHz, {Delta} > 130 > {MHz}**

The marker readout displays the rejection of the filter at 130 MHz above the cutoff frequency of the low-pass filter.

Figure 18 Measure the Rejection Range



Measuring Stop Band Attenuation of a Low-pass Filter

When measuring filter characteristics, it is useful to look at the stimulus response over a wide frequency range. Setting the analyzer x-axis (frequency) to display logarithmically provides this function. The following example uses the tracking generator to measure the stop band attenuation of a 370 MHz low-pass filter.

- 1 Connect the DUT as shown in Figure 16. This example uses a 370 MHz low-pass filter
- 2 Press **[Preset]** to perform a factory preset.
- 3 Set the start and stop frequencies:
 - Press **[FREQ] > {Start Freq} > 100 > {MHz}**
 - Press **[FREQ] > {Stop Freq} > 1 > {GHz}**
 - Press **[AMPTD] > {Scale Type} > {Log}**
- 4 Press **[BW/SWP] > {RBW} > {10} > {kHz}** to set the resolution bandwidth to 10 kHz.

CAUTION

Excessive signal input may damage the DUT. Do not exceed the maximum power that the device under test can tolerate.

- 5 Turn on the tracking generator and if necessary, set the output power to -10 dBm:

Press **[Mode] > {Track Generator} > {Amplitude (On)} > -10 > {dBm}**.
- 6 Press **[Sweep] > {Sweep Time (Auto)}** to put the sweep time into stimulus response auto coupled mode.

Adjust the reference level if necessary to place the signal on the screen.
- 7 Connect the cable (but not the DUT) from the tracking generator output to the analyzer input. Store the frequency response into trace 4 and normalize:

4 Making Measurements

Press **[MEAS] > {Normalize} > {Store Ref} (1-> 4) > {Normalize (On)}**

- 8 Reconnect the DUT to the analyzer. Note that the units of the reference level have changed to dB, indicating that this is now a relative measurement.

- 9 To change the normalized reference position:

Press **[MEAS] > {Normalize} > {Norm Ref Posn} > {8} > [ENTER]**

- 10 Place the reference marker at the specified cutoff frequency:

Press **[MARKER] > {Normal} > {370} > MHz**

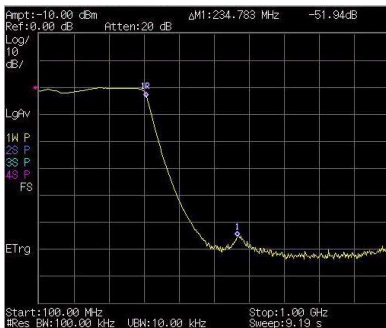
- 11 Set the second marker as a delta frequency of 37 MHz:

Press **{Delta} > 37 > MHz**

- 12 In this example, the attenuation over this frequency range is 19.16 dB/octave (one octave above the cutoff frequency).

- 13 Use the front-panel knob to place the marker at the highest peak in the stop band to determine the minimum stop band attenuation. In this example, the peak occurs at 600 MHz. The attenuation is 51.94 dB.

Figure 19 Minimum Stop Band Attenuation



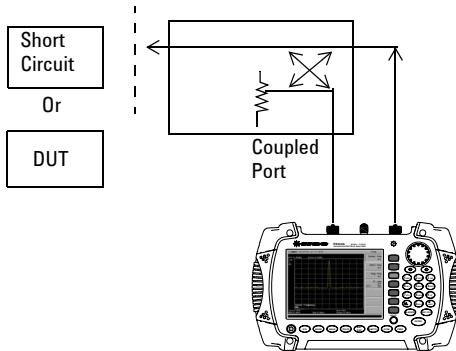
Making a Reflection Calibration Measurement

The following procedure makes a reflection measurement using a coupler or directional bridge to measure the return loss of a filter. This example uses a 370 MHz low-pass filter as the DUT.

The calibration standard for reflection measurements is usually a short circuit connected at the reference plane (the point at which the device under test (DUT) is connected.) See Figure 19. A short circuit has a reflection coefficient of 1 (0 dB return loss). It reflects all incident power and provides a convenient 0 dB reference.

- 1 Connect the DUT to the directional bridge or coupler as shown below. Terminate the unconnected port of the DUT.

Figure 20 Reflection Measurement Short Calibration Test Setup



NOTE

If possible, use a coupler or bridge with the correct test port connector types for both calibrating and measuring. Adapters between the test port and DUT degrades coupler/bridge directivity and system source match.

For best response, use the same adapter for the calibration and the measurement. Terminate the second port of a two port device.

4 Making Measurements

- 2 Connect the tracking generator output of the analyzer to the directional bridge or coupler.
- 3 Connect the analyzer input to the coupled port of the directional bridge or coupler.
- 4 Press [**Preset**] to perform a factory preset.
- 5 Turn on the tracking generator and if necessary, set the output power to -10 dBm:
Press [**Mode**] > {**Track Generator**} > {**Amplitude (On)**} > **-10** > {**dBm**}

CAUTION

Excessive signal input may damage the DUT. Do not exceed the maximum power that the device under test can tolerate.

- 6 Set the start and stop frequencies and resolution bandwidth:
 - Press [**FREQ**] > {**Start Freq**} > **100** > {**MHz**}
 - Press [**FREQ**] > {**Stop Freq**} > **1** > {**GHz**}
 - Press [**BW/Avg**] > {**RBW**} > **1** > {**MHz**}
- 7 Replace the DUT with a short circuit.
- 8 Normalize the trace:
Press [**MEAS**] > {**Normalize**} > {**Store Ref (1-> 4)**} > {**Normalize (On)**}

This activates the trace 1 minus trace 4 function and displays the result in trace 1.

The normalized trace or flat line represents 0 dB return loss. Normalization occurs with each sweep. Replace the short (cal device) with the DUT.

NOTE

Since the reference trace is stored in trace 4, changing trace 4 to Clear Write invalidates the normalization.

Figure 21 Short Circuit Normalized



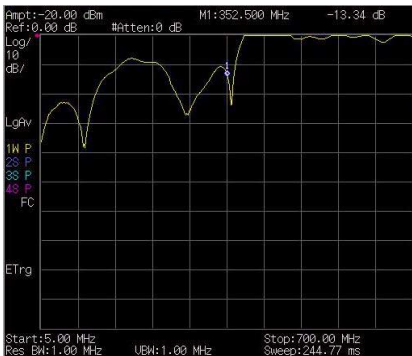
Measuring Return Loss Using the Reflection Calibration Routine

This procedure uses the reflection calibration routine in the previous procedure [“Making a Reflection Calibration Measurement”](#) on page 67, to calculate the return loss of the 370 MHz low-pass filter.

- 1 After calibrating the system with the above procedure, reconnect the filter in place of the short (cal device) without changing any analyzer settings.
- 2 Use the marker to read the return loss. Position the marker with the front-panel knob to read the return loss at that frequency.

Rotate the knob to find the highest peak and the readout is the maximum return loss.

Figure 22 Measuring the Return Loss of the Filter



Making an Average Power Measurement

Average power measurements provide a key metric in transmitter performance.

Base station transmit power must be set accurately to achieve optimal coverage in wireless networks. If the transmit power is set too high due to inaccurate power measurements, undesired interference can occur. If the transmit power is set too low, coverage gaps or holes may occur. Either case may affect system capacity and may translate into decreased revenue for service providers.

Average power can be measured for the channel of interest while the base station is active. All other channels should be inactive. Average power is a broadband measurement. If other signals (channels) are present the analyzer will also measure their power contributions.

The analyzer supports the U2000 Series USB power sensors.

The U2000 Series USB power sensors do not need manual calibration and zero routines performed. Calibration and zeroing are performed without removing the power sensor from the source, through internal zeroing. With internal zeroing of the U2000 Series USB power sensors, there is no need to disconnect the sensor or power-off the DUT. The U2000 Series do not require 50 MHz reference signal calibration, allowing the factory calibration to ensure measurement accuracy. For best accuracy, users are recommended to perform external zeroing for input signals below -30 dBm.

CAUTION

The maximum power for the RF In port and the RF Out/SWR port of the analyzer is +20 dBm (100 mW). The maximum power for the Power Sensor port is +24 dBm (300 mW). When directly coupled to a base station, the analyzer can be damaged by excessive power applied to any of these three ports.

To prevent damage, when directly coupling an analyzer to a base station, use a high power attenuator between the analyzer and the BTS.

4 Making Measurements

NOTE

If you suspect other signals may be present, it is recommended that you turn off all the other channels and measure average power only on the signal of interest.

Another option is to measure channel power (which is less accurate), that filters out all other channels (signals). You can measure channel power for CDMA using the CDMA Analyzer or CDMA Over Air tool. For other modulation formats, use their respective analyzers (that is, GSM, 1xEV-DO, or W-CDMA) or measure channel power using either the spectrum analyzer or the Channel Scanner tool.

NOTE

Connect the Power Meter as close as possible to the power amplifier/duplexer output. Do not use a coupled port. Sensors may not be as accurate at power levels provided by coupled ports.

Making a Basic Average Power Measurement

To make an average power measurement, connect the power sensor and cable, zero and calibrate the meter, before making a measurement.

Zeroing of the Power Meter will occur automatically:

- Every time the Power Meter function is used.
- When a 5 degree C. change in instrument temperature occurs.
- Whenever the power sensor is changed.
- Every 24 hours (min.).
- Before measuring low level signals °™for example, 10 dB above the lowest specified power the power sensor is capable of.

Calibrating the Power Meter every time you cycle the power on and off.

In most situations, you can press **{Zero+Cal}** to complete the two steps (zero and cal) together.

To Make a Basic Average Power Measurement

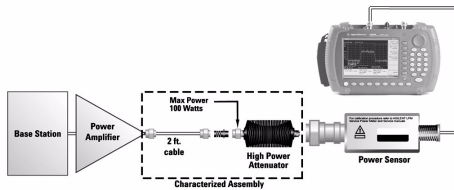
You can follow the steps below to make a basic average power measurement.

- 1 Press **[Preset]** to perform a factory preset.
- 2 Press **[Mode] > {Power Meter}** to turn on the power meter.
- 3 Zero and calibrate the meter. Press **{Zero}** and then **{Calibration}** in sequence or press **{Zero+Cal}** to make a Zero operation of the power sensor followed by the Calibration operation.

Key Access: **{Zero/Cal} > {Zero+Cal} or {Zero/Cal} > {Zero} > {Calibration}**

- 4 Connect the power sensor to the power Ref 50 MHz port. The analyzer supports the 2000 Series power sensors.
- 5 Connect external attenuation, if required, with the power sensor used.
- 6 Connect the analyzer to the base station. Connect the power sensor to the signal port to be measured. A typical BTS connection is after the output of the power amplifier and duplexer. The connection requires a 2 ft. cable and two Type-N barrel connectors, in addition to the power sensor and external attenuator.
- 7 Press **{Start}** to start a measurement.

Figure 23 Connection with base station



Setting Power Meter Resolution

You can choose from four levels of Power Meter resolution. Higher resolutions provide more accuracy but slow the measurement speed.

- 1 Press [**Preset**] to perform a factory preset.
- 2 Press [**Mode**] > [**Power Meter**] to turn on the power meter.
- 3 Press [**Meas Disp**] > [**Resolution**]. Select 1,2,3 or 4. The four options resolution settings are as follows:
 - [1] = 1
 - [2] = 0.1
 - [3] = 0.01
 - [4] = 0.001

Setting the Power Meter's Top and Bottom End-Points

Setting the end points (Disp Range) close to the expected measurement value changes the sensitivity of the Power Meter scale resolution. This is an advantage in viewing small changes in power. However, this will not affect the overall range of the sensor.

- 1 Press [**Preset**] to perform a factory preset.
- 2 Press [**Mode**] > [**Power Meter**] to turn on the power meter.
- 3 Press [**Meas Disp**] > [**Disp Range**] to access the end-points menu.
- 4 Press [**Top**] and enter the maximum scale value desired using the numeric keypad. Then press [**dBm**] to complete the setup.
- 5 Press [**Bottom**] and enter the minimum scale value desired using the numeric keypad. Then press [**dBm**] to complete the setup.

Setting the Power Meter's Upper and Lower Limits

The internal Power Meter can be configured to detect when a measurement has failed a user

predefined upper or lower amplitude limit.

- 1 Press **[Preset]** to perform a factory preset.
- 2 Press **[Mode] > {Power Meter}** to turn on the power meter.
- 3 Press **{Meas Setup} > {Limits}** to access the limits menu.
- 4 Press **{Limits}** to activate the limits function. Each time the softkey is pressed, the selected option changes.
- 5 Press **{Upper Limits}** and enter the high limit value using the numeric keypad. Then press **{dBm}** to complete the setup.
- 6 Press **{Lower Limits}** and enter the low limit value using the numeric keypad. Then press **{dBm}** to complete the setup.

4 Making Measurements



5 Key Reference

This Chapter provides descriptions of the Instrument hardkeys and softkey menu functionality, key access to softkey sub-menus, and instrument parameter control options.

Additional reference information is provided in the Menu Maps section.



Amplitude

Key access: **[AMPTD]**

Activates the reference level function and accesses the associated softkeys to set functions that affect the way data on the vertical axis is displayed or corrected.

Ref level

Key access: **[AMPTD] > {Ref level}**

Activates the reference level function.

The reference level is the amplitude power or voltage represented by the top graticule on the display. Changing the value of the reference level changes the absolute amplitude level (in the selected amplitude units) of the top graticule line. To change the reference level, use the arrow keys, the knob, or the numeric keypad. Pressing any digit (0 through 9) on the numeric keypad brings up the terminator menu.

Attenuation

Key access: **[AMPTD] > {Attenuation}**

Toggles the input attenuation between **Auto** or **Man**.

The input attenuation ranges from 1dB to 51 dB and allows you to set the attenuation level in 1 dB increments when Attenuation is set to **Man**.

The input attenuator, normally coupled to the reference level control, reduces the power level of the analyzer input signal at the input mixer. The attenuator is recoupled when Attenuation is set to **Auto**.

CAUTION

To prevent damage to the input mixer, do not exceed a power level of +33 dBm at the input. A granted power level for stable sensitive measurement is less than 20 dBm.

Preamp

Key access: [AMPTD] > {Preamp}

Toggles the internal preamp between **On** and **Off**.

Preamp results in a correction being applied to compensate for the gain of the preamp at 20 dBm so that amplitude readings show the actual value at the input connector.

NOTE

When the preamp is on, a PA indication appears on the left side of the display.

The preamp is set to on in frequency bands from 1 MHz to 3 GHz, otherwise the correction is not applied even though the **PA** indication still appears.

Scale/DIV

Key access: [AMPTD] > {Scale/DIV}

Sets the logarithmic units per vertical graticule division on the display.

NOTE

The Scale/Div function is only available when the Scale Type key is set to **Log**.

Scale Type

Key access: [AMPTD] > {Scale Type}

Toggles the scale type of vertical graticule divisions between logarithmic and linear.

When Scale Type is set to **Log**, a Logarithmic units is activated ranging from 1 to 10 dB per division.

When Scale Type is set to **Lin**, the vertical divisions are linearly scaled and the default amplitude units are volts. The top of the display is set to the reference-level value and the bottom graticule becomes zero volts. (Each division of the graticule is one-tenth of the reference level in volts.)

Ref Offset

Key access: **[AMPTD] > {Ref Offset}**

Adds an offset value, which ranges from -327.6 dB to +327.6 dB, to the displayed reference level.

NOTE

Reference-level offsets may only be entered using the numeric 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 analyzer input. Thus, the signal level measured by the analyzer may be referred to as the level at the input of an external amplitude conversion device. When an amplitude offset is entered, its value appears in the lower left corner of the display.

Y Axis Units

Key access: **[AMPTD] > {Y Axis Units}**

Sets the amplitude units.

NOTE

Amplitude units are maintained for both logarithmic and linear modes depending on the Scale Type setting.

MODE

Activates the sofkey menus to select the measurement mode of your analyzer. The measurement modes are:

- Spectrum Analyzer
- Tracking Generator
- Power Meter
- Demodulation Analysis (Option N9340A-AMA)
activated by License Key.

Spectrum Analyzer

Key access: **[MODE] > {Spectrum Analyzer}**

Select the spectrum analyzer mode, and press **[ENTER]** to make the spectrum analysis and measurement.

Tracking Generator

Key access: **[MODE] > {Tracking Generator}**

Use the arrow keys or knob to highlight this mode.

Select this mode, and press **[ENTER]** to make the specified measurement with the tracking generator. When selected, the Meas softkey menu for the Tracking Generator mode will appear.

Amplitude

Key access: **[MODE] > {Tracking Generator} > {Amplitude}**

Activates (**On**) or deactivates (**Off**) the output power of the tracking generator. The power level can then be adjusted using the numeric keypad, arrow keys, or knob. Pressing any digit, 0 through 9, on the numeric keypad brings up the selected terminator menu.

NOTE

When Amplitude (Off) is selected, the output attenuation on the N9340A is set to the maximum attenuation.

CAUTION

Power-level sensitive devices connected to the tracking generator output may be accidentally damaged. This is because the actual source amplitude will be greater than the amplitude indicated on the analyzer, when the power sweep function is being used. The source amplitude value is used as the starting amplitude for a power sweep. The ending amplitude for a power sweep is higher than the source amplitude value and it may actually be set to values beyond the specified output levels. Therefore, exercise caution when connecting a power-level sensitive device to the tracking generator output.

Amptd Step

Key access: **[MODE] > {Tracking Generator} > {Amptd Step}**

Allows you to set the step size of the power level range of the tracking generator. The default setting is one vertical scale division when in a logarithmic amplitude scale.

Amptd Offset

Key access: **[MODE] > {Tracking Generator} > {Amptd Offset}**

Offsets the displayed power of the tracking generator. Using the amplitude 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.

Normalize

Key access: **[MODE] > {Tracking Generator} > {Normalize}**

- **Store Ref (1-> 4)**

Copies trace 1 into trace 4. **Store Ref(1-> 4)** must be pressed before pressing **Normalize(On)**. If **Normalize(On)** is pressed before **Store Ref(1-> 4)**, the error message:

Store reference trace before turning on **Normalize(On)** is displayed in the status line, however **Normalize** has been activated.

- **Normalize**

Normalize(On) activates the normalize function. On each sweep, the normalized trace (Trace 4) is subtracted from Trace 1 and the result is added to the normalized reference level. The display shows the result of the following calculation:

Trace 1 - Normalized Trace + Normalized Reference Level

The trace data is normalized with respect to the normalized reference level, even if the value of the normalized reference level is changed. This function remains in effect on all subsequent sweeps until it is turned off.

NOTE

Segmented sweep is not available when **Normalize (On)** is selected.

CAUTION

Trace 1 should be in clear write mode prior to setting **normalize** to on.

The normalize function is useful in applying correction data to a trace while making a stimulus response measurement using a tracking generator. **Normalize** will compensate for irregularities of the components used in the test setup, isolating the performance of the DUT. For example, connect the cables and use a thru line in place of the device (DUT) to be measured, between the tracking generator and the analyzer input. Notice that the frequency response is not perfectly flat, showing the response of the cables, as well as the flatness of both the tracking generator and the analyzer.

Now press **Store Ref(1->4)**, **Normalize On**. Notice that the displayed trace is now flat, or normalized. The position of the normalized trace can now be moved to a different position on the display by changing the normalized reference position. This may be useful if the device to be tested has positive gain,

such as an amplifier. Now replace the thru line with the device under test, and an accurate measurement of the gain or loss can be made.

- **Norm Ref Lvl**

Sets the level (in dB) of the normalized reference.

- **Norm Ref Posn**

Offsets the displayed trace without affecting the instrument gain or attenuation settings. This allows the displayed trace to be moved without decreasing the measurement accuracy.

- **Ref Trace**

Allows you to view or blank the reference trace on the display.

Power Meter

Key access: **[MODE] > {Power Meter}**

Use the arrow keys to highlight the mode.

Select this mode, and press **[ENTER]** to make a measurement using the power meter function. When selected, the Power Meter softkey menu will be displayed and many of the instrument hardkeys will be disabled as they are not necessary for this mode.

Start

Key access: **[MODE] > {Power Meter} > {Start}**

This performs a “start/stop” function of the instrument when in Power Meter mode. Pressing this softkey will start a measurement. Pressing this softkey again will stop the measurement, and “Stop” is displayed on the softkey.

Zero/Cal

Access the associated Zero/Cal submenu of the power meter mode.

Key access: **[MODE] > {Power Meter} > {Zero/Cal}**

- **Zero**

Make a Zero operation of the power sensor.

- **Calibration**

Make a Calibration operation of the power sensor.

The U2000 Series USB Power Sensors have their sensor calibration tables stored in non-volatile memory which means that the reference calibration factor is automatically loaded during the power-on sequence.

- **Zero+Cal**

A Zero operation of the power sensor will happen first, followed by a Calibration operation.

Meas Disp

Access the Meas Disp submenu for defining the display range and resolution while in Power Meter mode.

Key access: **[MODE] > {Power Meter} > {Meas Disp}**

- **Disp Range**

Access the associated Disp Range submenu.

- **Top**

Sets the top value of the power meter's display range. Range from (Bottom + 0.01) to 200 dBm. The default value is 20 dBm.

- **Bottom**

Sets the bottom value of the power meter's display range. Range from -200 to (Top - 0.01) dBm. The default value is -70 dBm.

- **Resolution**

Accesses the Resolution submenu.

When the measurement suffix is W or %, this parameter represents the number of significant digits. When the measurement suffix is dB or dBm, 1 through 4 represents 1, 0.1, 0.01, and 0.001 dB respectively.

The default value is 3.

- **Disp Mode**

Changes the display mode between Meter and Chart. The default mode is Meter.

- **Chart View**

Accesses the Chart View submenu. This softkey is disabled when a measurement is in progress or if the display mode is set to Meter. This submenu is used to view the measurement chart.

- **Home**

View the first 21 points of current measurement chart.

- **End**

View the last 21 points of current measurement chart.

- **Prev**

View the previous point of the chart.

- **Next**

View the next point of the chart.

Meas Setup

Accesses the Meas Disp submenu which is used to configure the measurement settings.

Key access: [MODE] > {Power Meter} > {Meas Setup}

- **Freq**

Set a frequency between 1 kHz and 90.0 GHz using the numeric keypad, arrow key or knob. If the frequency does not correspond directly to a frequency in the sensor calibration table, the power sensor calculates the calibration factor using linear interpolation.

- **Power Range**

Accesses the **Power Range** submenu.

- **Auto Range**

Enables and disables auto ranging. When auto ranging is ON, the power sensor selects the best

measuring range for the measurement. When auto ranging is OFF, the power sensor remains in the current range and may be manually set by the user.

- **Range**

Selects the Lower or Upper power ranges when the Auto Range is Off.

- **Limits**

Accesses the **Limits** submenu.

- **Limits**

Enables or disables the limit function.

- **Upper Limit**

Sets the upper test limit value for the current measurement. The units used are dependent on the current setting of power unit. When the measured power is greater than the value specified, a failure will be reported.

- **Lower Limit**

Sets the lower test limit value for the current measurement. The units used are dependent on the current setting of power unit. When the measured power is less than the value specified, a failure will be reported.

- **Limit Beep**

Enables or disables the limit beep.

- **Rel/Offset**

Accesses the **Rel/Offset** submenu.

- **Rel**

Enables the comparison of a measurement result to a reference value and sets a reference value on the current measured data.

- **Offset**

Sets a value of the display offset on the current measurement, and enables or disables the display offset. The display offset is applied to the measurement signal after any math calculation.

- **Average**

Accesses the **Average** submenu.

- **Average**

Enables or disables the **Averaging** function.

- **Avg Count**

Sets the filter length and average count values to be Auto or Manual.

The power sensor automatically sets the number of readings averaged together to satisfy most power measurements averaging requirements. The number of averaged readings depends on the resolution and the power level settings the power sensor is currently using.

- **Step Detect**

Enables or disables step detection. In AUTO filter mode, the average of the last four values entered into the filter is compared to the entire filter average. If the difference between the two averages is greater than 12.5%, the digital filter is cleared. The filter will then start storing new measurement data. This feature shortens the filter time required when the input power changes substantially. Note that the result appears to settle faster, although true settling to the final value is unaffected.

- **Meas Interval**

Sets the interval time between two measurements.

Preset

Key access: [MODE] > {Power Meter} > {Preset}

Sets the Power Meter softkey menu options to the preset conditions. For example, the Upper and Lower Limits are set to their preset limit values.

BW/SWP

Activates the bandwidth function and accesses the softkey menus to control resolution bandwidth, video bandwidth and sweep time.

RBW

Key access: **[BW/SWP] > {RBW}**

Changes the 3 dB resolution bandwidth on the analyzer from 30 Hz to 1 MHz in a 1, 3, 10 sequence using the knob, step keys or the numeric keypad.

NOTE

If an unavailable bandwidth is entered using the numeric keypad, the closest available bandwidth in the 1, 3, 10 sequence is used.

As the resolution bandwidth is decreased, the sweep time is modified to maintain amplitude calibration. Resolution bandwidth is also related to span. As the span is decreased, the resolution bandwidth decreases. As the resolution bandwidth changes, the video bandwidth, if in auto couple mode, changes to maintain the VBW/RBW ratio.

NOTE

In non-zero span mode, the value of RBW is determined by whether the setting for RBW is Auto or Man (manual).

A “#” mark appears next to RBW on the display when it is not coupled.

VBW

Key access: **[BW/SWP] > {VBW}**

Changes the analyzer post-detector filter from 3 Hz to 1 MHz in a 1, 3, 10 sequence using the knob, the step keys, or the numeric keypad.

NOTE

If an unavailable bandwidth is entered using the numeric keypad, the closest available bandwidth in the 1, 3, 10 sequence is used.

5 Key Reference

As the video bandwidth is decreased, the sweep time is increased to maintain amplitude calibration.

A “#” mark appears next to RBW on the display when it is not coupled.

Key access: **[BW/SWP]**

VBW/RBW

Key access: **[BW/SWP] > {VBW/RBW}**

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 lower the noise. The knob and step keys change the ratio in a 1, 3, 10 sequence.

NOTE

When preset is set to default, or VBW/RBW is set to Auto, the ratio is set to 1.

Avg Type

Key access: **[BW/SWP] > {Avg Type}**

Accesses the functions to automatically or manually choose from one of the following averaging type:

Log Pwr

Key access: **[BW/SWP] > {Avg Type} > {Log Pwr}**

Averages the data as appropriate for the logarithmic scaled y-axis.

When the average type is set to **Log Pwr**, “LgAv” appears on the left side of the display.

Pwr

Key access: [BW/SWP] > {Avg Type} > {Power}

Converts the scale from logarithmic to linear power units, and then averages the power trace data.

With the average type set to **Pwr**, “PAvg” appears on the left side of the display.

Voltage

Key access: [BW/SWP] > {Avg Type} > {Voltage}

Averages the data as appropriate for the linearly scaled y-axis scale.

With the average type set to **Voltage**, “VAvg” appears on the left side of the display.

Key access: [BW/SWP] > {Avg Type}

There are actually four types of averaging processes within an N9340A. All, except VBW filtering, are affected by this setting. They are listed as follows:

- **Trace averaging**

Averages signal amplitudes on a trace-to-trace basis. (Press **Log Pwr** or **Pwr**)

- **Average detector**

Averages signal amplitudes during the time or frequency interval and represents the result as a single measurement point.

- **Noise marker**

Averages signal amplitudes across measurement points to reduce variations for noisy signals.

- **VBW filtering**

Performs a form of averaging of the video signal.

Sweep Time

Key access: **[BW/SWP]**

Selects the sweep time for the analyzer to tune across the displayed frequency span (or, in zero span, the time the analyzer takes to sweep the full screen). Inputs may be made using the knob, the arrow keys, or numeric keypad.

NOTE

Reducing the sweep time increases the sweep rate.

In non-zero spans:

When the sweep time is auto-coupled, the analyzer selects the optimum (shortest) sweep time ranging from 10 ms to 1000 s. The auto selection is determined by three measurement settings:

- Frequency Span
- The selected Resolution Bandwidth
- The selected Video Bandwidth

Note that changing one of the three factors above will change the sweep time. The sweep time is in direct ratio to frequency span and is in reverse ratio to the selected resolution bandwidth and video bandwidth when auto-coupled.

CAUTION

With sweep time set to a value less than the minimum auto-coupled value, an annotation “Data out of range” appears in the active function block and the sweep time is automatically set to the minimum auto-coupled value.

In zero span:

Auto-couple does not function when in a zero span setting. The sweep time can only be set manually. The sweep time range is selectable from 6 s to 200 s in zero span.

In FFT Mode

In FFT mode, the sweep time default is auto-coupled. The submenu, sweep time, is invalid in FFT mode.

Sweep

Key access: **[BW/SWP] > {Sweep}**

Activates the sweep mode function and accesses the softkey submenus to select the trace sweep functions.

Sweep

Toggles the analyzer between the continuous sweep mode and the single sweep mode.

- **Sweep (Single)**

Puts the analyzer in a single sweep mode. In this mode, pressing **[BW/SWP] > {Single Sweep}** enables a sweep.

Key access: **[BW/SWP] > {Sweep}**

- **Sweep (Cont)**

Performs one sweep after another as soon as it is triggered. Pressing **[Preset]** (When Preset Type is set to Default) or turning the power on, sets the sweep mode to continuous sweep.

Key access: **[BW/SWP] > {Sweep}**

Sweep Mode

An N9340A provides two sweep modes to meet different sweep time requirements:

- **Normal**

Activates the default sweep mode.

Key access: **[BW/SWP] > {Sweep} > {Sweep Mode}**

- **Fast**

Activates the fast sweep mode.

Fast sweep mode provides a fast measurement function that decreases the sweep time. Using Fast Sweep will decrease the measurement accuracy.

Key access: **[BW/SWP] > {Sweep} > {Sweep Mode}**

NOTE

Fast sweep is valid only if the span is not less than 50 MHz. Measurement data is not guaranteed in fast sweep mode.

Single Sweep

When the analyzer is in continuous sweep mode and not in a measurement mode (**[MEAS] > Measure Off**), pressing **[BW/SWP] > {Single Sweep}** will change the sweep setting to single sweep. It will then begin a sweep after the trigger conditions are met. If the analyzer is already in single sweep, pressing **[BW/SWP] > {Single Sweep}** will execute a new sweep after the trigger conditions are met.

If Average is on (**[TRACE] > {More (1 of 2)} > {Average} > On**), pressing **[BW/SWP] > {Single Sweep}** halts averaging of the current value, and will then continue averaging from the current count number when a single sweep function triggers.

Key access: **[BW/SWP] > {Sweep}**

ENTER

Hardkey function:

- Terminates data entry and enters into the analyzer numerical values keyed from numeric keypad on the front panel.
- Terminates filename entries.

ESC/CLR

This hardkey selection performs two functions:

Clear

- Clears any numeric entry and cancels the active function.
- Clears any title entry and cause the title to revert to the previous name.
- Clears input or output overloads.
- Clears error messages from the status line along the bottom of the display.

Association with other functions

Provides a permitted setting for triggering other functions such as:

- Activates the **LIMIT** function for pass/fail judgments.
- Activates the **SAVE** function for current trace saving.

CAUTION

When pressing [ESC/CLR], the current parameter annotation in the lower left corner, which is an indicator of the available settings of **LIMIT** and **SAVE**, disappears.

Frequency

Activates the center frequency function, and accesses the menu of frequency functions. The center frequency, or start and stop frequency values appear below the graticule on the display.

NOTE

When changing both the center frequency and the span, change the frequency first since the span can be limited by the frequency value.

Center Frequency

Key access: [FREQ] > {Center Freq}

Activates the center frequency function, which allows you to set the horizontal center of the display to a specified frequency.

Start Frequency

Key access: [FREQ] > {Start Freq}

Sets the frequency at the left side of the graticule. The left and right sides of the graticule correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of the center frequency and span.

Stop Frequency

Key access: [FREQ] > {Stop Freq}

Sets the frequency at the right side of the graticule. The left and right sides of the graticule correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of the center frequency and span.

CF Step

Key access: [**FREQ**] > {**CF Step**}

Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is activated, the arrow keys change the center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer. When auto-coupled, the center size is set to one division (10 percent of the span).

Marker

Accesses the marker control softkeys to select the type and number of markers. Markers are diamond-shaped characters that identify points of traces. Up to six pairs of markers may appear on the display simultaneously; only one pair can be controlled at a time. The marker that is controlled is called the “active” marker. Pressing **[MARKER]** activates the Normal menu key.

Marker

Selects one of the six possible markers. A marker that has already been selected will become active when it is turned on. If a marker has been turned on and assigned to a specific trace, it will become active on that trace if that marker is selected.

Key access: **[MARKER]** > {Marker}

Normal

Activates a single frequency marker at the center of the active trace if a marker is not already displayed. If a marker is displayed before the **Normal** function is enabled, the marker is enabled at the position of the selected marker. The marker number is indicated above the marker. The knob and/or arrow keys move the marker left or right. If a value is entered from the numeric keypad, the marker is moved to the trace point nearest to that value. Annotation in the active function block and in the upper right corner indicates the frequency and amplitude of the marker (time and amplitude, if in zero span.) Pressing **Normal** turns off the **Delta** function and moves the active marker to the delta marker position.

Key access: **[MARKER]** > {Normal}

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 (or time) of the first marker is fixed. The marker number is indicated above the delta marker, and the same number is indicated with an R (for example, 1R) above the reference marker. Use the data controls to position the delta marker. Annotation in the active function block and in the upper-right corner of the display indicates the frequency (or time) and amplitude differences between the two markers. The markers will be turned off if the scale type is changed between log and linear.

NOTE

Pressing **Delta** again moves the reference marker to the active marker position, so you are allowed to make delta measurements from differing reference points without having to turn off the makers and begin again.

NOTE

The delta marker function permits signal-to-noise measurements provided the signal is a single spectral component (sinusoid). Place a normal marker on the signal, press Delta, place the delta marker in the noise, and activate Marker Noise. The indicated amplitude indicates signal-to-noise/Hz.

Key access: **[MARKER] > {Delta}**

Off

Turns off the active function markers.

Key access: **[MARKER] > {Off}**

Peak Search

Places a marker on the highest peak based on the setting of the Search Criteria as follows:

- **Peak**

Places a marker on the highest peak.

Key access: [MARKER] > {Peak Search}

- **Next LF Peak**

Moves the marker to the next peak to the left of the current marker. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak to the left, the marker will not move and the **No Peak** Found error message will appear on the display.

Key access: [MARKER] > {Peak Search} > {Next Left PK}

- **Next RT Peak**

Moves the marker to the next peak to the right of the current marker. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak to the right, the marker will not move and the **No Peak** Found error message will appear on the display.

Key access: [MARKER] > {Peak Search} > {Next Right PK}

- **Auto Search**

In non-zero span, pressing **Auto Search** turns all six markers on and puts them on the six highest peaks in the current frequency span.

In zero span, the function is not available.

Key access: [MARKER] > {Peak Search} > {Auto Search}

Marker To

Accesses the following marker function menu keys:

- **To Center**

Sets the center frequency of the analyzer to the marker frequency. In Delta mode, pressing **[Marker] > {Marker To} > {To Center}** sets the center frequency to the marker delta value. This function is not available in zero span.

NOTE

When the frequency scale is in log mode, the center frequency is not at the center of the display.

Key access: **[MARKER] > {To Center}**

- **To Ref**

Changes the reference level to the active marker value, moving the marked point to the reference level (top line of the graticule). In Delta mode, pressing **[Marker] > {Marker To} > {To Ref}** sets the reference level to the amplitude difference between the markers.

Key access: **[MARKER] > {Marker To}**

Mode

Accesses the following menu keys that allow you to change the active marker readout mode.

- **Normal**

Activates the default readout mode.

- **Freq Count**

Activates a frequency counter mode.

NOTE

Frequency counter is only effective on CW signals or discrete peaks. For a valid reading, the marker must be greater than 25 dB above the noise. The **Freq Count** function is not supported when **Marker Delta** is selected.

- **Noise**

Activates a noise readout mode for evaluating power density.

NOTE

The **Noise** mode operates only on noise peaks and is not supported when **Marker Delta** is selected.

Key access: [MARKER] > {More} > {Mode}

Marker Trace

Activates a marker on the trace if there are no markers turned on. If a marker is currently active, press **Marker Trace** until **1**, **2**, **3**, or **4** is underlined. The active marker will be moved to the selected trace.

Selecting **Auto** will move the marker to the automatically selected trace. The selection order is to look for the lowest numbered trace in the following order of trace modes:

Clear write	Max hold
Min. hold	View

If there is no trace in any of these modes, it selects trace 1 as the default.

Key access: [MARKER] > {More}> {Marker Trace}

All Off

Turns off all of the markers, including markers used for signal track and demodulation. The Marker annotation is also removed.

Key access: [MARKER] > {More} > {All Off}

Meas

Hardkey menu access.

When in Spectrum Analysis mode, pressing **[Meas]** accesses the softkey menu for the power measurement suite which includes, adjacent channel power, occupied bandwidth, and channel power.

Refer to [“One-button Power Measurement”](#) on page 59 for more information about these measurements.

Span

Hardkey menu access.

Accesses the softkey submenu of span functions. Pressing **[SPAN]** allows you to change the frequency range. The frequency-span readout describes the total displayed frequency range. To determine the frequency span per horizontal graticule division (when in linear frequency scale type), divide the frequency span by 10.

Span

Enter a frequency span range value.

Key access: **[SPAN] > {Span}**

Full

Changes the span to the full frequency range of the analyzer.

Key access: **[SPAN] > {Full}**

Zero

Changes the frequency span to zero. In this mode, the current center frequency is displayed in the time domain (the x-axis is displayed in units of time), like a conventional oscilloscope.

Key access: **[SPAN] > {Zero}**

Last Span

Changes the span to the previous span setting.

Key access: **[SPAN] > {Last Span}**

Trace

Accesses the trace softkeys to store and manipulate trace information. Each trace is made of a series of data points in which amplitude information is stored. The analyzer updates the data for any active trace with each successive sweep.

When selecting **Channel Power, OBW, or ACPR** in the **MEAS** menu, refer to [“One-button Power Measurement”](#) on page 59.

Trace

Selects the trace (1-4) for current use.

Key access: [TRACE] > {Trace}

Clear Write

Erases any data previously stored trace data and continuously updates the display during following sweeps of the analyzer. This function is activated for trace 1 at power on and a factory preset.

Key access: [TRACE] > {Clear Write}

Max Hold

Maintains the displayed maximum level for each trace point of the selected trace. A trace point is updated if a new maximum level is detected in successive sweeps.

NOTE

Changing the vertical scale (**Amplitude, Scale Type, Log or Line**), or pressing **PRESET**, or turning averaging on (**TRACE, Average (On)**) or switching widows in Zero Span restarts the held trace.

Key access: [TRACE] > {Max Hold}

Minimum Hold

Maintains the displayed minimum level for each trace point of the selected trace, and updates each trace point if a new minimum level is detected in successive sweeps.

NOTE

Changing the vertical scale (**Amplitude, Scale Type, Log or Line**), or pressing **PRESET**, or turning averaging on (**TRACE, Average (On)**) or switching widows in Zero Span restarts the held trace.

Key access: [TRACE] > {Min Hold}

View

Holds the currently displayed measured data of the selected trace. The trace register is not updated as the analyzer sweeps. If a trace is deactivated by pressing **Blank**, the stored trace data can be retrieved by pressing **View**.

Key access: [TRACE] > {View}

Blank

Stores the currently displayed amplitude data for the selected trace and removes it from the display. The selected trace register will not be updated as the analyzer sweeps. This function is activated for traces 2, 3 and 4 at power-on and **Factory Preset**.

Key access: [TRACE] > {Blank}

Detector

Key access: [TRACE] > {More (1 of 2)} > {Detector}

Selects a specific detector type, or allows the system to auto select the appropriate detector for a measurement.

For every trace point displayed, there is a finite time during which the data for that point is collected. The analyzer has the ability to look at all of the data evaluated during that time and present

a single point of trace data based on the detector mode. The interval during which data for that trace point is being collected is referred to as the “bucket”. Thus, a trace is more than a series of single points. It is actually a series of trace “buckets”. The data may be sampled many times within each bucket.

With the detector set to **Auto**, pressing [TRACE] > {More (1 of 2)} > {Average} > {On} changes the detector. The **Auto** choice that is made by the analyzer will depend on the marker, trace, and trace averaging functions chosen. If a marker function or measurement is running, the **Auto** choice of the detector is either **Average** or **Sample**. When a detector (such as **Average**) is manually selected instead of using the **Auto** function, that detector is used without regard to other analyzer settings.

- **Auto**

Key access: [TRACE] > {More (1 of 2)} > {Detector} > {Auto}

Selects the peak detector as the default. If a measurement condition arises where a different detector type is better, the system will use that alternate selection.

- **Normal**

Selects the maximum and minimum video signal values alternately. When selecting the normal detector, “N” appears in the upper-left corner.

Key access: [TRACE] > {More (1 of 2)} > {Detector} > {Normal}

- **Average**

Measures the average value of the amplitude across each trace interval (bucket). When Average is selected, “A” appears on the upper-left corner.

Key access: [TRACE] > {More (1 of 2)} > {Detector} > {Average}

- **Pos Peak**

Obtains the maximum video signal between the last display point and the present display point. This value is stored in memory. It is used primarily when measuring sinusoidal (spectral) components. When Positive Peak is selected, “P” appears in the upper-left corner.

Key access: [TRACE] > {More (1 of 2)} > {Pos Peak}

- **Sample**

Primarily used to display noise (or noise-like) signals. It should not be used to measure the accurate amplitude of non-noise-like signals.

In sample mode, the instantaneous signal value at the present display point is placed in memory. When in Sample detector mode, an “S” appears in the upper-left corner of the display.

Key access: [TRACE] > {More (1 of 2)} > {Detector} > {Sample}

- **Neg Peak**

Similar to peak detector, but selects the minimum video signal value. Not to be used to measure the most accurate amplitude. When in Negative Peak mode, an “N” also appears in the upper-left corner.

Key access: [TRACE] > {More (1 of 2)} > {Detector} > {Neg Peak}

Average

Initiates a digital averaging routine that averages the sweep trace points resulting in trace “smoothing”. Increasing the average number will further smooth the trace. For the information of the type of averaging please refer to “Avg Type” on page 90.

The average is restarted when any of the following occurs:

- A new average number is entered.
- Any related parameter (for example, center frequency) is changed.

Press **Average (Off)** to turn off averaging.

The number of sweeps can only be set using the numeric keypad. The knob or arrow keys are not functional when in Average mode.

Key access: **[TRACE] > {More (1 of 2)} > {Average}**

Save Trace

Saves a current trace into a file (*.DAT).

The analyzer uses the filename of the preceding file saved, but adds an integer in 1, 2, 3 sequence to the end of the filename to differentiate it from others.

If there is no record of saved trace in the analyzer, the default file name of the current saved trace will be "HYTRACE.DAT".

Key access: **[TRACE] > {More (1 of 2)} > {Save trace}**

Save As

Saves a current trace to a file/directory, with a user-defined filename.

The filename is entered using the numeric keypad and terminated by pressing the **[ENTER]** hardkey.

Numbers, alpha characters and underline are all valid components of a filename.

Key access: **[TRACE] > {More (1 of 2)} > {Save as}**

Recall Trace

The user may recall a saved trace as the current activated trace.

Key access: **[TRACE] > {More (1 of 2)} > {Recall trace}**

Limit

Limit Line

Activates an adjustable horizontal line that is used as a visual reference line.

The limit line, used for trace arithmetic, has amplitude values that correspond to its vertical position when compared to the reference level. The value of the display limit line appears in both the active function block and on the left side of the display. The arrow keys, knob, or numeric keypad may be used to adjust the displayed limit line. Pressing any digit, 0 through 9, on the numeric keypad brings up the selected terminator menu. To deactivate the display line, press **Display Line (Off)**.

Key access: [Limit]

Limit Pattern

Turns on the limit pattern function and turns off the limit line function simultaneously.

Key access: [Limit]

Set Pattern

Allows you to set a limit pattern for measurements.

You can create or edit limit points, up to four points, to define the limit line.

Press X Axis Unite to toggle the frequency domain or time domain before you set the parameters of the limit points.

Key access: [Limit]

Limit Type

Defines the limit you are editing as either an upper or lower limit. An upper limit fails if trace 1 exceeds the limit. A lower limit fails if trace 1 falls below the limit.

Key access: [Limit]

Beep

Turns the Beep feature on or off. When on, it sounds an alarm as an indicator of a measurement limit failure.

Key access: **[Limit]**

Save Pattern

Saves the parameters of the current limit pattern in a file (*.PTN).

Enter the user defined filename using the numeric keypad and press **[ENTER]** as a terminator.

Number, alpha characters and underline are all valid components of a filename.

Key access: **[Limit]**

Recall Pattern

Recalls files previously saved containing the limit parameters that may be frequently used for test purposes.

Key access: **[Limit]**



6 SCPI Command Reference

This chapter contains basic information on using SCPI commands to control the analyzer.



SCPI Language Basics

Standard Commands for Programmable Instruments (SCPI) is an ASCII-based instrument command language designed for test and measurement instruments, with the goal of reducing automatic test equipment (ATE) program development time. SCPI accomplishes this goal by providing a consistent programming environment for instrument control and data usage. This consistent programming environment is achieved by the use of defined program messages, instrument responses, and data formats across all SCPI instruments.

By providing a consistent programming environment, replacing one SCPI instrument with another SCPI instrument in a system should require less effort than with non-SCPI instrument. SCPI is not a standard which completely provides for interchangeable instrumentation. SCPI helps move toward interchangeability by defining instrument commands and responses, but not functionality, accuracy, resolution, and so forth.

Table 1 Common Terms used in this Book

Terms	Description
Controller:	Any computer used to communicate with an instrument. A controller can be a personal computer (PC), a minicomputer, or a plug-in card in a card cage. Some intelligent instruments can also function as controllers.
Instrument:	Any device that implements SCPI. Most instruments are electronic measurement or stimulus devices, but this is not a requirement. Similarly, most instruments use a GPIB, RS-232, or USB interface for communication. The same concepts apply regardless of the instrument function or the type of interface used.
Command:	An instruction. You combine commands to form messages that control instruments to complete a specified task. In general, a command consists of mnemonics (keywords), parameters and punctuation.
Query:	A special type of command. Queries instruct the instrument to make response data available to the controller. Query keywords always end with a question mark (?).

Basic Knowledge Requirement

Programming with SCPI requires knowledge of:

- Computer programming languages, such as C or C++.
- The language of your instrument. A N9340A employs SCPI as its programming language.

Command Categories

SCPI commands fall into two categories:

- Subsystem commands
- Common commands

Use a computer to control the signal generator (but operate the line power switch manually). Computer programming procedures for the spectrum analyzer involve selecting a programming statement and then adding the specified programming codes to that statement to achieve the desired operating conditions.

Command Syntax

Command syntax includes standard notations and statement rules.

Command Statement Rules Overview

- Command statements read from left to right
- Use either long form or short form of keywords, but do not use both
- No separating space between the keywords, only use a colon to separate keywords of different levels
- Always separate a keyword from a variable with a space
- Always separate a variable from its units with a space (if variable has a unit)

Standard Notations

A command consists of mnemonics (keywords), parameters and punctuation. Before you start to program your analyzer, familiarize yourself with the standard notation of each of them.

Keywords

Many commands have both a long and a short form: use either one. (a combination of the two is not allowed). Consider the `:FREQuency` command for example:

- Short form `:FREQ`
- Long form `:FREQuency`

SCPI is not case sensitive, so `fREQuency` is just as valid as `FREQUENCY`, but `FREQ` and `FREQUENCY` are the only valid forms of the `FREQuency` command.

In this documentation, upper case letters indicate the short form of the keyword. The upper case and lower case letters indicate the long form of the keyword.

Punctuation

- A vertical bar `"|"` dictates a choice of one element from a list. For example: `<A>|` indicates that either A or B can be selected, but not both.
- Square brackets `"[]"` indicates that the enclosed items are optional.
- Angle brackets `"< >"` indicates a variable value to be defined.
- A question mark `"?"` after a command indicates that this command is a query. The instrument should return a data to the controller.
- A curly brackets `"{ }"` indicates a variable parameters to be defined.

Separator

- A colon “:” separates keywords of different hierarchy.
- A space separates a keyword and a parameter, as well as a parameter and a unit.

Default unit of parameters

The analyzer has the following default units for numeric variables.

Parameter	Default unit
Frequency	Hz
Absolute amplitude	dBm
Time	s

If you are using the default unit in a command, you can leave out the unit.

For example, if you are setting the center frequency to 800 MHz of ACPR measurement.

The following two commands have the same effect:

```
:MEASure:ACPR:CENTer <800000000>
:MEASure:ACPR:CENTer <800 MHz>
```

Common Commands

These commands are specified in IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987*. New York, NY, 1992.

Clear Status

*CLS

This command clears the error queue of the analyzer.

Identification Query

*IDN?

This command returns an instrument identification information string. The response is organized into four fields by commas. The field definitions are as follows:

- Manufacturer
- Model
- Serial number
- Firmware version

Reset

*RST

This command returns the instrument to a factory defined condition that is appropriate for remote programming operation.

CALCulate Subsystem

This subsystem is used to perform post-acquisition data processing. In effect, the collection of new data triggers the CALCulate subsystem. This subsystem is further divided into two subsections: limits and markers which are the primary functions in this subsystem.

Limit Line Subsection

An N9340A allows you to define a limit line for your measurement. You can then have the instrument compare the data to your defined limit and indicate a pass/fail condition.

Refer to TRACe subsystem for more trace commands.

Delete All Limit Lines in Memory

```
:CALCulate:LLINE:ALL:DELeTe
```

This command clears all limit lines in volatile memory.

Key access:	[Limit] > {Limit Mode}
-------------	------------------------

Select the Type of Limit Line

```
:CALCulate:LLINE[1]:TYPE UPPER|LOWer
```

```
:CALCulate:LLINE[1]:TYPE?
```

This command sets a limit line to be either an upper or lower type. An upper line will be used as the maximum allowable value when comparing the data. A lower limit line defines the minimum value.

*RST state:	Upper
-------------	-------

Range:	Upper Lower
--------	-------------

Key access:	[Limit] > {Limit Mode}
-------------	------------------------

Control Limit line Buzzer

```
:CALCulate:LLINE[1]:BUZZer[:STATe]
  OFF|ON|0|1
:CALCulate:LLINE[1]:BUZZer[:STATe]?
```

This command toggles the audio warning between on and off. If data exceeds the limit line the buzzer will sound an alarm.

*RST state:	Off
Key access:	[Limit] > {Beep}

Control Limit Line Testing

```
:CALCulate:LLINE[1]:[STATe] OFF|ON|0|1
:CALCulate:LLINE[1]:[STATe]?
```

This command toggles the limit line testing between on and off.

If the limit line is turned on, the limit pattern is automatically turned off.

*RST state:	Off
Key access:	[Limit] > {Limit Line}

Set Limit Line Y-axis value

```
:CALCulate:LLINE[1]:Y <ampl>
:CALCulate:LLINE[1]:Y?
```

This command sets the Y-axis value of a limit line.

Limit line Y-axis value is set independently and is not affected by the X-axis units.

*RST value:	0 dBm
Available unit:	dBm, -dBm, mV, uV
Key access:	[Limit] > {Limit Line}

Control Limit Pattern Testing

```
:CALCulate:LLINe[1]:PATtern[:STATe]
OFF|ON|0|1
```

```
:CALCulate:LLINe[1]:PATtern[:STATe]?
```

This command toggles the usage of limit pattern between on and off.

If the limit pattern is turned on, the limit line is automatically turned off.

*RST state:	Off
Key access:	[Limit] > {Limit Pattern}

Set Limit Pattern X-axis Units

```
:CALCulate:LLINe[1]:PATtern:DOMain FREQ|TIME
:CALCulate:LLINe[1]:PATtern:DOMain?
```

This command selects how the limit pattern points are defined; according to the frequency or sweep time setting of the spectrum analyzer. The query command returns a string of FREQ or TIME.

*RST state:	Frequency
Range:	FREQ TIME
Key access:	[Limit] > {Set pattern} > {X axis unit}

Define Limit Pattern Values

```
:CALCulate:LLINE[1]:DATA
<x-axis>,<ampl>{,<x-axis>,<ampl>}
:CALCulate:LLINE[1]:DATA?
```

This command defines limit pattern values, and deletes all existing data. The N9340A allows you to set as many as four points to compose the limit pattern by connecting them together.

<x-axis> can be a frequency or time axis.

*RST state: Off

Key access: [Limit] > {Set Pattern}

- <x-axis> – are variables in frequency or time domain as specified by

```
:CALCulate:LLINE[1]:PATTERN:DOMAIN
FREQ|TIME.
```

Domain	Valid unit
Frequency	Hz, kHz, MHz, GHz
Time	ms, ms, s, ks

- <ampl> – amplitude values are in the current Y-axis units.

CALCulate:MARKer Subsection

Markers All Off on All Traces

```
:CALCulate:MARKer:AOff
```

This command turns off all markers on all traces.

Key access: [Marker] > {More} > {All Off}

Markers All On

```
:CALCulate:MARKer:ALL
```

This command turns on all the markers and places them on the six highest peaks.

*RST state: Off

Key access: [Marker] > {Peak search} > {Auto search}

Frequency Counter Marker

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :FCOUNT  
[:STATE] OFF | ON | 0 | 1
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :FCOUNT  
[:STATE] ?
```

This command toggles the frequency counter between on and off.

*RST state: Off

Key access: [Marker] > {More} > {Freq Count}

To query frequency counter readout, use

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :FRECount:X?
```

Marker Function

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:FUNCTION  
FCOUNT|NOISE|OFF
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:FUNCTION?
```

This command selects the marker function for the designated marker.

FCOUNT refers to the frequency counter function.

NOISE refers to the noise measurement function.

OFF refers to turning off all functions.

Key access	[Marker] > {More (1 of 2)} > {Mode}
------------	-------------------------------------

Marker Peak (Maximum) Search

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:MAXimum
```

This command performs a peak search based on the search mode settings.

Key access	[Marker] > {Peak search} > {Peak}
------------	-----------------------------------

Marker Peak (Maximum) Left Search

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:MAXimum:LEFT
```

This command places the selected marker on the next highest signal peak to the left of the current marked peak.

Key access	[Marker] > {Peak search} > {Next Left PK}
------------	---

Marker Peak (Maximum) Right Search

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:MAXimum:RIGHT
```

This command places the selected marker on the next highest signal peak to the right of the current marked peak.

Key access	[Marker] > {Peak search} > {Next Right PK}
------------	--

Marker Mode

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:MODE
  POSition | DELTa | OFF
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:MODE?
```

This command sets the markers to the following mode:

- **Position**
Selects a normal marker that can be positioned on a trace and from which trace information will be generated.
- **Delta**
Activates a pair of markers, one of which is fixed at the current marker location. The other marker can then be moved around on the trace. The marker readout shows the difference between the two markers.
- **Off**
Turns marker off.

Key access:	[Marker] > {Normal}
	[Marker] > {Delta}
	[Marker] > {Off}

Set center frequency to the marker value

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6[:SET]:CENTer
```

This command sets the center frequency equal to the specified marker frequency, which moves the marker to the center of the screen. In delta marker mode, the center frequency is set to the marker delta value. This command is not available in zero span.

Key access:	[Marker] > {Marker To} > {To Center}
-------------	--------------------------------------

Set reference level to the marker value

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6[:SET]:RLeVel
```

This command sets the reference level to the specified marker amplitude. In delta marker mode, the reference level is set to the amplitude difference between the markers.

Key access:	[Marker] > {Marker To} > {To Ref}
-------------	-----------------------------------

Marker On/Off

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:STATe  
OFF | ON | 0 | 1
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:STATe?
```

This command toggles the selected marker status between on and off.

Key access:	[Marker] > {Normal}
	[Marker] > {Off}

Marker to Trace

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:TRACe <integer>
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:TRACe?
```

This command assigns the specified marker to the designated trace 1, 2, 3 or 4.

*RST value:	1
Range:	1, 2, 3, or 4
Key access:	[Marker] > {More} > {Marker Trace}

Marker readout: X Value

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 : X <para>
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 : X?
```

This command positions the designated marker on its assigned trace at the specified trace X value. The value is in the X-axis units, which can be frequency or time.

The query returns the current X value of the designated marker.

*RST state:	Matches the units of the trace on which the marker is positioned.
-------------	---

Key access:	[Marker] > {Normal}
-------------	---------------------

Marker readout: Y Value

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 : Y?
```

This command reads the current Y value for the designated marker or delta on its assigned trace. The value is in Y-axis units for the current trace.

*RST state:	Matches the units of the trace on which the marker is placed.
-------------	---

DEMOdulation Subsystem

These sub tree commands are used to control the demodulation after the measurement has been loaded by [:SENSe]:FREQuency:SPAN:ZERO

AM Demodulation

```
:DEMod:AM:STATE OFF|ON|0|1
```

```
:DEMod:AM:STATE?
```

This command toggles the AM demodulation function between on and off.

*RST state:	Off
Key access:	[Span] > {Demode} > {AM (On)}

FM Demodulation

```
:DEMod:FM:STATE OFF|ON|0|1
```

```
:DEMod:FM:STATE?
```

This command toggles the FM demodulation function between on and off.

*RST state:	Off
Key access:	[Span] > {Demode} > {FM (On)}

DISPlay Subsystem

The DISPlay subsystem controls the selection and presentation of textual, graphical, and trace information. Within a display, information may be separated into individual windows.

Turn the Entire Display On/Off

```
:DISPlay:ENABle OFF|ON|0|1
```

This command turns the display on or off. Having the display turned off may increase the repetitive measurement rate.

*RST state:	On
-------------	----

Trace Y-Axis Scaling

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision
1|2|5|10
:DISPlay:WINDow:TRACe:Y[:SCALe]:PDIVision?
```

This command sets the per-division display scaling for the y-axis when the scale type of the Y axis is set to Log.

*RST value:	10 dB
Range:	1, 2, 5 or 10
Key access:	[AMPTD] > {Scale/DIV}

Trace Y-Axis Reference Level

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:RLeVel<ampl>
```

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:RLeVel?
```

This command sets the amplitude value of the reference level for the Y-Axis.

*RST value:	0.00 dBm
Range:	–120.00 to +30 dBm (in factory default state)
Available unit:	dBm, –dBm, mV, mV
Key access:	[AMPTD] > {Ref Level}

Trace Y-Axis Reference Level Offset

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:RLeVel:OFFSet<ampl>
```

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:RLeVel:OFFSet?
```

This command sets the amplitude level offset for the Y-Axis.

*RST value:	0.00 dB
Range:	–327.60 to +327.60 dB
Available unit:	dB
Key access:	[AMPTD] > {Ref Offset}

Vertical Axis Scaling

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing
LINear|LOGarithmic
:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing?
```

Toggles the vertical graticule divisions between logarithmic or linear units. The default logarithmic unit is dBm, and the linear unit is mV.

*RST State:	Log
Key Access:	[AMPTD] > {Scale Type}

Display Mode

```
:DISPlay:MODE DARK|LIGHT
:DISPlay:MODE?
```

This command quick sets the screen brightness and contrast mode according to the lighting condition.

*RST State:	Dark
Key Access:	[SYS] > {Display}

Contrast

```
:DISPlay:MODE:CONTRast<integer>
```

```
:DISPlay:MODE:CONTRast?
```

This command adjusts the contrast of the current screen display.

*RST Value:	55
Range:	0 to 100
Key Access:	[SYS] > {Contrast}

Brightness

```
:DISPlay:MODE:BRIGhtness <integer>
```

```
:DISPlay:MODE:BRIGhtness?
```

This command adjusts the brightness of the current screen display. Setting brightness to 0 turns off the backlight of the LCD screen.

*RST Value:	45
Range:	1 to 100
Key Access:	[SYS] > {Brightness}

INITiate Subsystem

The INITiate subsystem is used to control the initiation of the trigger. Refer to the TRIGger subsystem for related commands.

Continuous or Single Sweep

```
:INITiate:CONTInuous OFF|ON|0|1
:INITiate:CONTInuous?
```

Toggles the continuous sweep between on and off.

- When the On (1) parameter is selected, the continuous sweep is enabled.
- When the Off (0) parameter is selected, the continuous sweep is disabled and single sweep is enabled.

*RST State:	Continuous sweep (On)
Key Access:	[BW/SWP] > {Sweep}

Initiate a single sweep

```
:INITiate[:IMMediate]
```

This command initiates a single sweep.

Note that the command becomes effective only after you have previously set the sweep mode to single sweep.

Key Access:	[BW/SWP] > {Single Sweep}
-------------	---------------------------

INSTRument Subsystem

This subsystem includes commands for querying and selecting the instrument measurement mode.

Select One button measurement

```
:INSTRument:MEASure OFF|CHPower|ACPR|OBW
:INSTRument:MEASure?
```

Selects the one-button measurement among channel power, adjacent channel power ratio, and occupied bandwidth.

Use this command to select a power measurement first, then use other commands to set the parameters of this power measurement.

*RST State:	Off
Key Access:	[MEAS]

MEASure Subsystem

Provides programming information for the keys associated with the measurements available when you press the front-panel Measure key.

OBW Subsection

Setting Percentage (%) method of OBW

```
:MEASure:OBW:PERCent <para>  
:MEASure:OBW:PERCent?
```

Edits the percentage of signal power used when determining the occupied bandwidth. Press {**%**} to set the percentage ranging from 10.00% to 99.99%.

Setting dBc method of OBW

```
:MEASure:OBW:XDB <para>  
:MEASure:OBW:XDB?
```

Specifies the power level used to determine the emission bandwidth as the number of dB down from the highest signal point, within the occupied bandwidth span.

ACPR Subsection

Center Freq

```
:MEASure:ACPR:CENTer <freq>
:MEASure:ACPR:CENTer?
```

Sets the center frequency of the main channel power.

Main channel

```
:MEASure:ACPR:MAIN <freq>
:MEASure:ACPR:MAIN?
```

Specifies the range of integration used in calculating the power in the main channel. Use the knob and the arrow keys to set the bandwidth.

Adjacent channel

```
:MEASure:ACPR:ADJacent <freq>
:MEASure:ACPR:ADJacent?
```

Specifies the range of integration used in calculating the power in the adjacent channel. Use the knob and the arrow keys to set the bandwidth.

Channel space

```
:MEASure:ACPR:SPACe <freq>
:MEASure:ACPR:SPACe?
```

Sets the space value between the center frequency of the main channel power and that of the adjacent channel power.

There are also some remote commands which are irrelative to the front-panel keys.

Main Channel Power

```
:MEASure:ACPR:MPower?
```

Returns the main channel power of the ACPR measurement.

Low Adjacent Channel Power

`:MEASure:ACPR:LPOWer?`

Returns the lower adjacent channel power of the ACPR measurement.

Upper Adjacent Channel Power

`:MEASure:ACPR:UPOWer?`

Returns the upper adjacent channel power of the ACPR measurement.

Low Adjacent Channel Power Ratio

`:MEASure:ACPR:LRATio?`

Returns the lower adjacent channel power to main channel power ratio.

Upper Adjacent Channel Power Ratio

`:MEASure:ACPR:URATio?`

Returns the upper adjacent channel power to main channel power ratio.

Channel Power Subsection

Center Freq

```
:MEASure:CHPower:CENTer <freq>  
:MEASure:CHPower:CENTer?
```

Sets the center frequency of the display.

Int BW

```
:MEASure:CHPower:IBW <freq>  
:MEASure:CHPower:IBW?
```

Specifies the integration bandwidth ranging from 100 Hz to 3 GHz to calculate the power.

Channel Span

```
:MEASure:CHPower:SPAN <freq>  
:MEASure:CHPower:SPAN?
```

Sets the analyzer span for the channel power measurement. Be sure the span is set between 1 and 10 times the integration bandwidth.

There are also some remote commands which are relative to the front-panel keys.

Channel Power and Power Density

```
:MEASure:CHPower?
```

Returns the channel power and power density.

Channel Power

```
:MEASure:CHPower:CHPower?
```

Returns the channel power.

Power Density

```
:MEASure:CHPower:DENSity?
```

Returns the power density.

SENSe Subsystem

Sets the instrument parameters for the input signal measurements.

[[:SENSe]:AVERage Subsection

Average Type

```
[ :SENSe ] :AVERage:TYPE LOGPower | POWER | VOLTage
[ :SENSe ] :AVERage:TYPE?
```

This command sets the average type to the following three types:

- Log Pwr
- Power
- Voltage

For more information about the three types of average refer to ["Avg Type"](#) on page 90.

*RST State:	Log Pwr
Range:	Log Pwr, Pwr, Voltage
Key Access:	[BW/SWP] > {Avg Type}

Clear the current Average

```
[ :SENSe ] :AVERage:TRACe1 | 2 | 3 | 4 | 5 | 6 :CLEar
```

This command restarts the trace averaging function.

NOTE

Restart the trace at the beginning of a sweep to obtain valid average data. To do this remotely abort the sweep and initiate a single sweep.

Turn Averaging On/Off

```
[ :SENSe]:AVERAge:TRACe 1|2|3|4|5|6[:STATe]
OFF|ON|0|1
```

```
[ :SENSe]:AVERAge:TRACe 1|2|3|4|5|6[:STATe]?
```

This command toggles averaging between off and on. Averaging combines the value of successive measurements to average out measurement variations.

*RST State:	Off
Key Access:	[TRACE] > {Average}

Set the Average Count

```
[ :SENSe]:AVERAge:TRACe1|2|3|4|5|6:COUNt <para>
```

```
[ :SENSe]:AVERAge:TRACe 1|2|3|4|5|6:COUNt?
```

This command specifies the number of measurements that are combined.

*RST Value:	100
Key Access:	[TRACE] > {Average}

[[:SENSe]:BANDwidth Subsection

Resolution Bandwidth

```
[[:SENSe]:BANDwidth|BWIDth[:RESolution] <freq>
[:SENSe]:BANDwidth|BWIDth[:RESolution]?
```

This command specifies the resolution bandwidth.

*RST Value:	1 MHz
Range:	30 Hz to 1 MHz
Available Unit:	Hz, kHz, MHz, GHz
Key Access:	[BW/SWP] > {RBW}

Resolution Bandwidth Automatic

```
[[:SENSe]:BANDwidth|BWIDth [:RESolution]:Auto
OFF|ON|0|1
[:SENSe]:BANDwidth|BWIDth
[:RESolution]:Auto?
```

This command couples the resolution bandwidth to the frequency span. Auto-couple resolution bandwidth is not available in zero span.

*RST State:	On
Key Access:	[BW/SWP] > {RBW}

Video Bandwidth

```
[[:SENSe]:BANDwidth|BWIDth:VIDeo <freq>
[:SENSe]:BANDwidth|BWIDth:VIDeo?
```

This command specifies the video bandwidth.

*RST Value:	1 MHz
Range:	3 Hz to 1 MHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[BW/SWP] > {VBW}

Video Bandwidth Automatic

```
[ :SENSe]:BANDwidth|BWIDth:VIDeo:AUTO
OFF|ON|0|1
[ :SENSe]:BANDwidth|BWIDth:VIDeo:AUTO?
```

This command couples the video bandwidth to the resolution bandwidth.

*RST State:	On
Key Access:	[BW/SWP] > {VBW}

Video to Resolution Bandwidth Ratio

```
[ :SENSe]:BANDwidth|BWIDth:VIDeo:RATio <para>
[ :SENSe]:BANDwidth|BWIDth:VIDeo:RATio?
```

This command specifies the ratio of the video bandwidth to the resolution bandwidth.

*RST Value:	1.00
Range:	0.001 to 1000
Key Access:	[BW/SWP] > {VBW/RBW}

Video to Resolution Bandwidth Ratio Mode Select

```
[ :SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO
OFF|ON|0|1
[ :SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO?
```

This command selects the auto or manual mode for the video bandwidth to resolution bandwidth ratio.

*RST State:	On
Key Access:	[BW/SWP] > {VBW/RBW}

[:SENSe]:DETECTOR Subsection

Automatic Detection Type Selected

```
[[:SENSe]:DETECTOR:TRACe[1]|2|3|4 AUTO  
OFF|ON|0|1
```

```
[[:SENSe]:DETECTOR:TRACe[1]|2|3|4 AUTO?
```

This command switches automatically to the optimum detection type for typical measurements using the current instrument settings.

The detector type is average if any of these are on:

- Noise marker
- Band power markers
- Trace averaging when the Average Type is Power (RMS).

The detector type is sample if any of the following conditions are true:

- Trace averaging is on with average type of video
- Both max. and min. hold trace modes are on
- Resolution bandwidth is less than 1 kHz, and noise marker, band power markers, or trace averaging is on.

The detector type is negative peak if any trace is in minimum hold and no traces are in maximum hold.

The detector type is peak if the above conditions are off.

Manually changing the detector function turns Auto off.

*RST State:	On
Key	
Access:	[TRACE] > {More (1 of 2)} > {Detector}

Types of Detection

```
[ :SENSe]:DETECTOR:TRACE[1] | 2 | 3 | 4
[FUNCTION]
AVERAge | POSitive | SAMPlE | NEGAtive | NORMAl
[ :SENSe]:DETECTOR:TRACE[1] | 2 | 3 | 4
[FUNCTION]?
```

This command specifies the detection mode. For each trace interval (bucket), average detection displays the average of all the samples within the interval. The averaging can be done using two methods:

- The power method (RMS)
- The video method (Y Axis Units)

The method is controlled by the TRACE, Detector.

FREQUENCY Subsection

Center Frequency

```
[ :SENSe]:FREQUENCY:CENTer <freq>
[ :SENSe]:FREQUENCY:CENTer UP | DOWN
[ :SENSe]:FREQUENCY:CENTer?
```

This command sets the center frequency.

*RST Value:	1.5 GHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[FREQ] > {Center Freq}

Center Frequency Step Size Automatic

```
[ :SENSe]:FREQUENCY:CENTer:STEP:AUTO
OFF | ON | 0 | 1
[ :SENSe]:FREQUENCY:CENTer:STEP:AUTO?
```

This command specifies whether the step size is set automatically based on the span.

*RST State:	On
Key Access:	[FREQ] > {CF Step}

Center Frequency Step Size

```
[ :SENSe] :FREQuency:CENTer:STEP[:INCRement]
<freq>
```

```
[ :SENSe] :FREQuency:CENTer:STEP[:INCRement] ?
```

This command specifies the center frequency step size.

*RST Value:	300 MHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[FREQ] > {CF Step}

Frequency Span

```
[ :SENSe] :FREQuency:SPAN <freq>
```

```
[ :SENSe] :FREQuency:SPAN?
```

This sets the frequency span.

Setting the span to 0 Hz puts the analyzer into zero span.

*RST Value:	3.0 GHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[SPAN] > {Span}

Full Frequency Span

```
[ :SENSe] :FREQuency:SPAN:FULL
```

This command sets the frequency span to full scale.

*RST Value:	3.0 GHz
Key Access:	[SPAN] > {Full}

Zero Frequency Span

```
[ :SENSe] :FREQuency:SPAN:ZERO
```

This command sets the frequency span to zero.

Key Access:	[SPAN] > {Zero Span}
-------------	----------------------

Last Frequency Span

```
[ :SENSe]:FREQuency:SPAN:PREVIOUS
```

This command sets the frequency span to the previous span setting.

Key Access:	[SPAN] > {Last Span}
-------------	----------------------

Start Frequency

```
[ :SENSe]:FREQuency:START <freq>
```

```
[ :SENSe]:FREQuency:START?
```

This command sets the start frequency.

*RST Value:	0 Hz
Available Unit:	Hz, kHz, MHz, GHz
Key Access:	[SPAN] > {Start Freq}

Stop Frequency

```
[ :SENSe]:FREQuency:STOP <freq>
```

```
[ :SENSe]:FREQuency:STOP?
```

This command sets the stop frequency.

*RST Value:	3.0 GHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[FREQ] > {Stop Freq}

[[:SENSe]:POWer Subsection

Input Attenuation

```
[[:SENSe]:POWer[:RF]:ATTenuation <para>
```

```
[[:SENSe]:POWer[:RF]:ATTenuation?
```

This command sets the value of the attenuator.

*RST Value:	20 dB
Range:	0 dB to 51 dB
Available unit:	dB
Key Access:	[AMPTD] > {Attenuation}

Input Port Attenuator Auto

```
[[:SENSe]:POWer[:RF]:ATTenuation:AUTO
```

```
OFF|ON|0|1
```

```
[[:SENSe]:POWer[:RF]:ATTenuation:AUTO?
```

This command selects the input port attenuator range to be set either automatically or manually.

On – Input attenuation is automatically set as determined by the Reference Level Setting.

Off – Input attenuation is manually set.

*RST State:	On
Key Access:	[AMPTD] > {Attenuation}

Input Port Power Gain

```
[[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1
```

```
[[:SENSe]:POWer[:RF]:GAIN[:STATe] ?
```

This command turns the internal preamplifier on or off.

*RST State:	Off
Key Access:	[AMPTD] > {Preamp}

SWEep Subsection

Sweep Time

```
[ :SENSe ] :SWEep:TIME <time>
```

```
[ :SENSe ] :SWEep:TIME?
```

This command specifies the time in which the instrument sweeps the display.

*RST State:	1.076067 s
Range:	10 ms to 1000 s
Available unit:	ks, s, ms, us
Key Access:	[BW/SWP] > {Sweep Time}

Automatic Sweep Time

```
[ :SENSe ] :SWEep:TIME:AUTO OFF | ON | 0 | 1
```

```
[ :SENSe ] :SWEep:TIME:AUTO?
```

This command automatically selects the fastest sweep time for the current settings.

*RST State:	On
Key Access:	[BW/SWP] > {Sweep Time}

Sweep Mode

```
[ :SENSe ] :SWEep:TIME:AUTO:MODE:NORMal | FAST
```

```
[ :SENSe ] :SWEep:TIME:AUTO:MODE?
```

This command toggles the sweep mode between normal and fast.

*RST State:	Normal
Key Access:	[BW/SWP] > {Sweep} > {Sweep Mode}

SYSTem Subsystem

This subsystem is used to set the controls and parameters associated with the overall system settings. These functions are not related to instrument performance.

Ext Input

```
:SYSTem:CONFigure:PORT REF|TRIGger
:SYSTem:CONFigure:PORT?
```

This command toggles the channel for external input between **Ref** and **Trig**.

Key access:	[SYS] > {Setting} > {Ext input}
-------------	---------------------------------

Date Query

```
:SYSTem:DATE?
```

This query returns the date of the real-time clock of the analyzer.

Time Query

```
:SYSTem:TIME?
```

This query returns the time of the real-time clock of the analyzer.

Error Information Query

```
:SYSTem:ERRor[:NEXT]?
```

This query returns the earlier entry to the error queue and then deletes that entry..

Key access:	[SYS] > {Show Error}
-------------	----------------------

TRACe Subsystem

The TRACe subsystem controls access to the internal trace memory of the analyzer.

Select Trace Display Mode

```
:TRACe[1] | 2 | 3 | 4 :MODE
WRITE | MAXHole | MINHole | VIEW | BLANK
:TRACe[1] | 2 | 3 | 4 :MODE?
```

This command selects the display mode as follows:

- **Write**
Puts the trace in the normal mode, updating the data.
- **Maximum Hold**
Displays the highest measured trace value for all the data that has been measured since the function was turned on.
- **View**
Turns on the trace data so that it can be viewed on the display.
- **Blank**
Turns off the trace data so that it is not viewed on the display.

*RST State:	Write
Key access:	[TRACE] > {Clear Write}
	[TRACE] > {Max Hold}
	[TRACE] > {Min Hold}
	[TRACE] > {View}
	[TRACE] > {Blank}

NOTE

Whenever the number of sweep points change, the following functions are affected:

- All trace data is erased
- Any traces in view mode will go to blank mode.

Tracking Generator Subsystem

The tracking generator subsystem controls the use of the tracking generator function of the analyzer.

State

```
:TGENerator:AMPLitude:STATe OFF|ON|0|1
:TGENerator:AMPLitude:STATe?
```

This command toggles the state of the tracking generator between on and off. Setting it to the ON state enables the tracking generator mode.

*RST State:	OFF
Key Access:	<ol style="list-style-type: none"> 1 Press [MODE] to enable the tracking generator mode. 2 Press {Amplitude} to toggle the tracking generator between on and off.

Output Amplitude

```
:TGENerator:AMPLitude <ampt>
:TGENerator:AMPLitude?
```

This command sets the tracking generator output amplitude. This command is valid when the tracking generator is enabled.

*RST State:	–20 dBm
Range:	0 to –30 dBm
Available unit:	dBm
Key Access:	{Amplitude}

Amplitude Step

```
:TGENerator:AMPLitude:STEP <ampt>
:TGENerator:AMPLitude:STEP?
```

This command sets the amplitude step size of the tracking generator output. This command is valid after the tracking generator is enabled.

*RST State:	1 dB
Range:	1 to 10 dB
Min. Increment	1 dB
Available unit:	dB
Key Access:	{Amptd Step}

Amplitude Offset

```
:TGENerator:AMPLitude:OFFSet <ampt>
```

This command sets the amplitude offset of the tracking generator output. This command is valid after the tracking generator is enabled.

*RST State:	0.00 dB
Range:	-88.40 to 327.60 dB
Min. Increment	0.01 dB
Available unit:	dB
Key Access:	{Amptd Offset}

Storing as reference

```
:TGENerator:NORMalize:REF
```

This command stores the current trace to Trace 4 as a reference. This command is valid after the tracking generator is enabled.

Key Access:	{Normalize} > {Store Ref}
-------------	---------------------------

Normalization

```
:TGENerator:NORMalize:STATE OFF|ON|0|1
```

```
:TGENerator:NORMalize:STATE?
```

This command toggles the normalization between on and off.

*RST State:	OFF
Key Access:	{Normalize} > {Normalize} (On/Off)

Normalization Reference Level

```
:TGENerator:NORMalize:LEVel <para>
```

```
:TGENerator:NORMalize:LEVel?
```

This command sets the normalization level.

*RST State:	0.00 dB
Range:	-327.6 to 327.60 dB
Min. Increment	0.01 dB
Available unit:	dB
Key Access:	{Normalize} > {Norm Ref Lvl}

Normalization Reference Position

```
:TGENerator:NORMalize:POSN <para>
```

```
:TGENerator:NORMalize:POSN?
```

This command sets the normalization reference position.

*RST State:	10
Range:	0 to 10
Min. Increment	1
Key Access:	{Normalize} > {Norm Ref Posn}

Reference Trace

```
:TGENerator:NORMALize:TRACe VIEW|BLANK
:TGENerator:NORMALize:TRACe?
```

This command toggles the reference trace display between VIEW and BLANK.

VIEW means to hold and display the amplitude data of the selected trace. If a trace is deactivated by pressing **Blank**, the stored trace data can be retrieved by pressing **View**.

BLANK means to store the amplitude data for the selected trace and removes it from the display.

*RST State:	BLANK
Key Access:	{Normalize} > {Ref Trace}

TRIGer Subsystem

Trigger subsystem is only valid when the analyzer is in zero span.

External Trigger Slope

```
:TRIGer[:SEquence]:EXTeRnal:SLOPe
POSitive|NEGative
:TRIGer[:SEquence]:EXTeRnal:SLOPe?
```

The external trigger signal must be a TTL signal at 0 V to 5 V. This function controls the trigger polarity (for positive or negative-going signals).

*RST state:	Positive
-------------	----------

Trigger Source

```
:TRIGer[:SEquence]:SOURce
IMMeDiate|VIDeo|EXTeRnal
:TRIGer[:SEquence]:SOURce?
```

This command sets the source (or type) of triggering used to start a measurement.

- Immediate is free-run triggering.
- Video triggers on the video signal level.
- External allows you to connect an external trigger source.

*RST state:	Immediate (free-run triggering)
-------------	---------------------------------

Key access:	[Span] > {Trigger}
-------------	--------------------

Video Trigger Level Amplitude

```
:TRIGer[:SEquence]:VIDeo:LEVel <ampl>
:TRIGer[:SEquence]:VIDeo:LEVe?
```

This command specifies the video trigger level.

*RST Value:	0.00 dBm
-------------	----------

Key Access:	[Span] > {Trigger}
-------------	--------------------

UNIT Subsystem

Selects a power unit for measurement.

```
:UNIT:POWer DBM|DBMV|DBUV|V|W
```

```
:UNIT:POWer?
```

This command specifies the amplitude units for the input, output, and display.

*RST Value:	dBm
-------------	-----

Available units	dBm, dBmV, dBuV, V, W
-----------------	-----------------------



7 Error Messages

This chapter contains Error Message information and definitions used by the analyzer.



Error Message List

NOTE

A symbol [F] at the beginning of an error message indicates this is an error caused by manual front panel operation. A symbol [R] at the beginning of an error message indicates this is an error caused by remote control mode.

Error Code	Error Message	Description
0	No error	
-410	Query INTERRUPTED	Indicates that a condition causing an INTERRUPTED query occurred (see IEEE 488.2, 6.3.2.7)
-350	Query overflow	Indicates the SCPI remote interface error queue overflowed.
-321	Out of memory	Indicates an internal operation needed more memory than that was available.
-224	Illegal parameter value	Indicates you sent a parameter for this command that is NOT allowed.
-223	Too much data	Indicates a legal program data element of block, expression or string type was received that contained more data than the device could handle due to related device-specific requirements or memory.
-222	Data out of range	Indicates legal data was parsed, but could not be executed because the interpreted value was outside the legal range defined by the analyzer. The displayed results may be clipped.
-220	No matched module	Indicates no matched measurement or mode found.

Error Code	Error Message	Description
-200	Execution error	This is a generic execution error for devices that cannot detect more specific errors. The code indicates an execution error defined in IEEE 488.2, 11.5.1.1.4 has occurred.
-171	Invalid expression	Indicates the data element was invalid, for example, unmatched parentheses, or an illegal character.
-144	Character data too long	Indicates the character data contained more than 12 characters. (see IEEE 488.2, 7.7.1.4)
764	Unable to save file	Indicates a failure occurred while saving a file. The file was not saved.
762	Unable to load file	Indicates a failure occurred while loading a file. The file was not loaded.
612	File NOT found	Indicates the analyzer could not find the specified file.
173	Lame package, please upgrade firmware	Indicates the current firmware has not been updated. The firmware needs upgrading.
172	Option install fail, invalid option licence	Indicates the option could not be installed, because of the invalid option licence.
171	File loaded	Indicates the file loading succeeded.
170	The menu is unavailable in this case	Indicates the menu is invalid in this case.
166	Marker counter opened in fast sweep	Indicates the counter's accuracy decreases when in fast sweep mode.
162	Cannot open fast sweep in this case	Indicates current settings do not allow you to open fast sweep. For example, currently in FFT, zero span, or any measurement in power suite does not allow fast sweep.
156	Incorrect alignment file on flash	Indicates an invalid alignment file.

7 Error Messages

Error Code	Error Message	Description
153	RF EEPROM operate fail	Indicates an error when writing an alignment file.
152	Alignment file oversize	Indicates the alignment file has an error or invalid data.
151	DSP boot fail	Indicates the analyzer cannot process the measurement currently. Wait for the analyzer to reboot. If the analyzer is frozen, try to restart the analyzer.
150	Mixer overload	Indicates the first mixer is in danger. Either increase the input attenuation or decrease the input signal level.
149	Mixer saturate	Indicates you need to either increase the input attenuation or decrease the input signal level.
147	Incorrect alignment data in EEPROM	Indicates invalid alignment data occurred.
143	Final IF overload	Indicates you need to either increase the input attenuation or decrease the input signal level.
138	USB device NOT ready	Indicates the USB device is not detected.
136	RBW limit to 30 kHz when in fast sweep	Indicates the analyzer automatically coupled the RBW to 30 kHz when in fast sweep mode.
130	Meas uncal	Indicates the measurement is uncalibrated due to fast sweeping through a narrow RBW filter. Check the sweep time, span, and bandwidth settings, or use auto coupling.
119	RF Board Changed	Indicates the RF board was changed, the analyzer needs to re-load the alignment data.
116	Cannot communicate with RF	Indicates the MCU cannot find the RF board.

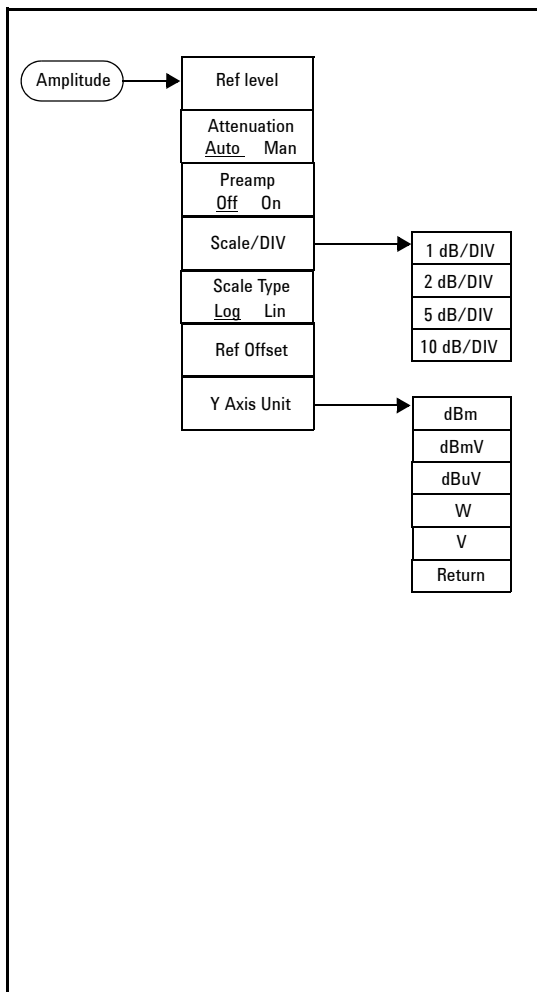


8 Menu Map

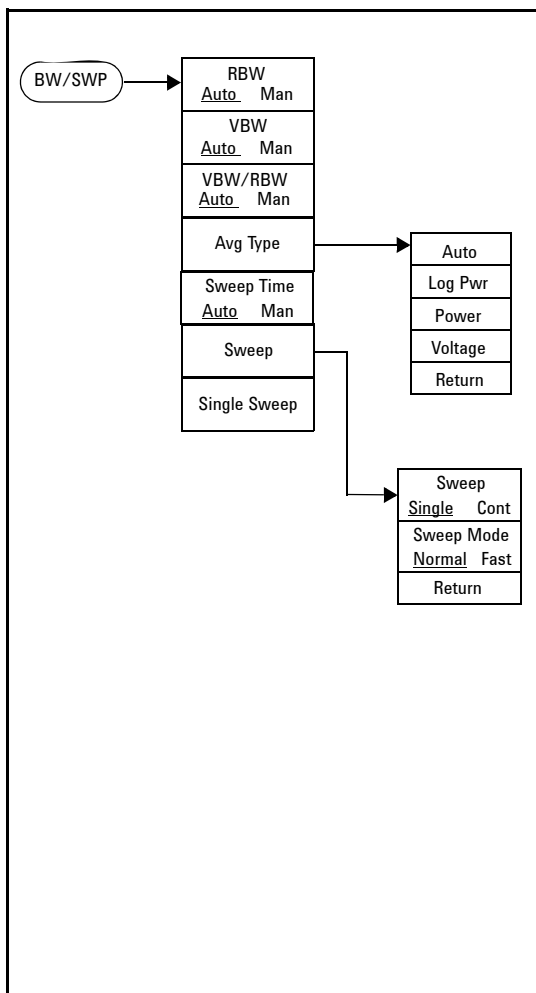
This chapter contains Menu Maps that visually present the menus and submenus that are accessed by pressing the Hardkeys and Softkey menu selections in the instrument. This is a quick reference guide for the experienced user.

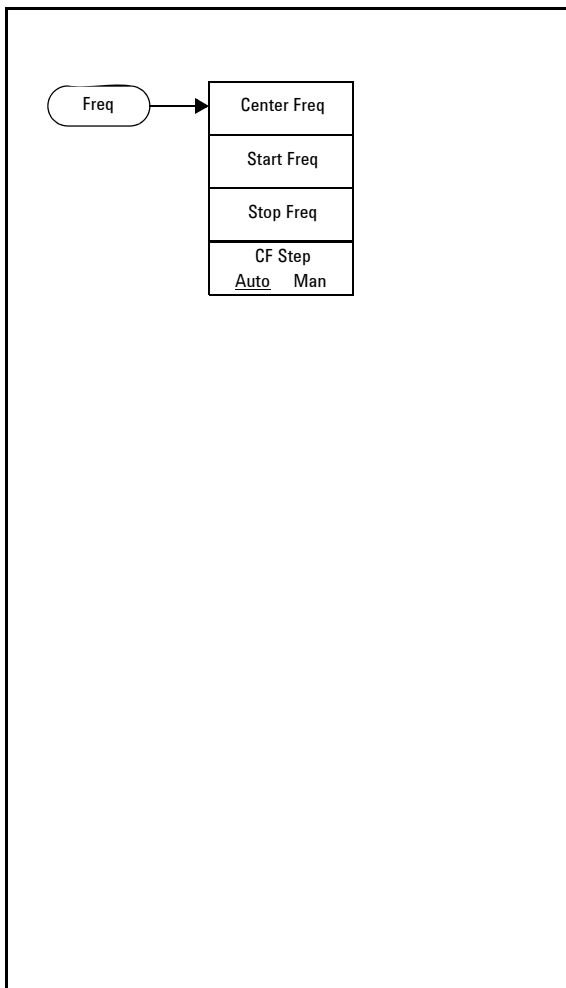


AMPTD

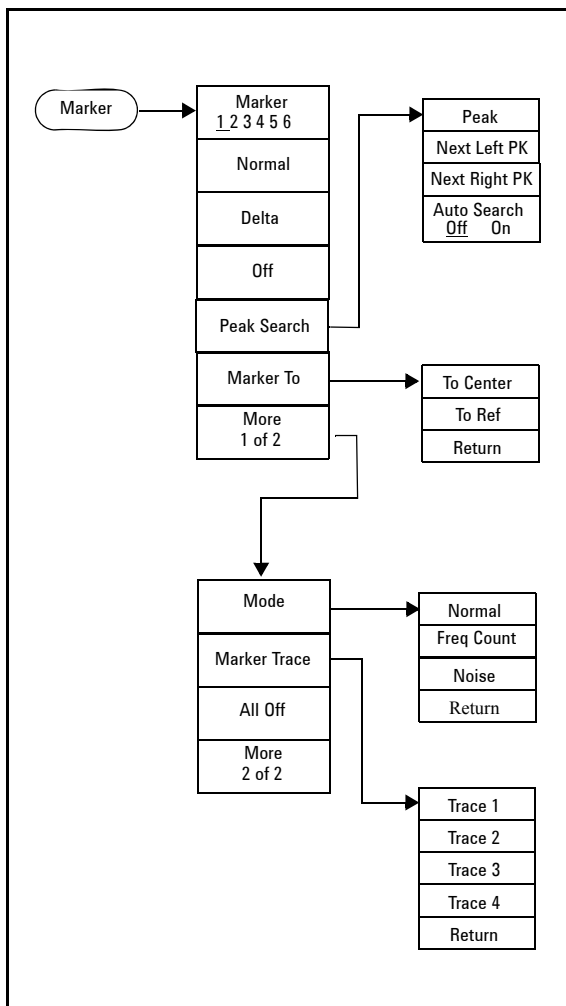


BW/SWP

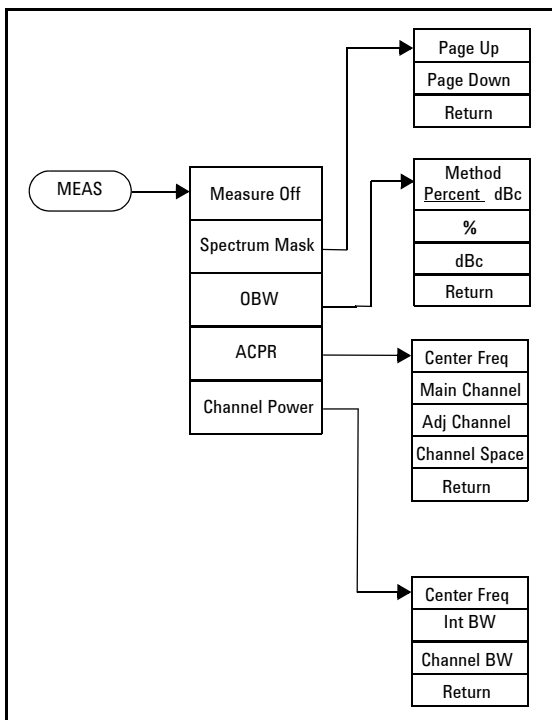


FREQ

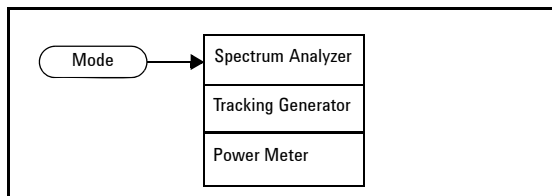
MARKER



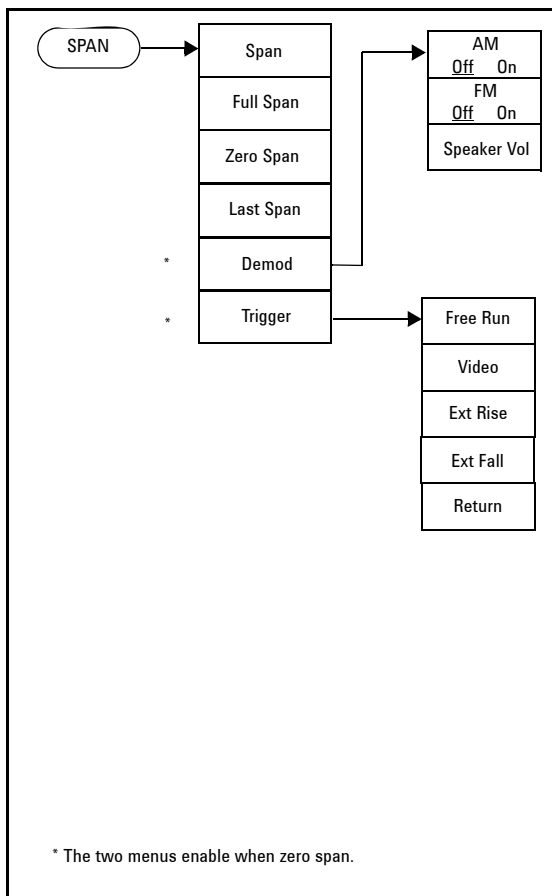
MEAS



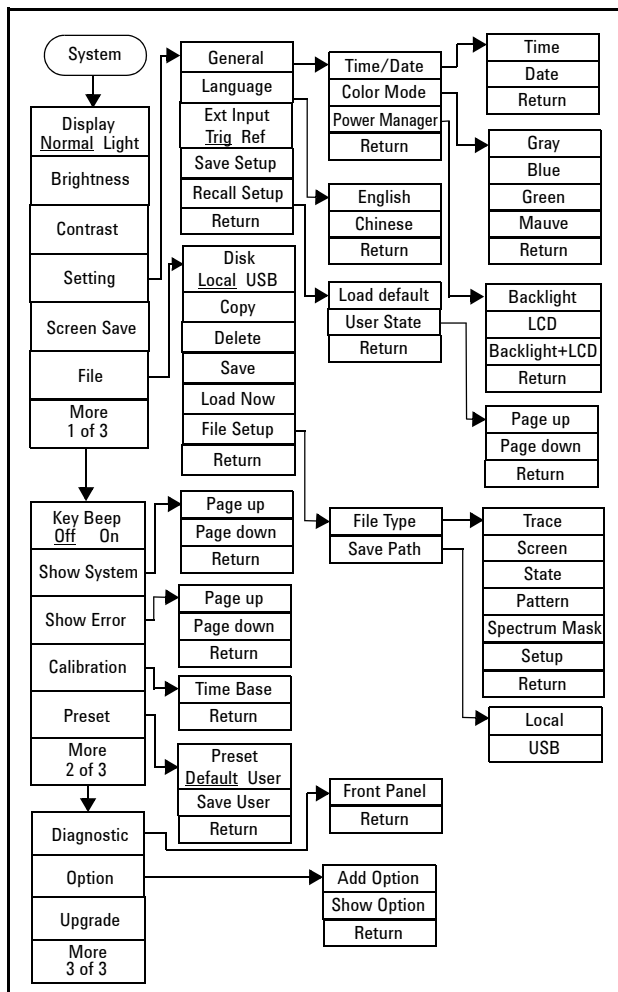
MODE



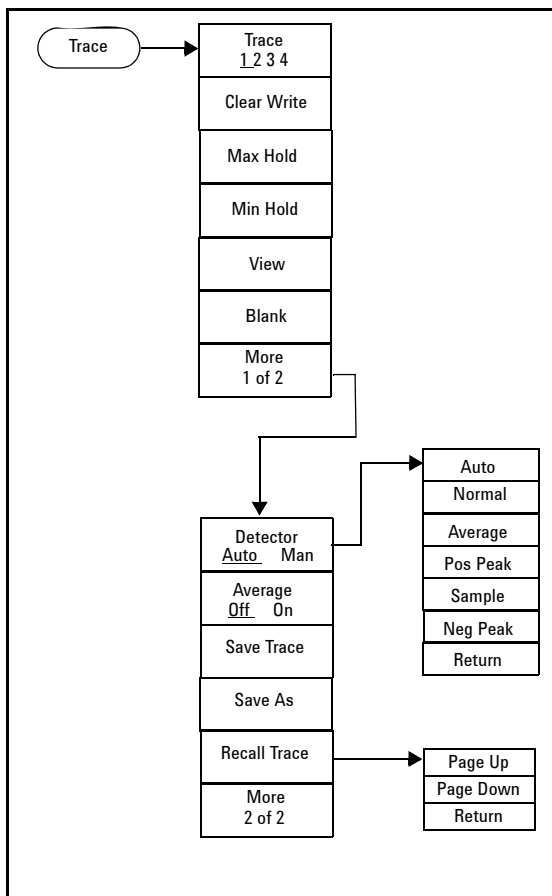
SPAN



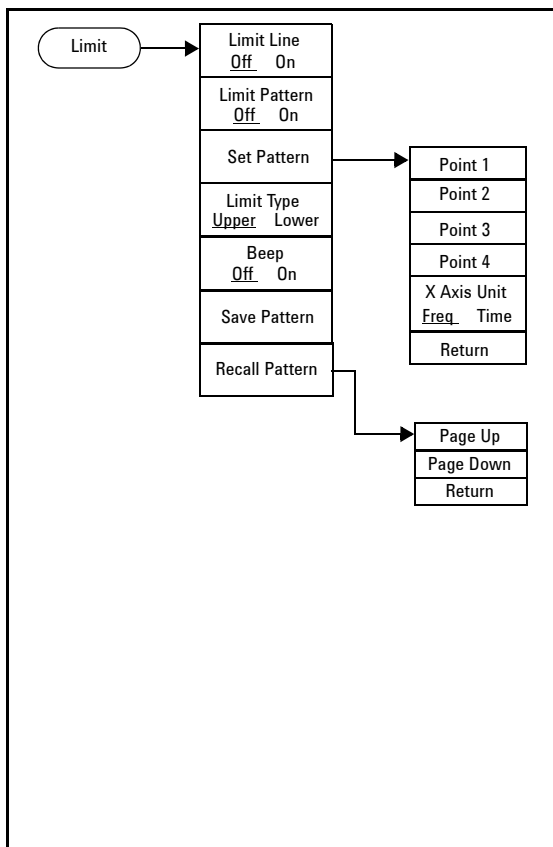
SYS



TRACE



Limit



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