HP 8566B/68B Code Compatibility Guide

Agilent Technologies
ESA and PSA Spectrum Analyzers

This manual provides documentation for the following instruments with Option 266 installed:

ESA-E Series

E4401B (9 kHz - 1.5 GHz)
E4402B (9 kHz - 3.0 GHz)
E4404B (9 kHz - 6.7 GHz)
E4405B (9 kHz - 13.2 GHz)
E4407B (9 kHz - 26.5 GHz)

PSA Series

E4440A (3 Hz - 26.5 GHz)
E4443A (3 Hz - 6.7 GHz)
E4445A (3 Hz - 13.2 GHz)
E4446A (3 Hz - 44.0 GHz)
E4448A (3 Hz - 50.0 GHz)

Manufacturing Part Number: E4440-90097
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Contents

1 Getting Started

Option 266 Description

Option 266 (HP 8566B/68B Code Compatibility) for Agilent Technologies' ESA-E series and PSA series spectrum analyzers allows the analyzer to be controlled using many of the HP 8566B and HP 8568B programming commands. It is designed to replace HP 8566B and HP 8568B analyzers in many automated systems with minimal or no modification to the currently used measurement software.

Option 266 Limitations

The Agilent Option 266 (HP 8566B/68B Code Compatibility) has been designed to emulate as closely as possible the operation of the HP 8566B and HP 8568B spectrum analyzers. It is not, however, intended as an absolute direct replacement for these analyzers.

Only a subset of the HP 8566B and HP 8568B commands is supported in this option (through a GPIB interface). These supported commands were determined by feedback from our customers combined with technical considerations and constraints.

NOTE Installing Option 266 Code Compatibility on a PSA series analyzer automatically uninstalls all incompatible personality options. Conversely, installing any incompatible personality option will uninstall the Option 266 Code Compatibility option.

In the HP 8566B and the HP 8568B, a "predefined function" is an analyzer command that returns a number that can be operated on by other analyzer commands. "Predefined variables" follow the same idea, only the value to be passed as a parameter to the next command is stored in a variable.

Option 266 does not support this type of behavior, so any commands that originally acted as predefined functions or variables, or that allowed predefined functions or variables as arguments in the HP 8566B or HP 8568B, will not do so in this analyzer. No user-defined functions, traces, or variables (FUNCDEF, TRDEF or VARDEF) can be used as arguments or commands in programs controlling this analyzer. In addition, the behavior of certain commands that rely on the "active functions" (UP, DN, etc.) might be slightly different.

Hardware Requirements for Option 266

One of the following Agilent spectrum analyzers and associated hardware options is required to run Option 266.

Table 1-1 Compatible Agilent ESA-E Series Spectrum Analyzers

Analyzer Model Number	Upper Frequency Limit	Firmware	HP 8566B/68B Code Compatibility Personality	B72 (Extended Memory Option)	A4H (GPIB and Parallel Interface Option)
E4401B	1.5 GHz	A.09.00 or later	Option 266	Required	Required
E4402B	3.0 GHz	A.09.00 or later	Option 266	Required	Required
E4404B	6.7 GHz	A.09.00 or later	Option 266	Required	Required
E4405B	13.2 GHz	A.09.00 or later	Option 266	Required	Required
E4407B	26.5 GHz	A.09.00 or later	Option 266	Required	Required

Table 1-2 Compatible Agilent PSA Series Spectrum Analyzers

Analyzer Model Number	Upper Frequency Limit	Firmware	HP 8566B/68B Code Compatibility Personality
E4440A	26.5 GHz	A.03.01 or later	Option 266
E4443A	6.7 GHz	A.03.01 or later	Option 266
E4445A	13.2 GHz	A.03.01 or later	Option 266
E4446A	44.0 GHz	A.03.01 or later	Option 266
E4448A	50.0 GHz	A.03.01 or later	Option 266

NOTE The upper frequency limit of the HP 8566B spectrum analyzer is 22 GHz, and the upper limit of the HP 8568B analyzer is 1.5 GHz.

Installing/Uninstalling Option 266 - ESA-E Series Analyzers Only

NOTE These installation instructions apply only to ESA-E series analyzer models, that is model numbers E4401B, E4402B, E4404B, E4405B, and E4407B.

You may want to install Option 266 or reinstall it after servicing or calibrating the analyzer. Before you can install the option, you will need an installation diskette or set of installation diskettes. The latest version of the installation disk set, at the time of purchase, was included with this programming compatibility guide.

To update an existing, previously installed Option 266, you may order the diskette(s) from Agilent Technologies or create a set from the Agilent internet site shown under "Spectrum Analyzer Updates" on page 29.

Creating the Installation Disks from the Web

To create the installation disks on-line, visit the Agilent internet site shown under "Spectrum Analyzer Updates" on page 29. Follow the instructions provided on the internet site for downloading the current Option 266 software and creating an installation disk. (A firmware update may be needed to ensure that the firmware and the software are compatible.) After successfully creating the installation disk set, you are ready to install Option 266 in your ESA-E Series analyzer.

NOTE Refer to Table 1-1 on page 3 to ensure your analyzer is capable of installing and running Option 266.

Installing the Option 266 Software

This procedure gives steps to install a new software option in an ESA-E Series Spectrum Analyzer using the internal floppy drive of the instrument. Screen messages display the update progress and give directions. The instrument will not need to be re-calibrated after this procedure since no changes are made to calibration or adjustment files.

If you have a problem with the installation process, refer to "Troubleshooting the Installer" on page 8.

NOTE Once the installer has begun installing the software, any error will cause the entire option (including a previously installed version) to be removed from the instrument. For this reason, it is very important that you verify the disk prior to installing it. If the disk or any of the files are corrupt, you will not be able to use the option until you obtain a new installation disk set and run the install using the new set.

NOTE *This applies only to ESA-E series analyzers:*

Option 266 - HP 8566B/68B Code Compatibility and Option 290 - 8590 Code Compatibilty cannot both be installed on the same Agilent analyzer at the same time as they will conflict with each other. If one of these personalities has been installed on your analyzer, it must be removed before the other is installed.

1. Press **System, More, Personalities**, and **Install**. If there is no floppy disk in the drive, the incorrect disk is inserted, or there is no installer on the disk, the error "No install disk present in disk drive" will be shown.

   The screen will change and the **Install Pers.** menu will be shown.

2. Select **Verify Disks**.

   When Verify Disks is running, the **Install Now** and **Exit Installer** keys will be grayed out.

3. When the verification has been completed successfully, press **Install Now** and the installation of the software will begin.

   While the installer is running, the **Verify Disks** and **Exit Installer** keys will be grayed out.

4. Once the installation is complete, press **Exit Installer**. If a problem occurs, refer to "Troubleshooting the Installer" on page 8.

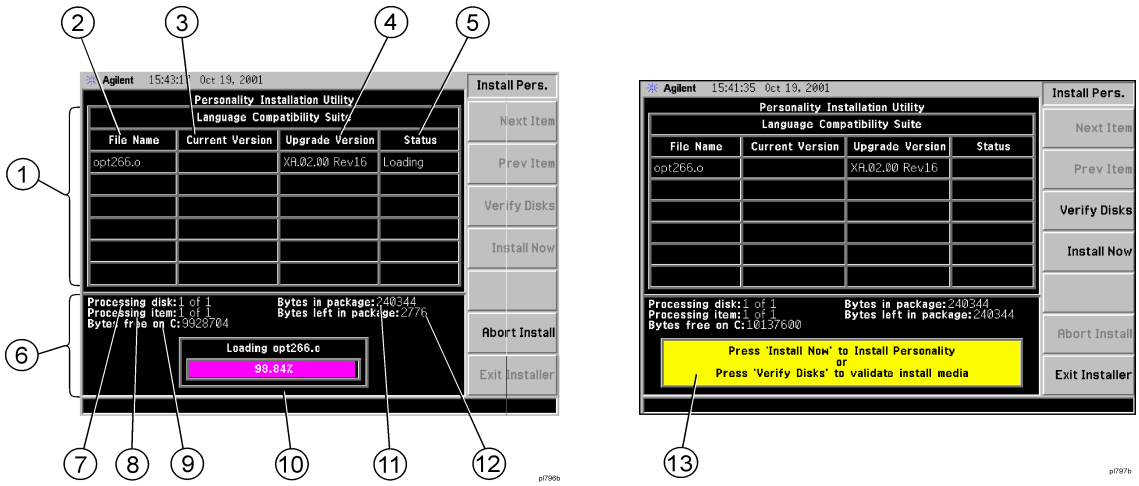
NOTE When the installer starts up, it examines the instrument to ensure that all the required software and hardware options are present. If they are not, the installer will generate an error and you will not be able to install the option.

Uninstalling Option 266

You may want to uninstall Option 266. To uninstall Option 266, press **System, More, Personalities, Uninstall**. Select the option using the up/down arrow keys on the front panel, and press **Uninstall Now**.

Installer Screen and Menu

The top portion of the install screen is a table in which the files that are about to be installed are listed. The bottom portion of the screen contains information needed to track the progress of the install.



1 **File Table** displays the files to be installed and various file information. If there are more then six files, **Next Item** and **Prev Item** allow you to scroll the table to view additional items.

2 **File Name** displays the name of the files on the installation disk.

3 **Current Version** displays the version of the file that is currently installed in the instrument. (This field will be blank if this file is not currently installed in the instrument or if the file is a data file that has no version.)

4 **Upgrade Version** shows the version of the file on the install disk. This is the version of the file that will replace the currently installed version.

5 **Status** is updated to reflect what the installer is doing to the current file as the install progress. The valid messages seen in this column are listed in Table 1-3 on page 7.

6 **Data Field** contains a status bar and various status information.

7 **Processing disk** shows the disk that is currently being read.

8 **Processing item** shows the file that is being processes by item number.

9 **Bytes free on C** is the number of bytes currently free on the instrument C: drive.

10 **Status Bar** contains a status bar that runs from 0 to 100% and tracks the progress of the current step and a message line displays the step that is currently being executed.

11 **Bytes in package** lists the number of bytes in the install package/ fill.

12 **Bytes left in package** lists the number of bytes left to be read.

13 Message and error popup window that displays over the status bar. Information in this box will prompt you for action required to proceed to the next phase of the installation. It may also inform you of errors in the installation process and may prompt you for action required to correct the problem.

Table 1-3 Installer Status Messages

`Failed`	This means that something has gone wrong while processing this item. It is a fatal error and the installation can not be completed. The installer will try to get the system back to a good state which may entail completely removing the currently installed personality.
`Loading`	The file is currently being copied from the install media to the instrument's file system.
`Verifying`	This may mean one of two things: 1. If "Verify Disks" was pressed then Verifying means that the installer is currently reading the install media and comparing the known checksums to ensure the data is good. 2. If "Install Now" was pressed, then Verifying means that the installer is reading what was just loaded to ensure the checksum is correct.
`Loaded`	This means that the data has been placed on the instrument disk but has not yet been registered with the firmware.
`Installed`	This means that the data has been loaded into the instrument and registered. The install for this file is complete.
`Skipping`	This means that the installer has determined that this file does not need to be loaded into the instrument.

Troubleshooting the Installer

If the installation process stalls or fails in another way, follow these steps to resolve your problem.

1. If the instrument stops the update process before all the disks are loaded proceed as follows:

   a. Press **Exit Installer** to abort the process.

   b. Return to step 1 under "Installing the Option 266 Software" on page 4.

2. If the instrument fails after repeating the installation procedure, get in touch with your nearest Agilent sales and service office for assistance. Please provide the following information:

   Model Number:

   Serial Number:

   State that you are having trouble installing Option 266.

Installing Option 266 - PSA Series Analyzers Only

When you install Option 266, follow the process described below. See "Loading an Optional Measurement Personality" on page 10

Adding additional measurement personalities requires purchasing a retrofit kit for the desired option. The retrofit kit contains the measurement personality firmware and a license key certificate. It documents the license key number that is specific for your option and instrument serial number.

Why Aren't All the Personality Options Loaded in Memory?

There are many measurement personality options available for use with this instrument. Some versions of instrument hardware may not have enough memory to accommodate all the options that you have ordered. If this is the case you will need to swap the applications in/out of memory, as needed. It may be possible to upgrade your hardware to have more memory. Contact your local sales/service office.

Available Measurement Personality Options

To order a measurement personality option you need the instrument model number, the host ID and the serial number.

Required Information:	**Front Panel Key Path:**
Model #: _____	
Host ID: _____	**System**, **Show System**
Instrument Serial Number: _____	**System**, **Show System**

NOTE The instrument must have Option B7J in order to add most of the measurement personality options. (cdmaOne, cdma2000, W-CDMA, GSM, EDGE, NADC, PDC.)

Available Personality Options[a]	Option	File Size (PSA Rev: A.02.04)
Phase noise measurement personality	**226**	2.6 MB
Basic measurement personality with digital demod hardware	**B7J**	Cannot be deleted
GSM (with EDGE) measurement personality	**202**	3.3 MB
cdmaOne measurement personality	**BAC**	2.0 MB
NADC measurement personalities (sold with PDC)	**BAE**	1.3 MB
PDC measurement personalities (sold with NADC)	**BAE**	1.4 MB
HP 8566B/68B Code Compatibility	**266**	0.65 MB[b]
W-CDMA measurement personality	**BAF**	4.2 MB[c]
cdma2000 measurement personality	**B78**	3.8 MB[c]
1xEV-DO measurement personality	**204**	6.0 MB[c]
Shared measurement library	n/a	1.5 MB

a. Available as of the print date of this guide.
b. This option is free and does not require a license key. Installing Option 266 Code Compatibility on a PSA series analyzer automatically uninstalls all incompatible personality options. Conversely, installing any incompatible personality option will uninstall the Option 266 Code Compatibility option.
c. Some personality options use a shared measurement library. You have to add the memory requirements of this library to the value needed for the option. If you are loading multiple personalities that use this library, you only need to add this memory requirement once.

Loading an Optional Measurement Personality

You must load the desired personality option into the instrument memory. Loading can be done from a firmware CD-ROM or the internet location. An automatic loading program comes with the files and runs from your PC.

When you add a new option, or update an existing option, you will get the updated version of all your current options since they are reloaded simultaneously. This process may also require you to update the instrument core firmware so that it is compatible with the new option.

You may not be able to fit all of the available measurement personalities in instrument memory at the same time. You may need to delete an existing option file from memory and load the one you want. Use the automatic update program that is provided with the files.

The approximate memory requirements for the options are listed above. These numbers are worst case examples. Some options share components and libraries, therefore the total memory usage of multiple options may not be exactly equal to the combined total.

You can install an updated version of firmware and your licensed options using a LAN connection and your PC. Instructions for loading future firmware updates are available from the following internet location: **http://www.agilent.com/find/psa/**

NOTE There is no license key for Option 266. You therefore do not need to follow the usual license key installation process.

Configuring Option 266 - ESA and PSA Analyzers

Figure 1-1 and Figure 1-2 show the menu maps to configure Option 266 (HP 8566B/68B Code Compatibility) on your spectrum analyzer. Pressing **System, Config I/0, Configure Remote Lang, Language** on a PSA Series analyzer (or **System, Configure Remote Lang, Language** on an ESA-E Series analyzer) allows you to select the remote programming language for the instrument you are replacing.

Figure 1-1 System Menu Map for Option 266 on ESA-E Series Analyzers

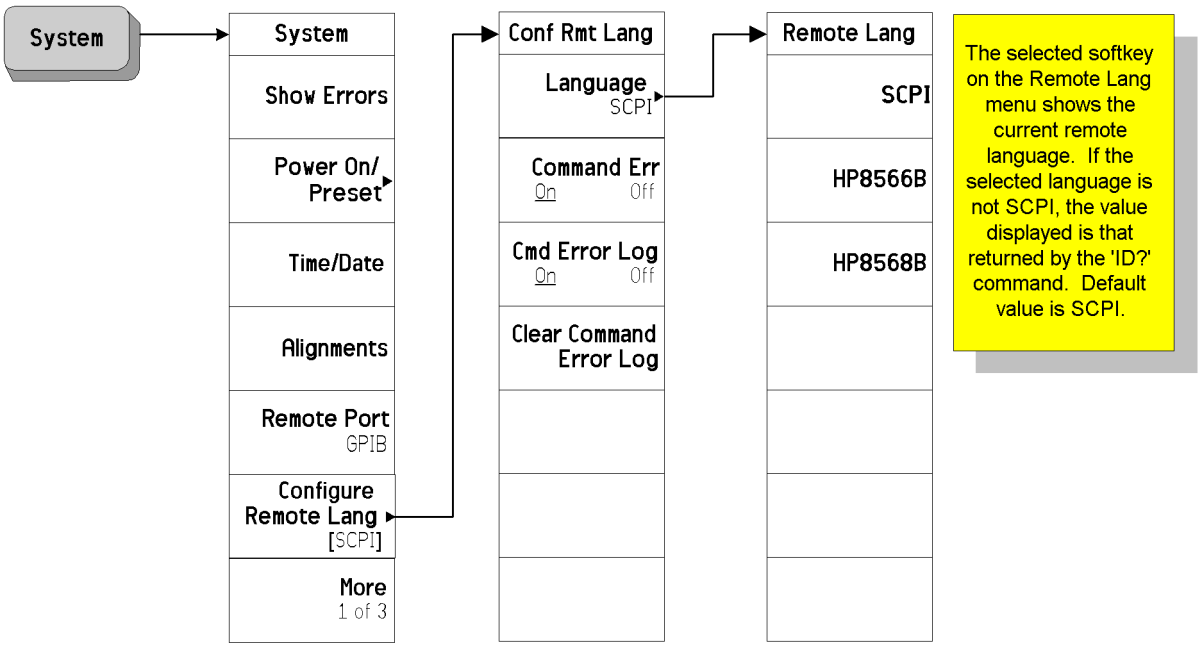
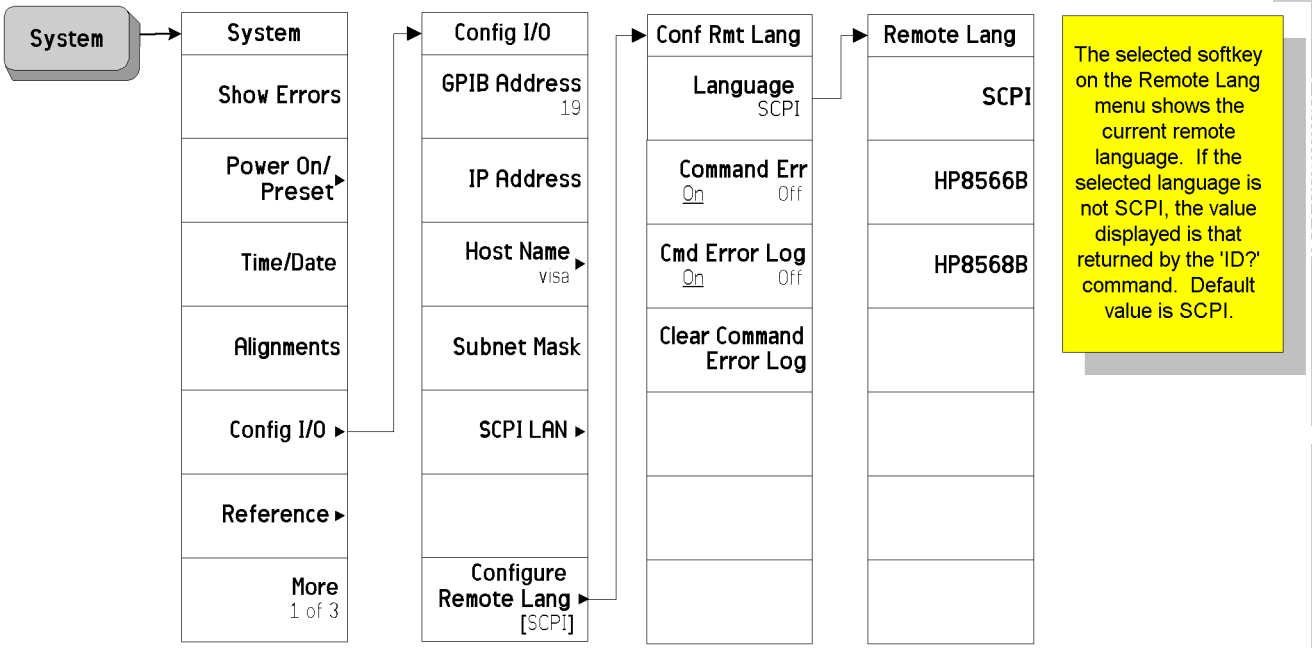


Figure 1-2 System Menu Map for Option 266 on PSA Series Analyzers



Analyzer Settings When Changing Language

When you power your ESA-E or PSA analyzer on for the first time, the language is set to SCPI. Subsequent changes of Remote Language cause the following settings to be changed:

SCPI

- The analyzer is preset
- The HP 8566B/68B Code Compatibility application is uncoupled

HP8566B

- The analyzer is preset
- Number of trace points is set to 1001
- Start frequency is set to 2 GHz
- Stop frequency is set to 22 GHz
- RF coupling is set to DC
- Sweep and FFT couplings are set

HP8568B

- The analyzer is preset
- Number of trace points is set to 1001
- Start frequency is set to 0 Hz
- Stop frequency is set to 1.5 GHz
- RF coupling is set to AC
- Sweep and FFT couplings are set

Analyzer Settings After Powering On and Off

Whenever you switch your ESA-E or PSA analyzer off, its current language setting is saved. When you next switch it on, it will power up with exactly the same language setting as when you switched it off.

The Configure Remote Lang Screen Menu - ESA-E and PSA Analyzers

Configure Remote Lang

This key displays a menu allowing you to select the remote language you wish to use, and to determine how command error messages are stored and displayed.

Language

This key allows you to select which remote programming language you wish to use.

SCPI Selects the **SCPI** remote programming language. This is the default setting after installation.

HP8566B Selects the **HP8566B** remote programming language and sets the response to the remote programming command 'ID' to **HP8566B**. It also performs an instrument preset, setting Span and Trace Points appropriately.

HP8568B Selects the **HP8568B** remote programming language and sets the response to the remote programming command 'ID' to **HP8568B**. It also performs an instrument preset, setting Span and Trace Points appropriately.

NOTE Setting the remote language to HP8566B or to HP8568B does not affect the response to the SCPI command '*IDN?' This command will still return the model number and firmware version number of the ESA-E or PSA analyzer.

Command Err

This key determines whether or not command errors are displayed on the screen. When set to **On**, error messages generated by unrecognized commands or command arguments are displayed on the screen. When set to **Off**, error messages generated by unrecognized commands are not displayed. The current setting is underlined on the key label, and this setting is reversed each time the key is pressed.

NOTE Command Err is set to **On** after Option 266 has been installed. Thereafter, the latest setting will always be retained, even after a preset has been performed.

Cmd Error Log

This key sets command error logging **On** or **Off**. When set to **On**, all error messages are stored in a log file, regardless of whether they have been displayed on the screen. When set to **Off**, no further command error messages are written to the log file.

The log file is an ASCII text file called `LOGFILE.TXT` on the C: drive. It has a maximum size of 32 KB. Once it has reached its maximum size, no further error messages will be recorded, but a message will be displayed prompting you to clear the log file. Switching **Cmd Error Log** to **Off** does not clear the log file. Only the **Clear Command Error Log** softkey will clear the error log.

NOTE

Command Err Log is set to **On** after Option 266 has been installed. Thereafter, the latest setting will always be retained, even after a preset has been performed.

Clear Command Error Log

This key allows you to clear all messages from the command error log file `LOGFILE.TXT`.

Differences Between Option 266 Commands and the Original HP 8566B/HP 8568B Commands

The following table lists commands that behave differently in Agilent Option 266 when compared to the original HP 8566B and HP 8568B analyzers:

Table 1-4 Analyzer Commands That Behave Differently in Option 266

Command	HP 8566B / HP 8568B Analyzers	ESA-E Option 266	PSA Option 266
ANNOT	Turns the annotation on or off.	No difference.	Command will be accepted but no change will be seen on the screen. Query will always return ON.
AT	Specifies RF input annotation	Maximum attenuation is limited to 65 dB.	No difference.
DET	Selects the type of detection - sample, normal, positive peak or negative peak - that is applied to the input signal.	Normal detection is not possible in the ESA, so selection of NRM command option will default to POS (Positive Peak) detection.	Normal detection is possible.
FPKA	Performs a fast preselector peak and returns the measured value of the active marker.	Adjusts the centering of the preselector filter to optimize the amplitude accuracy at the active marker frequency. This functionality is only available in ESA-E series analyzers whose frequency range extends beyond 3 GHz, that is the E4404B, the E4405B, and the E4407B analyzers.	Adjusts the centering of the preselector filter to optimize the amplitude accuracy at the active marker frequency. This functionality is available in all PSA series analyzers.
GRAT	Turns the graticule on or off.	No difference.	The command will be accepted but no change will be seen on the screen. Query always returns ON.

Table 1-4 Analyzer Commands That Behave Differently in Option 266

Command	HP 8566B / HP 8568B Analyzers	ESA-E Option 266	PSA Option 266
I1 *[one]*	Sets RF coupling to DC.	This command is not supported on model number E4401B. It is only supported on model number E4407B if Option UKB has been installed. Note also that the HP 8568B analyzer has two RF ports whereas the ESA only has one.	This command is only supported on PSA analyzers with a frequency range up to 26.5 GHz, that is the E4440A, the E4443A and the E4445A. Note also that the HP 8568B analyzer has two RF ports whereas the PSA only has one.
I2 *[two]*	Sets RF coupling to AC.	This command is not supported on model number E4401B. It is only supported on model number E4407B if Option UKB has been installed. Note also that the HP 8568B analyzer has two RF ports whereas the ESA only has one.	This command is only supported on PSA analyzers with a frequency range up to 26.5 GHz, that is the E4440A, the E4443A and the E4445A. Note also that the HP 8568B analyzer has two RF ports whereas the PSA only has one.
KS= *(on HP 8568B analyzers)*	Specifies the resolution of the marker frequency counter.	Language set to HP8566B: not supported. Language set to HP8568B: No difference.	Language set to HP8566B: not supported. Language set to HP8568B: Setting the marker frequency counter resolution changes the gate time. The gate time is calculated by: Gate Time = 1/(Res. value)
KSa	Selects normal detection.	Normal detection is not possible in the ESA, so selection of KSa command option will default to POS (Positive Peak) detection.	Normal detection is possible.
KSE	Activates the title mode, using '@' as the default termination character.	The only acceptable termination character is '@'. The '@' character does not appear on the screen.	The only acceptable termination character is '@'. The '@' character does not appear on the screen.
KSm	Blanks the graticule on the analyzer display.	No difference.	This command is unsupported on PSA series analyzers. The graticule display is always ON.

Table 1-4 Analyzer Commands That Behave Differently in Option 266

Command	HP 8566B / HP 8568B Analyzers	ESA-E Option 266	PSA Option 266
KSn	Turns on the graticule on the analyzer display.	No difference.	This command is unsupported on PSA series analyzers. The graticule display is always ON.
KSo	Blanks the annotation on the analyzer display.	No difference.	This command is unsupported on PSA series analyzers. The annotation display is always ON.
KSp	Turns on the annotation on the analyzer display.	No difference.	This command is unsupported on PSA series analyzers. The annotation display is always ON.
KST *(on HP 8566B analyzers)*	Performs a fast preset on HP 8566B analyzers.	*Language set to HP8566B:* ESA series analyzers cannot perform a fast preset. The KST command performs an instrument preset instead, setting the analyzer back to its factory default settings.	*Language set to HP8566B:* PSA series analyzers cannot perform a fast preset. The KST command performs an instrument preset instead, setting the analyzer back to its factory default settings.
KSx	Selects normal external triggering. Fast sweep times in zero span can cause the displayed trace to flicker.	The displayed trace is automatically refreshed. All flickering has been eliminated.	The displayed trace is automatically refreshed. All flickering has been eliminated.
KSy	Selects normal video triggering. Fast sweep times in zero span can cause the displayed trace to flicker.	The displayed trace is automatically refreshed. All flickering has been eliminated.	The displayed trace is automatically refreshed. All flickering has been eliminated.
M3	Measures the amplitude and frequency differences between the active and the delta marker.	No difference if Marker Noise (MKNOISE) is switched on when the measurement is made. If MKNOISE is switched on after the measurement has been made, the amplitude measured is that between the noise density and the carrier signal.	No difference if Marker Noise (MKNOISE) is switched on when the measurement is made. If MKNOISE is switched on after the measurement has been made, the amplitude measured is that between the noise density and the carrier signal.

Table 1-4 Analyzer Commands That Behave Differently in Option 266

Command	HP 8566B / HP 8568B Analyzers	ESA-E Option 266	PSA Option 266
MKA	Specifies the amplitude of the active marker in dBm when the active marker is of the fixed or amplitude type.	Only supports the query option.	Only supports the query option.
MKD	Measures the amplitude and frequency differences between the active and the delta marker.	No difference if Marker Noise (MKNOISE) is switched on when the measurement is made. If MKNOISE is switched on after the measurement has been made, the amplitude measured is that between the noise density and the carrier signal.	No difference if Marker Noise (MKNOISE) is switched on when the measurement is made. If MKNOISE is switched on after the measurement has been made, the amplitude measured is that between the noise density and the carrier signal.
MKFCR	Specifies the resolution of the marker frequency counter.	No difference.	Setting the marker frequency counter resolution changes the gate time. The gate time is calculated by: Gate Time = 1/(Res. value)
MKREAD	Selects the type of trace information that is displayed.	Will not accept the FFT (Fast Fourier Transform) keyword.	WIll not accept the FFT (Fast Fourier Transform) keyword.
ML	Specifies the maximum signal level applied at the input mixer for signals at or below the reference level.	The mixer level is calculated using the following equation. Mixer Level = Ref. Level - Attenuation + Ext. Amp Gain. The external amplifier gain is not preset by doing an IP in case the instrument is measuring a large signal.	The mixer level is calculated using the following equation. Mixer Level = Ref. Level - Attenuation + Ext. Amp Gain. The external amplifier gain is not preset by doing an IP in case the instrument is measuring a large signal.
PLOT	Transfers trace data, graticule parameters and graticule annotation directly to a plotter.	Prints the screen display on a printer rather than transferring data to a plotter.	Prints the screen display on a printer rather than transferring data to a plotter.

Table 1-4 Analyzer Commands That Behave Differently in Option 266

Command	HP 8566B / HP 8568B Analyzers	ESA-E Option 266	PSA Option 266
PP	Peaks preselector.	Adjusts the centering of the preselector filter to optimize the amplitude accuracy at the active marker frequency. This functionality is only available in ESA-E series analyzers whose frequency range extends beyond 3 GHz, that is the E4404B, the E4405B, and the E4407B analyzers.	Adjusts the centering of the preselector filter to optimize the amplitude accuracy at the active marker frequency. This functionality is available in all PSA series analyzers.
RB	Specifies the resolution bandwidth.	Default values may be different to the HP 8566B. Please refer to your ESA-E or PSA User's Guide for restrictions on the resolution bandwidth range.	Default values may be different to the HP 8566B. Please refer to your ESA-E or PSA User's Guide for restrictions on the resolution bandwidth range.
RC	Recalls registers containing a set of instrument states.	Recalling the previous state data (RC 7) is not supported.	Recalling the previous state data (RC 7) is not supported.
RCLS	Recalls registers containing a set of instrument states.	Recalling the previous state data (RCLS 7) is not supported.	Recalling the previous state data (RCLS 7) is not supported.
REV	Returns the firmware revision number.	Returns the build date of your Option 266 *(in YYWW format)*.	Returns the build date of your Option 266 *(in YYWW format)*.
RQS	Sets a bit mask for service requests.	Some differences may be noticed in the value returned by a query.	Some differences may be noticed in the value returned by a query.
R4	Activates the units-key-pressed and illegal-command service requests.	The units-key-pressed service request cannot be supported since front panel interaction is not allowed.	The units-key-pressed service request cannot be supported since front panel interaction is not allowed.
SMOOTH	Smooths the trace.	Some differences in the trace display may be noticed.	Some differences in the trace display may be noticed.

Table 1-4 Analyzer Commands That Behave Differently in Option 266

Command	HP 8566B / HP 8568B Analyzers	ESA-E Option 266	PSA Option 266
TH	Blanks the display of signals below the threshold level.	No change will be noticed in the display. Note that the PEAKS and MKPK commands can cause all values below the threshold level to be disregarded.	No change will be noticed in the display. Note that the PEAKS and MKPK commands can cause all values below the threshold level to be disregarded.
VB	Specifies the video filter bandwidth.	Default values may be different to the HP 8566B. Please refer to your ESA-E or PSA User's Guide for restrictions on the video bandwidth range.	Default values may be different to the HP 8566B. Please refer to your ESA-E or PSA User's Guide for restrictions on the video bandwidth range.
VAVG	Enables video averaging, displaying the original trace in Trace C. Sweep time remains unchanged.	Only displays the average trace in Trace A. Sweep time changes. Differences in how the average is calculated when other settings have changed.	Only displays the average trace in Trace A. Sweep time changes. Differences in how the average is calculated when other settings have changed.
VBO	Specifies the ratio of video to resolution bandwidths when coupled.	No change.	Some differences may be noticed when VBO of 1 or of -1 is used.

Differences Between HP8566B and HP8568B Remote Languages in Option 266

The following table lists Option 266 commands that behave differently in the HP8566B remote language when compared to the HP8568B remote language:

Table 1-5 Option 266 Commands That Behave Differently in the HP8566B and HP8568B Remote Languages

Command	HP8566B Remote Language	HP8568B Remote Language
FPKA	Valid and supported	Invalid - HP 8566B command only
I1 *[one]*	Invalid - HP 8568B command only	Valid and supported (but see Table 1-4 on page 17 and "I1 [one] Set RF Coupling to DC" on page 112)
I2 *[two]*	Invalid - HP 8568B command only	Valid and supported (but see Table 1-4 on page 17) and "I2 [two] Set RF Coupling to AC" on page 114
KSK	Valid and supported	Valid command on the HP 8568B but unsupported in Option 266
KSN	Valid and supported	Valid command on the HP 8568B but unsupported in Option 266
KST	Valid and supported	Valid command on the HP 8568B but unsupported in Option 266
KS=	Valid command on the HP 8566B but unsupported in Option 266	Valid and supported
LF	Valid and supported	Invalid - HP 8566B command only
MC0 *[zero]*	Invalid - HP 8568B command only	Valid and supported
MC1 *[one]*	Invalid - HP 8568B command only	Valid and supported
MKFC	Invalid - HP 8568B command only	Valid and supported

Table 1-5 Option 266 Commands That Behave Differently in the HP8566B and HP8568B Remote Languages

Command	HP8566B Remote Language	HP8568B Remote Language
MKFCR	Invalid - HP 8568B command only	Valid and supported
PP	Valid and supported	Invalid - HP 8566B command only

Running Software that Requires SCPI Commands

When Remote Language HP8566B or HP8568B has been selected, you will only have access to a very small subset of SCPI commands. If you are not familiar with the SCPI remote programming language, Chapter 5 , "A Brief Introduction to the SCPI Language," on page 245 contains some useful information.

The SCPI commands available while using the remote language HP8566B or HP8568B are:

- **`*IDN?`**

  Queries and returns the instrument identification string.

- **`*RST`**

  Performs an instrument preset.

- **`:SYSTem:LANGuage SCPI|HP8566B|HP8568B`**

  Sets the current remote language.

  This command is only available if you have Option 266 installed on your analyzer.

NOTE Agilent Technologies recommend that you do not repeatedly swap to and from the SCPI language within your programs.

- **`:SYSTem:LANGuage?`**

  Queries and returns the current remote language.

  This command is only available if you have Option 266 installed on your analyzer.

- **`[:SENSe]:SWEep:TYPE AUTO|SWEep|FFT`**

  Sets the Sweep Type.

- **`[:SENSe]:SWEep:TYPE?`**

  Queries and returns the Sweep Type.

- **`[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge|DYNamicrange`**

  Sets the auto rule setting for FFT and Sweep Type.

- **`[:SENSe]:SWEep:TYPE:AUTO:RULes?`**

  Queries and returns the auto rule setting for FFT and Sweep Type.

- **`:SYSTem:OPTion?`**

  Returns a list of installed options.

If Option 266 is installed on your analyzer, the string “266” will appear in the returned string. In the following example, options B7J, 266, and 1DS are all installed.

Example: `“B7J,266,1DS”`

To return the analyzer to its full ESA or PSA SCPI capability, you must specify the remote language as SCPI.

Service and Calibration

Since the Performance Verification and Adjustment Software uses the SCPI command language, you will need to set Remote Language to SCPI prior to calibration or service of your Agilent spectrum analyzer.

When your analyzer is returned from an Agilent Technologies service center, you may have to reinstall Option 266. Refer to "Installing/Uninstalling Option 266 - ESA-E Series Analyzers Only" on page 4 or "Installing Option 266 - PSA Series Analyzers Only" on page 9

Documentation for Option 266

Spectrum Analyzers with Option 266

When you purchase your ESA-E Series or PSA Series spectrum analyzer with the HP 8566B/68B Code Compatibility (Option 266), you will receive this manual - the *HP 8566B/68B Code Compatibility Guide*. For information on ESA series analyzers and other related documentation, refer to the ESA web site at http://www.agilent.com/find/esa/. For information on PSA series analyzers and other related documentation, refer to the PSA web site at http://www.agilent.com/find/psa/.

This *HP 8566B/68B Code Compatibility Guide* is not designed to be a comprehensive guide to all HP 8566B/68B commands. It gives brief descriptions of the supported commands, and highlights important functional or behavioral differences that you should be aware of when transferring existing HP 8566B or HP 8568B code to your ESA-E series or PSA analyzer. For a fuller description of the commands, refer to the HP 8566B or HP 8568B's *Operating and Programming Manual*.

Spectrum Analyzer Updates

For the latest information about this instrument, including software upgrades, application information, and product information, please visit the URL listed below.

Updating the Firmware and Software

Updated versions of the Agilent Spectrum Analyzers' firmware and software will be available via several sources. Information on the latest firmware and software revision can be accessed through the following URL.

URLs to Obtain Update Information

For ESA analyzers: http://www.agilent.com/find/esa/

For PSA analyzers: http://www.agilent.com/find/psa/

NOTE If you have purchased Option 266 as an upgrade, the latest version of the analyzer's firmware has been included and should be loaded into your instrument before installing the Option 266.

2 HP 8566B and HP 8568B Command List

Table of HP 8566B and HP 8568B Commands

The following table lists all HP 8566B and HP 8568B programming commands, and indicates which are supported in Option 266. Refer to the alphabetical listing of commands in Chapter 4 , “Programming Commands,” on page 59 for more detailed information about each supported command.

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
A1 *[one]*	Yes	Clear write of Trace A	See page 63 for more details
A2 *[two]*	Yes	Maximum hold for Trace A	See page 64 for more details
A3 *[three]*	Yes	View Trace A	See page 65 for more details
A4 *[four]*	Yes	Blank Trace A	See page 66 for more details
ABS	No	Puts the absolute value of the source into the destination.	Returns error - "CMD NOT SUPPORTED"
ADD	No	Operand 1 + Operand 2 into destination	Returns error - "CMD NOT SUPPORTED"
AMB	Yes	A minus B into A	See page 67 for more details
AMBPL	Yes	(A minus B) + DL into A	See page 68 for more details
ANNOT	Yes	Turns the Annotation ON or OFF	Not supported on PSA See page 69 for more details
APB	Yes	A plus B into A (Adds trace A and B point by point and sends results to A)	See page 70 for more details
AT	Yes	Specifies input attenuation	See page 71 for more details
AUNITS	Yes	Specifies amplitude units for input, output and display	See page 73 for more details
AVG	No	Operand is averaged into destination	Returns error - "CMD NOT SUPPORTED"
AXB	Yes	Exchange A and B	See page 74 for more details
B1 *[one]*	Yes	Clear write of Trace B	See page 75 for more details
B2 *[two]*	Yes	Maximum hold for Trace B	See page 76 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
B3 *[three]*	Yes	View Trace B	See page 77 for more details
B4 *[four]*	Yes	Blank Trace B	See page 78 for more details
BL	Yes	Trace B minus Display Line into B	See page 79 for more details
BLANK	Yes	Blanks traces and stops the sweep. Trace is not updated	See page 80 for more details
BML	Yes	Trace B minus Display Line into B	See page 81 for more details
BRD	No	Bus Read (Reads a 2 byte word at the internal input/output) (This is a service diagnostic function only)	Returns error - "CMD NOT SUPPORTED"
BTC	Yes	Transfers trace B to trace C	See page 82 for more details
BWR	No	Bus Write Word (Writes a 2 byte word at the internal input/output) (This is a service diagnostic function only)	Returns error - "CMD NOT SUPPORTED"
BXC	Yes	Exchanges traces B and C point by point	See page 83 for more details
C1 *[one]*	Yes	Trace A minus Trace B into Trace A On	See page 84 for more details
C2 *[two]*	Yes	Trace A minus Trace B into Trace A Off	See page 85 for more details
CA	Yes	Couple Attenuator (Resets the attenuation value so that a continuous wave signal displayed at the reference level will yield the maximum mixer level (see ML command) at the mixer input)	See page 86 for more details
CF	Yes	Center Frequency	See page 87 for more details
CLRAVG	Yes	Clear Average	See page 88 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
CLRW	Yes	Enables the Clear-Write Mode which continuously displays any signals present at the analyzer input	See page 89 for more details
CNVLOSS	No	Selects the reference level offset to amplitude calibrate the display for a mixer with a given loss	Returns error - "CMD NOT SUPPORTED"
COMPRESS	No	Compresses trace source to fit trace destination	Returns error - "CMD NOT SUPPORTED"
CONCAT	No	Concatenates operands and sends new trace to destination	Returns error - "CMD NOT SUPPORTED"
CONTS	Yes	Sets the analyzer to continuous sweep mode	See page 90 for more details
CR	Yes	Couples the resolution bandwidth with the video bandwidth and sweep time	See page 91 for more details
CS	Yes	Couples the center frequency step size to the span width (Step Size = 0.1 x Span Width) (1 major graticule division)	See page 92 for more details
CT	Yes	Couples the sweep time with the resolution and video bandwidths	See page 93 for more details
CTA	No	Converts the operand values from display units to absolute amplitude units	Returns error - "CMD NOT SUPPORTED"
CTM	No	Converts the operand values to vertical display units	Returns error - "CMD NOT SUPPORTED"
CV	Yes	Couples video bandwidth with the resolution bandwidth and sweep time	See page 94 for more details
D1 *[one]*	No	Sets the display to normal size, selected with IP.	Returns error - "CMD NOT SUPPORTED"
D2 *[two]*	No	Sets the display to full CRT size.	Returns error - "CMD NOT SUPPORTED"
DA	No	Display memory address	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
DD	No	Writes two 8 bytes (binary) into the current or specified memory address & advances address by 1	Returns error - "CMD NOT SUPPORTED"
DET	Yes	Input Detector	See page 95 for more details
DISPOSE	No	Clears specified operands (Trace Label, Var Identifier, Function Identifier, Key Number)	Returns error - "CMD NOT SUPPORTED"
DIV	No	Divide operand 1 by operand 2, point by point	Returns error - "CMD NOT SUPPORTED"
DL	Yes	Display Line Level (dBm)	See page 97 for more details
DLE	Yes	Enable or disables the Display Line	See page 98 for more details
DONE	Yes	A synchronizing function - sends a '1' to the controller after the command line is executed	See page 99 for more details
DR	No	Display Read - sends the contents of the current display address to the controller	Returns error - "CMD NOT SUPPORTED"
DSPLY	No	Displays the value of a variable	Returns error - "CMD NOT SUPPORTED"
DT	No	Define Terminator	Returns error - "CMD NOT SUPPORTED"
DW	No	Display Write - sends a decimal value from the controller to the display memory address	Returns error - "CMD NOT SUPPORTED"
D3 *[three]*	No	Sets the display to expanded size.	Returns error - "CMD NOT SUPPORTED"
E1 *[one]*	Yes	Moves the active marker to the maximum signal detected.	See page 100 for more details
E2 *[two]*	Yes	Moves the active marker frequency into the center frequency.	See page 101 for more details
E3 *[three]*	Yes	Moves the active marker frequency or the delta marker frequency into the center frequency step size.	See page 102 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
E4 *[four]*	Yes	Moves the active marker to the reference level.	See page 103 for more details
EE	No	Enables front panel number entry	Returns error - "CMD NOT SUPPORTED"
EK	No	Enables the data knob	Returns error - "CMD NOT SUPPORTED"
ELSE	No	Conditional command used in conjunction with an IF command	Returns error - "CMD NOT SUPPORTED"
EM	No	Erase Trace C memory addresses 3072 through 4095	Returns error - "CMD NOT SUPPORTED"
ENDIF	No	Finishing off an IF command	Returns error - "CMD NOT SUPPORTED"
ENTER	No	Enter from GPIB, allows a function definition to enter data from the GPIB port.	Returns error - "CMD NOT SUPPORTED"
ERASE	No	All user memory and save/recall registers are erased.	Returns error - "CMD NOT SUPPORTED"
EX	Yes	Exchange Trace A and Trace B	See page 104 for more details
EXP	No	Exponential (10 raised to the power of (operand/scaling factor), to destination)	Returns error - "CMD NOT SUPPORTED"
EXTMXR	No	Presets the External Mixing Mode (setting the frequency range from 18.0 GHz to 26.5 GHz)	Returns error - "CMD NOT SUPPORTED"
FA	Yes	Specifies the start frequency value	See page 105 for more details
FB	Yes	Specifies the stop frequency value	See page 106 for more details
FFT	No	Fast Fourier Transform on a trace array (contains logged magnitude components only)	Returns error - "CMD NOT SUPPORTED"
FFTKNL	No	16 bit Discrete Fourier Transform on specified traces, overlaying them with the results.	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
FOFFSET	Yes	Frequency Offset	See page 107 for more details
FPKA	Yes	Fast Preselector Peak	See page 108 for more details
FS	Yes	Full Span	See page 109 for more details
FULBAND	No	Sets the start & stop frequencies for the analyzer external mixing bands	Returns error - "CMD NOT SUPPORTED"
FUNCDEF	No	Function Define - defines a program routine as a function label	Returns error - "CMD NOT SUPPORTED"
GR	No	Plots GPIB inputs as graphs (in trace modes of application only)	Returns error - "CMD NOT SUPPORTED"
GRAT	Yes	Graticule on and off	Not supported on PSA See page 111 for more details
HD	No	Holds data entry (Disables)	Returns error - "CMD NOT SUPPORTED"
HNLOCK	No	Harmonic lock (LO harmonic frequency lock)	Returns error - "CMD NOT SUPPORTED"
HNUNLK	No	Harmonic Bank Unlock (tune over the whole frequency range)	Returns error - "CMD NOT SUPPORTED"
I1 *[one]*	Yes	Set RF coupling to DC.	Not supported on all ESAs. Not supported on PSAs where the maximum frequency range is greater than 26.5 GHz. See page 112 for more details
I2 *[two]*	Yes	Set RF coupling to AC.	Not supported on all ESAs. Not supported on PSAs where the maximum frequency range is greater than 26.5 GHz. See page 114 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
IB	No	Input to trace B memory	Returns error - "CMD NOT SUPPORTED"
ID	Yes	Instrument Identity (Identify)	See page 116 for more details
IDSTAT	No	Signal Identifier Status (Returns 1,0,-1)	Returns error - "CMD NOT SUPPORTED"
IF	No	Conditional command used in conjunction with other commands	Returns error - "CMD NOT SUPPORTED"
IFTKNL	No	16 bit Discrete Fourier Transform on specified traces, overlaying them with the results multiplied by N (length of each trace).	Returns error - "CMD NOT SUPPORTED"
INT	No	The greatest integer which is less than or equal to the source real is stored in the destination	Returns error - "CMD NOT SUPPORTED"
IP	Yes	Sets instrument parameters to preset values. (deactivates the display line)	See page 117 for more details
KEYDEF	No	Assigns function label or command list to soft key number	Returns error - "CMD NOT SUPPORTED"
KEYEXC	No	Executes specified soft key	Returns error - "CMD NOT SUPPORTED"
KS#	No	Turns off the YIG-tuned mixed (YTX) self heating correction factor	Returns error - "CMD NOT SUPPORTED"
KS(	No	Lock registers	Returns error - "CMD NOT SUPPORTED"
KS)	No	Unlock registers	Returns error - "CMD NOT SUPPORTED"
KS,	Yes	Specifies the maximum signal level that is applied to the input mixer	Does not support the use of no parameters
KS/	No	Manual Preselector Tracking	Returns error - "CMD NOT SUPPORTED"
KS<	No	Specifies the preamp gain for signal input 1.	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
KS= (HP 8566B only)	No	Reinstate Automatic Preselector Tracking	See page 119 for more details
KS= (HP 8568B only)	Yes	Specifies the resolution of the marker frequency counter	See page 119 for more details
KS>	No	Specifies the preamp gain for signal input 2.	Returns error - "CMD NOT SUPPORTED"
KS|	No	Writes the instruction word or data value into the specified memory address	Returns error - "CMD NOT SUPPORTED"
KS123	No	Reads display memory	Returns error - "CMD NOT SUPPORTED"
KS125	No	Writes to display memory	Returns error - "CMD NOT SUPPORTED"
KS126	No	Reads every nth value in the memory	Returns error - "CMD NOT SUPPORTED"
KS127	No	Writes to display memory	Returns error - "CMD NOT SUPPORTED"
KS39	No	Writes to display memory	Returns error - "CMD NOT SUPPORTED"
KS43	No	Sends Service Request '102'. This queries whether the analyzer current frequency band has been exceeded (Frequency Limit SRQ)	Returns error - "CMD NOT SUPPORTED"
KS91	No	Read amplitude error	Returns error - "CMD NOT SUPPORTED"
KS92	No	Write in display units	Returns error - "CMD NOT SUPPORTED"
KS94	No	Read LO harmonic number	Returns error - "CMD NOT SUPPORTED"
KSA	Yes	Sets amplitude units to dBm	See page 120 for more details
KSa	Yes	Normal input detection for displaying trace information	See page 122 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
KSB	Yes	Sets amplitude units to dBmV	See page 122 for more details
KSb	Yes	Positive peak input detection	See page 123 for more details
KSC	Yes	Sets amplitude units to dBuV	See page 124 for more details
KSc	Yes	Trace A + Trace B into Trace A (APB)	See page 125 for more details
KSD	Yes	Sets amplitude units to Volts	See page 126 for more details
KSd	Yes	Negative peak detection	See page 127 for more details
KSE	Yes	Activates the Title Mode	See page 128 for more details
KSe	Yes	Sample detection	See page 129 for more details
KSF	No	8566B Shift YTO: Removes the IF offset from the YIG-tuned oscillator (Service Diagnostic aid). 8568B: Measures the sweep time.	Returns error - "CMD NOT SUPPORTED"
KSf	No	Protects instrument state configuration during power loss	Returns error - "CMD NOT SUPPORTED"
KSG	Yes	Video averaging On	See page 130 for more details
KSg	Yes	CRT beam off	See page 131 for more details
KSH	Yes	Video averaging Off	See page 132 for more details
KSh	Yes	CRT beam on	See page 133 for more details
KSI	No	Extends reference level range to maximum limits (-139.9 dBm to +60 dBm)	Returns error - "CMD NOT SUPPORTED"
KSi	Yes	Exchange Trace B and Trace C (BXC)	See page 134 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
KSJ	No	DAC Control	Returns error - "CMD NOT SUPPORTED"
KSj	Yes	View Trace C	See page 135 for more details
KSK	Yes	Marker to Next Peak	See page 136 for more details
KSk	Yes	Blank Trace C	See page 137 for more details
KSL	Yes	Marker noise Off (disables the noise density function which displays the RMS noise density)	See page 138 for more details
KSl	Yes	Transfer Trace B to Trace C (BTC)	See page 139 for more details
KSM	Yes	Marker noise On	See page 140 for more details
KSm	Yes	Graticule Off	Not supported on PSA See page 141 for more details
KSN	Yes	Marker minimum value detected	See page 142 for more details
KSn	Yes	Graticule On	Not supported on PSA See page 143 for more details
KSO	Yes	Marker span	See page 144 for more details
KSo	Yes	Annotation Off	Not supported on PSA See page 145 for more details
KSP	No	GPIB address	Returns error - "CMD NOT SUPPORTED"
KSp	Yes	Annotation On	Not supported on PSA See page 146 for more details
KSQ	No	Band unlock	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
KSq	No	Step gain Off	Returns error - "CMD NOT SUPPORTED"
KSR	No	Diagnostics On	Returns error - "CMD NOT SUPPORTED"
KSr	No	Service Request 102 to the controller	Returns error - "CMD NOT SUPPORTED"
KSS	No	Fast GPIB remote operation	Returns error - "CMD NOT SUPPORTED"
KST (HP 8566B only)	Yes	Fast Preset 2-22 GHz	Remote language HP8566B only. See page 147 for more details
KST (HP 8568B only)	No	Shifts second LO down	Remote language HP8568B. Returns error - "CMD NOT SUPPORTED"
KSt	No	Harmonic lock	Returns error - "CMD NOT SUPPORTED"
KSU	No	Fast preset external mixer	Returns error - "CMD NOT SUPPORTED"
KSu	No	Marker stop	Returns error - "CMD NOT SUPPORTED"
KSV	Yes	Frequency offset	See page 148 for more details
KSv	No	External mixer signal identifier	Returns error - "CMD NOT SUPPORTED"
KSW	No	Activate error correction routine	Returns error - "CMD NOT SUPPORTED"
KSw	No	Displays correction data	Returns error - "CMD NOT SUPPORTED"
KSX	No	Correction factor On (incorporates them into measurements)	Returns error - "CMD NOT SUPPORTED"
KSx	Yes	External trigger mode	See page 149 for more details
KSY	No	Correction factors Off	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
KSy	Yes	Video trigger mode	See page 150 for more details
KSZ	Yes	Reference level offset	See page 151 for more details
KSz	No	Storage address	Returns error - "CMD NOT SUPPORTED"
L0 *[zero]*	Yes	Disables the display line	See page 152 for more details
LB	No	Writes text label	Returns error - "CMD NOT SUPPORTED"
LF (HP 8566B only)	Yes	Preset 0 - 2.5 GHz	See page 153 for more details
LG	Yes	Specifies the vertical graticule divisions as logarithmic units without changing the reference level (Log Scale)	See page 154 for more details
LL	No	Sends a voltage to the rear panel RECORDER OUTPUTS (Lower Left)	Returns error - "CMD NOT SUPPORTED"
LN	Yes	Linear Scale (scales the amplitude proportional to input voltage)	See page 155 for more details
LOG	No	Log. (Operand 1 x Scaling Factor into Destination)	Returns error - "CMD NOT SUPPORTED"
LOLIMOFF	No	Local oscillator limit off	Returns error - "CMD NOT SUPPORTED"
M1 *[one]*	Yes	Marker Off	See page 156 for more details
M2 *[two]*	Yes	Marker Normal	See page 157 for more details
M3 *[three]*	Yes	Delta Marker	See page 158 for more details
M4 *[four]*	No	Marker Zoom	Returns error - "CMD NOT SUPPORTED"
MA	Yes	Returns Marker Amplitude	See page 160 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
MBRD	No	Processor Memory Block Read	Returns error - "CMD NOT SUPPORTED"
MBWR	No	Processor Memory Block Write	Returns error - "CMD NOT SUPPORTED"
MC0 *[zero]* (HP 8568B only)	Yes	Turns off the marker frequency counter.	See page 161 for more details
MC1 *[one]* (HP 8568B only)	Yes	Turns on the marker frequency counter.	See page 162 for more details
MDS	Yes	Measurement Data Size	See page 163 for more details
MDU	No	Measurement Data Units	Returns error - "CMD NOT SUPPORTED"
MEAN	Yes	Returns the mean value of the trace, in display units	See page 164 for more details
MEM	No	Returns the amount of unused memory available for user-defined functions	Returns error - "CMD NOT SUPPORTED"
MERGE	No	Moves a portion of the source trace into the destination trace starting at a predetermined position.	Returns error - "CMD NOT SUPPORTED"
MF	Yes	Marker Frequency output	See page 165 for more details
MIN	No	Compares operand 1 and 2 and returns the minimum value	Returns error - "CMD NOT SUPPORTED"
MINPOS	Yes	Returns a value that is the *x* position of the minimum value in the given trace.	See page 166 for more details
MIRROR	No	Takes the mirror image of the source trace and moves it into a destination trace.	Returns error - "CMD NOT SUPPORTED"
MKA	Yes	Marker amplitude (in current amplitude units)	See page 167 for more details
MKACT	Yes	Marker Active	See page 168 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
MKCF	Yes	Marker to Center Frequency	See page 169 for more details
MKCONT	No	Marker Continue (Resumes the sweep)	Returns error - "CMD NOT SUPPORTED"
MKD	Yes	Marker Delta (Computes the frequency and amplitude difference of the active marker and the reference marker)	See page 170 for more details
MKF	Yes	Marker Frequency	See page 172 for more details
MKFC (HP 8568B only)	Yes	Marker Frequency Counter	See page 173 for more details
MKFCR (HP 8568B only)	Yes	Marker Frequency Counter Resolution	See page 174 for more details
MKMIN	Yes	Marker minimum	See page 175 for more details
MKN	Yes	Marker Normal (Moves the active marker to the specified frequency)	See page 176 for more details
MKNOISE	Yes	Marker Noise (RMS noise density at the marker)	See page 177 for more details
MKOFF	Yes	Marker Off	See page 178 for more details
MKP	Yes	Horizontal Marker Position (in Display Units)	See page 179 for more details
MKPAUSE	No	Marker Pause (pauses the sweep for the duration of the delay period)	Returns error - "CMD NOT SUPPORTED"
MKPK	Yes	Marker Peak	See page 180 for more details
MKPX	Yes	Marker Peak Excursion (specifies the minimum signal excursion for the analyzer internal peak identification routine)	See page 181 for more details
MKREAD	Yes	Marker Readout	See page 182 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
MKRL	Yes	Marker to reference level	See page 184 for more details
MKSP	Yes	Marker Span	See page 185 for more details
MKSS	Yes	Delta Marker Step Size	See page 186 for more details
MKSTOP	No	Marker stop (Stops the sweep)	Returns error - "CMD NOT SUPPORTED"
MKTRACE	Yes	Marker Trace specifies the marker to operate on data in Trace A, B, or C	See page 187 for more details
MKTRACK	Yes	Marker Track (keeps the active marker at the center of the display)	See page 188 for more details
MKTYPE	No	Marker Type	Returns error - "CMD NOT SUPPORTED"
ML	Yes	Mixer Level (specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level)	See page 189 for more details
MOD	No	Remainder of the division of source 1 by source 2 is stored in the destination.	Returns error - "CMD NOT SUPPORTED"
MOV	No	Moves the operand to the destination	Returns error - "CMD NOT SUPPORTED"
MPY	No	Multiply	Returns error - "CMD NOT SUPPORTED"
MRD	No	Memory Read Word	Returns error - "CMD NOT SUPPORTED"
MRDB	No	Memory Read Byte	Returns error - "CMD NOT SUPPORTED"
MT0 *[zero]*	Yes	Marker Tracking Mode Off	See page 190 for more details
MT1 *[one]*	Yes	Marker Tracking Mode On	See page 191 for more details
MWR	No	Memory Write Word	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
MWRB	No	Memory Write Byte	Returns error - "CMD NOT SUPPORTED"
MXM	No	Maximum	Returns error - "CMD NOT SUPPORTED"
MXMH	Yes	Maximum Hold (updates each trace element with the maximum level detected while the trace is active and displayed)	See page 192 for more details
NSTART	No	Start Harmonic (for signal identification routine - SIGID)	Returns error - "CMD NOT SUPPORTED"
NSTOP	No	Stop Harmonic (for signal identification routine - SIGID)	Returns error - "CMD NOT SUPPORTED"
O1 *[one]*	Yes	Selects display units data format.	See page 193 for more details
O2 *[two]*	Yes	Selects two 8-bit byte data format.	See page 194 for more details
O3 *[three]*	Yes	Selects real amplitude units format.	See page 195 for more details
O4 *[four]*	Yes	Selects one 8-bit byte data format.	See page 196 for more details
OL	No	Output Learn String (transmits information to the controller that describes the state of the analyzer)	Returns error - "CMD NOT SUPPORTED"
ONEOS	No	On end of sweep	Returns error - "CMD NOT SUPPORTED"
ONSWP	No	On Sweep	Returns error - "CMD NOT SUPPORTED"
OP	No	Output Parameter	Returns error - "CMD NOT SUPPORTED"
OT	Yes	Output Trace Annotations (Sends 32 character-strings, each of up to 64 characters)	See page 197 for more details
OUTPUT	No	Output is provided for sending data to the GPIB port from a function definition.	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
PA	No	Plot Absolute (Vector Location)	Returns error - "CMD NOT SUPPORTED"
PD	No	Pen Down (draws one or more vectors)	Returns error - "CMD NOT SUPPORTED"
PDA	No	Probability Distribution Amplitude (loads the destination trace according to the pattern of amplitude values in the source trace)	Returns error - "CMD NOT SUPPORTED"
PDF	No	Probability Distribution in Frequency (elements of the source trace that are above the threshold value cause corresponding elements in the destination trace to be increased in amplitude by one display unit.)	Returns error - "CMD NOT SUPPORTED"
PEAKS	Yes	Sorts signal peaks into frequency or amplitude order, sends results to destination trace.	See page 198 for more details
PKPOS	Yes	Returns a value that is the *x* position of the maximum value in the given trace.	See page 199 for more details
PLOT	Yes	Plot	See page 200 for more details.
PP	Yes	Preselector Peak	See page 201 for more details
PR	No	Plot Relative	Returns error - "CMD NOT SUPPORTED"
PS	No	Skip Page	Returns error - "CMD NOT SUPPORTED"
PU	No	Pen Up (Blanks the CRT beam)	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
PWRBW	No	Power Bandwidth (PWRBW command first computes the combined power of all signal responses contained in a trace array. The command then computes the bandwidth equal to a percentage of the total power, and returns this value to the controller.)	Returns error - "CMD NOT SUPPORTED"
R1 *[one]*	Yes	Resets service request 140	See page 202 for more details
R2 *[two]*	Yes	Allows service request 140 & 104	See page 203 for more details
R3 *[three]*	Yes	Allows service request 140 & 110	See page 204 for more details
R4 *[four]*	Yes	Allows service request 140 & 102	See page 205 for more details
RB	Yes	Resolution Bandwidth	See page 206 for more details
RC	Yes	Recalls State Register	See page 207 for more details
RCLS	Yes	Recalls State Register	See page 208 for more details
REPEAT	No	Repeat... Until (conditional programming)	Returns error - "CMD NOT SUPPORTED"
REV	Yes	Revision (returns the firmware revision and the Agilent Date Code)	See page 209 for more details
RL	Yes	Reference Level (amplitude value of the top CRT Graticule line)	See page 210 for more details
RMS	Yes	Root Mean Square	See page 211 for more details
ROFFSET	Yes	Reference Level Offset	See page 212 for more details
RQS	Yes	SRQ mask (sets a bit mask for the service request commands)	See page 213 for more details
S1 *[one]*	Yes	Sets the analyzer to continuous sweep mode	See page 214 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
S2 *[two]*	Yes	Sets the analyzer to single sweep mode	See page 215 for more details
SAVES	Yes	Saves the current state of the analyzer in the specified register	See page 216 for more details
SIGDEL	No	Specifies the maximum amplitude difference allowed between a signal and its image for the pair to be recognized by the signal identification routine (Default units are dB)	Returns error - "CMD NOT SUPPORTED"
SIGID	No	Identifies signals for external mixing frequency bands	Returns error - "CMD NOT SUPPORTED"
SMOOTH	Yes	Smooths the given trace over a specified number of points	See page 217 for more details
SNGLS	Yes	Sets the analyzer to single sweep mode	See page 218 for more details
SP	Yes	Frequency Span	See page 219 for more details
SQR	No	Square Root of the source trace amplitude, point by point	Returns error - "CMD NOT SUPPORTED"
SRQ	Yes	Service Request to the controller (User defined)	See page 220 for more details
SS	Yes	Center Frequency step size	See page 221 for more details
ST	Yes	Sweep Time	See page 222 for more details
STDEV	Yes	Returns standard deviation of trace amplitude in display units	See page 223 for more details
SUB	No	Subtract	Returns error - "CMD NOT SUPPORTED"
SUM	No	Returns sum of trace element amplitudes in display units	Returns error - "CMD NOT SUPPORTED"
SUMSQR	No	Squares trace element amplitudes and returns their sum	Returns error - "CMD NOT SUPPORTED"
SV	Yes	Saves State	See page 224 for more details

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
SW	No	Skip to next control instruction	Returns error - "CMD NOT SUPPORTED"
T0 *[zero]*	No	Turns the threshold level off.	Returns error - "CMD NOT SUPPORTED"
T1 *[one]*	Yes	Sets the analyzer sweep to Free Run Trigger Mode	See page 225 for more details
T2 *[two]*	Yes	Line Trigger Mode	See page 226 for more details
T3 *[three]*	Yes	External Trigger Mode	See page 227 for more details
T4 *[four]*	Yes	Video Trigger Mode	See page 228 for more details
TA	Yes	Transfer A (Trace A amplitude value from the analyzer to the controller)	See page 229 for more details
TB	Yes	Transfer B (Trace B amplitude value from the analyzer to the controller)	See page 230 for more details
TDF	Yes	Trace Data Format	See page 231 for more details
TEXT	No	Writes text on the analyzer screen	Returns error - "CMD NOT SUPPORTED"
TH	Yes	Threshold (blanks signal responses below the threshold value)	See page 232 for more details
THE	No	Threshold Enable / Disable	Returns error - "CMD NOT SUPPORTED"
THEN	No	Conditional programming	Returns error - "CMD NOT SUPPORTED"
TM	Yes	Trigger Mode	See page 233 for more details
TRDEF	No	Trace define (establishes the length and name of a user defined trace)	Returns error - "CMD NOT SUPPORTED"
TRDSP	Yes	Trace Display	See page 236 for more details
TRGRPH	No	Trace Graph display	Returns error - "CMD NOT SUPPORTED"

Table 2-1 Alphanumeric List of All HP 8566B/HP 8568B Commands and Their Option 266 Support

HP8566B/ HP8568B Command	Supported in Option 266?	Command Description	Note
TRMATH	No	Trace Math (executes various command lists)	Returns error - "CMD NOT SUPPORTED"
TRPST	No	Trace Preset (executes certain selected commands: A1, B4, C1, KSK, EM, T0, L0, DISPOSE)	Returns error - "CMD NOT SUPPORTED"
TRSTAT	Yes	Trace State	See page 237 for more details
TS	Yes	Take Sweep	See page 238 for more details
UNTIL	No	Conditional programming (Repeat.... Until)	Returns error - "CMD NOT SUPPORTED"
UR	No	Upper right Recorder Output (sends a voltage to the rear panel Recorder Output)	Returns error - "CMD NOT SUPPORTED"
USTATE	No	Configures or returns configuration of user defined states by certain commands	Returns error - "CMD NOT SUPPORTED"
VARDEF	No	Variable Define	Returns error - "CMD NOT SUPPORTED"
VARIANCE	No	Returns amplitude Variance of the specified trace	Returns error - "CMD NOT SUPPORTED"
VAVG	Yes	Enables Video Averaging	See page 239 for more details
VB	Yes	Video filter Bandwidth	See page 241 for more details
VBO	Yes	Video Bandwidth Coupling Offset	See page 242 for more details
VIEW	Yes	View (displays Trace and stops the sweep)	See page 243 for more details
XCH	Yes	Exchange	See page 244 for more details

3 Hints and Tips

This chapter includes a list of helpful hints and tips that will help you get the most from Option 266 on your ESA or PSA analyzer.

A Few Helpful Hints and Tips

These pages lists a few hints and tips that will help you get the most from your analyzer and Option 266.

- **Speed** - Option 266 will run faster on PSA series analyzers than it will on ESA series analyzers.
- **Compatibility - speed and consistency** - for best compatibility with the 22 GHz HP 8566B, Option 266 should be used on an E4440A analyzer which has an upper frequency limit of 26.5 GHz. This most closely matches the 22 GHz upper limit of the HP 8566B.
- **Compatibility and Sweep Times** - for best compatibility with the HP 8566B and HP 8568B, use the Manual Swept mode. This is the default setting.
  When analyzing stationary signals, you can change to the Best Speed setting, which is accessed from the Auto Couple hardkey and the FFT & Sweep menu. This results in faster sweep times on a PSA analyzer than on the HP 8566B or HP 8568B analyzers because of the PSA's better performance. In the majority of applications, this faster speed would be desirable, but that is not always the case. When you are using the Best Speed setting, you cannot change the sweep time manually as the sweep time is always coupled to give the fastest sweep times based on the current settings.
- **Time-out (1)** - Agilent suggests that you increase the timeout when performing MA and MF commands to allow previous marker functions to complete correctly.
- **Time-out (2)** - Agilent recommends increasing the timeout on a serial poll due to differences in Sweep Times on some settings. Note, however, that this may not be necessary when using the Best Speed setting on the FFT & Sweep menu (accessed from the Auto Couple hardkey).
- **Synchronization (1)** - to synchronize after an IP command, Agilent recommends that you use the DONE command. We also suggest that the DONE command is used in conjunction with a timeout of about 5 seconds in case the analyzer starts to auto align. Alternatively, you could set auto alignment to Off.
- **Synchronization (2)** - Agilent recommends that synchronization (using the DONE command) is used with marker functions when signal tracking is turned on.

- **AC and DC Coupling** - the HP 8568B analyzer has two RF input ports:
  - — DC Coupled (with a BNC connector) to handle a frequency range of 100 Hz to 1.5 GHz
  - — AC Coupled (with an N Type connector) to handle a frequency range of 100 kHz to 1.5 GHz

  The ESA-E and PSA series analyzers only have a single RF input port.

  When using PSA models E4440A, E4443A, and E4445A, or the ESA-E model E4407B with the UKB option, you must use DC coupling to see calibrated frequencies of less than 10 MHz. Signals of less than 10 MHz are not calibrated when using AC coupling on these analyzers.

  When using ESA-E series model E4402B with Option UKB, or models E4404B or E4405B, you must use DC coupling to see calibrated frequencies of less than 100 kHz. Signals of less than 100 kHz are not calibrated when using AC coupling on these analyzers.

NOTE

PSA models E4446A and E4448A do not allow AC coupling.

ESA-E model E4407B does not allow AC coupling unless Option UKB has been added.

ESA-E model E4401B does not allow DC coupling.

ESA-E model E4402B does not allow DC coupling unless Option UKB has been added.

- **Overloading** - if you are overloading the analyzer, connect a 10 dB attenuator to the RF input and set the **Ext Amp Gain** (external amplifier gain) to -10 dB. This softkey is accessed via the Amplitude hardkey.
- **Instrument Presets** - consecutive instrument presets (using the IP command, that is, issuing a command such as IP;IP;IP;) are not required.
- **SCPI Language** - Agilent recommends that you do not repeatedly swap to and from the SCPI language within your programs.

Hints and Tips

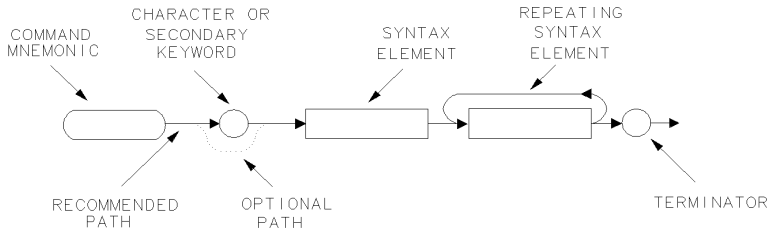
A Few Helpful Hints and Tips

4 Programming Commands

This chapter lists all the supported HP8566B/68B compatible commands in alphanumeric order, and gives brief details on their syntax and operation. For more detailed information on these commands, see your HP 8566B or HP 8568B *Operating and Programming Manual*.

Command Syntax

Command syntax is represented pictorially.



- Ovals enclose command mnemonics. The command mnemonic must be entered exactly as shown.
- Circles and ovals surround secondary keywords or special numbers and characters. The characters in circles and ovals are considered reserved words and must be entered exactly as shown.
- Rectangles contain the description of a syntax element defined in Table 4-1, “Syntax Elements.”
- A loop above a syntax element indicates that the syntax element can be repeated.
- Solid lines represent the recommended path.
- Dotted lines indicate an optional path for bypassing secondary keywords or using alternate units.
- Arrows and curved intersections indicate command path direction.
- Semicolons are the recommended command terminators. Using semicolons makes programs easier to read, prevents command misinterpretation, and is recommended by IEEE Standard 728.

NOTE Uppercase is recommended for entering all commands unless otherwise noted.

Syntax Elements are shown in the syntax diagrams as elements within rectangles. In the syntax diagrams, characters and secondary keywords are shown within circles or ovals. Characters and secondary keywords must be entered exactly as shown.

Table 4-1 Syntax Elements

Syntax Component	Definition/Range
Analyzer command	Any spectrum analyzer command in this chapter, with required parameters and terminators.
Character	S_P a b c d e f g h i j k l m n o p q r s t u v w x y z databyte.
Character & EOI	8-bit byte containing only character data and followed by end-or-identify (EOI) condition, where the EOI control line on GPIB is asserted to indicate the end of the transmission. END signifies the EOI condition.
Character string	A list of characters.
Data byte	8-bit byte containing numeric or character data.
Data byte & EOI	8-bit byte containing numeric or character data followed by end-or-identify (EOI) condition, where the EOI control line on GPIB is asserted to indicate the end of the transmission. END signifies the EOI condition.
Delimiter	| \ @ ^ $ % ; ! Matching characters that mark the beginning and end of a character string, or a list of spectrum analyzer commands. Choose delimiting characters that are not used within the string they delimit.
Digit	0 1 2 3 4 5 6 7 8 9
lsb length	Represents the least significant byte of a two-byte word that describes the number of bytes returned or transmitted. See msb length.
msb length	Represents the most significant byte of a two-byte word that describes the number of bytes returned or transmitted. See lsb length.
Number	Expressed as integer, decimal, or in exponential (E) form. Real Number Range: $\pm 1.797693134862315 \times 10^{308}$, including 0. Up to 15 significant figures allowed. Numbers may be as small as $\pm 2.225073858507202 \times 10^{-308}$ Integer Number Range: –32,768 through +32,767
Output termination	Carriage return(C_R) and line feed (L_F), with end-or-identify (EOI) condition. ASCII codes 13 (carriage return) and 10 (line feed) is sent via GPIB, then the end-or-identify control line on GPIB sets to indicate the end of the transmission.
Units	Represent standard scientific units. Frequency Units: GZ, MZ, KZ, HZ Amplitude Units: DB, DBMV, DM, DBMV, DBUV, V, MV, UV, Time Units: SC, MS, US

Programming Command Descriptions

All supported commands are listed here, along with their descriptions and cross-references to similar commands.

This chapter is not designed to be a comprehensive guide to all HP 8566B/68B commands. It gives brief descriptions of the supported commands, and highlights important functional or behavioral differences that you should be aware of when transferring existing HP 8566B or HP 8568B code to your ESA-E series or PSA analyzer. For a fuller description of the commands, refer to the HP 8566B or HP 8568B's *Operating and Programming Manual*.

In the descriptions of the commands, TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

To avoid confusion between numbers and letters, all commands that incorporate numbers have had the number spelled out and placed in square brackets after the command. For example, the command 'I1' is shown as 'I1 *[one]*' - that is, the capital letter 'I' followed by the number '1', and then the word 'one' italicized in square brackets. The italicized word in brackets does not form part of the command.

NOTE

With the exception of the two commands KSG and VAVG, all commands shown in the following pages as using the ON and OFF parameters will also accept 1 and 0. The parameters ON and 1 are interchangeable and offer identical functionality. Similarly, OFF and 0 offer identical functionality and are interchangeable. Please note, however, that the query commands always return ON or OFF, and never return a 1 or a 0.

A1 *[one]*
Clear Write for Trace A

Syntax

XA1

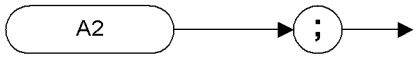
Description

The A1 command sets Trace A to clear write. That is, it continuously displays any signal present at the spectrum analyzer input. The A1 command initially clears Trace A, setting all elements to zero. The sweep trigger then signals the start of the sweep, and Trace A is continually updated as the sweep progresses. Subsequent sweeps send new amplitude information to the display addresses.

NOTE The functions of the command A1 are identical to the CLRW TRA command (page 89).

A2 *[two]*
Maximum Hold for Trace A

Syntax



XA2

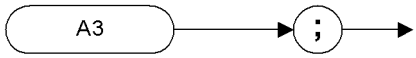
Description

The A2 command updates each trace element with the maximum level detected during the period that the trace has been active.

NOTE The functions of the command A2 are identical to the MXMH TRA command (page 192).

A3 *[three]* View Mode for Trace A

Syntax



XA3

Description

The A3 command displays Trace A and then stops the sweep if no other traces are active. Trace A does not get updated with new data.

NOTE The functions of the command A3 are identical to the VIEW TRA command (page 243).

A4 *[four]* Blank Trace A

Syntax

XA4

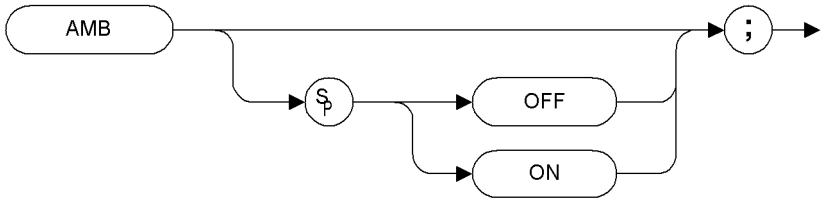
Description

The A4 command blanks Trace A and stops the sweep if no other traces are active. Trace A is not updated.

NOTE The functions of the command A4 are identical to the BLANK TRA command (page 80).

AMB
A minus B into A

Syntax



XAMB

Description

The AMB command subtracts the points in Trace B from the corresponding points in Trace A, and sends the results to Trace A. Thus, AMB can restore the original trace after an APB or a KSc command has been executed.

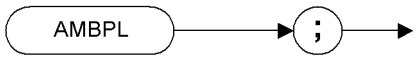
NOTE On HP 8566B and HP 8568B analyzers, the AMB command operates continuously. That is, it continuously updates Trace A to display the results of Trace A minus Trace B until AMB is switched off.

This is not the case with HP 8566B/68B Code Compatibility. The AMB command is performed once only, using the trace data available at the time of execution.

NOTE The functions of the command AMB are identical to the C2 *[two]* command (page 85).

AMBPL
(A minus B) plus Display Line into A

Syntax



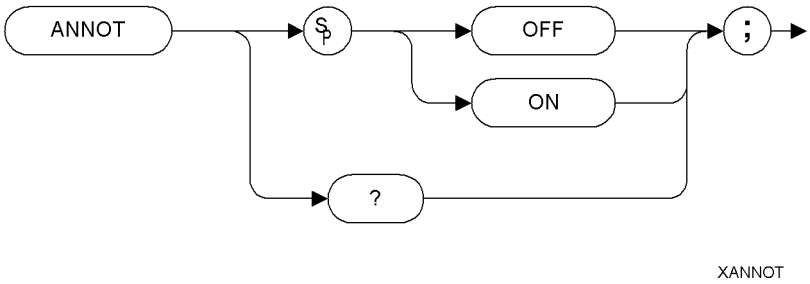
XAMBPL

Description

The AMBPL command does a point-by-point subtraction of Trace B from Trace A, and then adds the display line point values to the difference. The results are sent to Trace A

ANNOT
Annotation

Syntax



Preset State: ANNOT ON

Description

The ANNOT command turns on or off all annotation on the spectrum analyzer display. Softkey labels are not affected by this command and remain displayed.

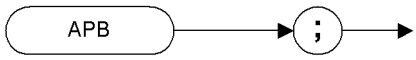
NOTE The functions of the command ANNOT are identical to the KSo command (page 145) and KSp command (page 146).

NOTE *PSA series analyzers only*

- this command will be accepted without generating an error, but the display will not change
- The query command will always return ON

APB
A Plus B to A

Syntax



XAPB

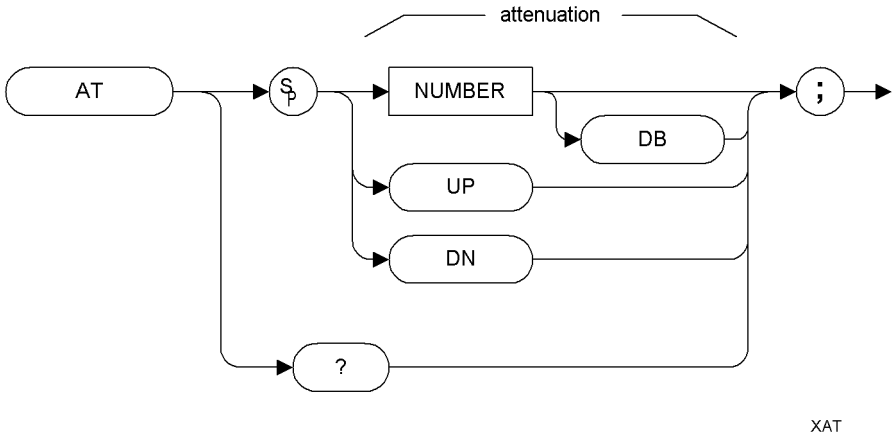
Description

The APB command does a point-by-point addition of Trace A and Trace B, and sends the results to Trace A. Thus, APB can restore the original trace after an AMB or a C2 command has been executed.

NOTE The functions of the command APB are identical to the KSc command (page 125)

AT
Attenuation

Syntax



Item	Description/Default	Range
Number	Any real number or integer. Default units are dB.	*PSA* - 0 to70 dB specified absolutely and 10 to 70 dB in 10 dB steps *ESA* - 0 to 65 dB specified absolutely and 10 to 65 dB in 10 dB steps

Preset State: 10 dB

Step Increment: 10 dB

Description

Specifies the RF input attenuation.

Although any attenuation level from 0 dB to 70 dB in PSA series analyzers (0 dB to 65 dB in ESA-E series analyzers) can be specified using absolute values, you can never set attenuation below 10 dB using the DOWN steps. This is a safety feature to prevent inadvertent setting of attenuation to a level that could damage the analyzer.

CAUTION Signal levels above +30 dBm will damage the spectrum analyzer.

NOTE

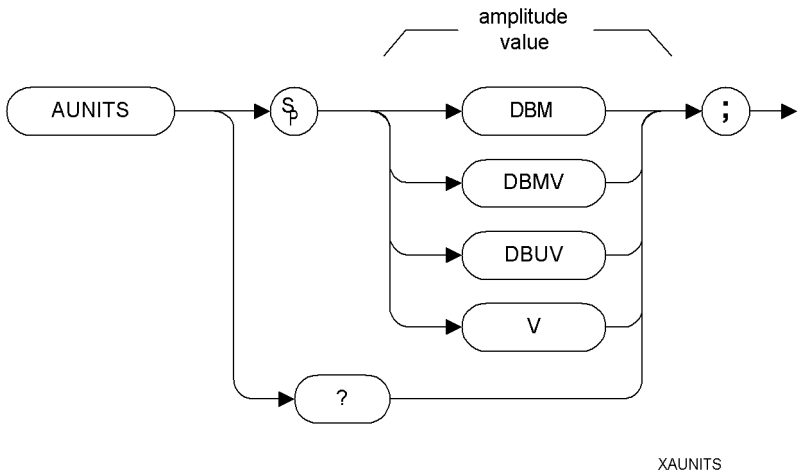
ESA series analyzers have a range of 10 dB to 65 dB when accessed in 10 dB steps. Stepping up from the default value of 10 dB, the sequence rises in 10 dB steps until an attenuation of 60 dB is reached. The next step will only be 5 dB as the analyzer's upper limit is 65 dB will have been reached.

Stepping down from 65 dB reverses this sequence. The first step down from 65 dB is to 60 dB. Thereafter, each step is of 10 dB until an attenuation level of 10 dB is reached.

You cannot step down below 10 dB. To set levels below 10 dB, you must specify the attenuation absolutely. For example, to set attenuation to 5 dB, you must use the command `AT 5DB`.

AUNITS
Amplitude Units

Syntax



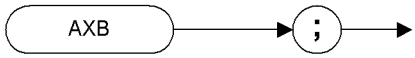
Description

Specifies the amplitude readout units for the reference level, the marker, and the display line.

NOTE The functions of the command AUNITS are identical to the commands KSA (page 120), KSB (page 122), KSC (page 124), and KSD (page 126).

AXB
Exchange Trace A and Trace B

Syntax



XAXB

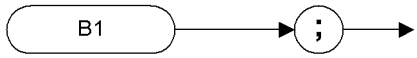
Description

This command exchanges Trace A and Trace B, point by point.

NOTE The functions of the command AXB are identical to the EX command (page 104) and to the XCH TRA,TRB command (page 244).

B1 *[one]*
Clear Write for Trace B

Syntax



XB1

Description

The B1 command sets Trace B to clear write. That is, it continuously displays any signal present at the spectrum analyzer input. The B1 command initially clears Trace B, setting all elements to zero. The sweep trigger then signals the start of the sweep, and Trace B is continually updated as the sweep progresses. Subsequent sweeps send new amplitude information to the display addresses.

NOTE The functions of the command B1 are identical to the CLRW TRB command (page 89).

B2 *[two]*
Maximum Hold for Trace B

Syntax

XB2

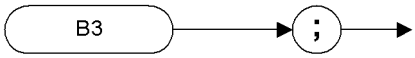
Description

The B2 command updates each trace element with the maximum level detected while the trace is active.

NOTE The functions of the command B2 are identical to the MXMH TRB command (page 192).

B3 *[three]* View Mode for Trace B

Syntax



XB3

Description

The B3 command displays Trace B and then stops the sweep if no other traces are active. Trace B does not get updated.

NOTE The functions of the command B3 are identical to the VIEW TRB command (page 243).

B4 *[four]*
Blank Trace B

Syntax

XB4

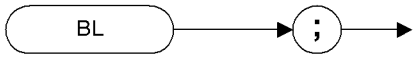
Description

The B4 command blanks Trace B and stops the sweep if no other traces are active. Trace B is not updated.

NOTE The functions of the command B4 are identical to the BLANK TRB command (page 80).

BL
Trace B minus Display Line to Trace B

Syntax



XBL

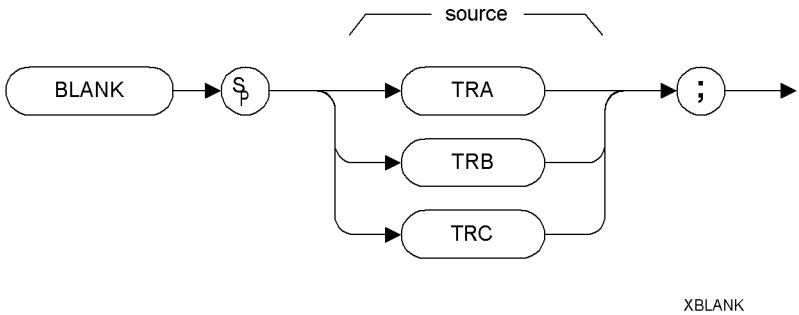
Description

The BL command subtracts the display line from Trace B and sends the results to Trace B.

NOTE The functions of the command BL are identical to the BML command (page 81).

BLANK
Blank Trace

Syntax



Preset State: BLANK TRB, BLANK TRC

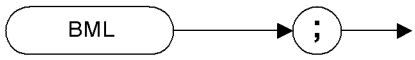
Description

Blanks Trace 1, trace 2, or trace 3, and stops taking new data into the specified trace. TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

NOTE The functions of the command BLANK are identical to the A4 command (page 66), the B4 command (page 78), and KSk command (page 137).

BML
Trace B Minus Display Line

Syntax



XBML

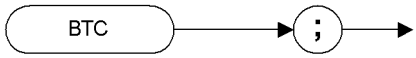
Description

The BML command subtracts the display line from trace B (point by point), and sends the difference to trace B. Trace B corresponds to Trace 2.

NOTE The functions of the command BML are identical to the BL command (page 79).

BTC
Transfer Trace B to Trace C

Syntax



XBTC

Description

The BTC command transfers Trace B data to Trace C

NOTE Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the analyzer sweeps. To ensure that the current settings of the analyzer are reflected in the data transferred from Trace B to Trace C, you must follow the four step process below.

- Select single sweep mode (S2 or SNGLS command)
- Select the desired analyzer settings
- Take one complete sweep
- Transfer the data

NOTE The functions of the command BTC are identical to the KSl command (page 139).

BXC
Exchange Trace B and Trace C

Syntax

XBXC

Description

The BXC command exchanges Trace B data with Trace C data.

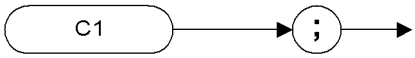
NOTE Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the analyzer sweeps. To ensure that the current settings of the analyzer are reflected in the data exchanged between Trace B and Trace C, you must follow the four step process below.

- Select single sweep mode (S2 or SNGLS command)
- Select the desired analyzer settings
- Take one complete sweep
- Exchange the data

NOTE The functions of the command BXC are identical to the KSi command (page 134) and to the XCH TRB,TRC command (page 244).

C1 *[one]*
Set A Minus B Mode Off

Syntax



XC1

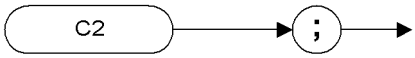
Description

The C1 command turns the A Minus B mode off. That is, it switches off the functionality that was switched on by the C2 command (page 85) or by the AMB ON command (page 67).

NOTE The functions of the command C1 are identical to the AMB OFF command (page 67).

C2 *[two]*
A Minus B Into A

Syntax



XC2

Description

The C2 command subtracts the points in Trace B from the corresponding points in Trace A, and sends the results to Trace A. Thus, if your input signal remains unchanged, C2 can restore the original trace after an APB command (page 70) or a KSc (page 125) command has been executed.

NOTE The functions of the command C2 are identical to the AMB ON command (page 67).

NOTE On HP 8566B and HP 8568B analyzers, the C2 command operates continuously. That is, it continuously updates Trace A to display the results of Trace A minus Trace B until C2 is switched off by issuing the C1 command.

This is not the case with HP 8566B/68B Code Compatibility. The C2 command is performed once only, using the trace data available at the time of execution.

CA
Couple Attenuation

Syntax

XCA

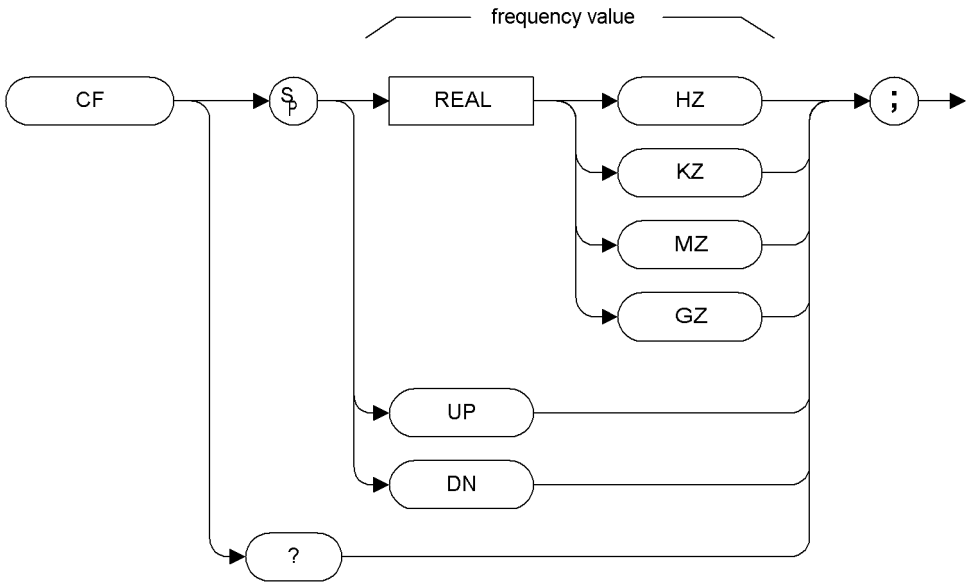
Description

During normal operation, the spectrum analyzer's input attenuation is coupled to the reference level. This coupling keeps the mixer input at a level such that a continuous wave signal displayed at the reference level is at or below -10 dBm (or the value specified in the ML command.)

The CA command sets the threshold to -10 dBm (or to the value specified by the ML command (page 189) or the KS, command (page 118)). The counterpart to the CA command is the AT command (page 71), which allows levels less than the threshold value at the mixer input.

CF
Center Frequency

Syntax



XCF

Item	Description/Default	Range
REAL	Any real or integer number. Default unit is HZ.	Frequency range of the spectrum analyzer

Description

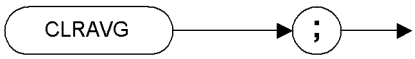
The CF command specifies the value of the center frequency.

The step size depends on whether the frequency has been coupled to the span width using the CS command (page 92). When coupled, the step size is 10% of the span, or one major graticule division; when uncoupled, the step size is determined by the SS command (page 221).

NOTE Although the spectrum analyzer allows entry of frequencies not in the specified frequency range, using frequencies outside the frequency span of the spectrum analyzer is not recommended and is not warranted to meet specifications.

CLRAVG
Clear Average

Syntax



XCLRAVG

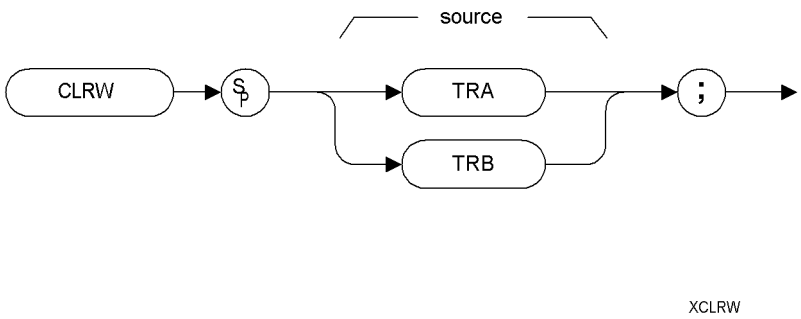
Description

The CLRAVG command restarts the VAVG command by resetting the number of averaged sweeps to one. The video averaging routine resets the number of sweeps, but does not stop video averaging. Use “VAVG OFF;” to stop video averaging.

CLRW
Clear Write

Clears the specified trace and enables trace data acquisition.

Syntax



XCLRW

Preset State: CLRW TRA

Description

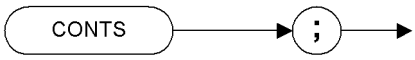
The CLRW command places the indicated trace in clear-write mode. Data acquisition begins at the next sweep. (See the TS command (page 238) for more information about data acquisition.)

TRA corresponds to Trace 1 and TRB corresponds to Trace 2.

NOTE The functions of the command CLRW are identical to the A1 command (page 63) and B1 command (page 75).

CONTS
Continuous Sweep

Syntax



XCONTS

Preset State: CONTS

Description

The CONTS command sets the spectrum analyzer to continuous sweep mode. In the continuous sweep mode, the spectrum analyzer takes its next sweep as soon as possible after the current sweep (as long as the trigger conditions are met). A sweep may temporarily be interrupted by data entries made over the remote interface or from the front panel.

NOTE The functions of the command CONTS are identical to the S1 command (page 214).

CR
Couple Resolution Bandwidth

Syntax

XCR

Description

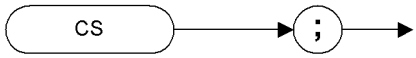
The CR command couples the resolution bandwidth to the video bandwidth and to the sweep time.

The counterpart to the CR command is the RB command (page 206) which breaks the coupling. Use the CR command to re-establish coupling after executing an RB command.

NOTE CR uses the coupling settings from the ESA-E or the PSA analyzer. These may differ from the HP 8566B and HP 8568B settings.

CS
Couple Frequency Step Size

Syntax



XCS

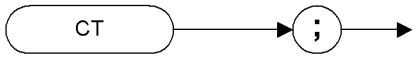
Description

The CS command couples the center frequency step size to the span width so that the step size equals 10% of the span width, or one major graticule division.

The counterpart to the CS command is the SS command (page 221) which breaks the coupling. Use the CS command to re-establish coupling after an SS command has been executed.

CT
Couple Sweep Time

Syntax



XCT

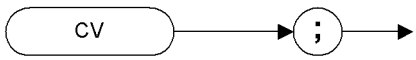
Description

The CT command couples the sweep time to the span, resolution bandwidth and video bandwidth.

The counterpart to the CT command is the ST command (page 222) which breaks the coupling. Use the CT command to re-establish coupling after an ST command has been executed.

CV
Couple Video Bandwidth

Syntax



XCV

Description

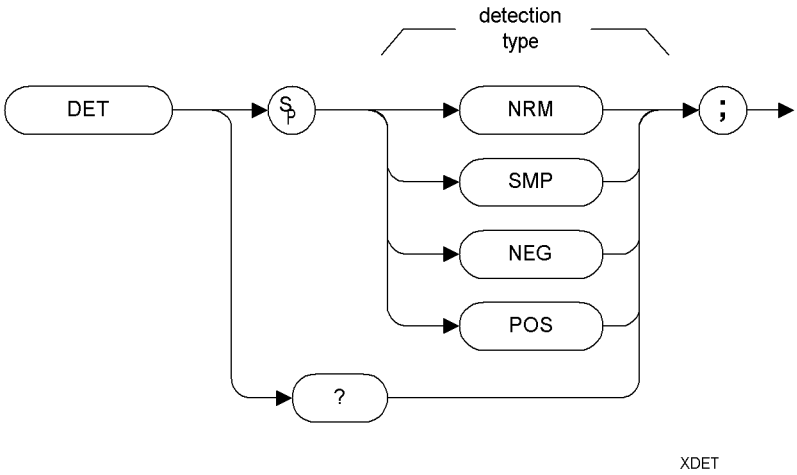
The CV command couples the video bandwidth to the resolution bandwidth.

The counterpart to the CV command is the VB command (page 241) which breaks the coupling. Use the CV command to re-establish coupling after executing a VB command.

NOTE CV uses the coupling settings from the ESA-E or the PSA analyzer. These may differ from the HP 8566B and HP 8568B settings.

DET
Detection Mode

Syntax



Preset State: DET POS

Description

The DET command selects the type of spectrum analyzer detection (positive-peak, negative peak, sample or normal).

POS enables positive-peak detection, which displays the maximum video signal detected over a number of instantaneous samples for a particular frequency.

SMP enables sample detection, which uses the instantaneous video signal value. Video averaging and noise-level markers, when activated, activate sample detection automatically.

NEG enables negative peak detection in sweep times of less than or equal to 200 ms.

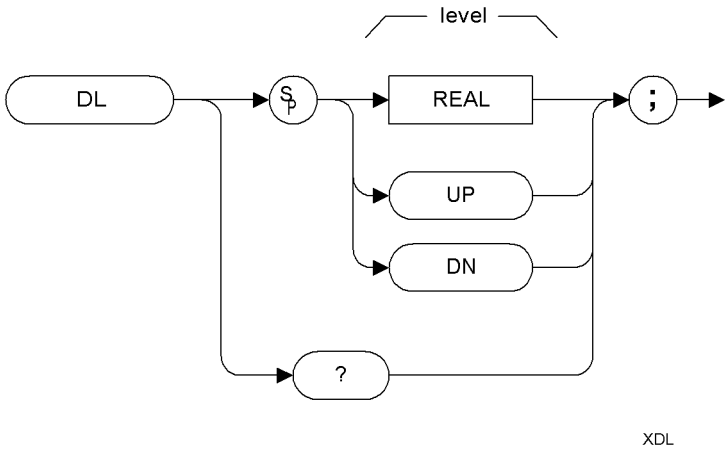
NRM (PSA) PSA series analyzers only - enables the '*rosenfell*' detection algorithm that selectively chooses between positive and negative values.

NRM (ESA) ESA series analyzers only - normal detection is not possible on ESA series analyzers, so the detection will default to positive-peak detection (POS) when NRM is selected.

NOTE The functions of the DET command are identical to the KSa command (page 121), the KSb command, (page 123) the KSd command (page 127) and KSe command (page 129).

DL
Display Line

Syntax



Item	Description/Default	Range
REAL	Any real or integer number. Default units are dBm.	Dependent on the reference level

Preset State: DL OFF

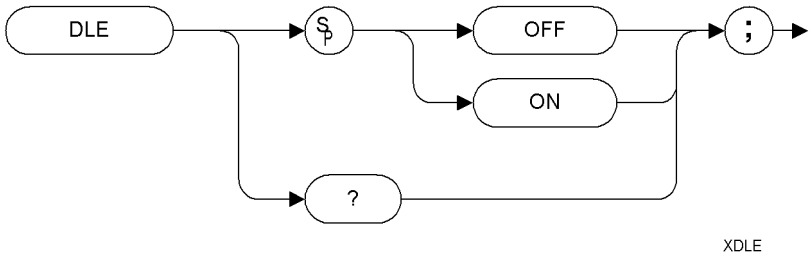
Step Increment: 1 major graticule division

Description

Defines the level of the display line and displays it on the spectrum analyzer screen.

DLE
Display Line Enable

Syntax

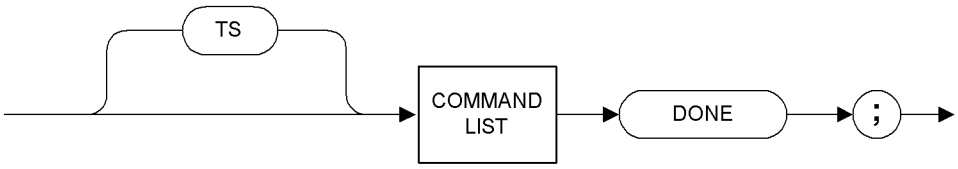


Description

The DLE command enables or disables the display line.

DONE
Done

Syntax



XDONE

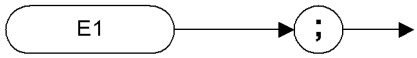
Description

Allows you to determine when the spectrum analyzer has parsed a list of spectrum analyzer commands and has executed all commands prior to and including DONE. The DONE command returns a value of “1” when all commands in a command string or command list have been completed.

If a take sweep (TS command (page 238)) precedes the command list, the TS command acts as a synchronizing function since the command list execution begins after the sweep has been completed.

E1*[one]*
Peak Marker

Syntax



XE1

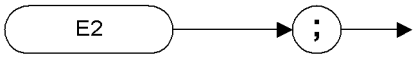
Description

The E1 command positions the marker at the signal peak.

NOTE The functions of the E1 command are identical to MKPK (no secondary keyword) and MKPK HI (page 180).

E2 *[two]*
Marker to Center Frequency

Syntax



XE2

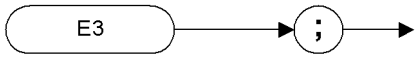
Description

The E2 command positions the marker on the screen at the center frequency position.

NOTE The functions of the E2 command are identical to the MKCF command (page 169).

E3 *[three]*
Delta Marker Step Size

Syntax



XE3

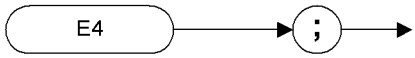
Description

The E3 command establishes the center frequency step size as being the frequency difference between the delta marker and the active marker.

NOTE The functions of the E3 command are identical to the MKSS command (page 186).

E4 *[four]*
Marker to Reference Level

Syntax



XE4

Description

The E4 command moves the active marker to the reference level.

NOTE The functions of the E4 command are identical to the MKRL command (page 184).

EX
Exchange Trace A and Trace B

Syntax

XEX

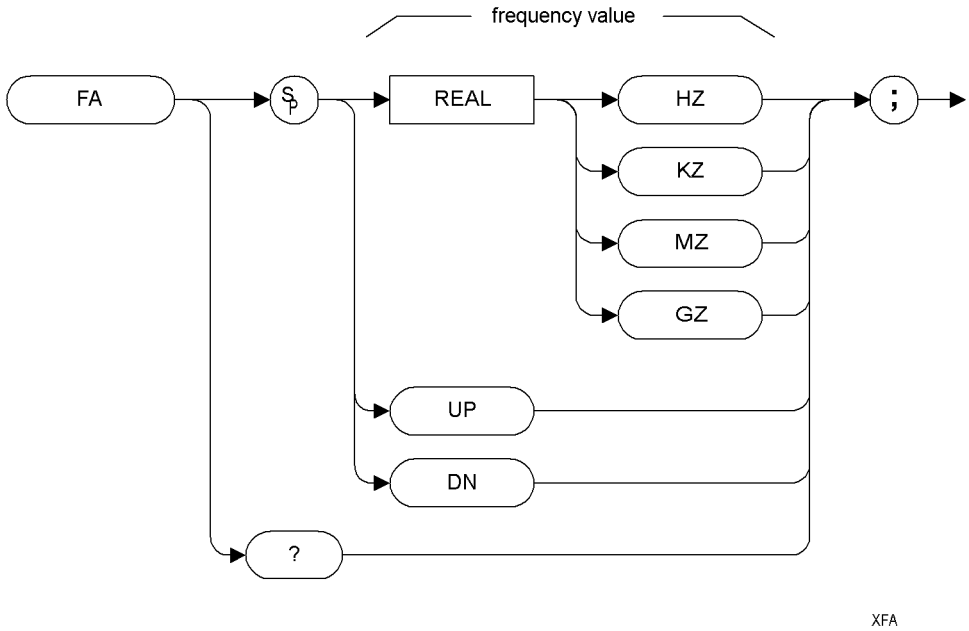
Description

This command exchanges Trace A and Trace B, point by point.

NOTE The functions of the EX command are identical to the AXB command (page 74) and to the XCH TRA,TRBcommand (page 244).

FA
Start Frequency

Syntax



Item	Description/Default	Range
REAL	Any real or integer number. Default unit is Hz.	Frequency range of the spectrum analyzer

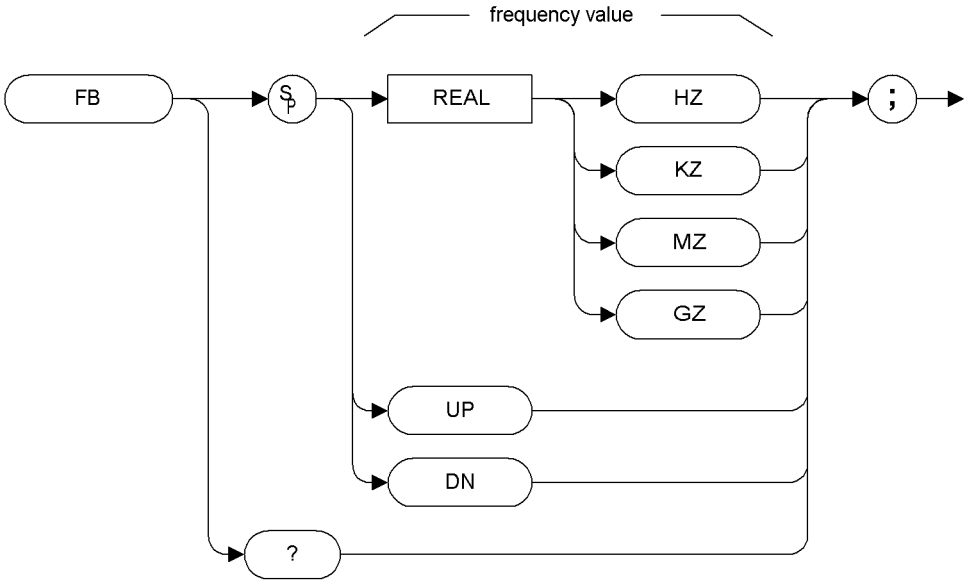
Step Increment: Frequency span divided by 10

Description

The FA command specifies the start frequency value. The start frequency is equal to the center frequency minus (the span divided by two) (FA = CF – SP/2). Changing the start frequency changes the center frequency and span.

FB
Stop Frequency

Syntax



XFB

Item	Description/Default	Range
REAL	Any real or integer number. Default unit is Hz.	Frequency range of the spectrum analyzer

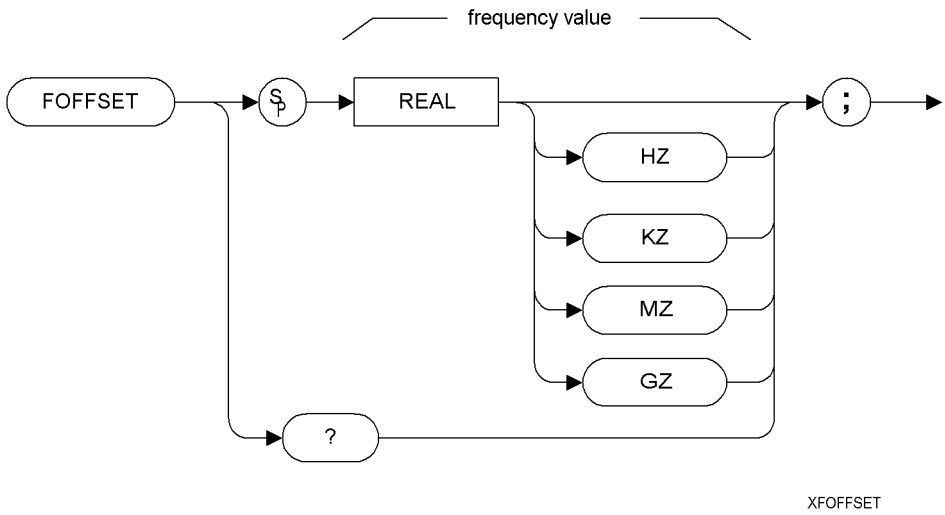
Step Increment: Frequency span divided by 10

Description

The FB command specifies the stop frequency value. The stop frequency is equal to the center frequency plus the span divided by two (FB = CF + SP/2). Changing the stop frequency changes the center frequency and span.

FOFFSET
Frequency Offset

Syntax



Item	Description/Default	Range
REAL	Any real or integer number. Default unit is Hz.	

Preset State: 0 Hz

Description

Specifies the frequency offset for all absolute frequency readouts such as center frequency.

The FOFFSET command selects a value that offsets the frequency scale for all absolute frequency readouts (for example, center frequency). Relative values such as span and marker delta are not offset.

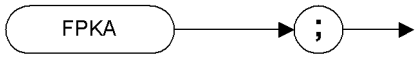
When an offset is in effect, it is displayed beneath the bottom graticule line on the spectrum analyzer screen.

Execute “FOFFSET 0;” or “IP;” to turn off the offset.

NOTE The functions of the FOFFSET command are identical to the KSV command (page 148).

FPKA
Fast Preselector Peak

Syntax



XFPKA

Description

The FPKA command automatically adjusts the preselector frequency to yield the greatest signal level at the active marker. It returns the amplitude of the active marker.

NOTE The FPKA command is only available when the analyzer's upper frequency limit is greater than 3 GHz. The command is not supported in analyzers with an upper frequency limit of 3 GHz or less, and will return an error message when used.

NOTE The FPKA command is not a valid HP8568B command, and is therefore not supported when the remote language is HP8568B.

FS
Full Span

Syntax

XFS

Description

The FS command sets the frequency span of the spectrum analyzer to full span. Resolution bandwidth, video bandwidth, and sweep time are all set to auto-coupled.

NOTE The functions of the FS command are identical to the LF command (page 153).

NOTE Whenever the frequency range of the analyzer you are using does not match the remote language's own range (2 to 22 GHz for HP 8566B and 0.0 to 1.5 GHz for HP 8568B), the span will be limited by the capabilities of the analyzer. The table below lists the frequency ranges of Agilent's ESA-E series and PSA series analyzers.

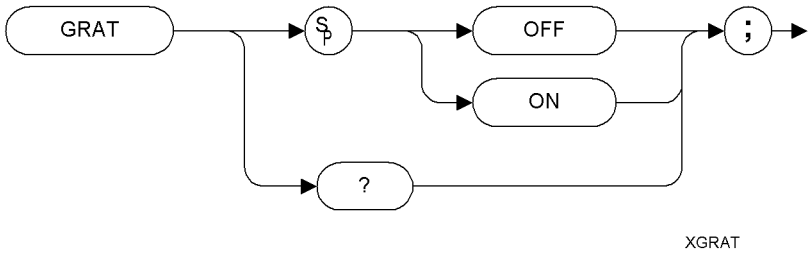
Table 4-2 **Frequency ranges of the Agilent ESA and PSA spectrum analyzers**

Spectrum Analyzer Model	Start Frequency	Stop Frequency
E4401B	9 kHz	1.5 GHz
E4402B	9 kHz[a]	3.0 GHz
E4404B	9 kHz[a]	6.7 GHz
E4405B	9 kHz[a]	13.2 GHz
E4407B	9 kHz[a]	26.5 GHz
E4440A	3 Hz	26.5 GHz
E4443A	3 Hz	6.7 GHz
E4445A	3 Hz	13.2 GHz
E4446A	3 Hz	44.0 GHz
E4448A	3 Hz	50.0 GHz

a. 100 Hz with Option UKB, the Low Frequency Extension

GRAT
Graticule

Syntax



Preset State: GRAT ON

Description

Turns the graticule on or off.

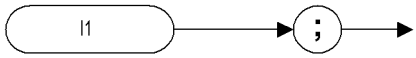
NOTE The functions of the GRAT command are identical to the KSm command (page 141) and the KSn command (page 143).

NOTE *PSA series analyzers only*

- this command will be accepted without generating an error, but the display will not change
- The query command will always return ON

I1 *[one]*
Set RF Coupling to DC

Syntax



XI1

Description

The I1 *[one]* command sets the RF coupling to DC if your analyzer is capable of being switched. If your analyzer cannot be switched to DC coupling, the command will have no effect but an error message will not be generated.

Whether or not your analyzer can be AC coupled, DC coupled, or both depends on both the analyzer's model number, and on whether or not Option UKB (Low Frequency Extension) has been installed. The tables below list the frequency specifications for all ESA-E series and PSA analyzers for both DC and AC coupling.

NOTE The I1 *[one]* command is not supported when the remote language is HP8566B.

Table 4-3 HP 8568A/B Analyzer Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Analyzer Model	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
HP 8568A/B	100 Hz	1.5 GHz	100 kHz	1.5 GHz

Table 4-4 PSA Series Analyzer Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Analyzer Model (PSA series)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
E4440A	3 Hz	26.5 GHz	10 MHz	26.5 GHz
E4443A	3 Hz	6.7 GHz	10 MHz	6.7 GHz
E4445A	3 Hz	13.2 GHz	10 MHz	13.2 GHz
E4446A	3 Hz	44 GHz	N/A	N/A
E4448A	3 Hz	50 GHz	N/A	N/A

Table 4-5 ESA-E Series Analyzer Frequency Coupling Specifications

		DC Coupled Range		AC Coupled Range	
Analyzer Model (ESA-E series)	**Installed Options**	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
E4401B		N/A	N/A	9 kHz	1.5 GHz
E4402B		N/A	N/A	9 kHz	3.0 GHz
E4402B	UKB	100 Hz	3.0 GHz	100 kHz	3.0 GHz
E4404B		9 kHz	6.7 GHz	100 kHz	6.7 GHz
E4404B	UKB	100 Hz	6.7 GHz	100 kHz	6.7 GHz
E4405B		9 kHz	13.2 GHz	100 kHz	13.2 GHz
E4405B	UKB	100 Hz	13.2 GHz	100 kHz	13.2 GHz
E4407B		9 kHz	26.5 GHz	N/A	N/A
E4407B	UKB	100 Hz	26.5 GHz	10 MHz	26.5 GHz

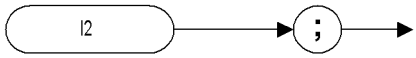
NOTE The ESA-E series and PSA series analyzers only have a single RF input port.

NOTE ESA-E model E4407B without Option UKB, and PSA models E4446A and E4448A, only allow DC coupling.

ESA-E model E4401B, and model E4402B without Option UKB, only allow AC coupling.

I2 *[two]*
Set RF Coupling to AC

Syntax



XI2

Description

The I2 *[two]* command sets the RF coupling to AC if your analyzer is capable of being switched. If your analyzer cannot be switched to AC coupling, the command will have no effect but an error message will not be generated.

Whether or not your analyzer can be AC coupled, DC coupled, or both depends on both the analyzer's model number, and on whether or not Option UKB (Low Frequency Extension) has been installed. The tables below list the frequency specifications for all ESA-E series and PSA analyzers for both DC and AC coupling.

NOTE The I2 *[two]* command is not supported when the remote language is HP8566B.

Table 4-6 HP 8568A/B Analyzer Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Analyzer Model	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
HP 8568A/B	100 Hz	1.5 GHz	100 kHz	1.5 GHz

Table 4-7 PSA Series Analyzer Frequency Coupling Specifications

	DC Coupled Range		AC Coupled Range	
Analyzer Model (PSA series)	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
E4440A	3 Hz	26.5 GHz	10 MHz	26.5 GHz
E4443A	3 Hz	6.7 GHz	10 MHz	6.7 GHz
E4445A	3 Hz	13.2 GHz	10 MHz	13.2 GHz
E4446A	3 Hz	44 GHz	N/A	N/A
E4448A	3 Hz	50 GHz	N/A	N/A

Table 4-8 ESA-E Series Analyzer Frequency Coupling Specifications

		DC Coupled Range		AC Coupled Range	
Analyzer Model (ESA-E series)	**Installed Options**	**Min. Freq.**	**Max. Freq.**	**Min. Freq.**	**Max. Freq.**
E4401B		N/A	N/A	9 kHz	1.5 GHz
E4402B		N/A	N/A	9 kHz	3.0 GHz
E4402B	UKB	100 Hz	3.0 GHz	100 kHz	3.0 GHz
E4404B		9 kHz	6.7 GHz	100 kHz	6.7 GHz
E4404B	UKB	100 Hz	6.7 GHz	100 kHz	6.7 GHz
E4405B		9 kHz	13.2 GHz	100 kHz	13.2 GHz
E4405B	UKB	100 Hz	13.2 GHz	100 kHz	13.2 GHz
E4407B		9 kHz	26.5 GHz	N/A	N/A
E4407B	UKB	100 Hz	26.5 GHz	10 MHz	26.5 GHz

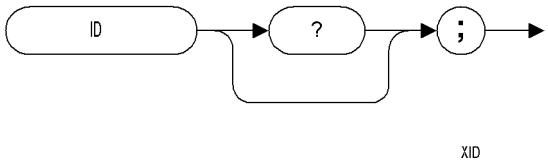
NOTE The ESA-E series and PSA series analyzers only have a single RF input port.

NOTE ESA-E model E4407B without Option UKB, and PSA models E4446A and E4448A, only allow DC coupling.

ESA-E model E4401B, and model E4402B without Option UKB, only allow AC coupling.

ID
Identify

Syntax



Description

The ID command returns the current remote language to the controller (for example, “HP8566B”).

NOTE The response value is determined by your remote language selection. This is configured via the front-panel menu selection for remote ID. See “Configuring Option 266 - ESA and PSA Analyzers” on page 12 for details.

IP
Instrument Preset

Syntax

XIP

Description

Performs an instrument preset, setting the analyzer back to its factory settings.

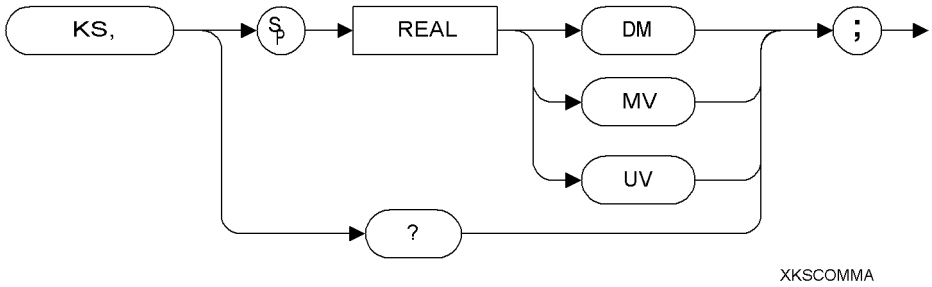
Instrument preset automatically occurs when you turn on the spectrum analyzer. IP is a good starting point for many measurement processes. When IP is executed remotely, the spectrum analyzer does not necessarily execute a complete sweep, however. You should execute a take sweep (TS) to ensure that the trace data is valid after an IP.

NOTE The functions of the IP command are identical to the KST command (page 147).

NOTE If the external amplifier gain has been set, executing an IP command will not reset this value. This is to protect the analyzer.

KS,
Mixer Level

Syntax



Description

The KS, command specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

The effective mixer level is equal to the reference level minus the input attenuator setting. When KS, is activated, the effective mixer level can be set from -10 dBm to -70 dBm in 10 dB steps.

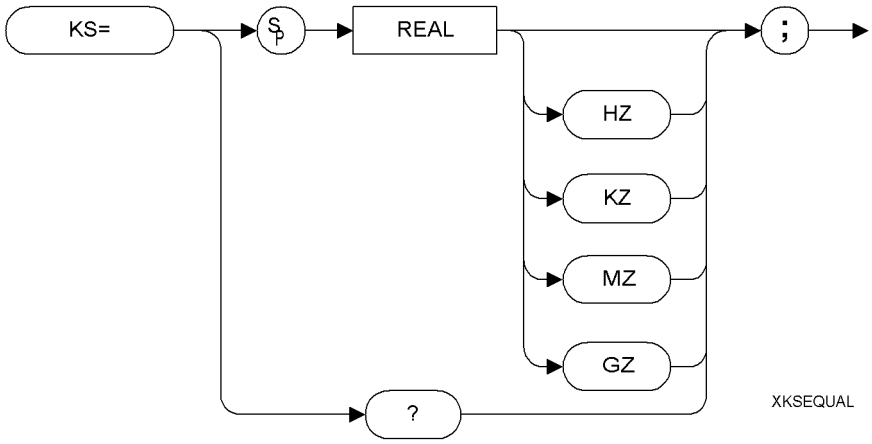
As the reference level is changed, the coupled input attenuator automatically changes to limit the maximum signal at the mixer input to your specified setting for signals less than or equal to the reference level.

NOTE If the external amplifier gain has been set, executing an IP command will not reset this value. This is to protect the analyzer.

NOTE The functions of the KS, command are identical to the ML command (page 189).

KS=
Marker Counter Resolution

Syntax



NOTE The marker counter can be specified in time units when operating in the time domain.

Description

Specifies the resolution of the marker frequency counter.

NOTE This command is not supported when the remote language is HP8566B.

NOTE The functions of the KS= command are identical to the MKFCR command (page 174).

NOTE On PSA analyzers, setting the marker frequency resolution will cause the Gate Time to change. The Gate Time is calculated using the following formula:

$$\text{Gate Time} = \frac{1}{\text{Resolution Value}}$$

For restrictions on the Gate Time, refer to the PSA *User's and Programmer's Reference Guide*.

KSA
Amplitude in dBm

Syntax

XKSA

Description

The KSA command sets the amplitude readout (reference level, marker, display line and threshold) to dBm units.

NOTE The functions of the KSA command are identical to the AUNITS DBM command (page 73).

KSa
Normal Detection

Syntax

XKSaa

Description

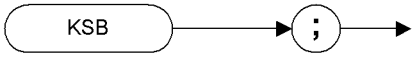
The KSa command selects normal input detection. That is, it enables the '*rosenfell*' detection algorithm that selectively chooses between positive and negative values.

NOTE Normal detection is only possible in PSA series analyzers. The KSa command will default to positive peak detection (KSb) (page 123) when executed on an ESA analyzer.

NOTE The functions of the KSa command are identical to the DET NRM command (page 95).

KSB
Amplitude in dBmV

Syntax



XKSB

Description

The KSB command sets the amplitude readout (reference level, marker, display line and threshold) to dBmV units.

NOTE The functions of the KSB command are identical to the AUNITS DBMV command (page 73).

KSb
Positive Peak Detection

Syntax

XKSbb

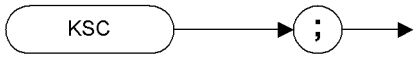
Description

The KSb command enables positive peak input detection for displaying trace information. Trace elements are only updated when the detected signal level is greater than the previous signal level.

NOTE The functions of the KSa command are identical to the DET POS command (page 95).

KSC
Amplitude in dBuV

Syntax



XKSC

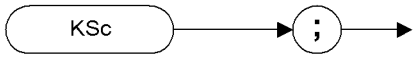
Description

The KSC command sets the amplitude readout (reference level, marker, display line and threshold) to dBuV units.

NOTE The functions of the KSC command are identical to the AUNITS DBUV command (page 73).

KSc
A Plus B to A

Syntax



XKScc

Description

The KSc command does a point-by-point addition of Trace A and Trace B, and sends the results to Trace A. Thus, if your input signal remains unchanged, KSc can restore the original trace after an AMB or a C2 command has been executed.

NOTE The functions of the command KSc are identical to the APB command (page 70).

KSD
Amplitude in Volts

Syntax

XKSD

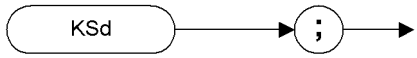
Description

The KSD command sets the amplitude readout (reference level, marker, display line and threshold) to voltage units.

NOTE The functions of the KSD command are identical to the AUNITS V command (page 73).

KSd
Negative Peak Detection

Syntax



XKSdd

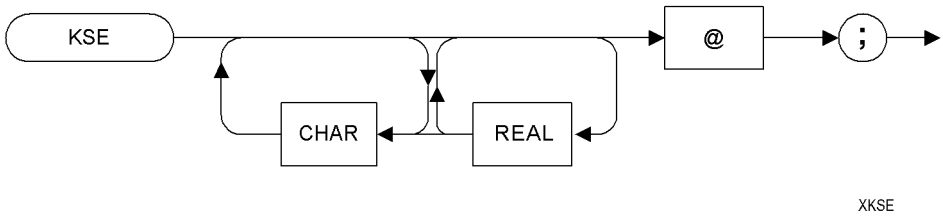
Description

The KSd command selects negative-peak input detection for displaying trace information. Each trace element is updated with the minimum value detected during the sweep.

NOTE The functions of the command KSd are identical to the DET NEG command (page 95).

KSE
Title Mode

Syntax



XKSE

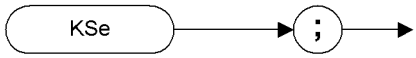
Description

The KSE command activates the title mode, writing a message to the top line of the display.

NOTE The only character that Option 266 will accept as a terminator is the '@' character.

KSe
Sample Detection

Syntax



XKSee

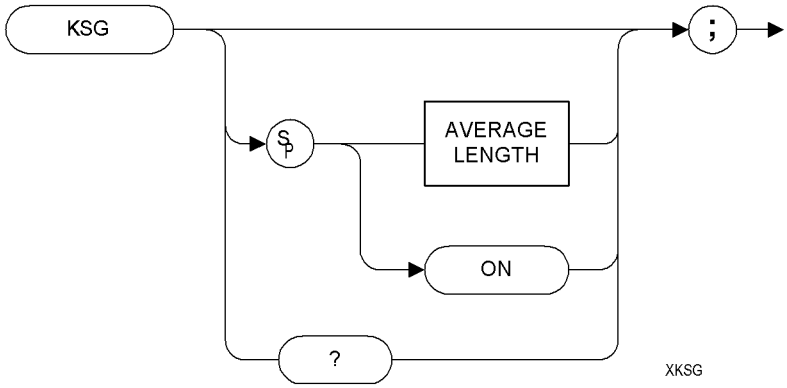
Description

The KSe command selects sample input detection for displaying trace information.

NOTE The functions of the command KSe are identical to the DET SMP command (page 95).

KSG
Video Averaging On

Syntax



Description

The KSG command enables video averaging. During video averaging, two traces are displayed simultaneously. Trace C shows the signal as seen at the input detector, while Trace A or Trace B show the same signal after averaging.

Before executing the KSG command, select Trace A or Trace B as the active trace (CLRW command (page 89)) and blank the remaining trace.

NOTE The functions of the KSG command are identical to the VAVG ON command (page 239).

KSg
Display Off

Syntax

XKSgg

Description

The KSg command turns the analyzer's display Off.

On the original HP 8566B and HP 8568B spectrum analyzers, this command turned the CRT beam power off to avoid unnecessary wear on the CRT. Although this command is supported, displays used on the ESA-E and PSA analyzers are not subject to wear.

KSH
Video Averaging Off

Syntax

XKSH

Description

The KSH command switches video averaging off.

Before executing the KSH command, select Trace A or Trace B as the active trace (CLRW command (page 89)) and blank the remaining trace.

NOTE The functions of the KSH command are identical to the VAVG OFF command (page 239).

KSh
Display On

Syntax

XKShh

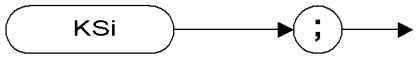
Description

The KSh command turns the analyzer's display On.

On the original HP 8566B and HP 8568B spectrum analyzers, CRT beam power was often switched Off to prevent wear of the CRT. This command (KSh) was used to turn the CRT beam power on again. Although this command is supported, displays used on the ESA-E and PSA analyzers are not subject to wear.

KSi
Exchange Trace B and Trace C

Syntax



XKSii

Description

The KSi command exchanges Trace B data with Trace C data.

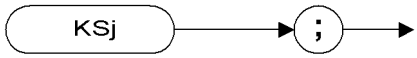
NOTE Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the analyzer sweeps. To ensure that the current settings of the analyzer are reflected in the data exchanged between Trace B and Trace C, you must follow the four step process below.

- Select single sweep mode (S2 (page 215) or SNGLS command (page 218))
- Select the desired analyzer settings
- Take one complete sweep using the TS command (page 238)
- Exchange the data

NOTE The functions of the command KSi are identical to the BXC command (page 83) and the XCH TRB,TRC command (page 244).

KSj
View Trace C

Syntax



XKSjj

Description

The KSj command displays Trace C.

NOTE The functions of the command KSj are identical to the VIEW TRC command (page 243).

KSK
Marker to Next Peak

Syntax

XKSK

Description

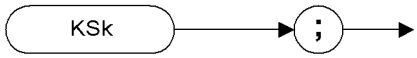
If there is a marker on the screen, the KSK command moves this marker to the next signal peak of lower amplitude.

NOTE The functions of the KSK command are similar to the MKPK NH command (page 180), except that KSK does not take in to account the marker peak excursion value. For more details on marker peak excursion, see the MKPX command (page 181).

NOTE This command is not supported when the remote language is HP8568B.

KSk
Blank Trace C

Syntax



XKSkk

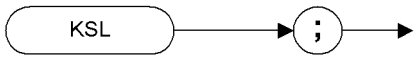
Description

The KSj command blanks Trace C.

NOTE The functions of the command KSk are identical to the BLANK TRC command (page 80))

KSL
Marker Noise Off

Syntax



XKSL

Description

The KSL command disables the noise density function which displays the RMS noise density at the marker. KSL does not blank the marker.

NOTE The functions of the KSL command are identical to the MKNOISE OFF command (page 177).

KSI
Transfer Trace B to Trace C

Syntax

XKSII

Description

The KSl command transfers Trace B data to Trace C

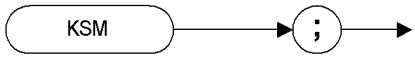
NOTE Trace C cannot be an active trace. This means that the data in Trace C cannot be updated as the analyzer sweeps. To ensure that the current settings of the analyzer are reflected in the data transferred from Trace B to Trace C, you must follow the four step process below.

- Select single sweep mode (S2 (page 215) or SNGLS command (page 218))
- Select the desired analyzer settings
- Take one complete sweep using the TS command (page 238)
- Transfer the data

NOTE The functions of the command KSl are identical to the BTC command (page 82).

KSM
Marker Noise On

Syntax



XKSM

Description

The KSM command displays the noise density at the marker. The noise density is normalized to a 1Hz bandwidth.

NOTE The functions of the KSM command are identical to the MKNOISE ON command (page 177).

NOTE If an MKD command or an M3 command is executed with the marker noise function active, the marker amplitude displayed and returned by the MKA? command (page 167) or the MA command (page 160) is the difference between the noise densities at the reference marker and at the delta marker.

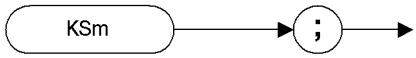
If an MKD command or an M3 command is executed before marker noise has been activated, the marker noise amplitude that is displayed on the screen is the difference between the carrier wave power and the noise density at the delta marker position.

However, the value returned by an MKA? (page 167) command or by an MA command (page 160) will always be the difference between the noise densities at the two markers. That is, the values returned by MKA? and MA do not always agree with those displayed on the screen. These returned values will only remain correct as long as there has been no change made to either the delta marker or the marker noise from the front panel.

The nominal noise bandwidth to RBW ratio for the RBW filters used in the ESA-E series analyzers is 1.128 for RBWs of 1 kHz and higher, and 1.055 for RBWs of less than 1 kHz. The nominal ratio for PSA analyzers is 1.055 for all RBWs. The nominal ratio for the HP 8566 family of analyzers is 1.128 for RBWs 100 kHz and higher, and 1.114 for RBWs of 30 kHz and lower.

KSm
Graticule Off

Syntax



XKSmm

Description

The KSm command blanks the graticule on the analyzer display.

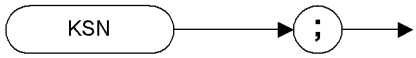
NOTE *PSA series analyzers only*

- this command will be accepted without generating an error, but the display will not change
- The graticule display is always ON

NOTE The functions of the command KSm are identical to the GRAT OFF command (page 111).

KSN
Marker Minimum

Syntax



XKSN

Description

The KSN command moves the marker to the minimum value detected.

NOTE The functions of the KSN command are identical to the MKMIN command (page 175).

NOTE This command is not supported when the remote language is HP8568B.

KSn
Graticule On

Syntax

XKSnn

Description

The KSn command turns on the graticule on the analyzer display.

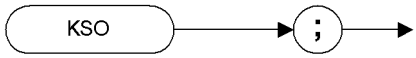
NOTE *PSA series analyzers only*

- The graticule display is always ON

NOTE The functions of the command KSn are identical to the GRAT ON command (page 111).

KSO
Marker Span

Syntax



XKSO

Description

The KSO command operates only when the delta marker is On (see MKD (page 170) or M3 (page 158)). When the delta marker is on and the KSO command is executed, the left marker specifies the start frequency, and the right marker specifies the stop frequency. If the delta marker is off, the command does nothing.

NOTE If the active marker is not a delta marker, there is no change in its position.

NOTE The functions of the KSO command are identical to the MKSP command (page 185).

KSo
Annotation Off

Syntax

XKSoo

Description

The KSo command blanks the annotation on the analyzer display.

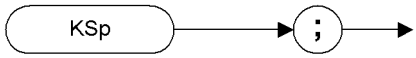
NOTE *PSA series analyzers only*

- this command will be accepted without generating an error, but the display will not change
- The annotation is always ON

NOTE The functions of the command KSo are identical to the ANNOT OFF command (page 69).

KSp
Annotation On

Syntax



XKSpp

Description

The KSp command activates the annotation on the analyzer display.

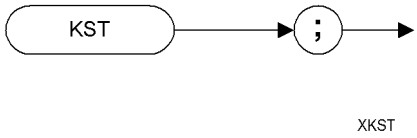
NOTE *PSA series analyzers only*

- Annotation is always ON

NOTE The functions of the command KSp are identical to the ANNOT ON command (page 69).

KST
Fast Preset

Syntax



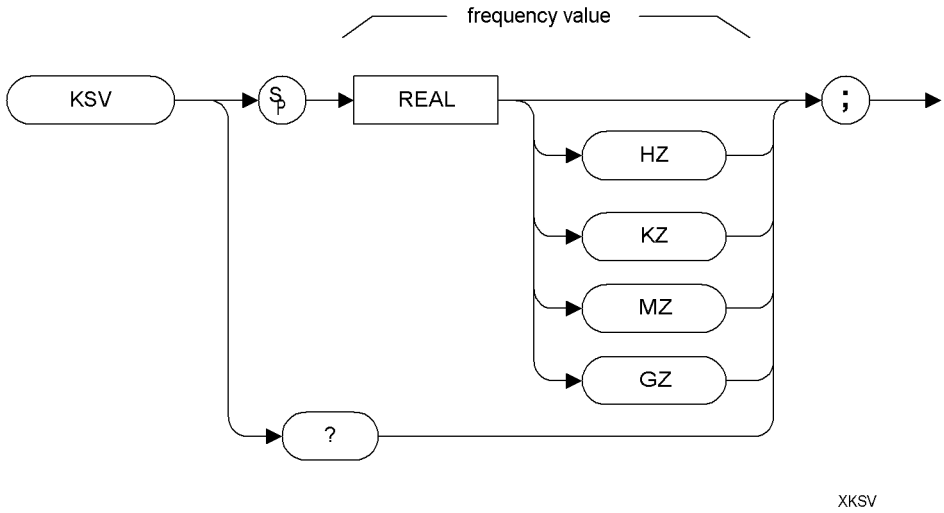
Description

Performs an instrument preset, setting the analyzer back to its factory settings.

NOTE There is no fast preset for ESA and PSA series analyzers. Instead, HP8566B/68B Code Compatibility performs an instrument preset (IP) when the KST command is issued. The functions of the command KST are therefore identical to the IP command (page 117).

KSV
Frequency Offset

Syntax



Description

The KSV command allows you to specify a value that offsets the frequency scale for all absolute frequency readouts, for example, center frequency. Relative values, for example, span and delta marker, are not offset.

NOTE The functions of the KSV command are identical to the FOFFSET command (page 107).

KSx
External Trigger

Syntax

XKSxx

Description

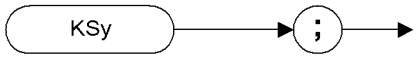
The KSx command activates the normal external trigger mode. When the KSx command is executed, the RF input signal is only displayed when the external trigger level exceeds the trigger threshold level.

NOTE If an HP 8566B or an HP 8568B analyzer is in zero span and the sweep time is less than 20 msec, the display only gets refreshed when a fresh trace has been taken. This can cause the displayed trace to flicker. In Option 266, all traces are displayed continuously, so all traces are therefore free of flicker.

NOTE The functions of the command KSx are identical to the TM EXT command (page 233).

KSy
Video Trigger

Syntax



XKSyy

Description

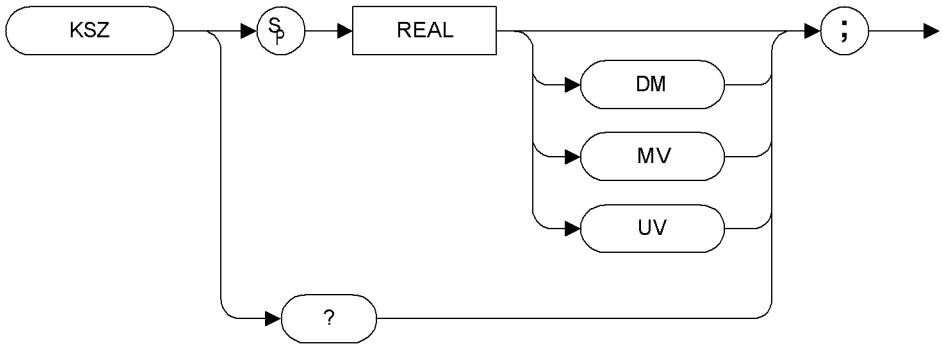
The KSy command activates the normal video trigger mode. When the KSy command is executed, the RF input signal is only displayed when the video trigger signal, which is internally triggered off the input signal, exceeds the trigger threshold level.

NOTE If an HP 8566B or an HP 8568B analyzer is in zero span and the sweep time is less than 20 msec, the display only gets refreshed when a fresh trace has been taken. This can cause the displayed trace to flicker. In Option 266, all traces are displayed continuously, so all traces are therefore free of flicker.

NOTE The functions of the command KSy are identical to the TM VID command (page 233) and to the T4 command (page 228).

KSZ
Reference Level Offset

Syntax



XKSZ

Description

The KSZ command offsets all amplitude readouts on the display but without affecting the trace.

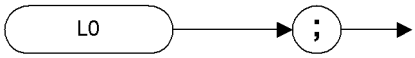
Once activated, the KSZ command displays the amplitude offset on the left side of the screen.

Entering KSZ 0 or presetting the spectrum analyzer eliminates an amplitude offset.

NOTE The functions of the KSZ command are identical to the ROFFSET command (page 212).

LO *[zero]*
Display Line Off

Syntax



XL0

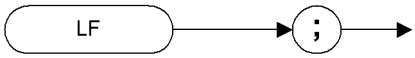
Description

The L0 *[zero]* command disables the display line.

NOTE The functions of the L0 *[zero]* command are identical to the DLE OFF command (page 98).

LF
Low Frequency Preset

Syntax



XLF

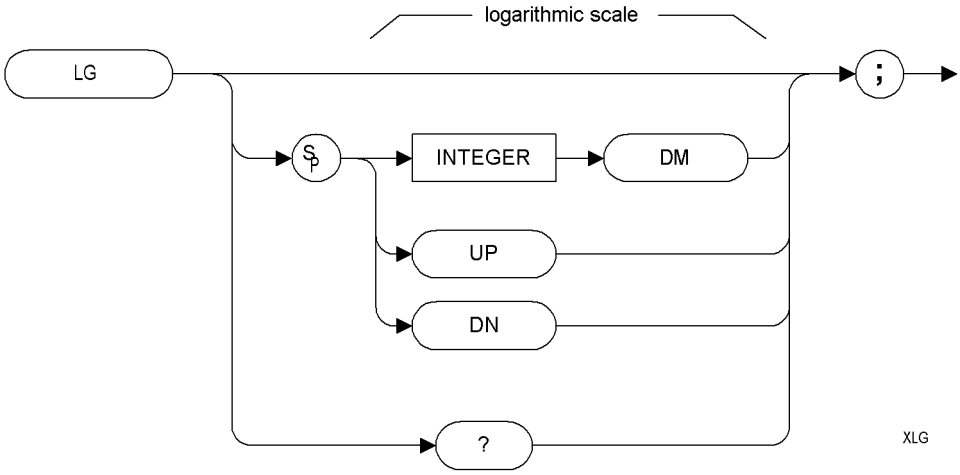
Description

Performs a low frequency preset. That is, it selects a Start Frequency of 0 Hz and a Stop Frequency of 2.5 GHz, a Reference Level of 0dBm, and sets all coupled functions to automatic.

NOTE This command is not supported when the remote language is HP8568B.

LG
Logarithmic Scale

Syntax

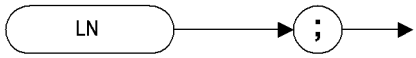


Description

Specifies the amplitude (vertical graticule divisions) as logarithmic units, without changing the reference level.

LN
Linear Scale

Syntax



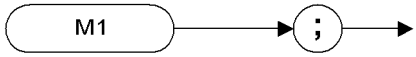
XLN

Description

Scales the amplitude (vertical graticule divisions) proportional to the input voltage, without changing the reference level. The bottom line of the graticule represents 0 volts.

M1 *[one]*
Marker Off

Syntax



XM1

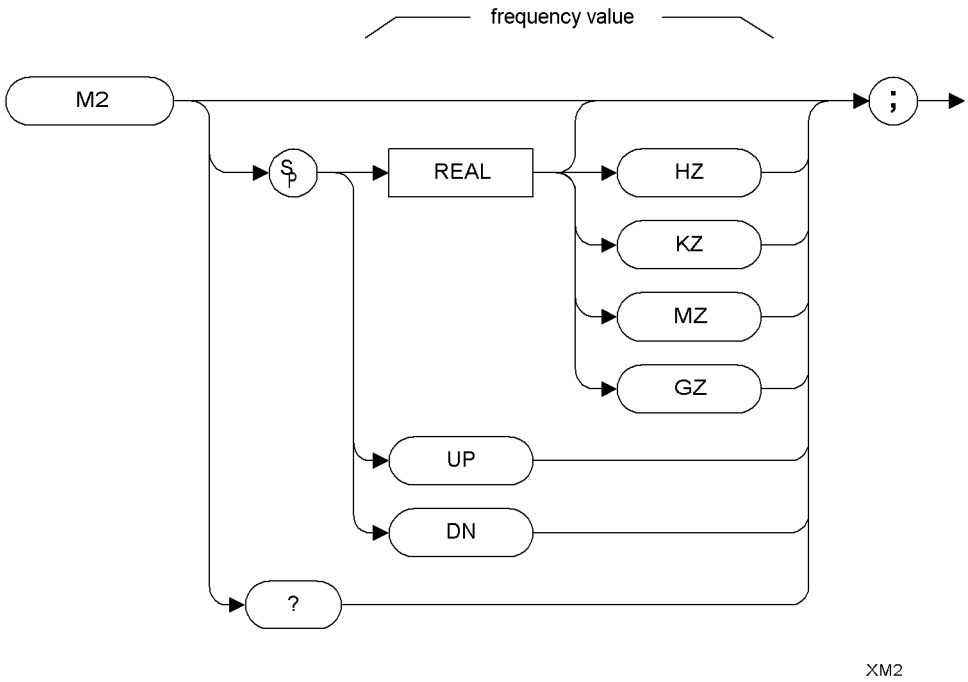
Description

The M1 *[one]* command blanks any markers showing on the display.

NOTE The functions of the M1 *[one]* command are identical to the MKOFF ALL command (page 178).

M2 *[two]* Marker Normal

Syntax



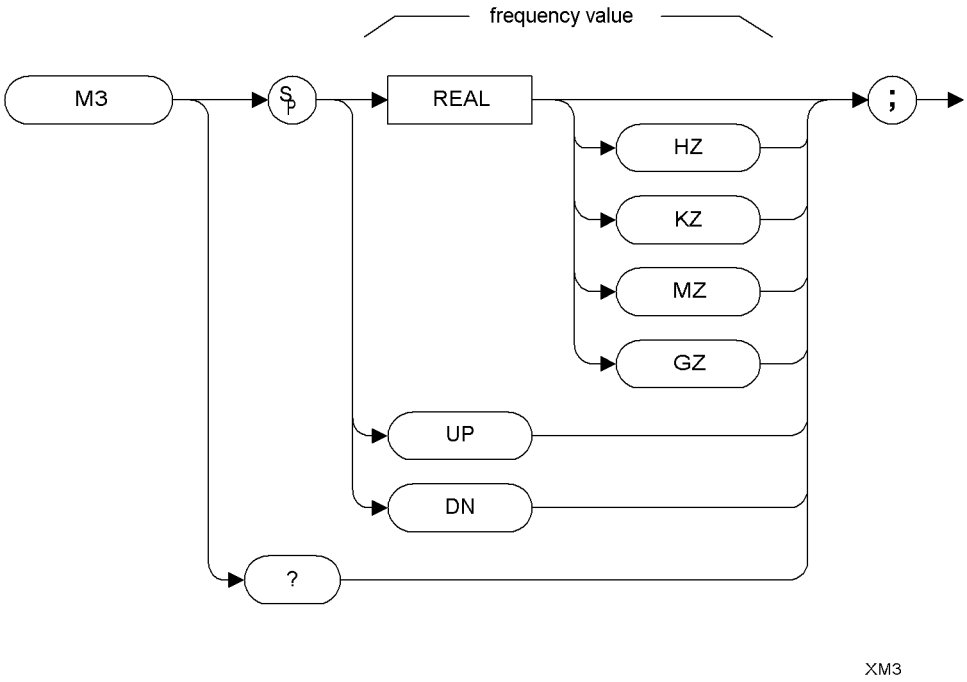
Description

The M2 *[two]* command moves the active marker to the marker frequency. If the active marker has not been declared with MKACT, a normal marker is turned on and this active marker is assumed to be 1. If the active marker type is not currently normal (for example, it is delta or peak), the M2 command will change it to a normal marker.

NOTE The functions of the M2 command are identical to the MKN command (page 176).

M3 *[three]* Delta Marker

Syntax



Description

The M3 *[three]* command computes the frequency and amplitude difference between the active marker and the delta (or difference) marker.

If a delta marker is not displayed on the screen, the M3 command places one at the specified frequency or on the right hand edge of the display. If an active marker is not displayed on the screen, the M3 command places an active marker at the center of the screen.

NOTE The active marker is the number 1 marker unless otherwise specified by the MKACT command (page 168).

NOTE

If the M3 command is executed with the marker noise function active (MKNOISE ON (page 177) or KSM (page 140)), the marker amplitude displayed and returned by the MKA? command (page 167) or the MA command (page 160) is the difference between the noise densities at the reference marker and at the delta marker.

If the M3 command is executed before marker noise has been activated, the marker noise amplitude that is displayed on the screen is the difference between the carrier wave power and the noise density at the delta marker position.

However, the value returned by an MKA? (page 167) command or by an MA command (page 160) will always be the difference between the noise densities at the two markers. That is, the values returned by MKA? and MA do not always agree with those displayed on the screen. These returned values will only be correct as long as there has been no change in either the delta marker or the marker noise on the front panel.

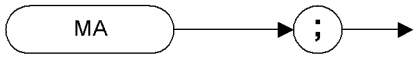
The nominal noise bandwidth to RBW ratio for the RBW filters used in the ESA-E series analyzers is 1.128 for RBWs of 1 kHz and higher, and 1.055 for RBWs of less than 1 kHz. The nominal ratio for PSA analyzers is 1.055 for all RBWs. The nominal ratio for the HP 8566 family of analyzers is 1.128 for RBWs 100 kHz and higher, and 1.114 for RBWs of 30kHz and lower.

NOTE

The functions of the M3 command are identical to the MKD command (page 170).

MA
Marker Amplitude Output

Syntax



XMA

Description

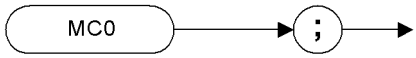
The MA command returns the amplitude level of the active marker if the marker is on the screen. If both the active marker and the delta marker are displayed, the MA command returns the amplitude difference between the two markers.

The format of the returned data is determined by the TDF (Trace Data Format) (page 231) command and, if TDF B (binary data format) has been selected, by the MDS command (page 163).

NOTE The functions of the MA command are identical to the MKA command (page 167).

MC0 *[zero]* Marker Frequency Counter Off

Syntax



XMC0

Description

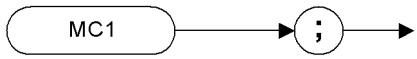
The MC0 *[zero]* command turns the marker frequency counter off.

NOTE The functions of the MC0 *[zero]* command are identical to the MKFC OFF command (page 173).

NOTE This command is not supported when the remote language is HP8566B.

MC1 *[one]*
Marker Frequency Counter On

Syntax



XMC1

Description

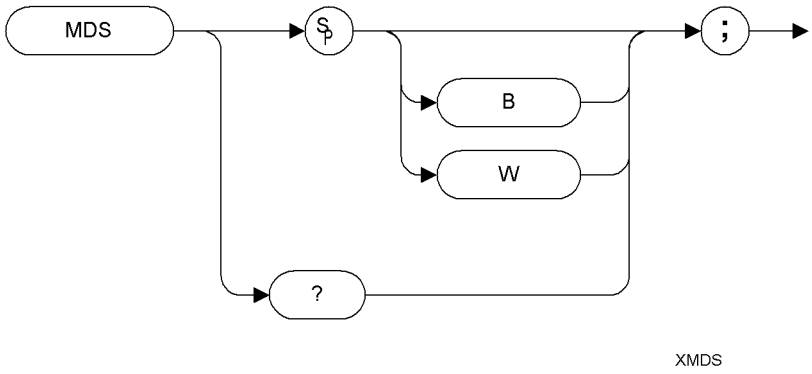
The MC1 *[one]* command turns the marker frequency counter on.

NOTE The functions of the MC1 *[one]* command are identical to the MKFC ON command (page 173).

NOTE This command is not supported when the remote language is HP8566B.

MDS
Measurement Data Size

Syntax



Description

The MDS command formats binary data in one of the following formats:

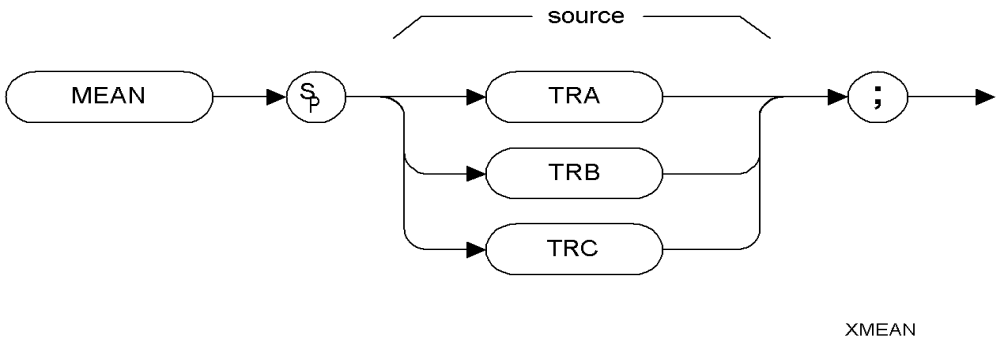
B selects a data size of one 8-bit byte.

W selects a data size of one word, which is two 8-bit bytes.

If no keyword is specified in the command, the default value of W is assumed.

MEAN
Trace Mean

Syntax



XMEAN

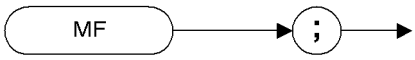
Description

Returns the mean value of the specified trace in display units.

NOTE TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

MF
Marker Frequency Output

Syntax



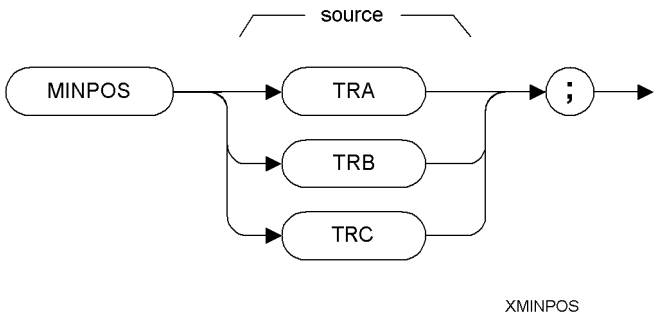
XMF

Description

Returns the frequency (or time) of the on-screen active marker. If both an active marker and the delta marker are on the screen, the frequency difference is returned.

MINPOS
Minimum X Position

Syntax

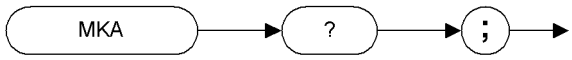


Description

The MINPOS command returns the *X* co-ordinate value that corresponds to the minimum amplitude of the specified trace.

MKA
Marker Amplitude

Syntax



XMKA

Description

The MKA command returns the amplitude level of the active marker if the marker is on the screen. If both the active marker and the delta marker are displayed, the MKA command returns the amplitude difference between the two markers.

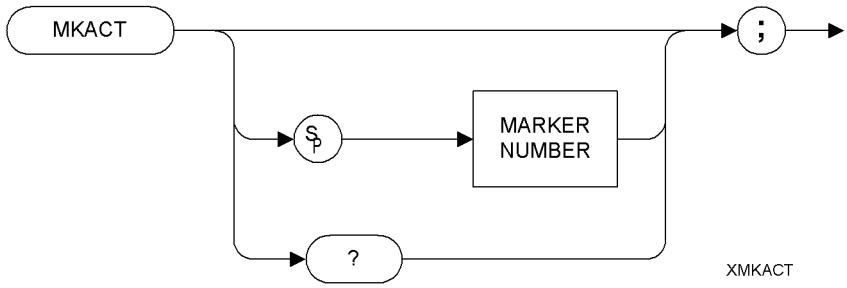
The format of the returned data is determined by the TDF (Trace Data Format) (page 231) command and, if TDF B (binary data format) has been selected, by the MDS command (page 163).

NOTE The functions of the MKA command are identical to the MA command (page 160).

NOTE In HP8566B and HP8568B analyzers, the MKA command can be used with a numeric argument that places the marker at the specified amplitude on the screen. In Option 266 HP 8566B/68B Code Compatibility, MKA is a query only command. That is, the command will not accept arguments of any type, and can only be used in the form MKA?.

MKACT
Activate Marker

Syntax



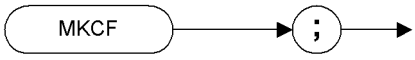
Item	Description/Default	Range
Marker Number	Any valid integer. Default value is 1.	1 to 4

Description

MKACT specifies the active marker. There can be four different markers, but only one marker can be active at any time.

MKCF
Marker to Center Frequency

Syntax



XMKCF

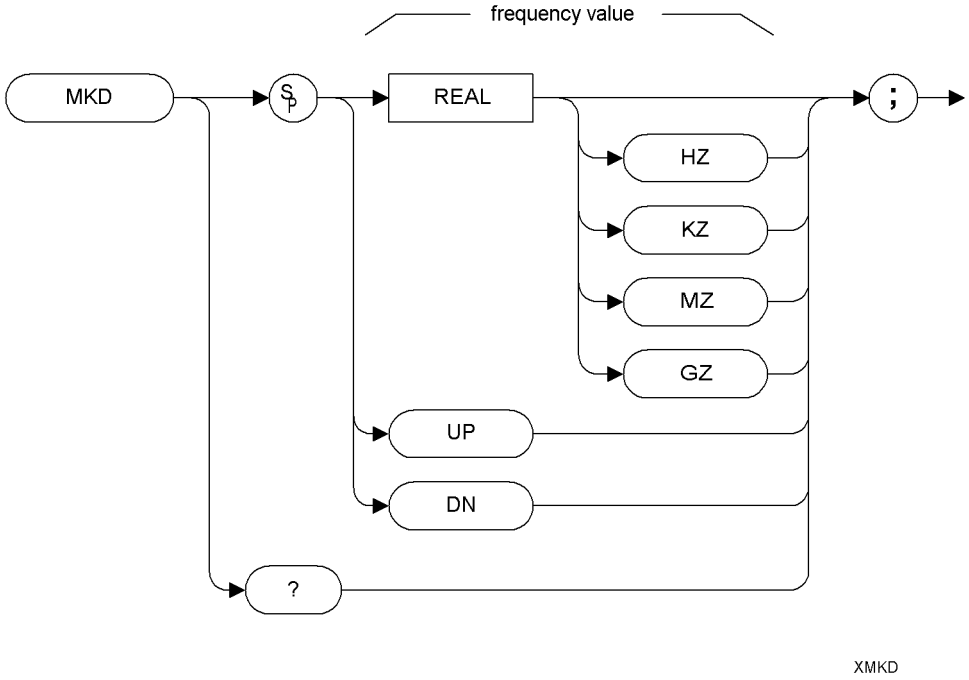
Description

Sets the center frequency equal to the marker frequency and moves the marker to the center of the screen.

NOTE The functions of the MKCF command are identical to the E2 command (page 101).

MKD
Marker Delta

Syntax



Step Increment: by 1/10 of the frequency span

Description

The MKD command computes the frequency and amplitude difference of the active marker and the delta marker. These values are displayed in the screen.

If a delta marker is not displayed on the screen, the MKD command places one at the specified frequency or on the right hand edge of the display. If an active marker is not displayed on the screen, the MKD command places an active marker at the center of the screen.

NOTE The active marker is the number 1 marker unless otherwise specified by the MKACT command (page 168).

NOTE

If the MKD command is executed with the marker noise function active (MKNOISE ON (page 177) or KSM (page 140)), the marker amplitude displayed and returned by the MKA? command (page 167) or the MA command (page 160) is the difference between the noise densities at the reference marker and at the delta marker.

If the MKD command is executed before marker noise has been activated, the marker noise amplitude that is displayed on the screen is the difference between the carrier wave power and the noise density at the delta marker position.

However, the value returned by an MKA? (page 167) command or by an MA command (page 160) will always be the difference between the noise densities at the two markers. That is, the values returned by MKA? and MA do not always agree with those displayed on the screen. These returned values will only be correct as long as there has been no change in either the delta marker or the marker noise on the front panel.

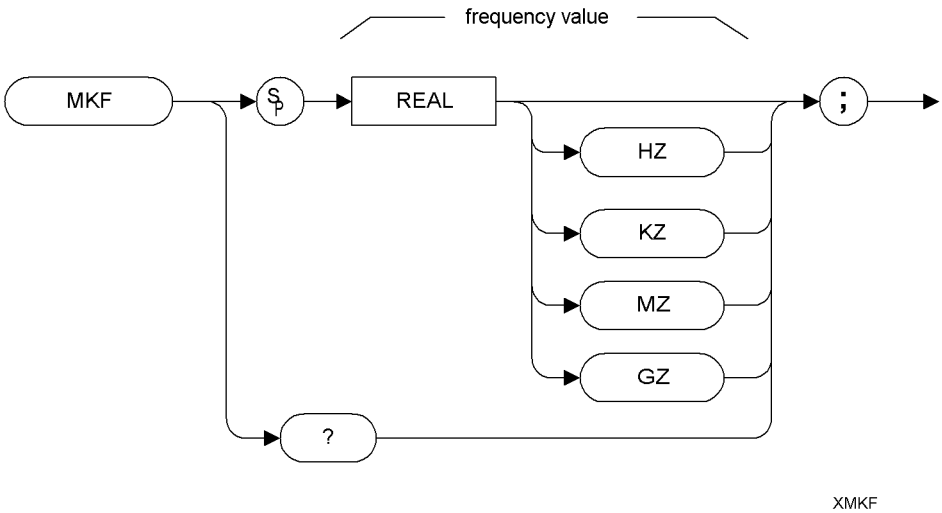
The nominal noise bandwidth to RBW ratio for the RBW filters used in the ESA-E series analyzers is 1.128 for RBWs of 1 kHz and higher, and 1.055 for RBWs of less than 1 kHz. The nominal ratio for PSA analyzers is 1.055 for all RBWs. The nominal ratio for the HP 8566 family of analyzers is 1.128 for RBWs 100 kHz and higher, and 1.114 for RBWs of 30kHz and lower.

NOTE

The functions of the MKD command are identical to the M3 command (page 158).

MKF
Marker Frequency

Syntax



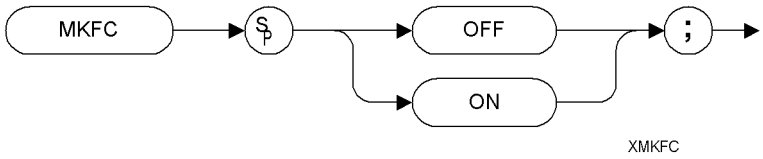
Description

Specifies the frequency value of the active marker.

The format of the returned data is determined by the TDF (Trace Data Format) (page 231) command and, if TDF B (binary data format) has been selected, by the MDS command (page 163).

MKFC
Marker Counter

Syntax



Description

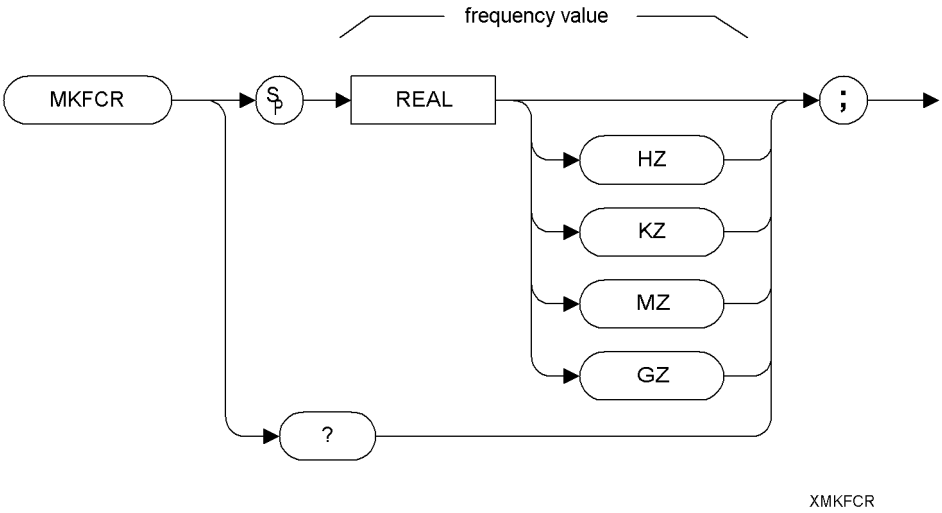
Turns on or off the marker frequency counter. The resolution of the frequency marker counter is determined by the MKFCR command (page 174).

NOTE The functions of the MKFC command are identical to the MC0 *[zero]* command (page 161) and MC1 *[one]* command (page 162).

NOTE This command is not supported when the remote language is HP8566B.

MKFCR
Marker Counter Resolution

Syntax



NOTE The marker counter can be specified in time units when operating in the time domain

Description

Sets the resolution of the marker frequency counter.

NOTE On PSA analyzers, setting the marker frequency resolution will cause the Gate Time to change. The Gate Time is calculated using the following formula:

$$\text{Gate Time} = \frac{1}{\text{Resolution Value}}$$

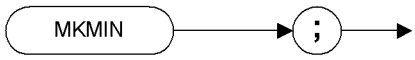
For restrictions on the Gate Time, refer to the PSA *User's and Programmer's Reference Guide*.

NOTE The functions of the MKFCR command are identical to the KS= command (page 119).

NOTE This command is not supported when the remote language is HP8566B.

MKMIN
Marker Minimum

Syntax



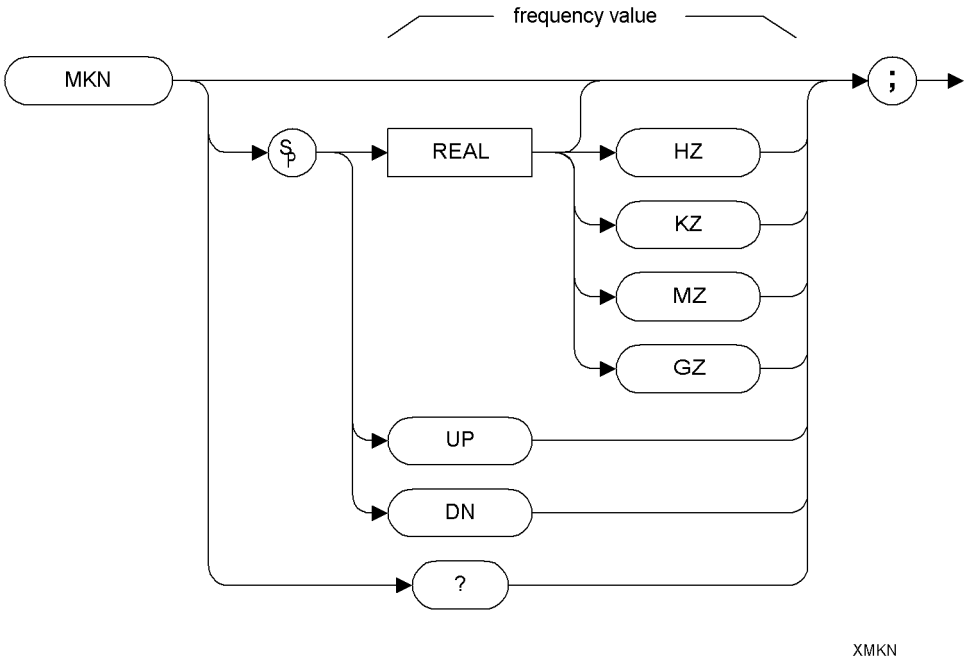
XMKMIN

Description

Moves the active marker to the minimum value detected.

MKN
Marker Normal

Syntax



Step Increment: by 1/10 of the frequency span.

Description

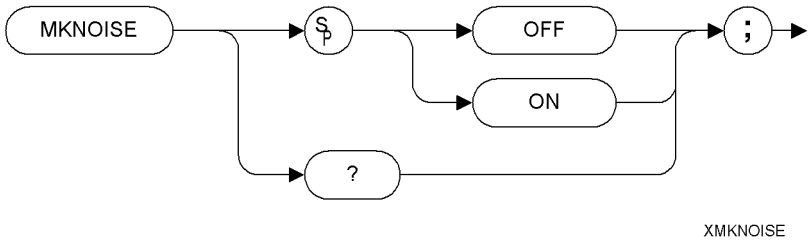
The MKN command moves the active marker to the specified frequency. If the active marker has not been declared with MKACT, a normal marker is turned on and this active marker is assumed to be 1. If the active marker type is not currently normal (for example, it is delta or peak), the MKN command will change it to a normal marker.

NOTE The functions of the MKN command are identical to the M2 *[two]* command (page 157).

NOTE This command is not supported when the remote language is HP8568B.

MKNOISE
Marker Noise

Syntax



Description

Displays the average RMS noise density at the marker.

NOTE The functions of the MKNOISE command are identical to the KSM command (page 140) and the KSL command (page 138).

NOTE If an MKD command or an M3 command is executed with the marker noise function active, the marker amplitude displayed and returned by the MKA? command (page 167) or the MA command (page 160) is the difference between the noise densities at the reference marker and at the delta marker.

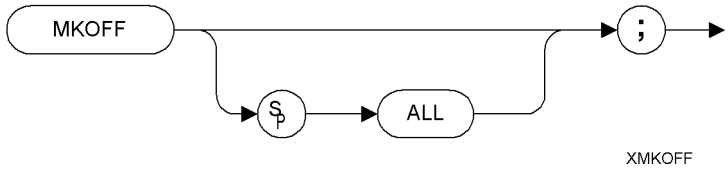
If an MKD command or an M3 command is executed before marker noise has been activated, the marker noise amplitude that is displayed on the screen is the difference between the carrier wave power and the noise density at the delta marker position.

However, the value returned by an MKA? (page 167) command or by an MA command (page 160) will always be the difference between the noise densities at the two markers. That is, the values returned by MKA? and MA do not always agree with those displayed on the screen. These returned values will only remain correct as long as there has been no change made to either the delta marker or the marker noise from the front panel.

The nominal noise bandwidth to RBW ratio for the RBW filters used in the ESA-E series analyzers is 1.128 for RBWs of 1 kHz and higher, and 1.055 for RBWs of less than 1 kHz. The nominal ratio for PSA analyzers is 1.055 for all RBWs. The nominal ratio for the HP 8566 family of analyzers is 1.128 for RBWs 100 kHz and higher, and 1.114 for RBWs of 30kHz and lower.

MKOFF
Marker Off

Syntax

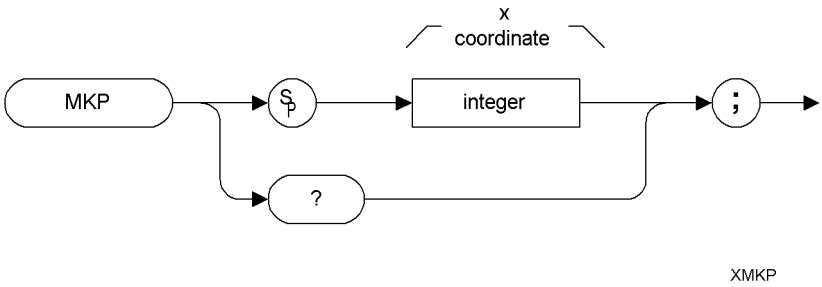


Description

Turns off either the active marker or all the markers. If the ALL parameter is omitted, only the active marker is turned off.

MKP
Marker Position

Syntax



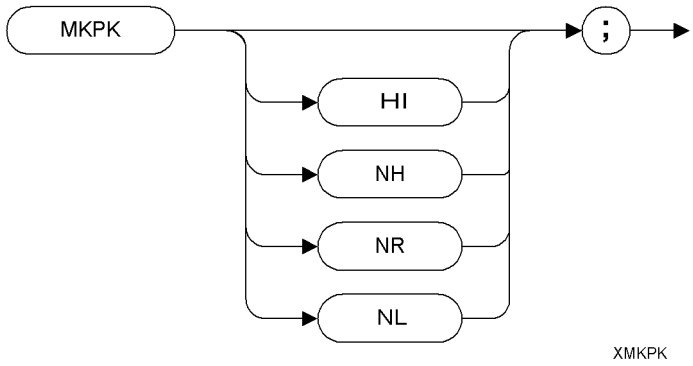
XMKP

Description

Places the active marker at the specified *X* co-ordinate.

MKPK
Marker Peak

Syntax



Description

Executing MKPK HI, or simply MKPK (no secondary keyword), positions the active marker at the highest signal detected. If an active marker is on the screen, the MKPK parameters move the marker as follows:

HI (highest) moves the active marker to the highest peak.

NH (next highest) moves the active marker to the next signal peak of lower amplitude.

NR (next right) moves the active marker to the next signal peak of higher frequency.

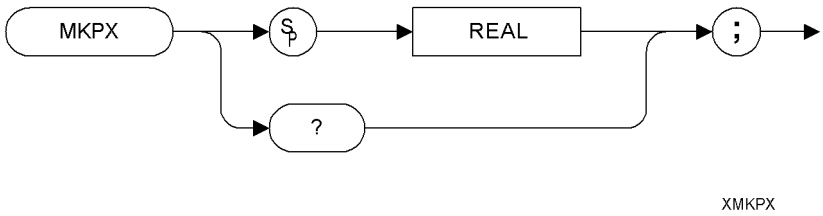
NL (next left) moves the active marker to the next signal peak of lower frequency.

NOTE The functions of the MKPK command (no secondary keyword) and the MKPK HI command are identical to the E1 commands: (page 100).

NOTE The functions of the MKPK NH command are similar to the KSK command (page 136), except that KSK does not take in to account the marker peak excursion value. For more details on marker peak excursion, see the MKPX command (page 181).

MKPX
Marker Peak Excursion

Syntax



XMKPX

Preset State: 6 dB.

Step Increment: by 1 dB.

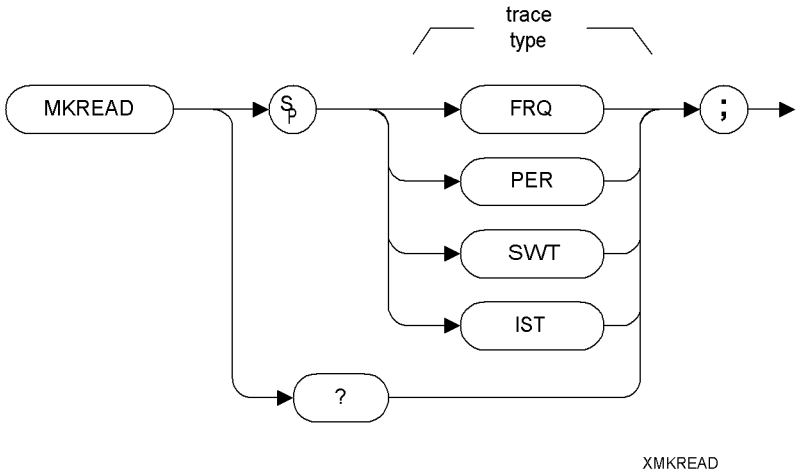
Description

Specifies the minimum signal excursion for the spectrum analyzer's internal peak identification routine.

The default value is 6 dB. In this case, any signal with an excursion of less than 6 dB on either side of the marker would not be identified. Thus, if an MKPK NH command were to be executed on such a signal, the analyzer would not place a marker on this signal peak.

MKREAD
Marker Readout

Syntax



Description

Selects the type of active trace information displayed by the spectrum analyzer marker readout.

The MKREAD command can select the following types of active trace information:

FRQ frequency

SWT sweep time

IST inverse sweep time

PER period

NOTE The Inverse Sweep Time (IST) readout is only available when using a delta marker in zero span.

The results of the data depend on the MKREAD parameter and the frequency span, and whether the marker delta function is used.

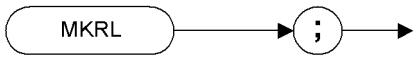
MKREAD Type	Non-Zero Span	Non-Zero Span Delta	Zero Span	Zero Span Delta
FRQ	Reads frequency	Reads delta frequency	N/A	N/A

MKREAD Type	Non-Zero Span	Non-Zero Span Delta	Zero Span	Zero Span Delta
SWT	Reads time since the start of sweep	Reads delta time between end points	Waveform measurements of detected modulation	Waveform measurements of detected modulation
IST	N/A	N/A	N/A	Computes frequency corresponding to delta of markers. Performs $1/(T_1 - T_2)$
PER	Period of frequency	(Pulse measurement) delta time	N/A	N/A

NOTE FFT (Fast Fourier Transform) is not available in the HP8566B/68B Code Compatibility option.

MKRL
Marker to Reference Level

Syntax



XMKRL

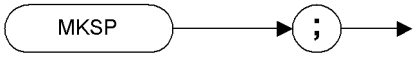
Description

The MKRL command moves the active marker to the reference level.

NOTE The functions of the MKRL command are identical to the E4 command (page 103).

MKSP
Marker to Span

Syntax



XMKSP

Description

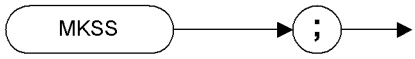
The MKSP command operates only when the delta marker is On (see MKD (page 170) or M3 (page 158).) When the delta marker is On and MKSP is executed, the delta marker and active marker determine the start and stop frequencies. The left marker specifies the start frequency, and the right marker specifies the stop frequency. If marker delta is Off, there is no operation.

NOTE If the active marker is not a delta marker, there is no change in its position.

NOTE The functions of the MKSP command are identical to the KSO command (page 144).

MKSS
Marker to Step Size

Syntax



XMKSS

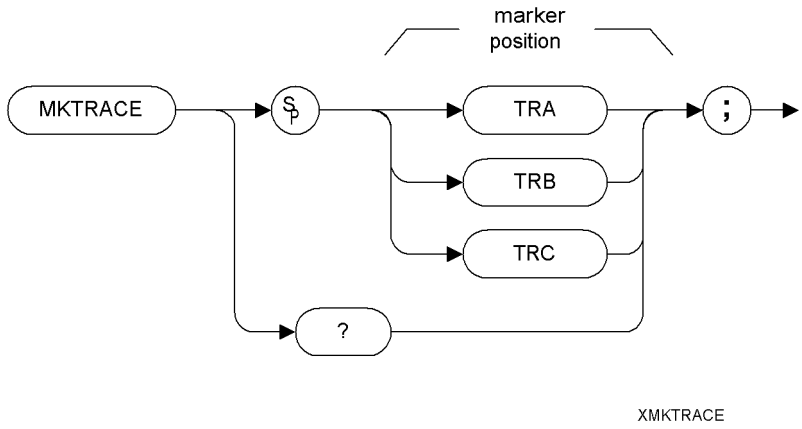
Description

Sets the center-frequency step-size equal to the marker frequency. If the analyzer is in the delta mode, the step size is set to the frequency difference between the active and the delta marker.

NOTE When the marker is a delta marker, the functions of the MKSS command are identical to the E3 command (page 102).

MKTRACE
Marker Trace

Syntax



XMKTRACE

NOTE TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

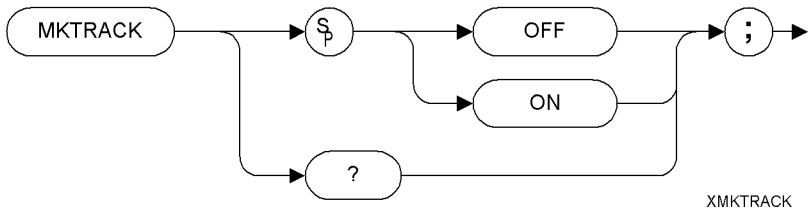
Description

Moves the active marker to the corresponding position in Trace 1, Trace 2, or Trace 3.

NOTE If the marker is moved to an inactive trace, the marker will move to the bottom of the screen on an ESA-E series analyzer, and to the top of the screen on a PSA analyzer.

MKTRACK
Marker Track

Syntax



Description

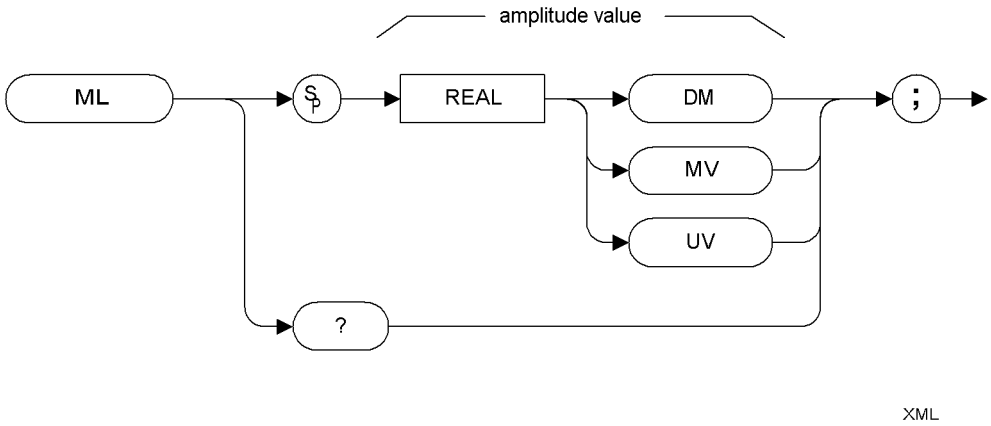
Moves the signal on which the active marker is located to the center of the spectrum analyzer display and keeps the signal peak at center screen.

To keep a drifting signal at center screen, place the active marker on the desired signal before turning on MKTRACK.

NOTE The functions of the MKTRACK command are identical to the MT0 *[zero]* command (page 190) and the MT1 *[one]* command (page 191).

ML
Mixer Level

Syntax



Description

The ML command specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

The effective mixer level is equal to the reference level minus the input attenuator setting.

NOTE If an external amplifier gain value is set, the mixer level is determined using the following equation:

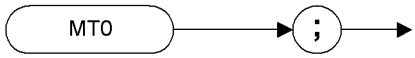
Mixer Level = Ref. Level - Attenuation + Ext. Amplifier Gain

The external amplifier gain is not preset by doing an IP command in case the analyzer is measuring a large signal. This is to protect the analyzer from damage from a large signal. For a helpful suggestion, see Chapter 3, “Hints and Tips,” on page 55.

NOTE The functions of the ML command are identical to the KS, command (page 118).

MT0 *[zero]* Marker Track Off

Syntax



XMT0

Description

The MT0 *[zero]* command disables the marker tracking mode.

NOTE The functions of the MT0 *[zero]* command are identical to the MKTRACK OFF command (page 188).

MT1 *[one]* Marker Track On

Syntax

XMT1

Description

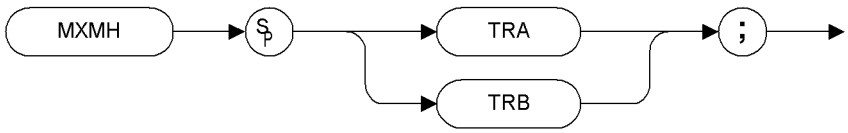
Moves the signal on which the active marker is located to the center of the spectrum analyzer display and keeps the signal peak at center screen.

To keep a drifting signal at center screen, place the active marker on the desired signal before issuing an MT1 *[one]* command.

NOTE The functions of the MT1 command are identical to the MKTRACK ON command (page 188).

MXMH
Maximum Hold

Syntax



XMXMH

Description

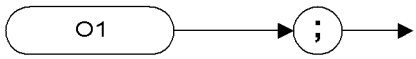
Updates each trace element with the maximum level detected.

MXMH updates the specified trace (either Trace A or Trace B) with a new value from a detector only if the new value is larger than the previous trace data value.

NOTE The functions of the MXMH command are identical to the A2 command (page 64)and B2 command (page 76).

O1 *[one]*
Format - Display Units

Syntax



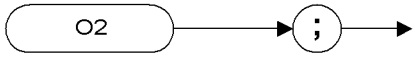
XO1

Description

The O1 *[one]* command transmits trace amplitude and position information as decimal values in display units.

O2 *[two]* Format - Two 8-Bit Bytes

Syntax



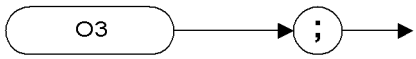
XO2

Description

The O2 *[two]* command transmits trace amplitude and position information as two 8-bit binary numbers, or one instruction word.

O3 *[three]*
Format - Real Amplitude Units

Syntax



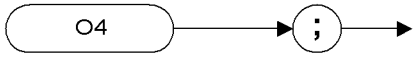
XO3

Description

The O3 *[three]* command transmits trace amplitude information only, in measurement units of Hz, dBm, dB, volts or seconds.

O4 *[four]*
Format - One 8-Bit Byte

Syntax



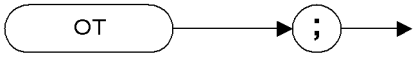
XO4

Description

The O4 *[four]* command transmits trace amplitude information only as a binary number.

OT
Output Trace Annotations

Syntax



XOT

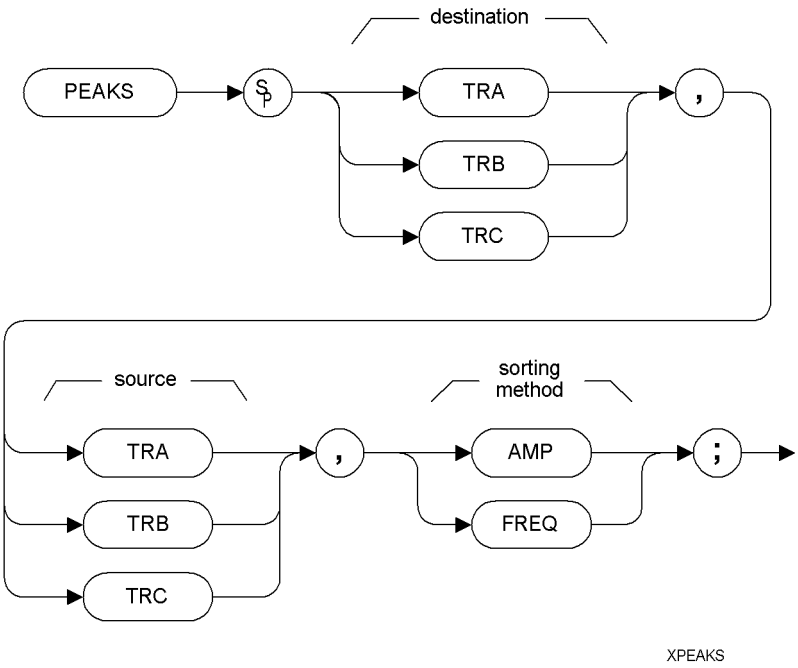
Description

The OT command sends 32 character-strings to the controller. Each character-string can be up to 64 characters long.

NOTE HP 8566B/68B Code Compatibility will not return any value in string numbers 1, 2 and 19 through 32.

PEAKS
Peaks

Syntax



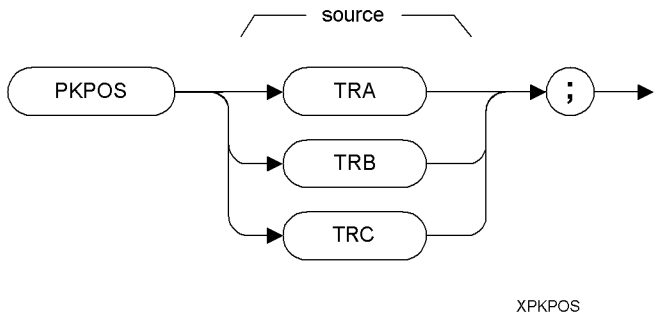
Prerequisite Commands: TS when using trace data

Description

The PEAKS command sorts the signal peaks in the source trace by frequency or amplitude, and sends the results to destination trace.

PKPOS
Peak Position

Syntax

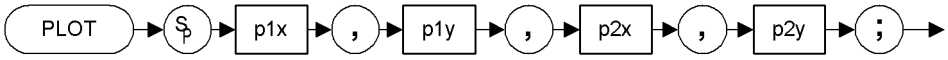


Description

The PKPOS command returns the *X* co-ordinate value of the maximum peak in the specified trace.

PLOT
Plot

Syntax



XPLOT

Description

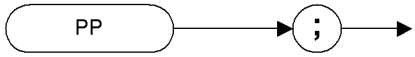
The PLOT command allows you transfer trace data, graticule and annotation information to a plotter.

NOTE The HP 8566B/HP 8568B transferred data directly to a plotter via the GPIB connection. The PLOT command now transfers data to a printer, and prints the entire screen. For instructions on connecting your analyzer to a printer, see the ESA-E and PSA User's Reference and Programming Guide.

NOTE Although the PLOT command will read in plotter dimension values, these will be ignored.

PP
Preselector Peak

Syntax



XPP

Description

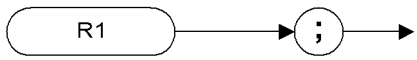
The PP command optimizes preselector tracking to peak the amplitude of a signal at the active marker. If a marker is not on the screen, PP places a marker at the highest signal level, and optimizes preselector tracking at that frequency.

NOTE This command is not supported when the remote language is HP8568B.

NOTE This command is only supported when the analyzer's maximum frequency limit is greater than 3 GHz. If the command is issued on an analyzer with a maximum frequency limit of 3 GHz or less, an error message will be generated stating that the command is not supported.

R1 *[one]* Illegal Command SRQ

Syntax



XR1

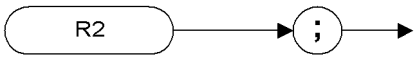
Description

The R1 *[one]* command deactivates all analyzer service requests (SRQs) except SRQ140, the illegal-command service request.

NOTE HP 8566B/68B Code Compatibility does not support the setting of bit 1 (units-key-pressed) of the status byte. Bit-1 of the status byte is always set to Off.

R2 *[two]* End-of-Sweep SRQ

Syntax



XR2

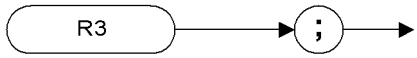
Description

The R2 *[two]* command activates the end-of-sweep and illegal-command service requests.

NOTE HP 8566B/68B Code Compatibility does not support the setting of bit 1 (units-key-pressed) of the status byte. Bit-1 of the status byte is always set to Off.

R3 *[three]* Hardware Broken SRQ

Syntax



XR3

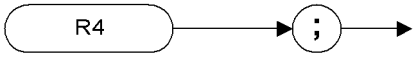
Description

The R3 *[three]* command activates the hardware-broken and illegal-command service requests.

NOTE HP 8566B/68B Code Compatibility does not support the setting of bit 1 (units-key-pressed) of the status byte. Bit-1 of the status byte is always set to Off.

R4 *[four]* Units-Key-Pressed SRQ

Syntax



XR4

Description

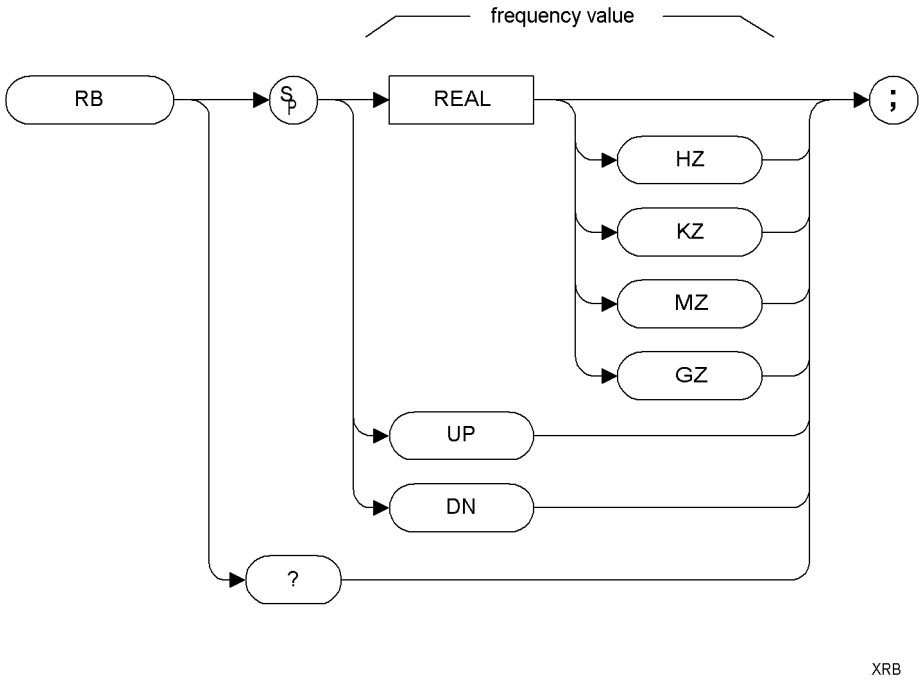
The R4 *[four]* command activate the units-key-pressed and illegal-command SRQs.

NOTE ESA and PSA analyzers cannot replicate the units-key-pressed service request since no front panel interaction is supported.

NOTE HP 8566B/68B Code Compatibility does not support the setting of bit 1 (units-key-pressed) of the status byte. Bit-1 of the status byte is always set to Off.

RB
Resolution Bandwidth

Syntax



Preset State: 3 MHz.

Step Increment: In a 1, 3, 10 series.

Description

The RB command specifies the resolution bandwidth. Available bandwidths are 10 Hz, 30 Hz, 300 Hz, 1 kHz, 3kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, and 3 MHz. The resolution bandwidths, video bandwidths, and sweep time are normally coupled. Executing RB decouples them. Execute CR (page 91) to reestablish coupling.

NOTE Default values on ESA and PSA analyzers may vary from the HP 8566B and the HP 8568B analyzers. Refer to the relevant ESA-E or PSA User Guide to find out any restrictions that may apply.

RC
Recall State

Syntax

XRC

Description

Recalls analyzer state data from the specified state register in the analyzer's memory.

Registers one through six are reserved for the user, and contain instrument states (such as front panel configuration) sorted with the SAVES command (page 216) or SV command (page 224).

NOTE Registers 7, 8 and 9 had specific uses in the HP8566B and HP 8568B analyzers. HP 8566B/68B Code Compatibility does not use these registers, so they are available for the your own use.

NOTE The functions of the RC command are identical to the RCLS command (page 208).

RCLS
Recall State

Syntax

XRCLS

Description

Recalls analyzer state data from the specified state register in the analyzer's memory.

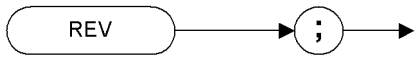
Registers one through six are reserved for the user, and contain instrument states (such as front panel configuration) sorted with the SAVES command (page 216) or SV command (page 224).

NOTE The functions of the RCLS command are identical to the RC command (page 207).

NOTE Registers 7, 8 and 9 had specific uses in the HP8566B and HP 8568B analyzers. HP 8566B/68B Code Compatibility does not use these registers, so they are available for the your own use.

REV
Revision

Syntax



XREV

Description

The REV command returns the firmware revision number.

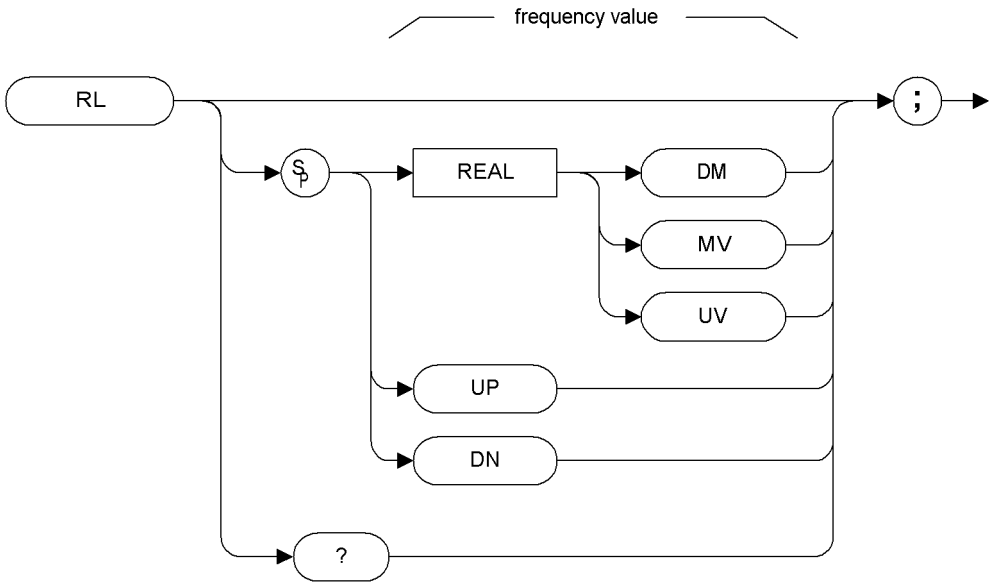
NOTE

In ESA and PSA analyzers, this command returns the build date of Option 266 that you have installed in your analyzer. The date is returned in YYWW format where YY is the number of years since 1950, and WW is the Work Week.

As an example, if your Option 266 HP 8566B/68B Code Compatibility firmware was built on May 23 2002, the number 5221 would be returned. The year 2002 is 52 years after 1950, and May 23 is the 21st week of the year, hence 5221.

RL
Reference Level

Syntax



XRL

Description

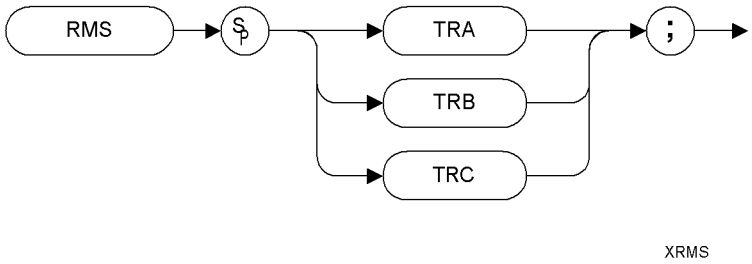
Specifies the amplitude level of the top graticule line on the display. This represents the reference level.

CAUTION Signal levels above +30 dBm will damage the spectrum analyzer. For a helpful suggestion on this subject, see Chapter 3, “Hints and Tips,” on page 55.

RMS
Root Mean Square Value

Returns the root mean square value of the trace in measurement units.

Syntax



Prerequisite Commands: TS when using trace data.

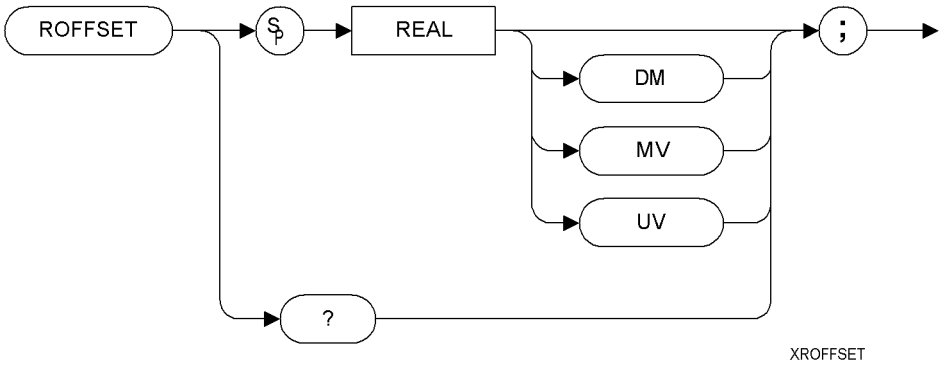
Description

Returns the RMS value of the trace in display units.

NOTE TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

ROFFSET
Reference Level Offset

Syntax



Description

Offsets all amplitude readouts without affecting the trace.

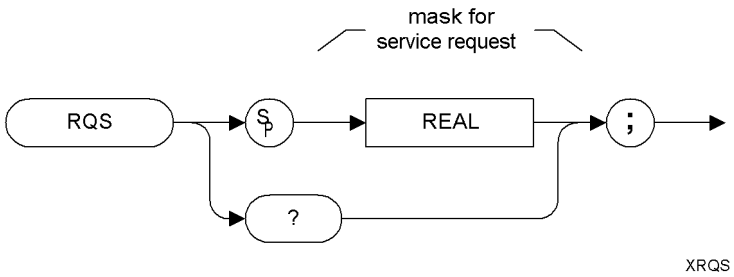
Once activated, the ROFFSET command displays the amplitude offset on the left side of the screen.

Entering ROFFSET 0 or presetting the spectrum analyzer eliminates an amplitude offset.

NOTE The functions of the ROFFSET command are identical to the KSZ command (page 151).

RQS
Service Request Mask

Syntax



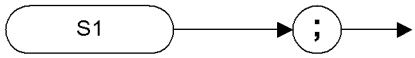
Description

Sets a bit mask for service requests.

NOTE Some differences may be noticed in the value returned by the RQS query when compared with the value set. This is because Option 266 on ESA and PSA analyzers does not support the use of bit-1 of the status byte. Bit-1 of the status byte is always set to Off.

S1*[one]* Continuous Sweep

Syntax



XS1

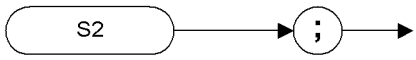
Description

The S1 command sets the spectrum analyzer to continuous sweep mode. In the continuous sweep mode, the spectrum analyzer takes its next sweep as soon as possible after the current sweep (as long as the trigger conditions are met). A sweep may temporarily be interrupted by data entries made over the remote interface.

NOTE The functions of the command S1 are identical to the CONTS command (page 90).

S2 *[two]* Single Sweep

Syntax



XS2

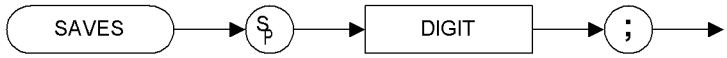
Description

The S2 command sets the analyzer to single sweep mode. Each subsequent time that the command S2 is sent, one sweep is started if the trigger conditions are met.

NOTE The functions of the S2 command are similar to the SNGLS command (page 218).

SAVES
Save State

Syntax



XSAVES

Description

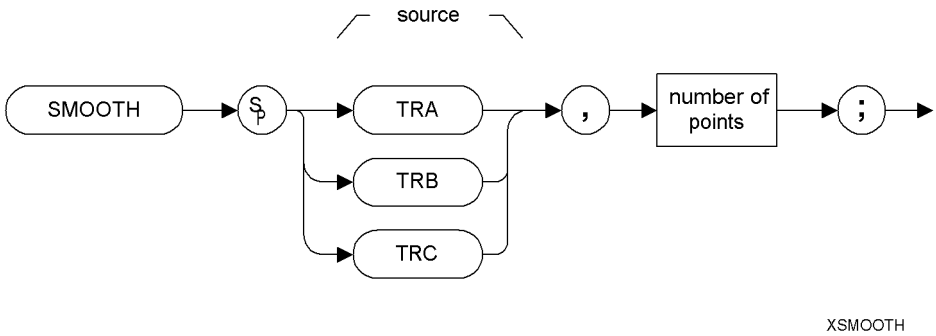
Saves the current state of the spectrum analyzer in any of the registers one through six.

NOTE Registers 7, 8 and 9 had specific uses in the HP8566B and HP 8568B analyzers. HP 8566B/68B Code Compatibility does not use these registers, so they are available for the your own use.

NOTE The functions of the SAVES command are identical to the SV command (page 224).

SMOOTH
Smooth Trace

Syntax



Prerequisite Commands: TS when using trace data.

Description

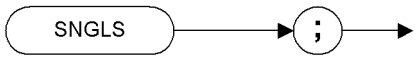
Smooths the trace according to the number of points specified for the running average.

Each point value is replaced with the average of the values (in measurement units) of the given number of points centered on it. Increasing the number of points increases smoothing at the cost of decreasing resolution. If the number of points is an even number, then the number of points is increased by one. If the number of points is larger than the size of SOURCE, then the size of SOURCE is used (unless size of SOURCE is even, in which case the size of SOURCE minus one is used). Smoothing decreases at the endpoints.

NOTE Some differences may be noticed between the smoothed trace in HP8566B/68B analyzers and the smoothed trace using the same signal in ESA-E and PSA analyzers.

SNGLS
Single Sweep

Syntax



XSNGLS

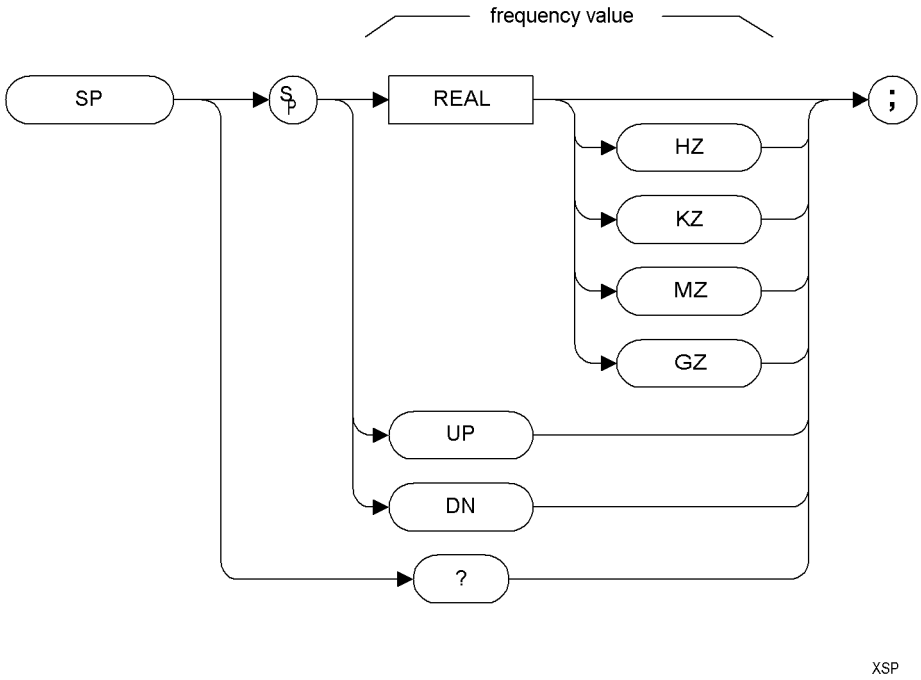
Description

Sets the spectrum analyzer to single-sweep mode. Each time TS (take sweep) is sent, one sweep taken as long as the trigger conditions are met.

NOTE The functions of the SNGLS command are similar to the S2 command (page 215).

SP
Frequency Span

Syntax



Step Increment: 1, 2, 5, 10 sequence (up to the stop frequency of the spectrum analyzer)

Description

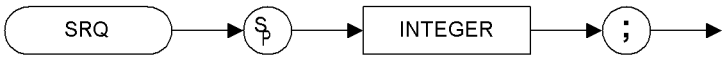
Changes the total displayed frequency range symmetrically about the center frequency.

If resolution and video bandwidths are coupled to the span width, the bandwidths change with the span width to provide a predetermined level of resolution and noise averaging. Likewise, the sweep time changes to maintain a calibrated display, if coupled. All of these functions are normally coupled, unless RB (page 206), VB (page 241), or ST (page 222) have been executed.

NOTE HP 8566B/68B Code Compatibility does not mimic the exact coupling behavior of the HP8566B or HP8568B analyzers. Refer to your ESA - or PSA User's and Programmer's Reference Guide for the values used.

SRQ
User-Defined SRQ

Syntax



XSRQ

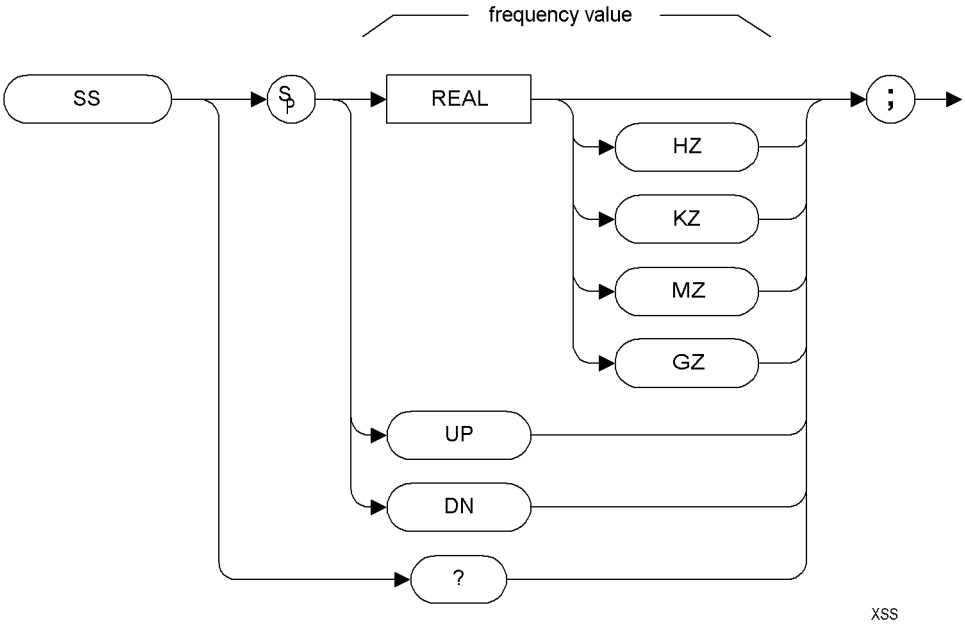
Description

The SRQ command sends a service request to the controller when the SRQ operand fits the mask supplied with the RQS command.

NOTE HP 8566B/68B Code Compatibility does not support the setting of bit 1 (units-key-pressed) of the status byte. Bit-1 of the status byte is always set to Off

SS
Center Frequency Step Size

Syntax

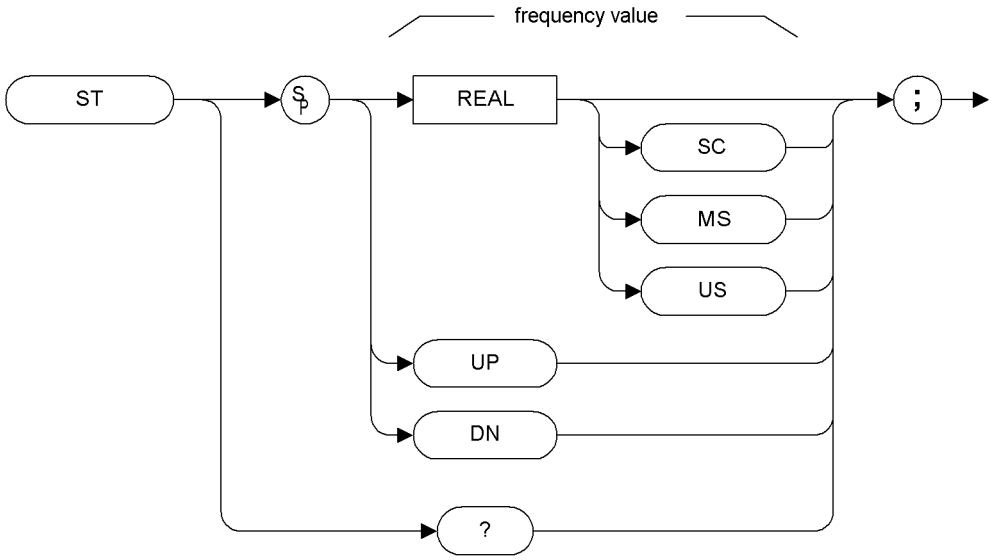


Description

Specifies center frequency step size.

ST
Sweep Time

Syntax



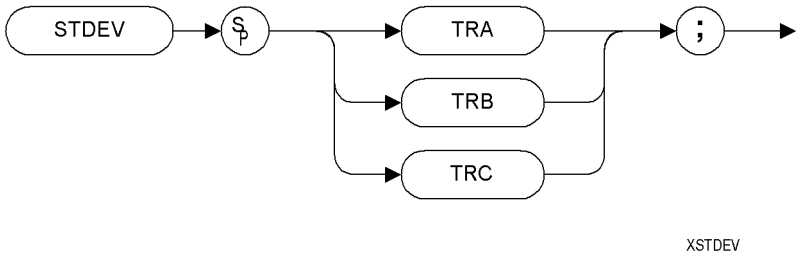
XST

Description

The ST command specifies the time in which the analyzer sweeps the displayed frequency or time span.

STDEV
Standard Deviation of Trace Amplitudes

Syntax



Prerequisite Commands: TS when using trace data

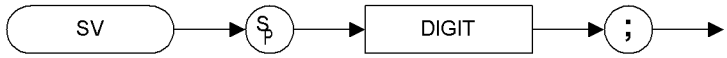
NOTE TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

Description

Returns the standard deviation of the trace amplitude in display units.

SV
Save State

Syntax



XSV

Description

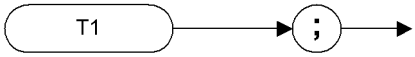
Saves the current state of the spectrum analyzer in any of the registers one through six.

NOTE Registers 7, 8 and 9 had specific uses in the HP8566B and HP 8568B analyzers. HP 8566B/68B Code Compatibility does not use these registers, so they are available for the your own use.

NOTE The functions of the SV command are identical to the SAVES command (page 216).

T1 *[one]*
Free Run Trigger

Syntax



XT1

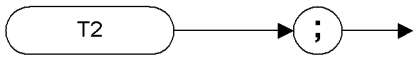
Description

The T1 *[one]* command sets the analyzer sweep to free run trigger mode.

NOTE The functions of the T1 *[one]* command are identical to the TM FREE command (page 233).

T2 *[two]* Line Trigger

Syntax



XT2

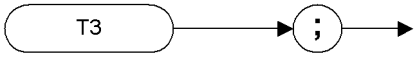
Description

The T2 *[two]* command sets the analyzer sweep to line trigger mode.

NOTE The functions of the T2 *[two]* command are identical to the TM LINE command (page 233).

T3 *[three]* External Trigger

Syntax



XT3

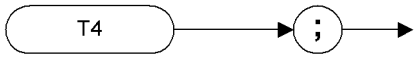
Description

The T3 *[three]* command sets the analyzer sweep to external trigger mode.

NOTE The functions of the T3 *[three]* command are identical to the TM EXT command (page 233).

T4 *[four]* Video Trigger

Syntax



XT4

Description

The T4 *[four]* command sets the analyzer sweep to video trigger mode.

NOTE The functions of the T4 *[four]* command are identical to the TM VID command (page 233).

TA
Trace A

Syntax

XTA

Description

Returns trace A amplitude values from the analyzer to the controller.

The display unit values are transferred in sequential order (from left to right) as seen on the screen. Display unit values can be transferred to the controller in any one of the four output formats as determined by the O1 *[one]* (page 193), O2 *[two]* (page 194), O3 *[three]* (page 195) and O4 *[four]* commands (page 196). The format of the returned data is also affected by the TDF (Trace Data Format) (page 231) command and, if TDF B (binary data format) has been selected, by the MDS command (page 163).

TB
Trace B

Syntax

XTB

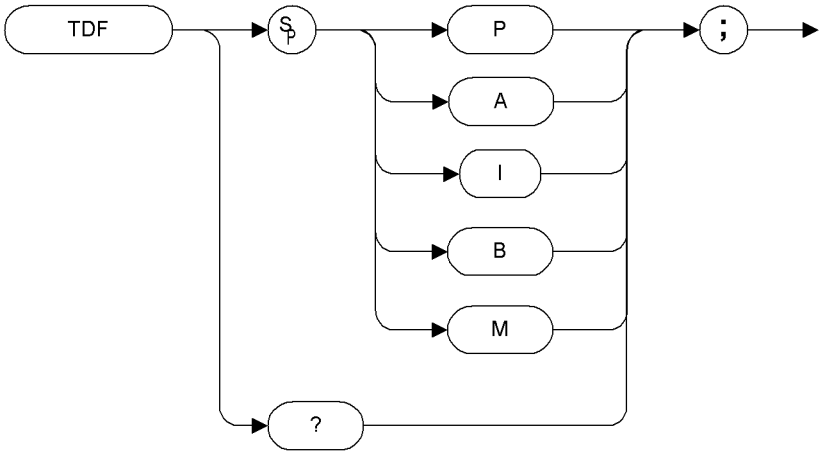
Description

Returns trace B amplitude values from the analyzer to the controller.

The display unit values are transferred in sequential order (from left to right) as seen on the screen. Display unit values can be transferred to the controller in any one of the four output formats as determined by the O1 *[one]* (page 193), O2 *[two]* (page 194), O3 *[three]* (page 195) and O4 *[four]* commands (page 196). The format of the returned data is also affected by the TDF (Trace Data Format) (page 231) command and, if TDF B (binary data format) has been selected, by the MDS command (page 163).

TDF
Trace Data Format

Syntax



XTDF

Description

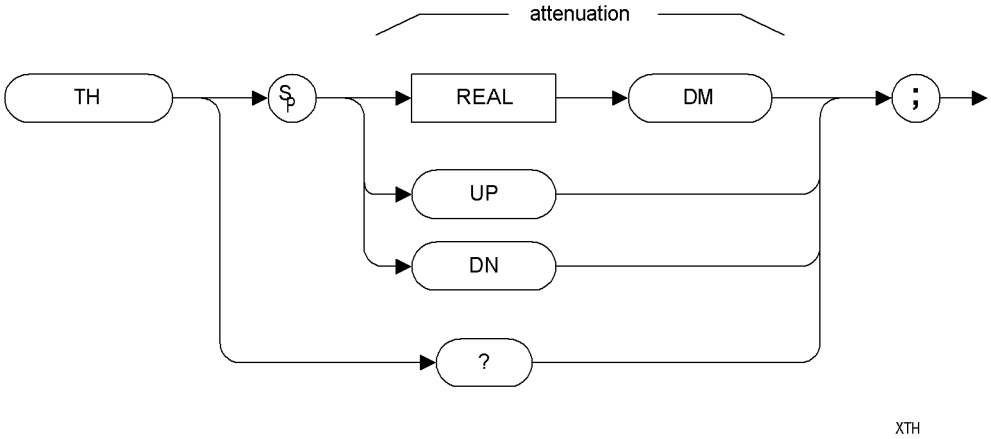
Formats trace information for return to the controller.

The different trace data formats are as follows:

- Specifying M enables the 01 format and returns values in display units, from 0 to 1001.
- Specifying P enables the 03 format and returns absolute measurement values, such as dBm or Hz.
- Specifying A returns data as an A-block data field. The MDS command determines whether data comprises one or two 8-bit bytes. (See MDS (page 163))
- Specifying I returns data as an I-block data field. The MDS command determines whether data comprises one or two 8-bit bytes. (See MDS (page 163))
- Specifying B enables the 02 or 04 format. The MDS command determines whether data comprises one or two 8-bit bytes

TH
Threshold

Syntax



Description

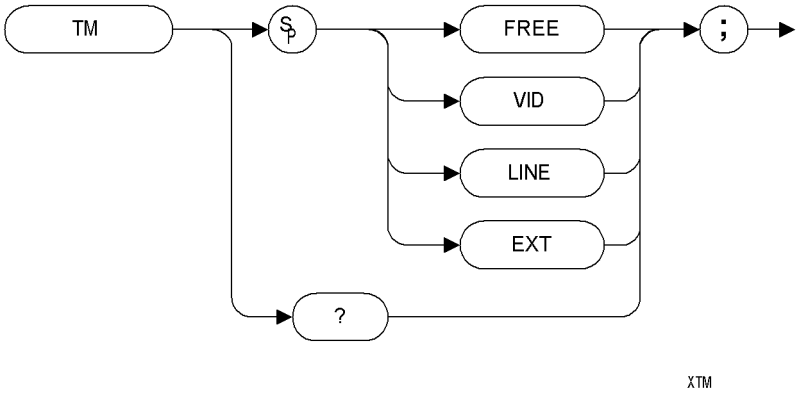
The TH command blanks signal responses below the threshold level, similar to a base line clipper. The threshold level is nine major divisions below the reference level, unless otherwise specified. The UP and DN commands move the threshold 10 dB.

NOTE

The HP 8566B and HP 8568B both blank the display of everything below the threshold level, but this is not the case with ESA and PSA analyzers. Using the PEAKS (page 198) and MKPK (page 180) commands causes any values below the threshold level to be disregarded, even though the full trace will still be displayed.

TM
Trigger Mode

Syntax



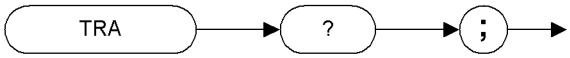
Description

Selects a trigger mode: free, line, video, or external.

NOTE The functions of the TM command are identical to the T1 (page 225), T2 (page 226), T3 (page 227) and T4 (page 228) commands.

TRA
Trace Data Input and Output

Syntax



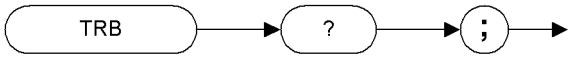
XTRA

Description

The TRA command transfers Trace A amplitude values from the analyzer to the controller. The units are display units, and the format depends on the trace data format selected.

TRB
Trace Data Input and Output

Syntax



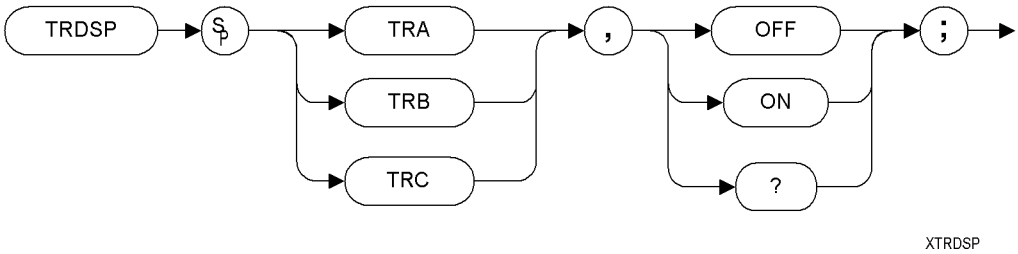
XTRB

Description

The TRB command transfers Trace B amplitude values from the analyzer to the controller. The units are display units, and the format depends on the trace data format selected.

TRDSP
Trace Display

Syntax

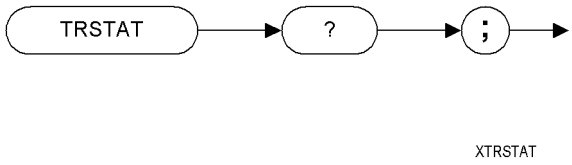


Description

The TRDSP command turns the display of the specified trace on or off.

TRSTAT
Trace State

Syntax

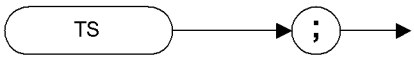


Description

The TRSTAT command returns trace states to the controller. Valid trace states are Clear-write, View, and Blank.

TS
Take Sweep

Syntax



XTS

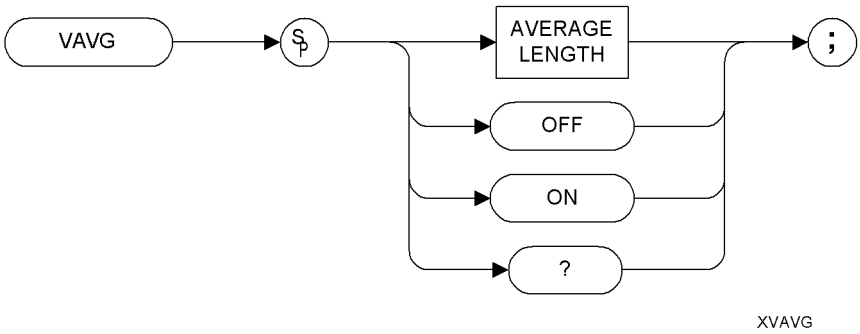
Description

Starts and completes one full sweep before the next command is executed.

A take sweep is required for each sweep in the single-sweep mode. TS prevents further input from the interface bus until the sweep is completed to allow synchronization with other instruments.

VAVG
Video Average

Syntax



Description

Enables the video-averaging function, which averages trace points to smooth the displayed trace. When queried, the VAVG command returns the average length.

Before executing the VAVG command, select Trace A or Trace B as the active trace (CLRW command (page 89)) and blank the remaining trace.

NOTE The functions of the VAVG command are identical to the KSG command (page 130) and KSH command (page 132).

NOTE There are a few differences in the way video averaging works in HP 8566B/68B Code Compatibility compared to the original spectrum analyzers. See the table below for a summary of these differences.

Table 4-9 Video Averaging Behavioral Differences

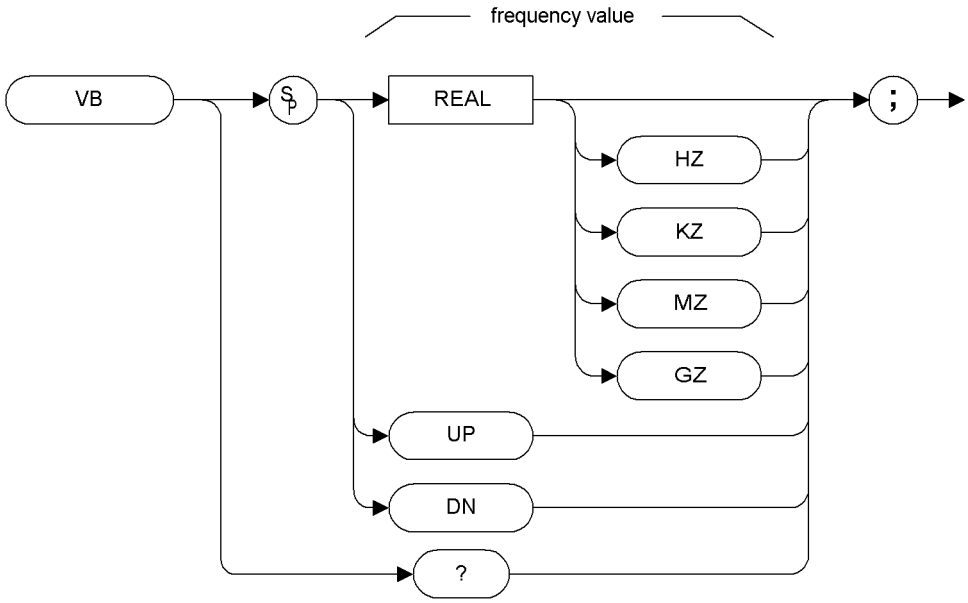
Condition	Original HP 8566B and HP 8568B Spectrum Analyzers	HP 8566B/68B Code Compatibility Option
Change in center frequency or span	In single sweep mode, resets counter to zero and starts the averaging again	In single sweep mode, resets counter to zero and starts the averaging again

Table 4-9 Video Averaging Behavioral Differences

Condition	Original HP 8566B and HP 8568B Spectrum Analyzers	HP 8566B/68B Code Compatibility Option
Change in resolution bandwidth, video bandwidth, sweep time, reference level or attenuation	In single sweep mode, resets counter to zero and starts the averaging again	Continues the measurement without resetting the counter.
Change in average counter setting to a higher value	Continues counting from where the previous value left off	Resets the counter to zero and starts the measurement again
Change in average counter setting to a lower value	Updates the screen annotation with the lower averaging value	Resets the counter to zero and starts the measurement again
All conditions	Original trace is displayed in Trace C	Only displays the averaged trace. The averaged trace is displayed in Trace A
Averaging turned on	Sweep time remains unchanged	Sweep time changes due to the selection of the sample detector

VB
Video Bandwidth

Syntax



XVB

Description

Specifies the video bandwidth, which is a post-detection, low-pass filter.

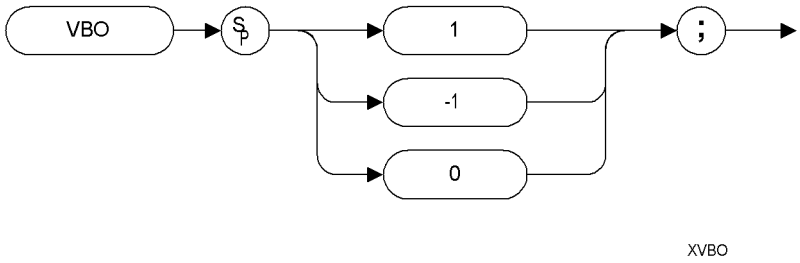
NOTE

Default values on the ESA and PSA analyzers may differ from the HP 8566B and HP 8568B analyzers. Refer to the relevant ESA and PSA User's and Programmer's Reference Guides for more details on the restrictions on the video bandwidth range.

When auto coupled, the video bandwidth is calculated as Resolution Bandwidth x Video:Resolution Bandwidth Ratio

VBO
Video Bandwidth Coupling Offset

Syntax



XVBO

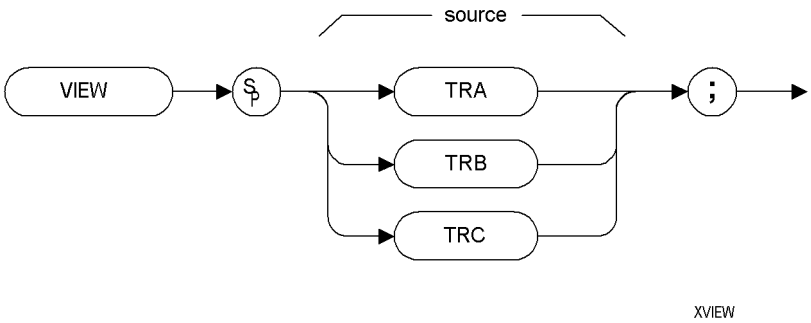
Description

The VBO command specifies the relationship between the video and resolution bandwidths which is maintained when these bandwidths are coupled. The bandwidths are usually coupled unless the RB command (page 206) or VB command (page 241) have been executed.

- When 0 is selected, the ratio remains fixed at 1. That is, the resolution bandwidth and the video bandwidth are always equal
- When 1 is selected, the video bandwidth is one step higher than the resolution bandwidth. That is, the video bandwidth:resolution bandwidth ratio is three.
- When -1 is selected, the video bandwidth is one step lower than the resolution bandwidth. That is, the video bandwidth:resolution bandwidth ratio is 0.3.

VIEW
View Trace

Syntax



Description

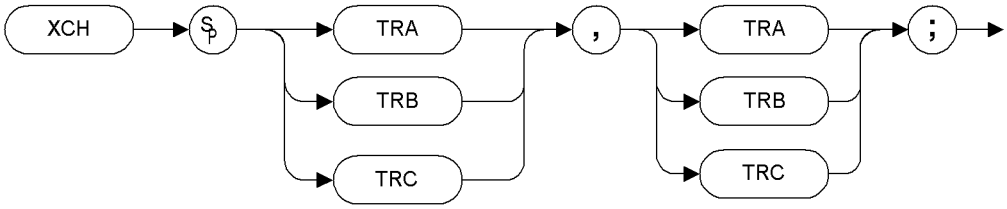
Displays Trace A, trace B, or trace C, and stops taking new data into the viewed trace.

NOTE The functions of the VIEW command are identical to the A3 (page 65), B3 (page 77) and KSj (page 135) commands.

NOTE TRA corresponds to Trace 1, TRB corresponds to Trace 2, and TRC corresponds to Trace 3.

XCH
Exchange

Syntax



XXCH

Description

The XCH command exchanges the contents of the source and destination traces. The traces are analyzed and adjusted to fit the number of display points on the screen which is typically 1001 points.

NOTE

The functions of the XCH TRA,TRB command are identical to the AXB (page 74) and EX (page 104) commands.

The functions of the XCH TRB,TRC command are identical to the BXC (page 83) and KSi (page 134) commands.

5 A Brief Introduction to the SCPI Language

SCPI Language Basics

This section is not intended to teach you everything about the SCPI (Standard Commands for Programmable Instruments) programming language. The SCPI Consortium or IEEE can provide that level of detailed information.

Topics covered in this chapter include:

- "Creating Valid Commands" on page 5-247
- "Command Keywords and Syntax" on page 5-246
- "Special Characters in Commands" on page 5-248
- "Parameters in Commands" on page 5-249
- "Putting Multiple Commands on the Same Line" on page 5-251

For more information refer to:

IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*. New York, NY, 1998.

IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols and Comment Commands for Use with ANSI/IEEE Std488.1-1987*. New York, NY, 1998.

Command Keywords and Syntax

A typical command is made up of keywords set off by colons. The keywords are followed by parameters that can be followed by optional units.

Example: `SENSe:FREQuency:STARt 1.5 MHZ`

The instrument does not distinguish between upper and lower case letters. In the documentation, upper case letters indicate the short form of the keyword. The lower case letters, indicate the long form of the keyword. Either form may be used in the command.

Example: Sens:Freq:Star 1.5 mhz

is the same as `SENSE:FREQ:start 1.5 MHz`

NOTE The command `SENS:FREQU:STAR` is not valid because `FREQU` is neither the short, nor the long form of the command. Only the short and long forms of the keywords are allowed in valid commands.

Creating Valid Commands

Commands are not case sensitive and there are often many different ways of writing a particular command. These are examples of valid commands for a given command syntax:

Command Syntax	Sample Valid Commands
`[SENSe:]BANDwidth[:RESolution] <freq>`	The following sample commands are all identical. They will all cause the same result. • `Sense:Band:Res 1700` • `BANDWIDTH:RESOLUTION 1.7e3` • `sens:band 1.7KHZ` • `SENS:band 1.7E3Hz` • `band 1.7kHz` • `bandwidth:RES 1.7e3Hz`
`MEASure:SPECtrum[n]?`	• `MEAS:SPEC?` • `Meas:spec?` • `meas:spec3?` The number 3 in the last meas example causes it to return different results then the commands above it. See the command description for more information.
`[:SENSe]:DETector[:FUNCtion] NEGative|POSitive|SAMPle`	• `DET:FUNC neg` • `Detector:Func Pos`
`INITiate:CONTinuous ON|OFF|1|0`	The sample commands below are identical. • `INIT:CONT ON` • `init:continuous 1`

Special Characters in Commands

Special Character	Meaning	Example
|	A vertical stroke between **parameters** indicates alternative choices. The effect of the command is different depending on which parameter is selected.	Command: `TRIGger:SOURce EXTernal|INTernal|LINE` The choices are external, internal, and line. Ex: `TRIG:SOURCE INT` is one possible command choice.
	A vertical stroke between **keywords** indicates identical effects exist for both keywords. The command functions the same for either keyword. Only one of these keywords is used at a time.	Command: `SENSe:BANDwidth|BWIDth:OFFSet` Two identical commands are: Ex1: `SENSE:BWIDTH:OFFSET` Ex2: `SENSE:BAND:OFFSET`
[ ]	keywords in square brackets are optional when composing the command. These implied keywords will be executed even if they are omitted.	Command: `[SENSe:]BANDwidth[:RESolution]:AUTO` The following commands are all valid and have identical effects: Ex1: `bandwidth:auto` Ex2: `band:resolution:auto` Ex3: `sense:bandwidth:auto`
< >	Angle brackets around a word, or words, indicates they are not to be used literally in the command. They represent the needed item.	Command: `SENS:FREQ <freq>` In this command example the word <freq> should be replaced by an actual frequency. Ex: `SENS:FREQ 9.7MHz`.

{ }	Parameters in braces can optionally be used in the command either not at all, once, or several times.	Command:
		`MEASure:BW <freq>{,level}`
		A valid command is:
		`meas:BW 6 MHz, 3dB, 60dB`

Parameters in Commands

There are four basic types of parameters: booleans, keywords, variables and arbitrary block program data.

OFF | ON | 0 | 1 (Boolean)

This is a two state boolean-type parameter. The numeric value 0 is equivalent to OFF. Any numeric value other than 0 is equivalent to ON. The numeric values of 0 or 1 are commonly used in the command instead of OFF or ON. Queries of the parameter always return a numeric value of 0 or 1.

keyword

The keywords that are allowed for a particular command are defined in the command syntax description.

Units

Numeric variables may include units. The valid units for a command depend on the variable type being used. See the following variable descriptions. The indicated default units will be used if no units are sent. Units can follow the numerical value with, or without, a space.

Variable

A variable can be entered in exponential format as well as standard numeric format. The appropriate range of the variable and its optional units are defined in the command description.

The following keywords may also be used in commands, but not all commands allow keyword variables.

- DEFault - resets the parameter to its default value.
- UP - increments the parameter.
- DOWN - decrements the parameter.
- MINimum - sets the parameter to the smallest possible value.
- MAXimum - sets the parameter to the largest possible value.

The numeric value for the function's MINimum, MAXimum, or DEFault can be queried by adding the keyword to the command in its query form. The keyword must be entered following the question mark.

Example query: `SENSE:FREQ:CENTER? MAX`

Variable Parameters

<freq> <bandwidth>	Is a positive rational number followed by optional units. The default unit is Hz. Acceptable units include: HZ, KHZ, MHZ, GHZ.
<time> <seconds>	Is a rational number followed by optional units. The default units are seconds. Acceptable units include: S, MS, US.
<voltage>	Is a rational number followed by optional units. The default units are V. Acceptable units include: Volts, V, MV, UV.
<power> <ampl>	Is a rational number followed by optional units. The default units are dBm. Acceptable units include: DBM, DBMV, W.
<rel_power> <rel_ampl>	Is a positive rational number followed by optional units. The default units are dB. Acceptable units include: DB.
<angle> <degrees>	Is a rational number followed by optional units. The default units are degrees. Acceptable units include: DEG, RAD.
<integer>	An integer value has no units.
<real>	Is a floating point number, with no units.
<percent>	Is a rational number between 0 and 100, with no units.
<string>	Is a series of alpha numeric characters.
<bit_pattern>	Specifies a series of bits rather than a numeric value. The bit series is the binary representation of a numeric value. There are no units. Bit patterns are most often specified as hexadecimal numbers, though octal, binary or decimal numbers may also be used. In the SCPI language these numbers are specified as: • Hexadecimal, #Hdddd or #hdddd where ‘d’ represents a hexadecimal digit 0 to 9 and ‘a’ to ‘f’. So #h14 can be used instead of the decimal number 20. • Octal, #Odddddd or #odddddd where ‘d’ represents an octal digit 0 to 7. So #o24 can be used instead of the decimal number 20.

- Binary, #Bddddddddddddddd or #bddddddddddddddd where 'd' represents a 1 or 0. So #b10100 can be used instead of the decimal number 20.

Block Program Data

Some parameters consist of a block of data. Block data There are a few standard types of block data. Arbitrary blocks of program data can also be used.

<trace> Is an array of rational numbers corresponding to displayed trace data. See FORMat:DATA for information about available data formats.

A SCPI command often refers to a block of current trace data with a variable name such as: Trace1, TRACE2, or trace3, depending on which trace is being accessed.

<arbitrary block data> Consists of a block of data bytes. The first information sent in the block is an ASCII header beginning with #. The block is terminated with a semi-colon. The header can be used to determine how many bytes are in the data block. There are no units.

For example, suppose the header is #512320.

- The first digit in the header (5) tells you how many additional digits/bytes there are in the header.
- The 12320 means 12 thousand, 3 hundred, 20 data bytes follow the header.
- Divide this number of bytes by your current data format (bytes/data point), either 8 (for real64), or 4 (for real32). For this example, if you're using real64 then there are 1540 points in the block.

Putting Multiple Commands on the Same Line

Multiple commands can be written on the same line, reducing your code space requirement. To do this:

- Commands must be separated with a semicolon (;).
- If the commands are in different subsystems, the key word for the new subsystem must be preceded by a colon (:).
- If the commands are in the same subsystem, the full hierarchy of the command key words need not be included. The second command can start at the same key word level as the command that was just executed.

SCPI Termination and Separator Syntax

A terminator must be provided when an instrument is controlled using RS-232. There are several issues to be understood about choosing the proper SCPI terminator and separator when this is the case. There is no current SCPI standard for RS-232. Although one intent of SCPI is to be interface independent, <END> is only defined for IEEE 488 operation. At the time of this writing, the RS-232 terminator issue was in the process of being addressed in IEEE standard 1174.

A semicolon (;) is not a SCPI terminator, it is a separator. The purpose of the separator is to queue multiple commands or queries in order to obtain multiple actions and/or responses. Make sure that you do not attempt to use the semicolon as a terminator when using RS-232 control.

All binary trace and response data is terminated with <NL><END>, as defined in Section 8.5 of 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.

The following are some examples of good and bad commands. The examples are created from a theoretical instrument with the simple set of commands indicated below:

```
[:SENSe]
     :POWer
          [:RF]
          :ATTenuation 40dB

:TRIGger
     [:SEQuence]
     :EXTernal [1]
          :SLOPe
               POSitive

[:SENSe]
     :FREQuency
          :STARt
     :POWer
     [:RF]
          :MIXer
               :RANGe
              [:UPPer]
```

Bad Command	Good Command
`PWR:ATT 40dB`	`POW:ATT 40dB`
The short form of **POWER** is **POW**, not **PWR**.	
`FREQ:STAR 30MHz;MIX:RANG -20dBm`	`FREQ:STAR 30MHz;POW:MIX:RANG -20dBm`
The **MIX:RANG** command is in the same **:SENSE** subsystem as **FREQ**, but executing the **FREQ** command puts you back at the **SENSE** level. You must specify **POW** to get to the **MIX:RANG** command.	
`FREQ:STAR 30MHz;POW:MIX RANG -20dBm`	`FREQ:STAR 30MHz;POW:MIX:RANG -20dBm`
MIX and **RANG** require a colon to separate them.	
`:POW:ATT 40dB;TRIG:FREQ:STAR 2.3GHz`	`:POW:ATT 40dB;:FREQ:STAR 2.3GHz`
:FREQ:STAR is in the **:SENSE** subsystem, not the **:TRIGGER** subsystem.	
`:POW:ATT?:FREQ:STAR?`	`:POW:ATT?;:FREQ:STAR?`
:POW and **FREQ** are within the same **:SENSE** subsystem, but they are two separate commands, so they should be separated with a semicolon, not a colon.	
`:POW:ATT -5dB;:FREQ:STAR 10MHz`	`:POW:ATT 5dB;:FREQ:STAR 10MHz`
Attenuation cannot be a negative value.	

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