Errata

Title & Document Type: 8562A/B Portable Spectrum Analyzer
Operating and Programming Manual

Manual Part Number: 08562-90001

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HP References in this Manual

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

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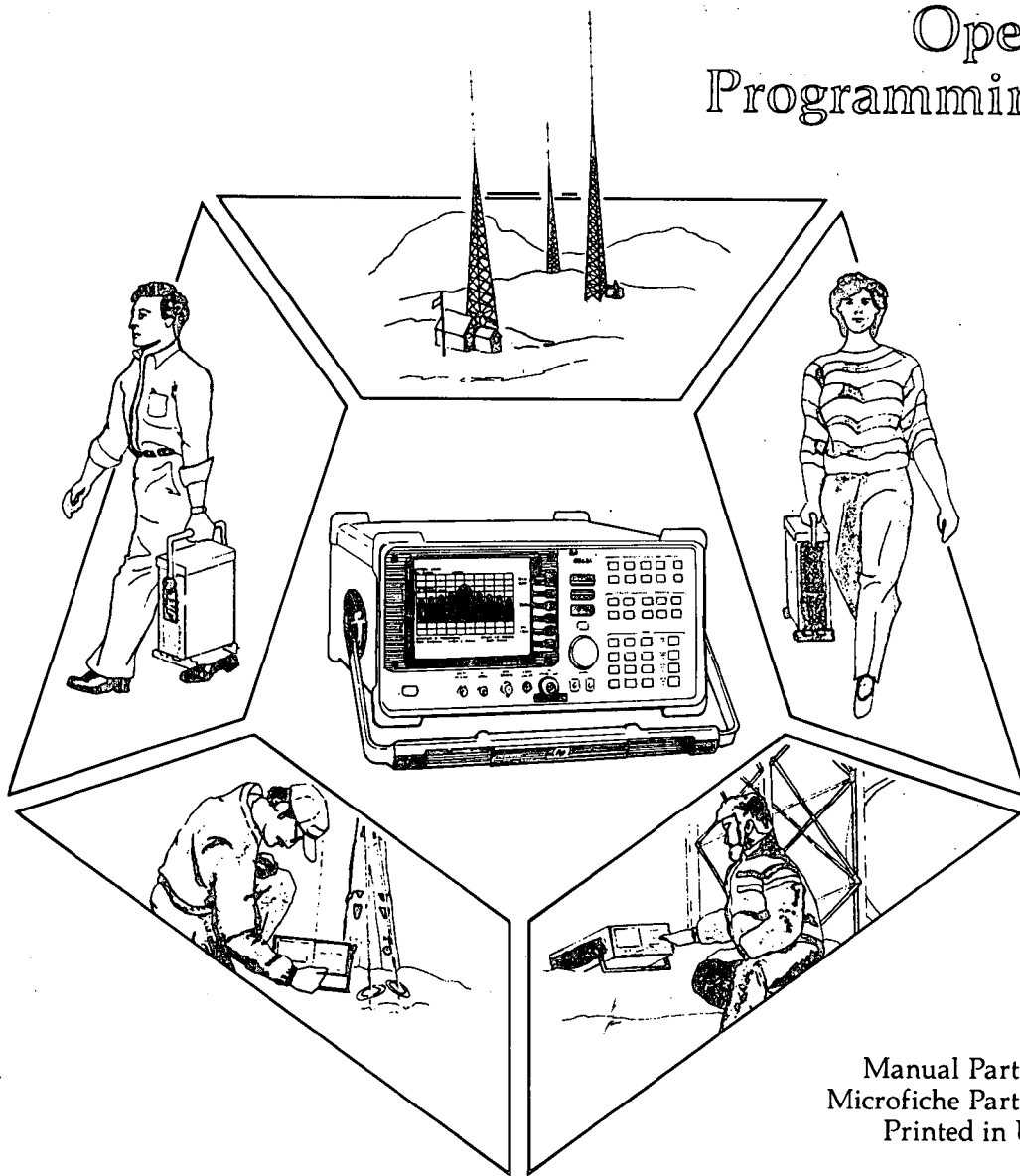
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HEWLETT PACKARD

HP 8562A/B High Performance Portable Spectrum Analyzer

Operating and Programming Manual

HP 8562A/B DOCUMENTATION DESCRIPTION

MANUALS SHIPPED WITH YOUR ANALYZER:

Installation Manual
HP Part Number 08562-90007

• Tells you how to install the spectrum analyzer

• Tells you what to do in case of a failure

Operating and Programming Manual
HP Part Number 08562-90001

• Tells you how to make measurements with your spectrum analyzer

• Tells you how to program your spectrum analyzer

• Describes analyzer features

Pocket Operating Guide
HP Part Number 08562-90003

• An abbreviated version of the Operating and Programming Manual

Quick Reference Guide
HP Part Number 08562-90006

• Provides you with a listing of all remote programming commands

OPTIONS:

Support Manual (Part of Option 915)*
HP Part Number 08562-90009

• Describes troubleshooting and adjustments of the analyzer

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* Option 915, Service Documentation, consists of one copy each of the Support Manual, the Installation Manual, the Operating and Programming Manual, the Pocket Operating Guide, and the Quick Reference Guide.

PAGE 1-2:

All Serials

Table 1.1. Front-panel connector data.
Change RF INPUT to INPUT 50Ω.
For INPUT 50Ω under FREQUENCY RANGE, change "1 kHz – 22 GHz" to "1 kHz – 22 GHz *(Option 026: 1 kHz – 26.5 GHz)*."
For INPUT 50Ω under AMPLITUDE/VOLTAGE LIMITS, change "+10 dBm Max" to "+30 dBm Max with 10 dB attenuation.."

PAGE 1-5:

All Serials

Paragraph 3
Change "0.5V/GHz from 0 – 22 GHz" to "0.5V/GHz from 0 – 22 GHz *(Option 026: 0.5V/GHz from 0 – 26.5 GHz)*."

PAGE 2-2:

All Serials

Paragraph 2, CENTER FREQ
Change "2.75 GHz – 22 GHz" to "2.75 GHz – 22 GHz *(Option 026: 2.75 GHz – 26.5 GHz)*."

PAGE 2-3:

All Serials

Paragraph 2, NOTE
Change "2.75 GHz – 22 GHz" to "2.75 GHz – 22 GHz *(Option 026: 2.75 GHz – 26.5 GHz)*."

All Serials

Paragraph 4, FULL SPAN
Change "the full span is 19.25 GHz" to "the full span is 19.25 GHz *(Option 026: 23.75 GHz)*."

PAGE 2-4:

All Serials

Table 2.1. Frequency bands and their minimum reference levels.
Under BAND, change "19.1 GHz – 22 GHz" to "19.1 GHz – 22 GHz *(Option 026: 19.1 GHz – 26.5 GHz)*."

PAGE 4-2:

All Serials

Table 4.1. State of instrument after [PRESET] is executed.
In the STATE column, make the following changes:
Change line 2, CENTER FREQ, from "12.38 GHz (HP 8562A)" to "12.38 GHz (HP 8562A) *Option 026: 14.63 GHz (HP 8562A)*."
Change line 3, SPAN, from "19.25 GHz (HP 8562A)" to "19.25 GHz (HP 8562A) *Option 026: 23.75 GHz (HP 8562A)*."
Change line 4, CF STEP, from "1.93 GHz, AUTO" to "1.93 GHz, AUTO *(Option 026: 2.375 GHz, AUTO)*."
Change line 20, SWEEP TIME, from "400 ms, AUTO" to "400 ms, AUTO *(Option 026: 500 ms, AUTO)*."

PAGE 4-13:

All Serials

Last paragraph, SIG ID→CF
Change "less than 22 GHz" to "less than 22 GHz *(Option 026: less than 26.5 GHz)."*

PAGE 5-2:

All Serials

Paragraph 7, .5V/GHz (FAV)
Change "0 Hz to 22 GHz" to "0 Hz to 22 GHz *(Option 026: 0 Hz to 26.5 GHz)."*

PAGE 5-3:

HP 8562A: 2805A
HP 8562B: 2809A

Paragraph 6, RES BW and RES BW AUTO MAN
Change the second sentence to read:

The bandwidth, which appears in the active function block, ranges from 100 Hz to 1 MHz in a 1, 3, 10 sequence and 2 MHz (3 MHz at –6 dB).

PAGE 5-7:

HP 8562A: 2805A
HP 8562B: 2809A

Paragraph 8
Above paragraph 8, PLOTTER MENU, add the following text:

PRINT/PLOT	Accesses a menu of print and plot modes which are described below.
PRINT	Prints the entire contents of the spectrum analyzer display (except for the menus and error codes). When PRINT is active, STOP PRINT appears in its place, allowing you to stop printing before it is finished.
COLOR PRINT	Prints the entire contents of the spectrum analyzer display (except for the menus and error codes) in color to the HP 3630A PaintJet printer. When COLOR PRINT is active, STOP PRINT appears in its place, allowing you to stop printing before it is finished. Colors of the printed display are fixed by the spectrum analyzer.

NOTE

If the HP 3630A PaintJet printer is not connected at the execution of COLOR PRINT, erroneous information will be printed.

PLOT	Same as PLOT ALL.
PLOT OPTIONS	Same as PLOTTER MENU.

PAGE 7-4:

HP 8562A: 2805A
HP 8562B: 2809A

After the last page of chapter 7, add the new pages 7A-1 through 7A-3, provided in this Manual Updating Supplement.

PAGE 13-4:

HP 8562A: 2805A
HP 8562B: 2809A

Paragraph 1, Preselector Control
After paragraph 1, add the following paragraph:

Printer Output
PRINT   Sends the analyzer display to a printer.

PAGE 14-66:

All Serials

Table 14.3. HP 8562A/B preset state.
In the STATE column, make the following changes:
    Change line 2, CENTER FREQ, from "12.38 GHz (HP 8562A)" to "12.38 GHz (HP 8562A) *Option 026: 14.63 GHz (HP 8562A)*."
    Change line 3, SPAN, from "19.25 GHz (HP 8562A)" to "19.25 GHz (HP 8562A) *Option 026: 23.75 GHz (HP 8562A)*."
    Change line 4, CF STEP, from "1.93 GHz, AUTO" to "1.93 GHz, AUTO *(Option 026: 2.375 GHz, AUTO)*."
    Change line 20, SWEEP TIME, from "400 ms, AUTO" to "400 ms, AUTO *(Option 026: 500 ms, AUTO)*."

PAGE 14-108

HP 8562A: 2805A
HP 8562B: 2809A

After page 14-108, add the new pages 14-108a and 14-108b, provided in this Manual Updating Supplement.

HOW TO USE THIS MANUAL

The HP 8562A/B Operating and Programming Manual contains detailed descriptions of all spectrum analyzer functions and remote operation commands, and provides instruction in remote operation. For instruction in manual operation and introductory remote operation, refer to the HP 8562A/B Pocket Operating Guide. The remote operation chapters in the Pocket Operating Guide prepare you for the more advanced topics discussed in the Operating and Programming Manual.

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CHAPTER 1

INSTRUMENT OVERVIEW

This chapter introduces the front- and rear-panel keys and connectors on the HP 8562A/B Spectrum Analyzer. Complete descriptions of each front-panel function appear in Chapters 2-5.

THE FRONT PANEL

The following paragraphs briefly describe the groups of front-panel keys shown in Figure 1.1.
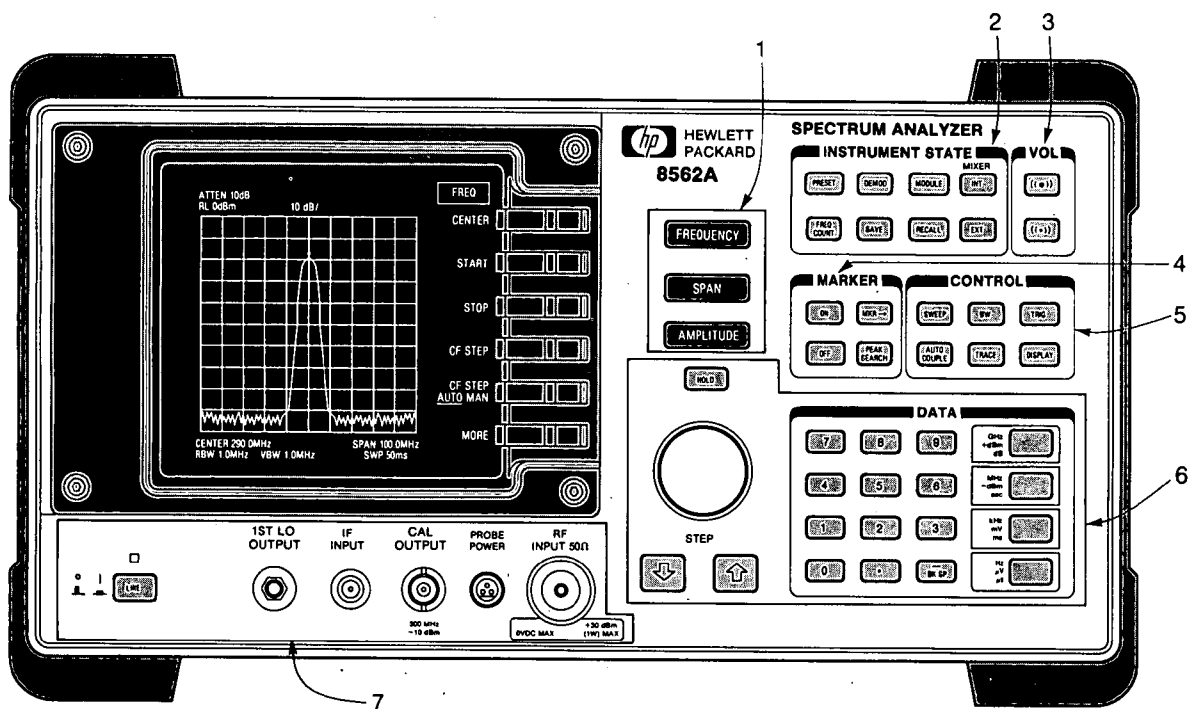

Fig. 1.1. HP 8562A/B front panel.

1. FREQUENCY, SPAN, and AMPLITUDE are the fundamental functions for most measurements.

2. INSTRUMENT STATE functions generally affect the state of the entire spectrum analyzer, not just of a single function.

3. VOL functions control the volume of the speaker in the spectrum analyzer. [((•))] increases volume, [((•))] decreases it.

4. MARKER functions, to describe a few, read out frequencies and amplitudes along the spectrum analyzer trace; allow you to make relative measurements; automatically locate the signal of highest amplitude on a trace; and tunes the analyzer to automatically track a signal.

5. CONTROL functions allow you to adjust the resolution and video bandwidths, the sweeptime, and the display, and to vary other functions that control spectrum analyzer measurement capabilities.

6. DATA keys, STEP keys, and the knob allow you to change the numeric value of an active function. Use the DATA keys to enter an exact value or to quickly move from one end of the frequency range to the other. The STEP keys vary a value in predefined increments or, for some functions, in increments that you choose. The knob allows you to "fine tune" most numeric values. The HOLD key freezes the active function and holds it at a set value until the function key is pressed again. HOLD also blanks the softkey menu.

7. The signal connections provide an RF input, active-probe power, a 300 MHz calibrator signal, a 310.7 MHz IF input, and a first LO output. These functions are described more fully in Table 1.1. The LINE button turns on the spectrum analyzer. The LED above indicates whether or not AC power is applied to the spectrum analyzer.

{ CAUTION }

The maximum input level to the RF input is +30 dBm with a minimum of 10 dB input attenuation. Maximum DC voltage to the RF input is 0 V. Exceeding either of these levels can damage the input attenuator and the input mixer.

CONNECTOR	FREQUENCY RANGE	AMPLITUDE/ VOLTAGE LIMITS
RF INPUT 50Ω	1 kHz – 22 GHz (up to XX GHz with external mixers) (Option 26 (kHz to 26.5 GHz)	0 Vdc Max +10 dBm Max
PROBE POWER		+15V, −12V (150 mA max)
CALIBRATOR OUTPUT	300 MHz	−10 dBm
IF INPUT	321.4 MHz	0 Vdc Max
LO OUTPUT	3 GHz –6.81 GHz	+16 dBm

Table 1.1. Front-panel connector data.

Display Annotation

Figure 1.2 illustrates the display annotation.
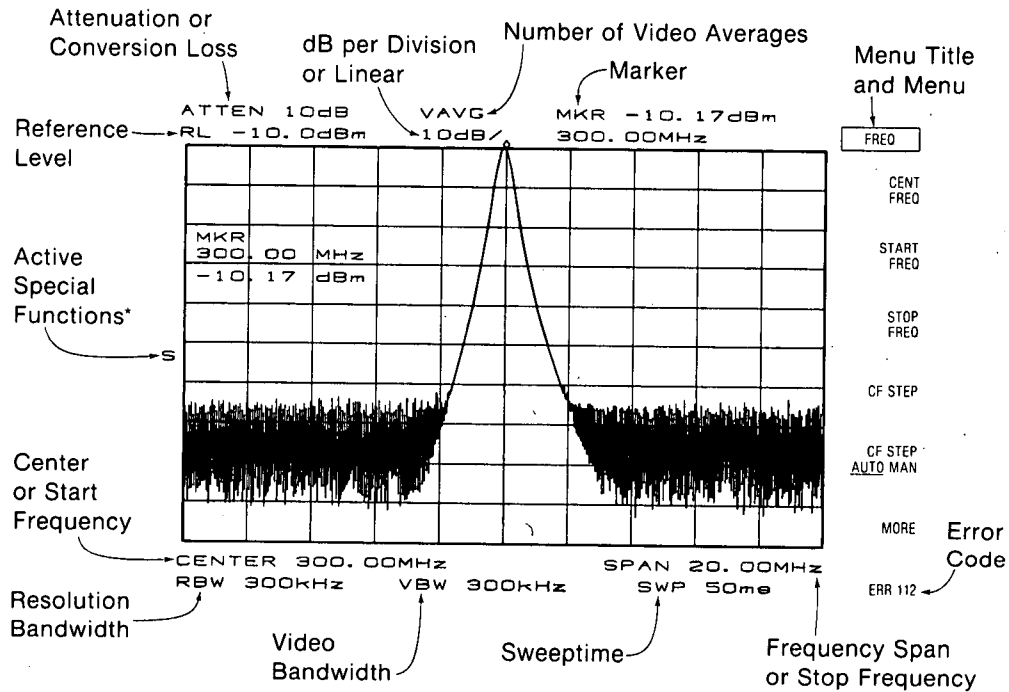
Fig. 1.2. Display annotation.

*The following characters appear in a vertical line and indicate activated functions:

T = Trigger Mode set to Line, Video, or External
D = Detector Mode set to Sample, Negative, or Positive
S = Single Sweep Active
F = Frequency Offset < > 0 Hz
X = External Frequency Reference Active
R = Reference Level Offset < > 0 dB
A = IF Adjust Turned Off
K = Signal Track Active
M = Trace Math On
+ = Positive External Mixer Bias On
— = Negative External Mixer Bias On

THE REAR PANEL

The following paragraphs describe the functions available from the rear panel, as shown in Figure 1.3.
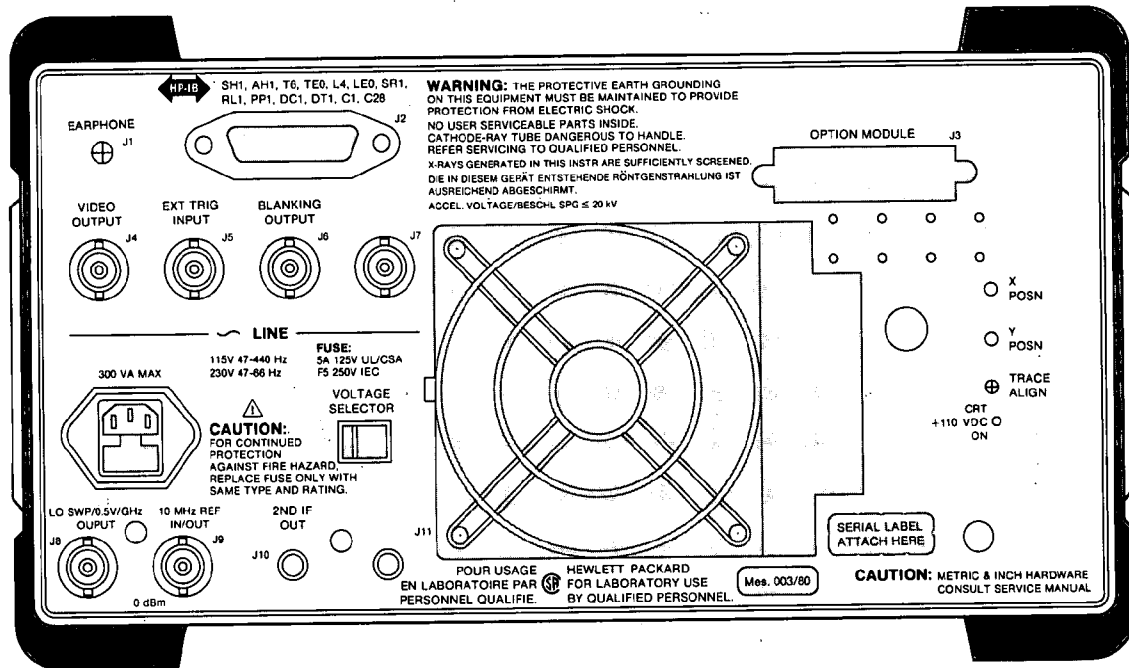
Fig. 1.3. HP 8562A/B rear panel.

> **CAUTION**
>
> To prevent damage to the instrument, be sure to set the voltage selector to the appropriate value for your local line-voltage output. For more information, refer to the Installation and Support Manual.

The LINE input operates at nominally 115 V (47-440 Hz) or at nominally 230 V (47-66 Hz).

J1 provides a 4Ω impedance earphone jack.

J2 is the Hewlett-Packard Interface Bus (HP-IB) connector.

J3 allows you to connect optional modules, such as the HP 85629A Test and Adjustment Module.

J4 provides a detected video output that is proportional to the vertical deflection of the CRT trace. The output range is 0-1 V when terminated in 50Ω, and can be used when the display is in 10 dB/div or LINEAR mode.

J5 provides an external trigger input. The input signal range is 0-5 V (TTL). When the trigger is in external mode, the instrument sweep triggers on the rising, positive edge of the signal (about 1.5 V).

J6 provides a blanking output from 0-5 V (TTL) that is low (0 V) during spectrum analyzer sweeps. The output is high (5 V) when the instrument is relocking between bands in multi-band sweeps. Use this output for pen lift when plotting with non-digital plotters. This output is also useful for synchronizing instruments.

J8 provides a 0-10 V ramp corresponding to the sweep ramp that tunes the local oscillator or a sweeping DC output of 0.5 V/GHz from 0-22 GHz. The output can be selected from the softkeys 0 → 10V LO SWP and .5 V/GHz, respectively, which are under the **SWEEP** menu. (Option 026: 0.5V/GHz from 0-26.5GHz)

J9 provides a 10 MHz, 0 dBm minimum, time-base reference signal. This connector can be switched to an input, in order to connect an external reference. An external reference must be 10 MHz at a minimum of 0 dBm. To select the external reference mode, use the softkey 10 MHZ INT EXT under the **FREQUENCY** menu.

X POSN, Y POSN, and TRACE ALIGN allow you to align the spectrum analyzer CRT using a special CRT pattern. Refer to the softkey CRT ADJ PATTERN under the **RECALL** menu, or consult the Installation and Support Manual.

CHAPTER 2

FREQUENCY, SPAN, AND AMPLITUDE FUNCTIONS

This chapter describes the functions available from FREQUENCY , SPAN , and AMPLITUDE .
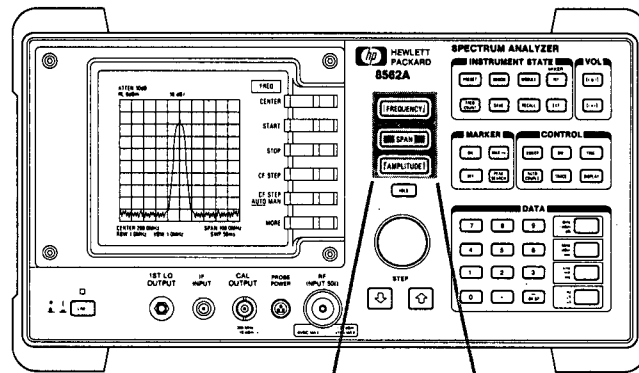
FREQUENCY

SPAN

AMPLITUDE

FREQUENCY

FREQUENCY

SPAN

AMPLITUDE

FREQUENCY accesses a menu of frequency-related functions, which are described below. **FREQUENCY** also activates the center frequency function when the spectrum analyzer is in the center frequency/span mode. If the analyzer is in start frequency/stop frequency mode, the start frequency is activated.

CENTER FREQ activates the center frequency and sets the spectrum analyzer to the center frequency/span mode. CENTER can be adjusted using the DATA keys, the STEP keys, or the knob. If a selected center frequency is not compatible with the current span (e.g., when a sweep would cross over from the 1kHz-2.9 GHz range to the 2.75 GHz-22 GHz range), the span is adjusted to the nearest value that will accommodate the desired center frequency.

Option 026   2.75 GHz - 26.5 GHz)

START FREQ activates the start frequency and sets the spectrum analyzer to the start frequency/stop frequency mode. START FREQ can be adjusted using the DATA keys, the STEP keys, or the knob. When adjusting START FREQ with other data controls, if the selected start frequency exceeds the stop frequency, the stop frequency increases to equal the start frequency.

STOP FREQ activates the stop frequency and sets the spectrum analyzer to the start frequency/stop frequency mode. STOP FREQ can be adjusted using the DATA keys, the STEP keys, or the knob. When adjusting STOP FREQ with other data controls, if the selected stop frequency is less than the start frequency, the start frequency decreases to equal the stop frequency.

CF STEP and CF STEP AUTO MAN adjust the center frequency step size. When this function is in coupled (AUTO) mode, pressing a STEP key yields a 1-division shift (10% of span) in the center frequency. For manual (MAN) mode, press either key to activate the step size. After entering a step size and changing the active function to CENTER FREQ, use the STEP keys to adjust the center frequency by the step size selected. This function is useful for quickly tuning to the harmonics of an input signal. For example, to tune to the harmonics of a 300 MHz signal, press CF STEP and enter 300 MHz. If the center frequency is at 300 MHz, pressing the STEP ⬆ key increases the center frequency to 600 MHz, which is equal to the second harmonic. Pressing ⬆ again increases the center frequency by another 300 MHz, to 900 MHz. CF STEP AUTO MAN indicates whether the step size is in a coupled (AUTO) or manual mode (MAN). When the step size is in manual mode, pressing CF STEP AUTO MAN returns the function to coupled mode.

MORE accesses additional, frequency-related functions, which are described below.

FREQ OFFSET adds an offset to the displayed frequency values, including marker frequency values. It does not affect the frequency range of the sweep. Enter the value using the DATA keys, the STEP keys, or the knob. When this function is active, an "F" appears on the left edge of the display.

10 MHz INT EXT allows you to select the internal frequency reference (INT) or to supply your own external reference (EXT). An external reference must be 10 MHz ±100 Hz at a nominal amplitude of 0 dBm (limits are from −2 dBm to +10 dBm). Connect the external reference to J9 on the rear panel.

PREV MENU accesses the previous softkey menu.

SPAN

FREQUENCY

SPAN

AMPLITUDE

SPAN accesses the menu of span-related functions, which are described below.

NOTE

The low band of the spectrum analyzer ranges from 1 kHz to 2.9 GHz. The upper band ranges from 2.75 GHz to 22 GHz. The frequency span cannot be set to overlap both bands at the same time. For example, two sweeps are required to cover the range of 2.0 GHz to 3.5 GHz: a low band to sweep from 2.0 GHz to 2.9 GHz and an upper band to sweep from 2.9 GHz to 3.5 GHz. *Option 026: 2.75 GHz — 26.5 GHz)*

SPAN WIDTH activates the span width function and sets the spectrum analyzer to center frequency/span mode. The span can be changed using the data keys, the step keys, or the knob. The span can be set to 0 Hz using either the DATA keys or the ZERO SPAN softkey.

FULL SPAN sets spectrum analyzer to the center frequency/span mode and sets the span to the maximum range. The maximum span selected depends upon whether the center frequency is in low band or the upper band. The full span for low band is 2.9 GHz; for the upper band, the full span is 19.25 GHz. *(Option 026: 23.75 GHz)*

ZERO SPAN sets the span to 0 Hz. This effectively allows an amplitude vs. time mode in which to view signals. This is especially useful for viewing modulation.

LAST SPAN sets the spectrum analyzer to the previously selected span, allowing you to toggle between two settings. For example, you can toggle between zero span and a larger span to view modulation in both the frequency and time domain.

SWEEP TIME and SWP TIME AUTO MAN adjust the sweep time of the spectrum analyzer. SWEEP TIME is normally a coupled function; that is, the analyzer selects an appropriate sweep time for the chosen span and bandwidth settings. If desired, the sweep time can be adjusted using the DATA keys, the STEP keys, or the knob. If the chosen sweep time is too fast for the measurement conditions, the message "MEAS UNCAL" appears on the display. To activate the sweep time function, press either softkey. A line under AUTO or MAN indicates whether the sweeptime is coupled (AUTO) or is in manual mode (MAN). If the sweep time is in manual mode, press SWP TIME AUTO MAN to return to the coupled mode.

AMPLITUDE

```
┌─────────────┐
│  FREQUENCY  │
└─────────────┘
```

```
┌─────────────┐
│    SPAN     │
└─────────────┘
```

```
┌─────────────┐
│  AMPLITUDE  │
└─────────────┘
```

AMPLITUDE activates the reference level function and accesses a menu of amplitude-related functions, which are described below.

REF LVL   activates the reference level function. The reference level can be adjusted using the DATA keys, the STEP keys, or the knob. When the spectrum analyzer scale is in dB/div, the reference level is the top-most horizontal line on the graticule. For best measurement accuracy, place the peak of a signal of interest on the reference level line. (For more information on this, refer to the HP 8562A/B Pocket Operating Guide.) The spectrum analyzer input attenuator is coupled to the reference level and automatically adjusts to avoid compression of the input signal. The function MAX MXR LEVEL, which is described below, is closely related to the reference level.

The minimum reference level available varies with the frequency band and the amplitude scale, as shown in Table 2.1. When switching bands, the reference level may automatically increase if the current reference level is not available in the new band.

	MINIMUM REFERENCE LEVEL	
BAND	LOG SCALE	LINEAR SCALE
1 kHz - 2.9 GHz	−120.0 dBm	2.2μV
2.75 GHz - 6.46 GHz	−120.0 dBm	2.2μV
5.8 GHz - 13 GHz	−115.0 dBm	4.0μV
12.4 GHz - 19.7 GHz	−105.0 dBm	12.6μV
19.1 GHz - 22 GHz	−100.0 dBm	22.4μV

$\left(Opt.\ 0261\ 19.1 - 26.5 GHz \right)$ $-100 dBm$ / $22.4\mu V$

Table 2.1. Frequency bands and their minimum reference levels.

ATTEN
and
ATTEN
AUTO MAN   adjusts the spectrum analyzer input attenuator. The attenuator ranges from 0 dB to 70 dB in 10 dB increments. Input attenuation can be adjusted using the DATA keys, the STEP keys, or the knob; 0 dB attenuation can be selected using only the DATA keys. Attenuation is normally a coupled function and automatically adjusts to changes in the reference level. The reference level, however, generally does not change when the attenuation changes. The attenuator adjusts so that the maximum signal amplitude at the input mixer is −10 dBm or less. For example, if the reference level is 23 dBm, the attenuation is 40 dB, for an input of −17 dBm at the mixer (23 − 40 = −17). This prevents signal compression. Press either ATTEN or ATTEN AUTO MAN to adjust the input attenuator. A line under AUTO or MAN indicates whether the attenuator is coupled (AUTO) or in manual mode (MAN). When the input attenuator is in manual mode, pressing ATTEN AUTO MAN recouples the attenuator to the reference level.

CAUTION

Maximum input signal amplitude is +30 dBm with at least 10 dB of input attenuation. Higher amplitude signals can result in damage to the input attenuator or to the input mixer.

LOG
dB/DIV   selects a 1, 2, 5, or 10 dB logarithmic amplitude scale. The default value is 10 dB/div. Any activated markers normally read out in dBm, and delta markers read the difference between the markers, in dB. If desired, it is possible to read other units while in a log-scale mode (see UNITS, below).

LINEAR   selects a linear amplitude scale. Measurements using a linear scale are normally read in volts, but other units can be selected (see UNITS, below).

MORE   accesses additional softkeys, which are described below.

REF LVL
CAL   allows you to calibrate the reference level. This procedure is described in Chapter 2 of the Pocket Operating Guide.

REF LVL
OFFSET   introduces an offset to all amplitude readouts, (e.g., reference level and marker amplitude). The offset is in dB, regardless of the selected scale and units. The offset can be useful to account for gains or losses in accessories connected to the input of the analyzer. To enter an offset value use the DATA keys, the STEP keys, or the knob. When this function is active, an "R" appears on the left edge of the display.

MAX MXR
LEVEL   selects the maximum signal amplitude seen at the input mixer. This value is always in dBm, regardless of the selected scale or units. MAX MIXER LEVEL is especially useful when distortion-free dynamic range is an important consideration.

The following procedure explains how to quickly check for signal compression. Increase the attenuation using the STEP key. If the signal peak shifts more than 1 dB, the signal is in compression. In this case, continue to increase the attenuation until the peak moves less than 1 dB between steps; then decrease the attenuation one step.

IF accesses a menu of adjustment functions, which are described below.
ADJUST

IF ADJ allows you to turn the automatic IF adjustment ON or OFF. This function
ON OFF is normally ON. When IF ADJ is ON, various parameters in the IF are
adjusted during the retrace time of the sweep. Several minutes and several
sweeps may be required to complete a cycle of all the adjustments. This
function automatically deactivates when the analyzer is set to zero span;
it may be reactivated, if desired. It is automatically reactivated when the
analyzer is set to a span greater than zero.

When IF ADJ ON OFF is off, an "A" appears in the active functions column
along the left side of the screen graticule.

ADJ CURR executes a routine that adjusts only the current state of the IF system.
IF STATE

FULL executes a complete adjustment of the IF system. Once activated, the soft-
IF ADJ key changes to STOP ADJUST which, if pressed, stops the IF adjustment
and returns the analyzer to its original state.

PREV accesses the previous menu of softkeys.
MENU

UNITS accesses additional amplitude functions, which are described below.

UNITS selects amplitude units automatically (AUTO) or manually (MAN). When
AUTO MAN in AUTO mode, the default units are dBm (in log scale) or VOLTS (in lin-
ear scale). The following units are available from this menu:

dBm (absolute decibel above 1 milliwatt)
dBμV (absolute decibel above 1 microvolt)
dBmV (absolute decibel above 1 millivolt)
VOLTS
WATTS

PREV accesses the previous menu of softkeys.
MENU

CHAPTER 3

MARKER FUNCTIONS

This chapter describes the functions available from the MARKER section of the front panel.

MARKER

ON   MKR⇒

OFF   PEAK SEARCH
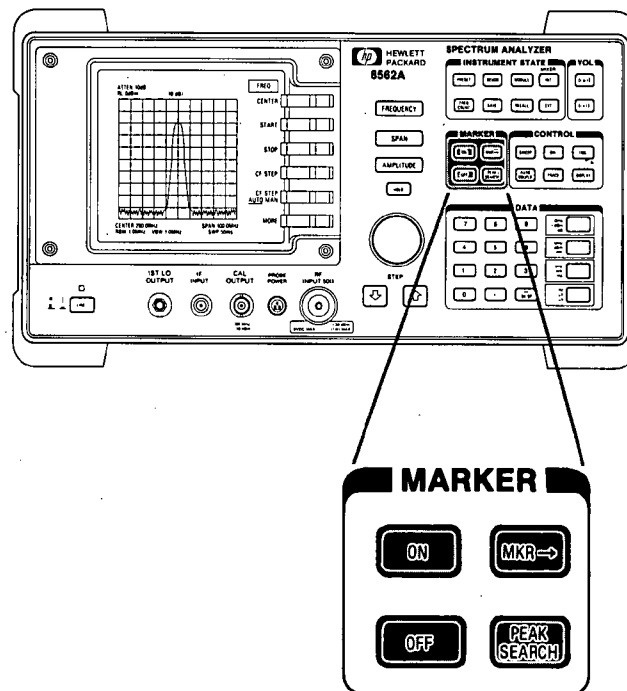
MARKER PRIORITY

Markers can be activated on Trace A or Trace B. However, the current state of the two traces determines on which trace the markers will appear. The trace states are listed below, in order of highest marker priority to lowest priority:

Trace A in Clear-Write Mode
Trace B in Clear-Write Mode
Trace A in Max-Hold Mode
Trace B in Max-Hold Mode
Trace A in View Mode
Trace B in View Mode

ON

```
  ██ MARKER ██
  ┌─────────────────┐
  │  ┌────┐  ┌────┐  │
  │  │ ON │  │MKR→│  │
  │  └────┘  └────┘  │
  │  ┌────┐  ┌──────┐│
  │  │OFF │  │ PEAK ││
  │  └────┘  │SEARCH││
  │          └──────┘│
  └─────────────────┘
```

ON accesses a menu of softkeys, which are described below. **ON** also activates the current marker mode (such as MARKER DELTA); if no mode is active, **ON** activates MARKER NORMAL.

MARKER
NORMAL
    activates a single marker and places it at the center of the trace. If one marker is already on, no operation takes place. If two markers are on (i.e., as in MARKER DELTA mode), MARKER NORMAL deletes the anchor marker and makes the active one the new, single marker. The marker reads the amplitude and the frequency (or the relative time, when the frequency span equals 0 Hz), and displays these values in the active function block and in the upper-right corner of the display. To move the marker, use either the knob, the STEP keys, or the DATA keys.

    The marker reads data from the currently active trace. (An active trace is one in either the clear-write or max-hold mode; this may be either Trace A or Trace B.) If both traces are active, or if both traces are in view mode, the marker reads data from Trace A.

MARKER
DELTA
    reads the difference in amplitude and frequency (or time, when the frequency span equals 0 Hz) between two markers, and displays these values in the active function block and in the upper-right corner of the display. If a single marker is already on, MARKER DELTA places both an anchor marker and an active (moveable) marker at the position of the original, single marker. To move the active marker, use either the knob, the STEP keys, or the DATA keys. If two markers are already on, pressing MARKER DELTA once makes it the active function. However, if MARKER DELTA is already the active function, pressing MARKER DELTA places the anchor marker at the same position as the active marker. The delta amplitude is displayed in dB, or as a ratio when linear units are selected. You can toggle between MARKER DELTA and MARKER 1/DELTA without changing the status of the markers.

MARKER
1/DELTA
    reads the reciprocal of the frequency or time difference between two markers, and displays this value in the active function block and in the upper-right corner of the display. If two markers are on and the frequency span is greater than 0 Hz, MARKER 1/DELTA reads the difference between the two markers in time. If two markers are on and the frequency span is equal to 0 Hz, MARKER 1/DELTA reads the difference in frequency. You can toggle between MARKER 1/DELTA and MARKER DELTA without changing the status of the markers.

    An example of how to use MARKER 1/DELTA appears in Appendix E of the Pocket Operating Guide.

MKRNOISE
ON OFF
    turns the marker noise function ON or OFF. This function normalizes the equivalent amplitude of the measured noise to a 1 Hz bandwidth. To do this, it sets the detector mode to sample and displays the average of 32 data points (sixteen data points on one side of the marker, the marker itself, and fifteen data points on the other side). This average is corrected for effects

of the log amplifier, bandwidth shape factor, RF detector, and resolution bandwidth. If two markers are on, MKRNOISE ON OFF works on the active marker and not on the anchor marker. Turning off the marker also turns off MKRNOISE ON OFF.

SIG TRK ON OFF turns the signal tracking function ON or OFF. The signal track function keeps the active marker on the signal where it has been initially placed and sets the center frequency to its value. This is done after every sweep, thus maintaining the marker signal at the center frequency. This allows you to quickly "zoom in" from a wide span to a narrow one without losing the signal from the screen. Or, use SIG TRK to keep a slowly-drifting signal centered on the display. When this function is active, a "K" appears on the left edge of the display.

OFF
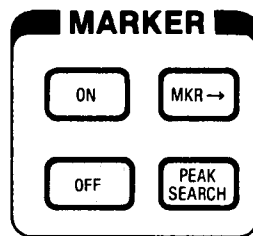
OFF turns off all markers, including frequency counter and demodulation markers.

PEAK SEARCH
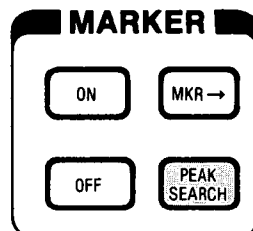
PEAK SEARCH places a marker on the highest point of a trace and accesses a menu of marker functions. The frequency and amplitude of the marker are displayed in the upper-right corner of the screen; PEAK SEARCH does not alter the active function. In most cases, PEAK SEARCH does not find the LO feedthrough as a peak. The functions available from the PEAK SEARCH menu are described below.

MARKER→   sets the center frequency equal to the marker frequency. This function provides a quick way
CF   to move a signal to the center of the screen. The active function is not affected. When the
frequency span is equal to 0 Hz, this key accesses the MARKER NORMAL function.

MARKER   reads the difference in amplitude and frequency (or time, when the frequency span equals
DELTA   0 Hz) between two markers, and displays these values in the active function block and in
the upper-right corner of the display. If a single marker is already on, MARKER DELTA places
both an anchor marker and an active (moveable) marker at the position of the original, sin-
gle marker. To move the active marker, use either the knob, the STEP keys, or the DATA keys.
If two markers are already on, pressing MARKER DELTA once makes it the active function.
However, if MARKER DELTA is already on, pressing MARKER DELTA places the anchor
marker at the same position as the active marker. The delta amplitude is displayed in dB,
or as a ratio when linear units are selected.

NEXT   moves the active marker to the next highest trace point relative to the current marker posi-
PEAK   tion. The next peak must meet the current peak excursion and peak threshold criteria in order
to be considered a peak. This function finds successively lower peaks when the key is pressed
repeatedly.

MKRNOISE   turns the marker noise function ON or OFF. This function normalizes the equivalent amplitude
ON OFF   of the measured noise to a 1 Hz bandwidth. To do this, it sets the detector mode to sample
and displays the average of 32 data points (sixteen data points on one side of the marker, the
marker itself, and fifteen data points on the other side). This average is corrected for effects
of the log amplifier, bandwidth shape factor, RF detector, and resolution bandwidth. If two
markers are on, MKRNOISE ON OFF works on the active marker and not on the anchor
marker. Turning off the marker also turns off MKRNOISE ON OFF.

SIG TRK   turns the signal tracking function ON or OFF. The signal track function keeps the active marker
ON OFF   on the signal where it has been initially placed and sets the center frequency to its value. This
is done after every sweep, thus maintaining the marker signal at the center frequency. This
allows you to quickly "zoom in" from a wide span to a narrow one without losing the signal
from the screen. Or, use SIG TRK to keep a slowly-drifting signal centered on the display.
When this function is active, a "K" appears on the left edge of the display.

MORE   accesses additional marker functions, which are described below.

NEXT PK   finds the next peak to the right of the current marker position. The trace peak must meet
RIGHT   the current peak excursion and peak threshold criteria in order to be considered a peak.

NEXT PK   finds the next peak to the left of the current marker position. The trace peak must meet the
LEFT   current peak excursion and peak threshold criteria in order to be considered a peak.

PEAK   defines what constitutes a peak on a trace. To enter a value, use the DATA keys, STEP keys,
EXCURSN   or the knob and terminate the entry with dB. The value specifies the amount that a
trace must increase monotonically and then decrease monotonically in order to be a peak.
For example, if the peak excursion is 5 dB, the amplitude of the sides of a candidate peak
must descend at least 5 dB in order to be considered a peak (see Figure 3.1). The excursion
values range from 0.1 to 99 dB. The default value is 6 dB.

Any portion of a peak that falls below the peak threshold is also used to satisfy the peak
excursion criteria. For example, when the peak excursion is equal to 6 dB, a peak that is equal
to 3 dB above the peak threshold will be found if the peak extends an additional 3 dB or more
below the threshold.

```
✳ATTEN  20dB                          MKR  -10.00dBm
 RL  0dBm                   10dB/      288MHz
```

A Peak:
Signal Increases
then Decreases
by 10 dB.

PEAK EXCURSION
10.00 dB

Not a Peak:
Signal Increases
then Decreases by
Less than 10 dB.

```
 START  270MHz                 STOP  2.900GHz
 RBW  1.0MHz      ✳VBW  3.0kHz        SWP  3.0sec
```

Fig. 3.1. PEAK EXCURSN defines the peaks on a trace.

PEAK THRESHLD sets the minimum amplitude level from which a peak on the trace can be detected. This function places a dashed line across the graticule to denote the selected level. To enter a value, use the DATA keys, the STEP keys, or the knob and terminate the entry with [+dBm] or [-dBm]. The default is −120 dBm.

Any portion of a peak that falls below the peak threshold is also used to satisfy the peak excursion criteria. For example, when the peak excursion is equal to 6 dB, a peak that is equal to 3 dB above the threshold will be found if the peak extends an additional 3 dB or more below the threshold.
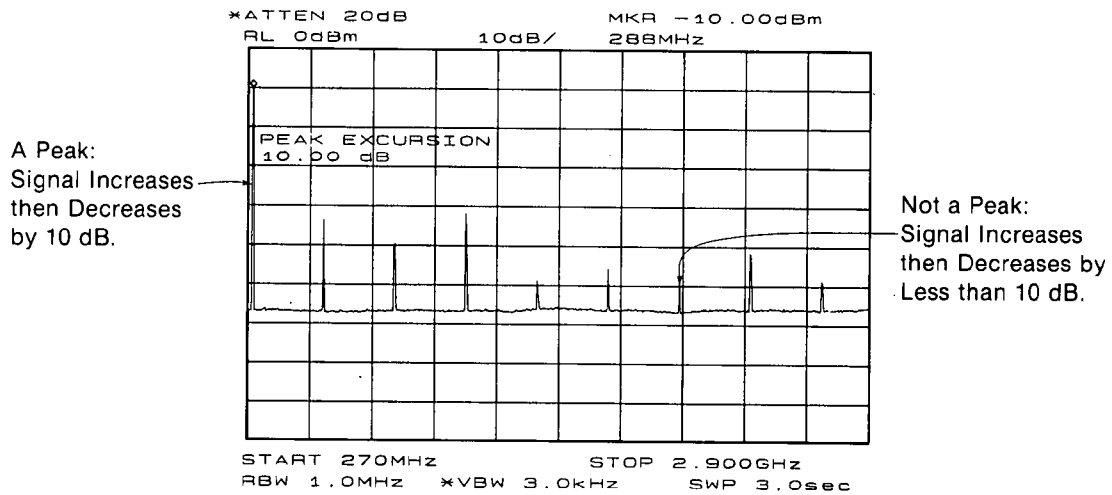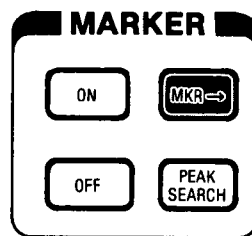
PREV MENU displays the previous softkey menu.

MKR →

MARKER

ON   [MKR⇒]

OFF   PEAK SEARCH

[MKR⇒] accesses a menu of marker functions, which are described below. If no markers are active, [MKR⇒] activates MARKER NORMAL.

MANUAL OPERATION

MARKER NORMAL — activates a single marker and places it at the center of the trace. If one marker is already on, no operation takes place. If two markers are on (i.e., as in MARKER DELTA mode), MARKER NORMAL deletes the anchor marker and makes the active one the new, single marker. The marker reads the amplitude and the frequency (or the relative time, when the frequency span equals 0 Hz), and displays these values in the active function block and in the upper-right corner of the display. To move the marker, use either the knob, the STEP keys, or the DATA keys.

The marker reads data from the currently active trace. (An active trace is one in either the clear-write or max hold mode; this may be either Trace A or Trace B.) If both traces are active, or if both traces are in view mode, the marker reads data from Trace A.

MARKER DELTA — reads the difference in amplitude and frequency (or time, when the frequency span equals 0 Hz) between two markers, and displays these values in the active function block and in the upper-right corner of the display. If a single marker is already on, MARKER DELTA places both an anchor marker and an active (moveable) marker at the position of the original, single marker. To move the active marker, use either the knob, the STEP keys, or the DATA keys. If two markers are already on, pressing MARKER DELTA once makes it the active function. However, if MARKER DELTA is already on, pressing MARKER DELTA places the anchor marker at the same position as the active marker. The delta amplitude is displayed in dB, or as a ratio when linear units are selected.

PEAK SEARCH — places a marker on the highest point on a trace. The frequency and amplitude of the marker are displayed in the upper-right corner of the screen; PEAK SEARCH does not alter the active function. In most cases, PEAK SEARCH does not find the LO feedthrough as a peak.

When one marker is active and the frequency span is greater than 0 Hz, the following softkeys complete the menu.

MARKER→ REF LVL — sets the amplitude reference level equal to the amplitude of the marker. MARKER → REF LVL does not alter the active function.

MARKER→ CF — sets the center frequency equal to the frequency of the marker. MARKER → CF does not alter the active function.

MARKER→ CF STEP — sets the center frequency step-size equal to the marker frequency. MARKER → CF STEP does not alter the active function.

When two markers are on and the frequency span is greater than 0 Hz, the following softkeys complete the menu.

MKRΔ→ SPAN — sets the start frequency equal to the frequency of the left marker and sets the stop frequency equal to the frequency of the right marker. This does not change the active funtion.

MKRΔ→ CF — sets the center frequency equal to the difference in frequency between the two markers. MKRΔ→ CF does not change the active function.

MKRΔ→ CF STEP — sets the center frequency step-size equal to the difference in frequency between the two markers. MKRΔ→ CF STEP does not change the active function.

When one marker is on and the frequency span equals 0 Hz, the following softkey completes the menu.

MARKER→ REF LVL — sets the reference equal to the amplitude of the marker. MARKER→ REF LVL does not change the active function.

3-6

When two markers are on and the frequency span equals 0 Hz, the following softkeys complete the menu.

MKR1/Δ→ sets the center frequency equal to the frequency corresponding to the time period designated
CF by the two markers. MKR1/Δ→ CF does not change the active function.

MKR1/Δ→ sets the center frequency step size equal to the frequency corresponding to the time period
CF STEP designated by the two markers. MKR1/Δ→ CF STEP does not change the active function.

CHAPTER 4

INSTRUMENT STATE FUNCTIONS

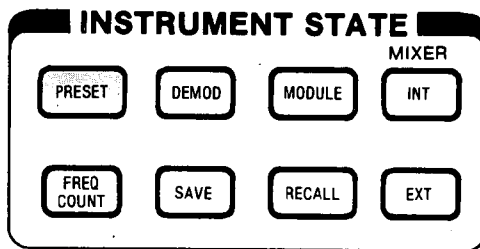This chapter describes the functions available from the INSTRUMENT STATE section of the front panel.
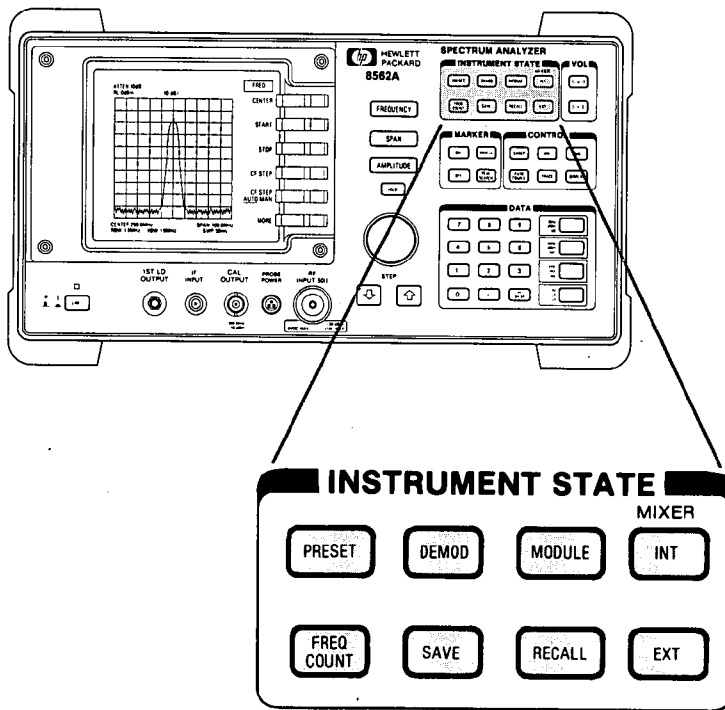
PRESET

[PRESET] sets the spectrum analyzer to a known, predefined state, shown in Table 4.1. [PRESET] does not affect the spectrum analyzer HP-IB address, the contents of any data or trace registers, stored preselector data or whether the state and trace registers are locked (SAVELOCK). [PRESET] also accesses a menu of functions, which are described below.

FUNCTION	STATE
FREQ MODE	CENTER-SPAN
CENTER FREQ	12.38 GHz (HP 8562A); 1.45 GHz (HP 8562B)
SPAN	19.25 GHz (HP 8562A); 1.45 GHz (HP 8562B)
CF STEP	1.93 GHz, AUTO
FREQ OFFSET	0 MHz, OFF
10 MHz REF	INTERNAL
REFERENCE LEVEL	0 dBm
INPUT ATTENUATION	10 dB, AUTO
MAX MIXER LEVEL	−10 dBm
REF LEVEL OFFSET	0 dBm, OFF
VERTICAL SCALE	10 dB/DIV.
UNITS	dBm, AUTO
AUTO IF ADJUST	ON
DETECTOR	NORMAL
RESOLUTION BW	1 MHz, AUTO
VIDEO BW	1 MHz, AUTO
VBW/RBW RATIO	1
RBW/SPAN RATIO	.011
VIDEO AVERAGE	100, OFF
SWEEP TIME	400 ms, AUTO
TRIGGER MODE	CONTINUOUS
TRIGGER SOURCE	FREE-RUN
VIDEO TRIG LEVEL	0 dBm
SWEEP OUTPUT	0-10V LO-SWEEP RAMP
MARKER MODE	OFF
NOISE MARKER	OFF
SIGNAL TRACK	OFF
PEAK THRESHOLD	−120 dBm
PEAK EXCURSION	6 dB
FREQUENCY COUNTER	OFF
FREQUENCY COUNTER RESOLUTION	10 kHz
TRACE A	CLEAR-WRITE
TRACE B	BLANK
TRACE-DATA	FORMAT P
A−B−>A	OFF
A−B+DISPLAYLINE−>A	OFF
DISPLAY LINE	0 dBm, OFF
THRESHOLD	−90 dBm, OFF
GRATICULE	ON
ANNOTATION	ON
FREQUENCY DISPLAY OFF	CLEAR
DEMODULATION	FM OFF AM OFF
DEMODULATION TIME	1 sec
SQUELCH	OFF
SQUELCH LEVEL	−120 dBm
AGC	OFF
VOLUME	0
SIGNAL IDENTIFICATION	OFF
MIXER	INT
EXT MIXER LO HARMONIC	6
MIXER CONV LOSS	30.0 dBm
BAND LOCK	OFF
EXT MIXER BIAS	0 mA

*Handwritten annotations in right margin:*
Opt. 026   14.63 GHz
Opt. 626   23.75 GHz
Opt. 026   2.375 GHz Auto

Opt. 026   500ms Auto

Table 4.1. State of instrument after [PRESET] *is executed.*

RECALL   sets the instrument state to the same state that occurred when (LINE) was switched on. This
PWR ON   state must be saved initially under the (SAVE) key.

LAST   recalls the instrument state that existed previous to pressing (PRESET) or turning off the power.
STATE

REALIGN   activates the automatic local oscillator (LO) and intermediate frequency (IF) alignment rou-
LO & IF   tines. These are the same routines that occur when (LINE) is switched on. When this func-
tion is active, the annotation ALIGN LO & IF changes to STOP REALIGN, to allow you
to stop the routine before it is finished. If STOP REALIGN is activated, the accuracy of mea-
surements made by the instrument may not meet published specifications.

HP-IB   displays the current HP-IB address in the active function block. To change the address, use
ADDRESS   the DATA keys (and terminate the entry with (ENTER)), or use the STEP keys or the knob
(and terminate with (HOLD)). The spectrum analyzer will continue to use this address
until (LINE) is switched off. To store the address so that it will return when (LINE) is
switched on, after selecting an address, press STORE HP-IB.

FREQ COUNT
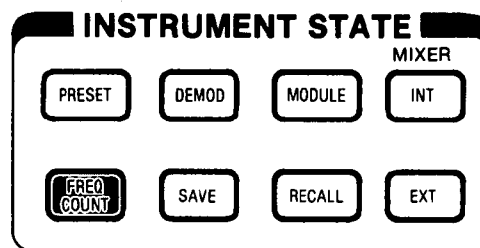
(FREQ COUNT) activates the frequency counter and displays its results in the upper-right corner of the
screen. This replaces any current marker readout in that area. If MARKER NORMAL or MARKER DELTA
is already active, (FREQ COUNT) uses that marker mode to read the frequency or the difference in frequency
between two markers, respectively. If no marker mode is active, pressing (FREQ COUNT) automatically acti-
vates MARKER NORMAL. The counter will only count signals that are displayed on the screen. All signal-
counting is done during the retrace time of the sweep. (FREQ COUNT) uses the same marker priority as
described in Chapter 3.

(FREQ COUNT) also accesses a menu of additional counter functions, which are described below.

COUNTER   allows you to activate (ON) or deactivate (OFF) the counter mode. The counted value appears
ON OFF   in the upper-right corner of the display.

COUNTER   adjusts the resolution of the frequency-count measurement. The resolution ranges from
RES   10 Hz to 1 MHz in decade increments. The default value is 10 kHz.

MARKER NORMAL   activates a single marker and places it at the center of the trace. If one marker is already on, no operation takes place. If two markers are on (i.e., as in MARKER DELTA mode), MARKER NORMAL deletes the anchor marker and makes the active one the new, single marker. The marker reads the amplitude and the frequency (or the relative time, when the frequency span equals 0 Hz), and displays these values in the active function block and in the upper-right corner of the display. To move the marker, use either the knob, the STEP keys, or the DATA keys.

The marker reads data from the currently active trace. (An active trace is one in either the clear-write or max-hold mode; this may be either Trace A or Trace B.) If both traces are active, or if both traces are in view mode, the marker reads data from Trace A.

MARKER DELTA   reads the difference in amplitude and frequency (or time, when the frequency span equals 0 Hz) between two markers, and displays these values in the active function block and in the upper-right corner of the display. If a single marker is already on, MARKER DELTA places both an anchor marker and an active (moveable) marker at the position of the original, single marker. To move the active marker, use either the knob, the STEP keys, or the DATA keys. If two markers are already on, pressing MARKER DELTA once makes it the active function However, if MARKER DELTA is already the active function, pressing MARKER DELTA places the anchor marker at the same position as the active marker. The delta amplitude is displayed in dB, or as a ratio when linear units are selected.

NEXT PEAK   moves the active marker to the next highest trace point relative to the current marker position. This function finds successively lower peaks when the key is pressed repeatedly.

PEAK SEARCH   places a marker on the highest point on a trace. The frequency and amplitude of the marker are displayed in the upper-right corner of the screen; PEAK SEARCH does not alter the active function.

DEMODULATION

INSTRUMENT STATE

MIXER

PRESET   DEMOD   MODULE   INT

FREQ COUNT   SAVE   RECALL   EXT
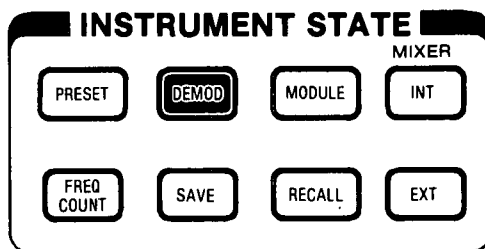
DEMOD accesses a menu of demodulation functions, which are described below. An example of how to perform demodulation appears in Chapter 2 of the Pocket Operating Guide.

AM DEMOD ON OFF   turns AM demodulation ON or OFF. If no marker is active and the frequency span is greater than 0 Hz, pressing AM DEMOD ON OFF automatically places a marker at the center of the trace and demodulates the signal at that marker position. Activating AM demodulation turns off FM demodulation, if it is on. When the frequency span is greater than 0 Hz, a

10 kHz resolution bandwidth is used during demodulation, regardless of the bandwidth annotated on the screen. When the span is equal to 0 Hz, the displayed bandwidth is used. In either case, the video bandwidth is not applied to the demodulation.

FM DEMOD turns FM demodulation ON or OFF. If no marker is active and the frequency span is greater
ON OFF than 0 Hz, pressing FM DEMOD ON OFF automatically places a marker at the center of the trace and demodulates the frequency at that marker position. Turning FM demodulation on turns off AM demodulation, if it is active. When the frequency span is greater than 0 Hz, a 100 kHz bandwidth is used during the demodulation, regardless of the bandwidth annotated on the screen. When the span is equal to 0 Hz, the displayed bandwidth is used. In either case, the video bandwith is not applied to the demodulation.

When one marker is on and the frequency span is greater than 0 Hz, the following softkey appears on the menu.

MARKER activates a single marker and places it at the center of the trace. If one marker is already on,
NORMAL no operation takes place. If two markers are on (i.e., as in MARKER DELTA mode), MARKER NORMAL deletes the anchor marker and makes the active one the new, single marker. The marker reads the amplitude and the frequency (or the relative time, when the frequency span equals 0 Hz), and displays these values in the active function block and in the upper-right corner of the display. To move the marker, use either the knob, the STEP keys, or the DATA keys.

The marker reads data from the currently active trace. (An active trace is one in either the clear-write or max-hold mode; this may be either Trace A or Trace B.) If both traces are active, or if both traces are in view mode, the marker reads data from Trace A.

When two markers are on and the frequency span is greater than 0 Hz, the following softkey appears on the menu.

MARKER reads the difference in amplitude and frequency (or time, when the frequency span equals
DELTA 0 Hz) between two markers, and displays these values in the active function block and in the upper-right corner of the display. If a single marker is already on, MARKER DELTA places both an anchor marker and an active (moveable) marker at the position of the original, single marker. To move the active marker, use either the knob, the STEP keys, or the DATA keys. If two markers are already on, pressing MARKER DELTA once makes it the active function. When MARKER DELTA is already the active function, pressing MARKER DELTA places the anchor marker at the same position as the active marker. The delta amplitude is displayed in dB, or as a ratio when linear units are selected.

When the frequency span equals 0 Hz, the following softkey appears on the menu.

CENTER activates the center frequency. To adjust the center frequency, use the DATA keys, the STEP
FREQ keys, or the knob.

The following softkeys complete the [DEMOD] menu.

PEAK places a marker on the highest point on a trace. The frequency and amplitude of the marker
SEARCH are displayed in the upper-right corner of the screen; PEAK SEARCH does not alter the active function.
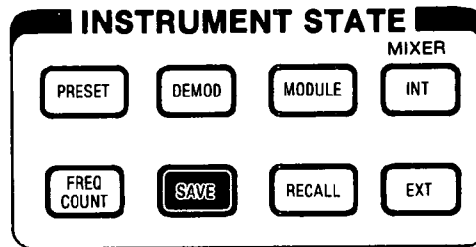
NEXT moves the active marker to the next highest trace point relative to the current marker posi-
PEAK tion. This function finds successively lower peaks when the key is pressed repeatedly.

MORE accesses a menu of additional demodulation functions.

DEMOD   adjusts the duration of demodulation between successive sweeps when the span is greater than
TIME   0 Hz. The time ranges from 0.1 seconds to 60 seconds; the default value is 1 second. When
the frequency span equals 0 Hz, demodulation is continuous.

VOLUME   adjusts the volume of the demodulated signal. Use [((○))] or [((○))] (located in the upper-right
corner of the front panel) to lower or raise the volume, respectively. The volume can also
be changed using the DATA keys, the STEP keys, or the knob. The volume level is displayed
in the active function block. This level is a unitless value in which 0 equals no volume and
15 equals maximum volume.

SQUELCH   adjust the squelch level. The value is displayed in the active function block, in dBm. The squelch
and   level is also indicated by a dashed line across the display. A marker must be active and above
SQUELCH   the squelch line for demodulation to occur when squelch is on; in zero span, squelch is inactive.
ON OFF

AGC   switches the automatic gain control (AGC) ON or OFF. The AGC keeps the volume relatively
ON OFF   constant during AM demodulation. AGC is available only during AM demodulation and
when the frequency span is greater than 0 Hz.

PREV   displays the previous menu of softkeys.
MENU

SAVE

INSTRUMENT STATE

MIXER

PRESET   DEMOD   MODULE   INT

FREQ COUNT   SAVE   RECALL   EXT

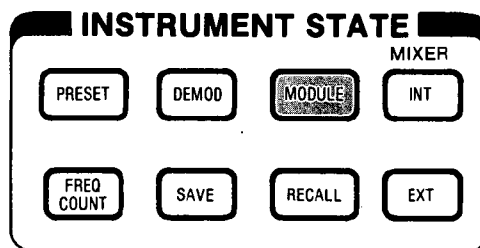[SAVE] accesses a menu of softkeys that allow you to save instrument-state data and trace data. These
functions are described below.

SAVE   displays a menu of registers in which the current instrument state can be stored. Registers
STATE   0-4 appear on the display, as well as the softkey NEXT STATES. Press NEXT STATES to access
registers 5-9 and the softkey PREV STATES. PREV STATES displays the previous menu of
registers. To store current instrument data in a desired register, press the softkey next to the
register number, or enter the number using the DATA keys. Terminate the entry with any
units key ([Hz], [kHz], etc.).

If a stored state has a title, the first sixteen characters of the title are used as the softkey anno-
tation for that register. The register annotation appears in two rows of eight characters each.
For example, if the data stored in register 0 has the title, "Harmonic Test," the annotation
"STATE 0" is replaced with "Harmonic Test."

PWR ON STATE saves the current instrument state in the power-on register. The spectrum analyzer will then be set to this state whenever ▓LINE▓ is switched on. The same state can be retrieved with RECALL PWR ON (available from the ▓PRESET▓ menu).

SAVE TRACE A displays a menu of registers in which the current contents of Trace A can be stored. Registers 0-4 appear on the display, as well as the softkey MORE. Press MORE to view registers 5-7 and the softkey PREV MENU (for returning to the previous menu). To store current Trace A data in a desired register, press the softkey next to the register number, or enter the number using the DATA keys. Terminate the entry with any units key (▓HZ▓ , ▓KHZ▓ , etc). Like SAVE STATE, SAVE TRACE A registers are annotated with a label derived from the display title.

SAVE TRACE B displays a menu of registers in which the current contents of Trace B can be stored. Registers 0-4 appear on the display, as well as the softkey MORE. Press MORE to view registers 5-7 and the softkey PREV MENU (for returning to the previous menu). To store the data, press the softkey next to the desired register number, or enter the number using the DATA keys. Terminate the entry with any units (▓HZ▓ , ▓KHZ▓ , etc). Like SAVE STATE, SAVE TRACE B registers are annotated with a label derived from the display title.

SAVELOCK ON OFF prevents storing any new data in the state or trace registers. When SAVELOCK is ON, the registers are "locked"; the data in them cannot be erased or overwritten, although the data can be recalled. To "unlock" the registers and store new data, switch SAVELOCK to OFF.

SAVE PRES PK (HP 8562A only) saves the current preselector-peak data in a user data table. This does not affect the preselector data that is set at the factory, which is in a factory data table. To recall the saved data, use the RECALL PRSEL PK softkey listed under ▓RECALL▓ . More information on preselector data tables appears under the internal mixing key ▓INT▓ .

MODULE

INSTRUMENT STATE

MIXER

PRESET   DEMOD   MODULE   INT

FREQ COUNT   SAVE   RECALL   EXT

▓MODULE▓ gives access to additional functions when a module (such as the HP 85629A Test and Adjustment Module) is connected to the spectrum analyzer.

RECALL

INSTRUMENT STATE

MIXER

[PRESET]   [DEMOD]   [MODULE]   [INT]

[FREQ COUNT]   [SAVE]   [RECALL]   [EXT]
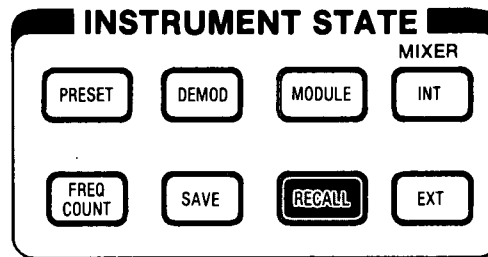
RECALL accesses a menu of softkeys that allow you to recall stored instrument-state data and trace data. The softkeys are described below.

RECALL STATE displays a menu of registers from which the stored instrument states can be recalled and displayed on the spectrum analyzer screen. Registers 0-4 appear on the display, as well as the softkey NEXT STATES. Press NEXT STATES to view registers 5-9 and the softkey PREV STATES (for returning to the previous menu). To recall the data, press the softkey next to the desired register number, or enter the number using the DATA keys. Terminate the entry with any units (**HZ** , **KHZ** , etc.).

If a stored state has a title, the first sixteen characters of the title are used as the softkey annotation for that register. The register annotation appears in two rows of eight characters each. For example, if the data stored in register 0 has the title, "Harmonic Test," the annotation "STATE 0" is replaced with "Harmonic Test."

RECALL TO TRA displays a menu of registers from which trace data can be recalled and placed in Trace A. Registers 0-4 appear on the display, as well as the softkey MORE. Press MORE to view registers 5-7 and the softkey PREV MENU (for returning to the previous menu). To recall the data, press the softkey next to the desired register number, or enter the number using the DATA keys. Terminate the entry with any units (**HZ** , **KHZ** , etc). Like RECALL STATE, RECALL TO TRA registers are annotated with a label derived from the display title.

RECALL TO TRB displays a menu of registers from which trace data can be recalled and placed in Trace B. Registers 0-4 appear in the display, as well as the softkey MORE. Press MORE to view registers 5-7 and the softkey PREV MENU (for returning to the previous menu). To recall the data, press the softkey next to the desired register number, or enter the number using the DATA keys. Terminate the entry with any units (**HZ** , **KHZ** , etc). Like RECALL STATE, RECALL TO TRB registers are annotated with a label derived from the display title.

MORE accesses additional softkeys, which are described below.

RECALL ERRORS displays the last error that has occurred. Use the STEP keys to cycle through accumulated errors. A list of HP-IB remote-operation error codes appears in Appendix B. For additional error information, refer to the Installation and Support Manual.

Hint: If you are using an external frequency reference and generating errors, be sure your reference meets the requirements specified in Chapter 1.

FREQ DIAGNOSE displays a menu of diagnostic functions, which are described below.

LO FREQ   displays the first local oscillator frequency corresponding to the current start frequency. In multiband sweeps, the frequency displayed corresponds to the band being swept when the key was pressed.

SAMPLER FREQ   displays the sampling oscillator frequency corresponding to the current start frequency. In multiband sweeps, the frequency displayed corresponds to the band being swept when the key was pressed.

SAMPLER HARMONIC   displays the sampler harmonic number corresponding to the current start frequency. In multiband sweeps, the frequency displayed corresponds to the band being swept when the key was pressed.

MAIN ROLLER   displays the main-roller oscillator frequency corresponding to the current start frequency. In multiband sweeps, the frequency displayed corresponds to the band being swept when the key was pressed.

OFFSET ROLLER   displays the offset-roller oscillator frequency corresponding to the current start frequency. In multiband sweeps, the frequency displayed corresponds to the band being swept when the key was pressed.

TRANSFER ROLLER   displays the transfer-roller oscillator frequency corresponding to the current start frequency. In multiband sweeps, the frequency displayed corresponds to the band being swept when the key was pressed.

CRT ADJ PATTERN   displays a fixed pattern of lines and characters on the screen, each of which is used in setting the various adjustments in display hardware (such as vertical gain, blanking, etc.). Three of these adjustments — X POSN, Y POSN, and TRACE ALIGN — are available from the rear panel. Use the stencil provided with the instrument and these three adjustments to align the display. Place the stencil on the screen and line up the display to match the stencil. Refer to Figure 4.1. When this function is active, the softkey annotation changes to EXIT. Press EXIT to remove the pattern. For other display adjustments, refer to the Installation and Support Manual.
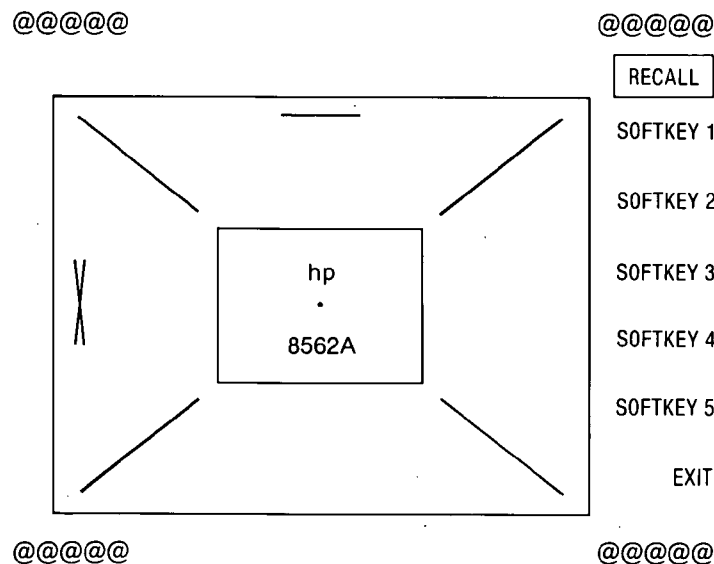
Fig. 4.1. CRT alignment pattern. X POSN moves the display left and right; Y POSN moves the display up and down. TRACE ALIGN rotates the display.

ELAPSED   displays the cumulative operating time of the spectrum analyzer. The value, which is expressed
TIME   in hours, appears in the active function block.

FACTORY   (HP 8562A only) restores the preselector-peaking data that is set at the factory and makes
PRSEL PK   this data the current preselector data. This data is stored in the factory data table and cannot be changed.

RECALL   (HP 8562A only) recalls the preselector data that is stored by the user in the user data table.
PRSEL PK   This data can be saved using the softkey SAVE PRSEL PK, found under the **SAVE** menu. More information on preselector data tables appears under the internal mixing key **INT**.

INTERNAL MIXING

INSTRUMENT STATE

MIXER

| PRESET | DEMOD | MODULE | INT |

| FREQ COUNT | SAVE | RECALL | EXT |
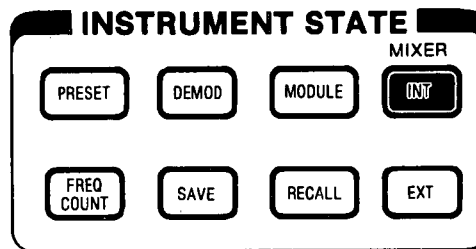
INT accesses a menu of functions that employ the internal input mixer in the spectrum analyzer. These functions are described below.

PRESELECTOR PEAKING

The HP 8562A has three tables of preselector data. These tables are described below.

Current Data Table: This table contains the data used to tune the preselector. The data is obtained from either the user data table or the factory data table. You can modify the data in the current table using the PRESEL MAN ADJ or the PRESEL AUTO PK functions. To save the data, use the SAVE PRSEL PK function listed under **SAVE**. If the current data is not saved, it is lost when the instrument is preset or turned off.

Factory Data Table: This is the default data table. This data is set at the factory and cannot be changed. This data is sent to the current data table when **PRESET** is pressed. The data in this table is sufficient for virtually all applications, since this is the table that allows the HP 8562A to meet its published specifications.

User Data Table: The data in this table is stored in non-volatile memory and is placed in the current data table when it is recalled using the RECALL PRSEL PK softkey under **RECALL**.

PRESEL MAN ADJ (HP 8562A only) adjusts the preselector tracking. Place a marker on a desired signal on a trace, then press PRESEL MAN ADJ. The current preselector tracking number, which is displayed in the active function block, can be changed using the DATA keys, the STEP keys, or the knob. The value ranges from 0 to 128. If no marker is active, pressing PRESEL MAN ADJ also executes a marker peak search. Executing the function affects data in the current data table (which may be data from either the user or the factory data tables). To save this data, use the SAVE PRES PK softkey found under **SAVE**.

PRESEL AUTO PK automatically peaks the preselector on a desired signal on a trace. Set the trace to clear-write mode, place a marker on the desired point, then press PRESEL AUTO PEAK. The peaking routine zooms to zero span, peaks the preselector tracking, then returns to the original position. To read the new preselector peaking number, press PRESEL MAN ADJ.

SIG ID AT MKR activates a signal identification function that employs the harmonic search method for locating the correct mixer response. Place a marker on the desired signal, then activate SIG ID AT MARKER. The frequency of the correct response and the L.O. harmonic mixing number appear in the active function block. Should this not be a valid signal, no values appear in the active function block.

SIG ID → CF sets the center frequency to a correct mixer response obtained from the softkey SIG ID AT MKR. This function is available when the center frequency is less than 22 GHz. Use this function only after executing SIG ID AT MKR.

SIG ID ON OFF switches the manual signal identification function ON and OFF. When ON, this function employs the frequency shift method of identifying signals. Displayed signals are shifted horizontally and vertically on alternate sweeps. The correct signal is shifted horizontally by less than 80 kHz. To ensure accuracy, limit the frequency span to less than 20 MHz.

EXTERNAL MIXING
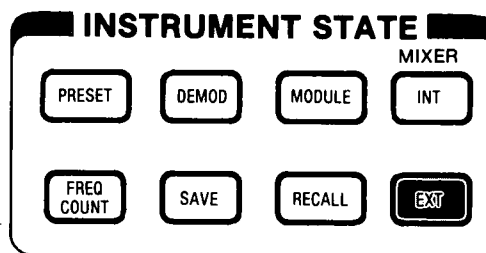
EXT accesses a menu of functions that allow you to extend the HP 8562A/B frequency range using external mixers. These functions are described below. For additional information on external mixing, refer to Appendix F in the Pocket Operating Guide.

FULL BAND allows you to select a commonly-used frequency band above 18 GHz. These bands are shown in Table 4.2. Use the STEP keys or the knob to select a desired frequency band; the selected band appears in the active function block. Activating FULL BAND also activates the harmonic lock function, which is described below.

LOCK
HARMONIC
and
LOCK
ON OFF

displays the current harmonic number. A harmonic number refers to the local oscillator harmonic that is used to sweep a specific frequency band, are shown in Table 4.2. When LOCK HARMONIC is ON, only center frequencies and spans that fall within the frequency band of the current harmonic may be entered. When FULL SPAN under ▐SPAN▌ is activated, the span is limited to the frequency band of the selected harmonic.

When LOCK HARMONIC is OFF, more than one harmonic can be used to sweep across a desired span. For example, with HARMONIC LOCK OFF, sweep a span from 26.5 GHz to 60 GHz. In this case, the spectrum analyzer will automatically sweep first using 8- and then using 10-. When FULL SPAN is active and LOCK HARMONIC is OFF, the entire range of external mixing appears on the display.

FREQUENCY BAND	FREQUENCY RANGE (GHz)	MIXING HARMONIC	CONVERSION LOSS
K	18.0 - 26.5	6 -	30 dB
A	26.5 - 40.0	8 -	30 dB
Q	33.0 - 50.0	10 -	30 dB
U	40.0 - 60.0	10 -	30 dB
V	50.0 - 75.0	14 -	30 dB
E	60.0 - 90.0	16 -	30 dB
W	75.0 - 110.0	18 -	30 dB
F	90.0 - 140.0	24 -	30 dB
D	110.0 - 170.0	30 -	30 dB
G	140.0 - 220.0	36 -	30 dB
Y	170.0 - 260.0	44 -	30 dB
J	220.0 - 325.0	54 -	30 dB

Table 4.2. Mixing harmonics for frequencies above 18 GHz.

AMPTD
CORRECT

displays a menu of functions that set conversion losses and flatness data.

AVERAGE
CNV LOSS

displays the mean conversion loss for the current harmonic and allows you to enter new conversion loss data. In a full frequency band (such as K band), the mean conversion loss is defined as the minimum loss plus the maximum loss for that band divided by two. To change the maximum and minimum values, use the CNV LOSS VS FREQ softkey. Any change to the average conversion loss also affects the flatness data, which is described below.

The default conversion loss value for each band is 30 dB.

CNV LOSS   displays the stored conversion loss for a specific frequency in the current
VS FREQ   band. This allows amplitude correction to be entered to compensate for
changes in conversion loss with frequency. To enter a new value, use the
DATA keys. To change the displayed frequency, use the STEP keys. Any
changes to the data also affect the mean conversion loss stored under AVER-
AGE CNV LOSS. Table 4.3 shows the number of flatness points for each
band and the default flatness values. To view the correction, connect a 310.7
MHz signal of a known amplitude to the IF input and set the analyzer to
sweep the associated band.

FREQUENCY BAND	FREQUENCY RANGE (GHz)	NUMBER OF FLATNESS POINTS	POINT SPACING	CONVERSION LOSS
K	18.0 - 26.5	6	2 GHz	30 dB
A	26.5 - 40.0	8	2 GHz	30 dB
Q	33.0 - 50.0	7	3 GHz	30 dB
U	40.0 - 60.0	6	4 GHz	30 dB
V	50.0 - 75.0	6	5 GHz	30 dB
E	60.0 - 90.0	7	5 GHz	30 dB
W	75.0 - 110.0	8	5 GHz	30 dB
F	90.0 - 140.0	6	10 GHz	30 dB
D	110.0 - 170.0	7	10 GHz	30 dB
G	140.0 - 220.0	9	10 GHz	30 dB
Y	170.0 - 260.0	7	15 GHz	30 dB
J	220.0 - 325.0	8	15 GHz	30 dB

Table 4.3. Flatness points and conversion losses for frequencies above 18 GHz.

PREV   displays the previous menu of softkeys.
MENU

SIGNAL   displays a menu of signal identification functions, which are described below.
IDENT

SIG ID   activates a signal identification function for locating the correct mixer
AT MKR   response. Place a marker on the desired signal, then activate SIG ID AT
MARKER. The frequency of the signal and the L.O. harmonic mixing num-
ber appear in the active function block. If the function cannot identify the
signal, "NOT FOUND" is displayed in the active function block.

SIG ID   sets the center frequency to the frequency obtained from the softkey SIG
→ CF   ID AT MKR. This function is available when the center frequency is less
than 22 GHz. Use this function only after executing SIG ID AT MKR.
(Option 026: less than 26.5 GHz)

4-13

SIG ID   switches the manual signal identification function ON and OFF. When ON,
ON OFF   this function employs a frequency shift method of identifying signals. Displayed signals are shifted horizontally and vertically on alternate sweeps. The correct signal is shifted horizontally by less than 80 kHz. To ensure accuracy, limit the frequency span to less than 20 MHz.

MARKER   activates a single marker and places it at the center of the trace. If one marker
NORMAL   is already on, no operation takes place. If two markers are on (i.e., as in MARKER DELTA mode), MARKER NORMAL deletes the anchor marker and makes the active one the new, single marker. The marker reads the amplitude and the frequency (or the relative time, when the frequency span equals 0 Hz), and displays these values in the active function block and in the upper-right corner of the display. To move the marker, use either the knob, the STEP keys, or the DATA keys.

The marker reads data from the currently active trace. (An active trace is one in either the clear-write or max-hold mode; this may be either Trace A or Trace B.) If both traces are active, or if both traces are in view mode, the marker reads data from Trace A.

PEAK   places a marker on the highest point on a trace. The frequency and ampli-
SEARCH   tude of the marker are displayed in the upper-right corner of the screen; PEAK SEARCH does not alter the active function.

NEXT   moves the active marker to the next highest trace point relative to the cur-
PEAK   rent marker position. This function finds successively lower peaks when the key is pressed repeatedly.

BIAS   displays a menu of functions that allow you to select external-mixer bias. The bias is provided on the center conducter of the IF input connector on the front panel. These functions are described below.

WARNING

The open-circuit bias voltage can be as great as ± 3.5 V through a source resistance of 300Ω. Such voltage may appear when recalling an instrument state in which an active bias has been stored.

NOTE

The bias value that appears on the spectrum analyzer display is expressed in terms of short-circuit current (i.e., the amount of current that would flow if the IF line were shorted to ground). The actual amount of current flowing into the mixer will be less.

BIAS turns off the external-mixer bias.
OFF

POSITIVE selects positive mixer bias for an external mixer. This value, which can be
BIAS entered using the DATA keys, the STEP keys, or the knob, appears in the
active function block and is expressed in milliamps. When the bias is greater
than 0 mA, a "+" appears on the left edge of the display.

NEGATIVE selects negative mixer bias for an external mixer. This value, which can
BIAS be entered using the DATA keys, the STEP keys, or the knob, appears in
the active function block and is expressed in milliamps. When the bias is
less than 0 mA, a "−" appears on the left edge of the display.
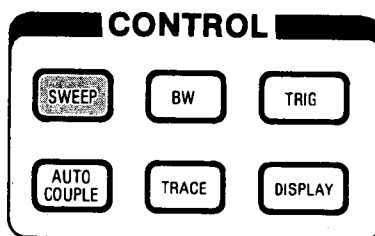
PREV displays the previous menu of softkeys.
MENU

CHAPTER 5

CONTROL FUNCTIONS

This chapter describes the functions available from the CONTROL section of the front panel.
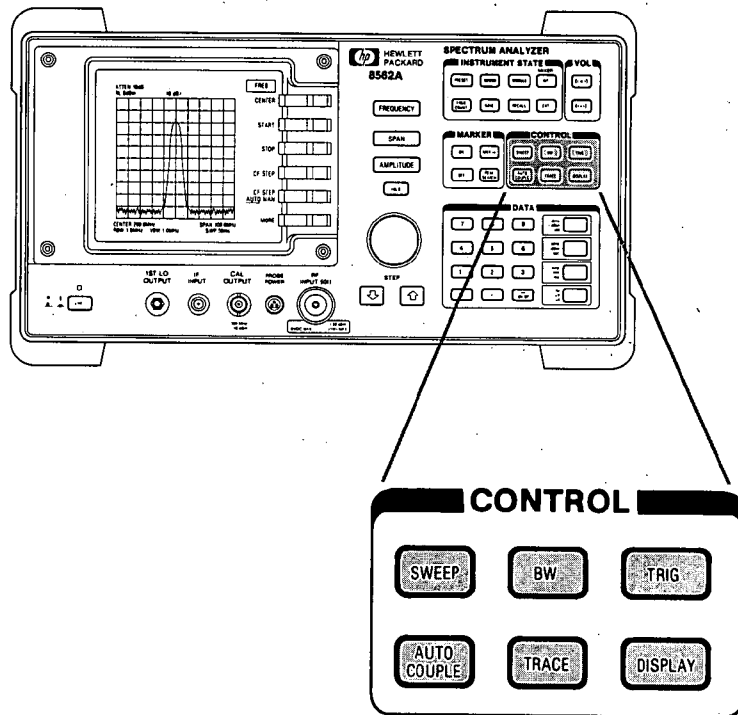
SWEEP

[SWEEP] accesses a menu of sweep-related functions, which are described below. **[SWEEP]** also activates the sweep-time function.

CONT   activates the continuous-sweep mode. CONT is underlined, to indicate that it is the current sweep mode. Press CONT to restart the sweep at the next trigger.

SINGLE   activates the single-sweep mode. SINGLE is underlined, to indicate that it is the current sweep mode. Press SINGLE to restart the sweep at the next trigger. When this function is active, an "S" appears on the left edge of the display.

SWEEP   adjust the sweep time of the spectrum analyzer. Press either key to activate this function.
TIME   To change the sweep time, use the DATA keys, the STEP keys, or the knob. A line under AUTO
and   or MAN indicates whether the sweep time is coupled (AUTO) or is in manual mode (MAN).
SWP TIME   When the sweep time is in manual mode, pressing SWP TIME AUTO MAN returns the sweep
AUTO MAN   time to coupled mode.

REAR PNL   displays a menu of functions that provide access to certain signals via a rear-panel output.
OUTPUT   These functions are described below.

0→10V   provides a 0-10 V ramp out of J8. This ramp corresponds to the sweep ramp
LO SWP   that tunes the first local oscillator (LO). In multiband sweeps, one ramp is provided for each frequency band.

.5V/GHz   provides a DC ramp out of J8. The ramp is a frequency-analog voltage cor-
(FAV)   responding to the tuned frequency of the analyzer. The voltage is 0.5 V per GHz, from 0 Hz to 22 GHz.
Option 026 : 0 Hz to 26.5 GHz
PREV   displays the previous menu of softkeys.
MENU
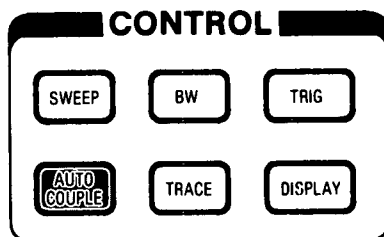
AUTO COUPLE

[AUTO COUPLE] accesses a menu of coupled-mode functions, which are described below.

ALL   sets the video bandwidth, the resolution bandwidth, the input attenuator, the sweep time, and the center frequency step-size to coupled mode. The spectrum analyzer chooses appropri-ate values for these functions depending on the selected frequency and span (or start and stop frequencies). These values are set according to the coupled ratios stored under the soft-keys VBW:RBW or RBW:SPAN; if no ratios are stored, default ratios are used instead.

VBW:RBW   displays the current coupling ratio between the video bandwidth and the resolution band-width. The ratio is displayed in the active function block, and it is used when the two band-widths are in coupled mode. The ratio ranges from 0.003 to 3, in a 1, 3, 10 sequence. The default value is 1.

RBW:SPAN   displays the current coupling ratio between the resolution bandwidth and the frequency span. The ratio is displayed in the active function block, and it is used when the two functions are in coupled mode. The ratio ranges from 0.002 to 0.10, in a 1, 2, 5 sequence. The default ratio is 0.011.

MAX MXR   selects the maximum signal amplitude seen at the input mixer. This value is always in dBm,
LEVEL   regardless of the selected scale or amplitude units. MAX MIXER LEVEL is useful when distortion-free dynamic range is an important consideration.

The following procedure explains how to quickly check for signal compression. Increase the attenuation using the STEP key. If the signal peak shifts more than 1 dB, the signal is in com-pression. In this case, continue to increase the attenuation until the peak moves less than 1 dB between steps; then decrease the attenuation one step.

BANDWIDTH
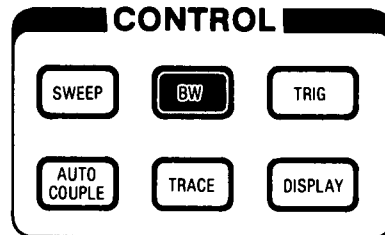
[BW] accesses a menu of bandwidth functions, which are described below. [BW] also activates the resolution bandwidth function.

RES BW   adjust the resolution bandwidth. The bandwidth, which appears in the active function block,
and ⚹ ranges from 100 Hz to 1 MHz in a 1, 3, 10 sequence. The value can be changed using the
RES BW   DATA keys, the STEP keys, or the knob. Press either key to activate the resolution band-
AUTO MAN   width. A line under AUTO or MAN indicates whether the bandwidth is coupled (AUTO) or is in manual mode (MAN). When the resolution bandwidth is in manual mode, pressing RES BW AUTO MAN returns the bandwidth to coupled mode.
⚹ See Change Sheet in Front
Further explanation of resolution bandwidth appears in the Pocket Operating Guide.

VIDEO BW   adjust the video bandwidth. The bandwidth, which appears in the active function block,
and   ranges from 1 Hz to 3 MHz in a 1, 3, 10 sequence. The value can be changed using the DATA
VIDEO BW   keys, the STEP keys, or the knob. Press either key to activate the video bandwidth. A line
AUTO MAN   under AUTO or MAN indicates whether the bandwidth is coupled (AUTO) or is in manual mode (MAN). When the video bandwidth is in manual mode, pressing VIDEO BW AUTO

MAN returns the bandwidth to coupled mode. When the video bandwidth is less than 300 Hz, the IF detector automatically changes to sample mode.

Narrow video filters help smooth a trace, allowing you to view signals that are otherwise masked by the noise. Narrower bandwidths require longer sweep times, however.
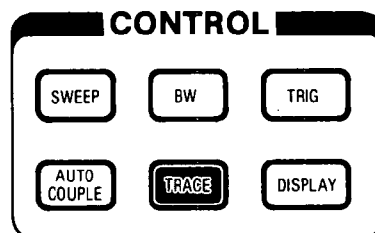
MAX NO. VID AVGS selects the number of sweeps used in video averaging (see below). This value ranges from 1 to 999 and appears in the active function block. After the desired value is entered, video averaging automatically begins. A number indicating the sweeps that have been averaged appears at the top of the display.

VID AVG ON OFF turns the video averaging ON or OFF. Video averaging smooths the displayed trace without using a narrow video bandwidth. The function sets the IF detector to sample mode and smooths the trace by averaging successive traces with each other.

Video averaging is available only for Trace A, and Trace A must be in clear-write mode for video average to execute. After video averaging is activated, the number of sweeps that have been averaged appears at the top of the screen.

Using video averaging allows you to view changes to the entire trace much faster than using narrow video filters. Narrow video filters require long sweep times, which may not be desired. Video averaging, though requiring more sweeps, uses faster sweep times; in some cases, it can produce a smooth trace faster than a narrow video filter.

TRACE

```
█████ CONTROL █████
┌─────────┐ ┌─────────┐ ┌─────────┐
│  SWEEP  │ │   BW    │ │  TRIG   │
└─────────┘ └─────────┘ └─────────┘
┌─────────┐ ┌─────────┐ ┌─────────┐
│  AUTO   │ │  TRACE  │ │ DISPLAY │
│ COUPLE  │ │         │ │         │
└─────────┘ └─────────┘ └─────────┘
```

TRACE accesses a menu of trace-related functions, which are described below. Trace A is brighter than Trace B, to distinguish the two traces.

CLR-WRT A clears Trace A and sets it to continuously accept and display new input-signal data.

MAX HOLD A displays and holds in Trace A the maximum responses of the input signal. In this mode, the trace accepts data from subsequent sweeps.

VIEW A displays the current contents of Trace A, but does not update the contents.

BLANK A blanks Trace A from the screen. The contents of Trace A are retained, but not updated.

TRACE B   displays the Trace B menu of softkeys, which are described below.

> **CLR-WRT**   clears Trace B and sets it to continuously accept and display new input-
> **B**   signal data.

> **MAX HOLD**   displays and holds in Trace B the maximum responses of the input signal.
> **B**   In this mode, the trace accepts data from subsequent sweeps.

> **VIEW B**   displays the current contents of Trace B, but does not update the contents.

> **BLANK B**   blanks Trace B from the screen. The contents of Trace B are retained, but
> not updated.

> **TRACE A**   displays the Trace A menu of softkeys, as previously described.

MORE   displays the following menu of softkeys, which are described below.

A−B→A   turns A−B→A trace math ON or OFF. When this function is ON, the contents of Trace B
ON OFF   are subtracted from the contents of Trace A; the result, in dBm, is placed in Trace A. In lin-
ear mode, the result is in volts. When this function is on, it is executed on all subsequent sweeps.
An "M" appears on the left edge of the display to indicate its active status. A discussion on
trace math appears at the end of the ▮TRACE▮ softkey descriptions.

B−DL→B   subtracts the value of the display line from the contents of Trace B and places the result (in
dBm) in Trace B. This function executes only once; to execute it a second time, press the key
again.

A−B+DL→A   turns A−B+DL→A trace math ON or OFF. When this function is ON, the contents of
ON OFF   Trace B are subtracted from the contents of Trace A and the value of the display line is added
to the result. The result is then displayed in Trace A. This function is executed on all subse-
quent sweeps until it is turned off. An "M" appears on the left edge of the display to indicate
its active status. A discussion on trace math appears at the end of the ▮TRACE▮ softkey
descriptions.

A+B→A   sums the contents of Trace A with the contents of Trace B, and places the result, in dBm, in
Trace A. When in linear mode, the result is in volts. This function is done only once and
not on a continuous basis. A discussion on trace math appears at the end of the ▮TRACE▮ soft-
key descriptions.

A EXCH B   exchanges the contents of Trace A with that of Trace B.

DETECTOR   accesses a menu of detector modes, which are described below. When any detector mode other
MODES   than NORMAL is active, a "D" appears on the left edge of the display.

> **DETECTOR**   sets the detector to normal mode; this is also the default mode.
> **NORMAL**

> **DETECTOR**   sets the detector to video sample mode. This mode is used with the video
> **SAMPLE**   averaging and marker noise functions, as well as for video bandwidths less
> than 300 Hz.

> **DETECTOR**   selects the positive-peak detector mode. Use this mode to detect the positive-
> **POS PEAK**   peak noise level of a trace. This is the detector used for MAX HOLD.

DETECTOR selects the negative-peak detector mode. Use this mode to detect the
NEG PEAK negative-peak noise level of a trace.

PREV displays the previous menu of softkeys.
MENU

TRIGGER

CONTROL

| SWEEP	BW	TRIG
AUTO COUPLE	TRACE	DISPLAY
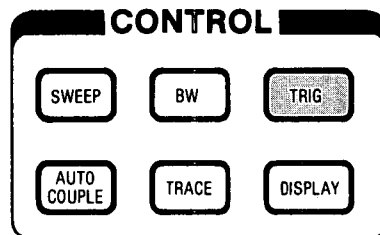
TRIG accesses a menu of trigger functions, which are described below. When any mode other than FREE
RUN is selected, a "T" appears on the left edge of the display.

CONT sets the sweep and trigger to continuous mode. This function, which is the default mode,
is underlined to indicate that it is the current mode.

SINGLE sets the sweep and trigger to single mode. SINGLE is underlined to indicate that it is the cur-
rent mode. Press SINGLE to restart the sweep at the next trigger. An "S" appears on the left
edge of the display to indicate the function's active status.

FREE RUN sets the trigger to free-run mode. Sweep triggers occur as rapidly as the spectrum analyzer will allow.

VIDEO sets the trigger to video mode. Sweep triggers occur whenever the input signal passes through, with a positive slope, the video trigger level. This trigger level can be changed using the DATA keys, the STEP keys, or the knob. A dashed line appears on the screen to denote the selected level.

EXTERNAL sets the trigger to external mode. Connect an external trigger source to J5 on the rear panel of the spectrum analyzer. The source must range from 0 to 5 VDC (TTL). The trigger occurs on the rising, positive edge of the signal (about 1.5 V).

LINE sets the trigger to line mode. Sweep triggers occur at intervals synchronized to the line frequency.

DISPLAY
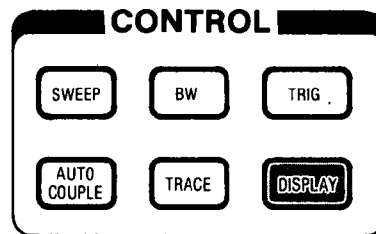
DISPLAY accesses a menu of display-related functions, which are described below.

DISPLAY LINE and DSP LINE ON OFF activate a display line. Press either key to activate the display line, then use the DATA keys, the STEP keys, or the knob to adjust it. When the display line is ON, pressing DSP LINE ON OFF turns the line OFF.

THRESHLD and THRESHLD ON OFF set a threshold that determines the lower limit of the active trace(s). To change the threshold, use the DATA keys, the STEP keys, or the knob. The selected level is indicated by a dashed line across the screen. When the trace is in view or in max-hold mode, once the threshold is raised, any data below the new threshold is permanently lost.

PLOTTER MENU accesses a menu of plotter functions, which are described below. A procedure for making plots appears in Chapter 4 of the Pocket Operating Guide. Plot keys (except for PLOT ALL and PLOT ORG) can be pressed in any order; the functions will be executed in that order.

See Change Sheet In Front of Manual

PLOT ALL plots the entire contents of the spectrum analyzer screen (except for the menu and error codes). When PLOT ALL is active, STOP PLOT appears in its place, allowing you to stop the plot before it is finished.

PLOT TRACE A — plots only the contents of Trace A and any markers associated with Trace A. When PLOT TRACE A is active, STOP TRACE A appears in its place, allowing you to stop the plot before it is finished.

PLOT TRACE B — plots only the contents of Trace B and any markers associated with Trace B. When PLOT TRACE B is active, STOP TRACE B appears in its place, allowing you to stop the plot before it is finished.

PLOT GRATICUL — plots only the graticule. When PLOT GRAT is active, STOP GRAT appears in its place, allowing you to stop the plot before it is finished.

PLOT ANNOT — plots only the annotation (excluding the menu, markers, and error codes). When PLOT ANNOT is active, STOP ANNOT appears in its place, allowing you to stop the plot before it is finished.

PLOT ORG DSP GRAT — selects either the display (DSP) or the graticule (GRAT) mode. When DSP is selected, the plotter references P1 and P2 to the corners of the spectrum analyzer display. When GRAT is selected, the plotter references P1 and P2 to the lower-left and upper-right corners of the graticule, respectively. GRAT allows you to position the desired plot information on a pre-printed graticule (obtained from PLOT GRAT), and to save plotting time.

MORE — accesses a menu of additional softkeys, which are described below.

SCREEN TITLE — displays a menu of functions that allow you to create a title on the screen. These functions are described below. SCREEN TITLE also displays a set of characters in the active function block. Use the STEP keys or the knob to select the desired characters for your title. After selecting the desired character, press SELECT CHAR to place it in the title area, which is in the upper-right corner of the graticule. The title can be up to two lines of sixteen characters each. An example of creating a screen title appears in Chapter 4 of the Pocket Operating Guide.

SELECT CHAR — causes the currently selected character in the active function block to appear in the next available character position of the title. This key may be held for repeated characters.

SPACE — places a blank space in the next available character position in the title.

BACK SPACE — deletes the last character placed in the title.

TITLE DONE — fixes the current title and returns to the previous softkey menu.

CHAR SET 1 2 — selects one of two character sets. Character set 1 contains upper-case letters, numbers, and miscellaneous characters. Character set 2 contains lower-case letters, and miscellaneous characters.

ERASE TITLE — erases the current title from the display.

GRAT ON OFF — blanks the graticule from the display (OFF) or reactivates it (ON).

ANNOT   blanks the annotation from the display (OFF) or reactivates it (ON).
ON OFF

FREQ DSP   turns off all frequency annotation. This includes the start and stop frequencies, the center
OFF   frequency, the frequency span, marker readouts, the center frequency step-size, and signal identification to center frequency. Once this key is pressed, there is no way to display the frequency data. To reactivate the annotation, press **PRESET** .

FOCUS   changes the focus of the display. Press FOCUS, then use the DATA keys, the STEP keys, or the knob to adjust the focus. The focus ranges from 0 to 255; the current value appears in the active function block. When FOCUS is pressed, STORE FOCUS appears on the menu. Press STORE FOCUS to store the new focus value.

INTEN   changes the intensity of the display. Press INTEN, then use the DATA keys, the STEP keys, or the knob to adjust the intensity. The intensity ranges from 0 to 255; the current value appears in the active function block. When INTEN is pressed, STORE INTEN appears on the menu. Press STORE INTEN to store the new intensity value.

For indoor use, keep the intensity around 90. For outdoor use, increase the intensity as necessary, keeping in mind that excessive brightness shortens the life of the CRT.

TRACE MATH IN THE HP 8562A/B

Trace math in the HP 8562A/B allows easy application of correction data to a trace. Trace math in the HP 8562A/B is performed either in dBm units, when in log mode, or in volts, when in linear mode. Sometimes trace-math results are not intuitive; an explanation of what occurs follows.

ADDING AND SUBTRACTING IN DBM

The HP 8562A/B trace-math scheme allows easy addition and subtraction of correction values in dBm units. For example, to correct for 3 dB of loss in Trace A data values, you can add or subtract Trace B, which has been preloaded with +3 dBm or −3 dBm as its data values. The two traces can then be added or subtracted using A+B→A; or A−B→A and thus eliminate the effects of the loss.

Note that in the example above, the result is an addition or subtraction of dBm and not an addition or subtraction of power. Consider a trace data value of −50 dBm and a second trace data value of −50 dBm. When the two values are added using A−B→A, the result is −50 dBm + −50 dBm = −100 dBm. However, if two −50 dBm power sources at two different frequencies are physically summed, the result is a power of −47 dBm. To further illustrate this point, if Trace A is at 3.0 dBm and Trace B is at 7.0 dBm, performing A+B→A moves Trace A to 10.0 dBm (i.e., Trace A would move up on the screen). On the other hand, if Trace A is at −10 dBm and Trace B is at −6.0 dBm, performing A+B→A drops Trace A data to −16 dBm, even though Trace B is 4.0 dBm higher in power in both cases. As you can see, the HP 8562A/B is not adding and subtracting physical values, but rather providing an efficient method for calculations in dBm units.

Use A−B+DL→A to Correct Data

The function A−B+DL→A provides the most versatile method for applying correction data to a trace. A−B+DL→A subtracts the contents of Trace B from the contents of Trace A and adds the result to the display line. Consider characterising the response of a device under test in a swept-measurement system. Enter the response of the system in Trace B. Insert the device into the system, then enter this response into Trace A. Use A−B+DL→A to subtract the system response from the response with the device under test; the result is the response of the device under test, which is centered about the display line. So, to correct data, use Trace B to store a copy of the uncorrected response and subtract this from new data in Trace A; the result is a corrected response.

If the two traces are identical, as in the following example, result of subtracting these two traces will equal 0 dBm. Note, however, that if the reference level is less than 0 dBm, the results will be off the screen, or even clipped (clipping is described at the end of this chapter). The display line is added to return the result to the screen, with no clipping occurring. Since you can specify the position of the display line, you can move the corrected data to any on-screen position.

The following example illustrates how to use A−B+DL→A. Preset the instrument, connect the calibration signal to the RF input, then set the spectrum analyzer to the state described below:

> Center Frequency: 299.995 MHz
> Frequency Span: 20 kHz
> Resolution Bandwidth: 10 kHz
> dB per Division: 5
> Sweep Mode: Single
> Trace A and Trace B: clear-write mode

Take two sweeps (i.e., press SINGLE twice) and set Trace B to view mode. This places an identical trace in both Trace A and Trace B, then freezes the data in Trace B. Activate the display line and place the line where you want the corrected data to appear on the screen (at −16 dBm, for example). Now activate A−B+DL→A. Trace B is subtracted from Trace A; since the traces are identical, the result is a flat response equal to 0 dBm. Note, however, that the reference level is at −10 dBm; if this were the end of the calculation, you would not be able to see the result. The display line is added to move the response to −16 dBm and onto the screen where you can view the result.

ADDING AND SUBTRACTING IN VOLTS

In linear mode, all trace math is executed in positive-voltage units. This means that the function A+B→A moves Trace A data up the screen, while the function A−B→A moves Trace A data down the screen (assuming Trace B contains non-zero data).

TRACE DATA LIMITS

The displayed amplitude of each trace element falls in one of 600 data points (see Figure 5.1). There are an additional 10 points of overrange. The HP 8562A/B clips results that exceed these limits. The overrange is equal to 1/6 of a division above the reference level. Also, the same clipping algorithm is applied to correction data in a trace (e.g., correction data that you enter into Trace B). For example, if the reference level is 0 dBm the scale is equal to 10 dB per division, the correction values must be within the range of +1.66 dBm to −100.00 dBm (1/6 of 10 dB is equal to 1.66 dB).
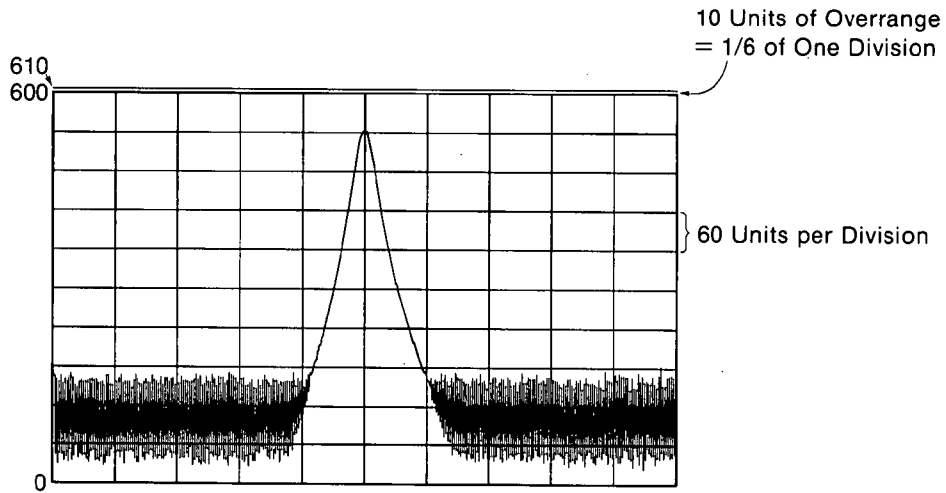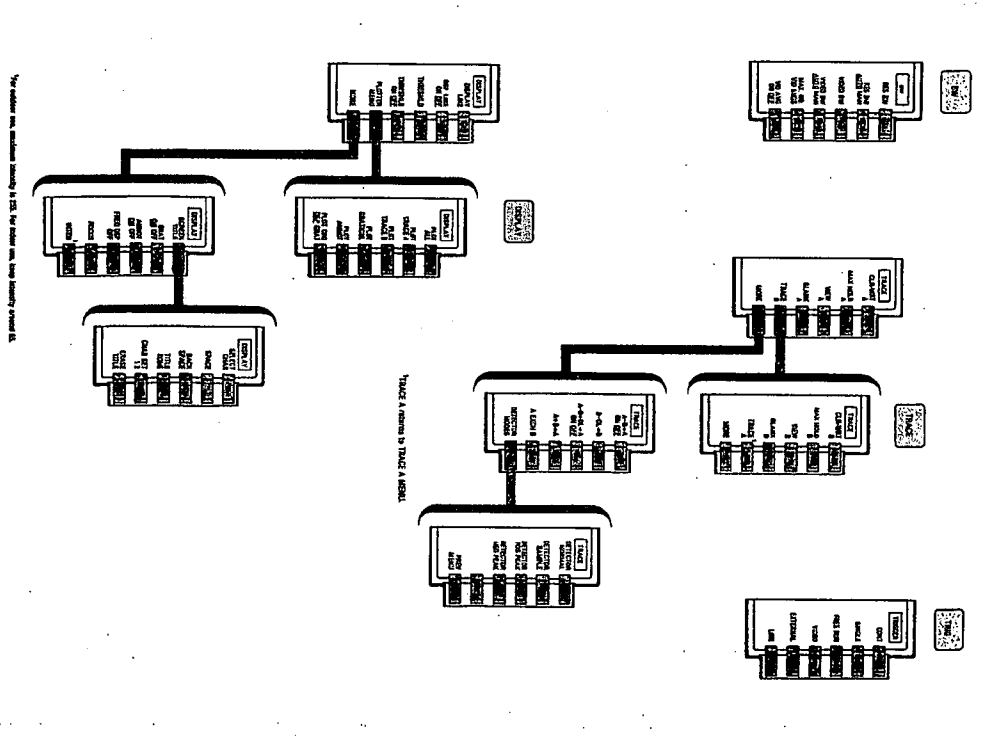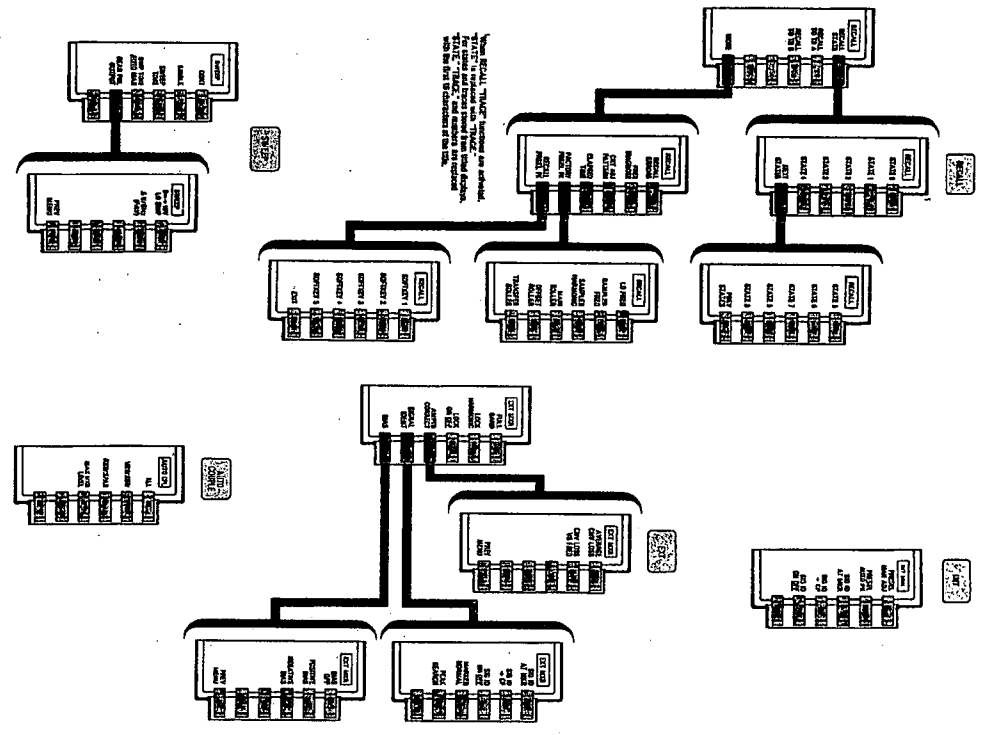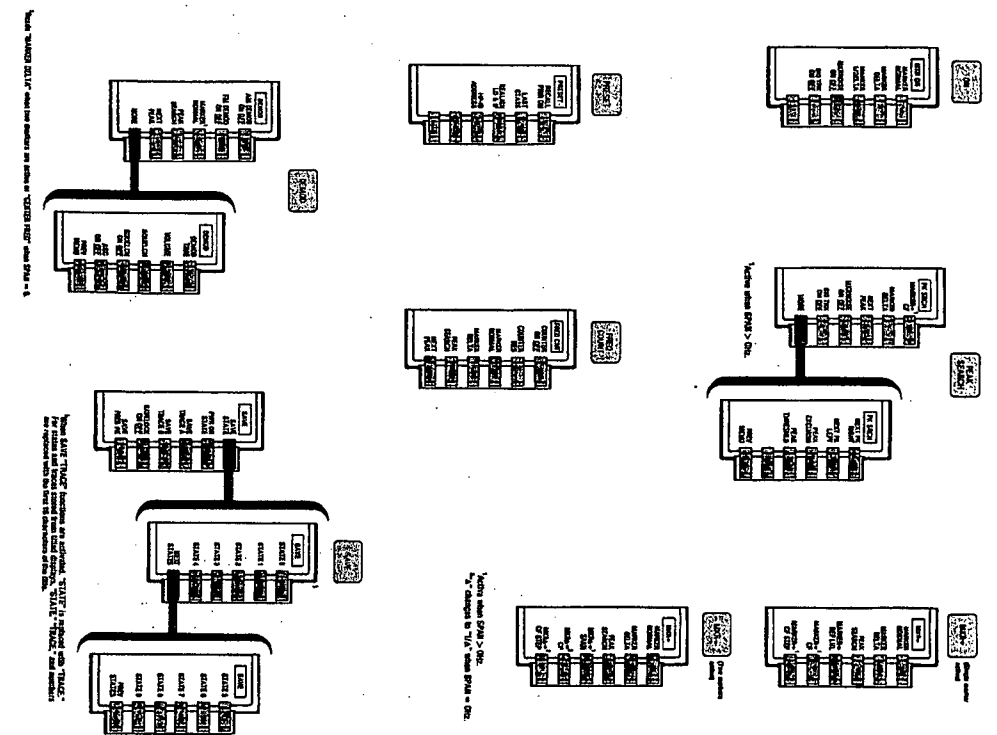
Fig. 5.1. HP 8562A/B display units.
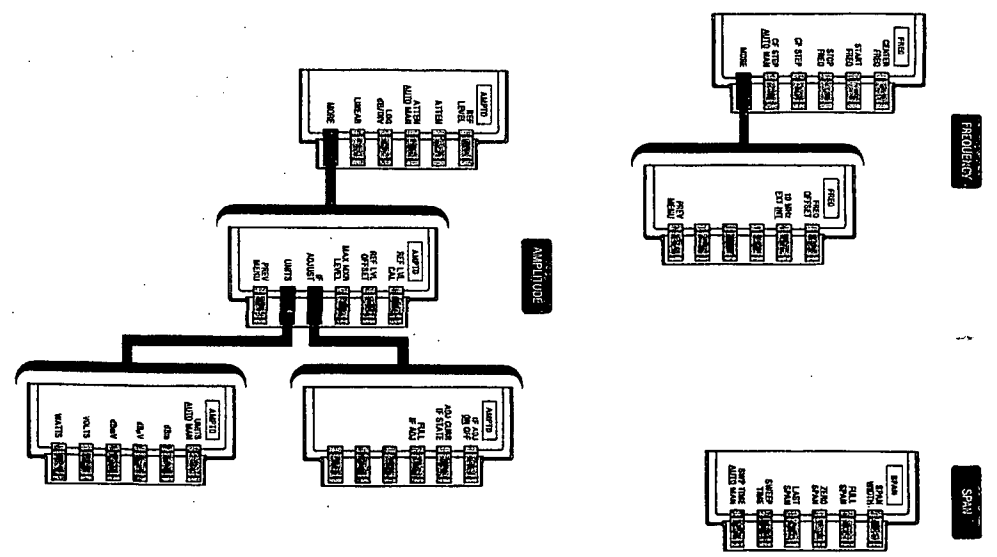
Menu Foldout

Remote Operation

CHAPTER 6

CREATING SCREEN TITLES

Screen titles (shown in Figure 6.1) allow you to label instrument data. They can help to identify on-screen data or data that you want to store or plot. The HP 8562A/B has commands to create titles remotely, and several methods can be used to make titles. These include using no format, or using A-block or I-block format. Each method is described below.

Note also that the first sixteen characters of a title become the label for a stored instrument state or stored trace. The label replaces the register number of the state or trace that usually appears on the spectrum analyzer menu. If you save or recall states or traces remotely, be sure to use the register number and not this label.
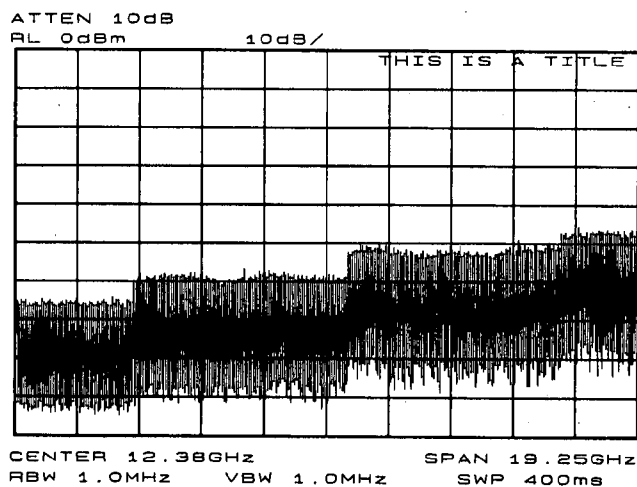
Fig. 6.1. Screen titles appear in the upper-right corner of the display.

NO-FORMAT METHOD

This is the simplest method for creating a title. No format is used; you simply enclose the title within string delimiters (a list of delimiters appears below). Refer to Example 1.

Example 1

```
10        OUTPUT 718;"TITLE@This is a title@;"
20        END
```

In this example, the "at" symbols are the string delimiters. Inside the delimiters is the title. A title can be up to 32 characters in length. On the spectrum analyzer display, a title appears on up to two lines of 16 characters each. The title can be made up of any valid, printing ASCII characters (line feed and carriage return are not recommended).

The list of string delimiters follows:
! " $ % & ' / : = @ \ ¦ < > { }

FORMAT METHODS

The method described above allows you to enter a title directly. Using formats provides greater flexibility. You can use data that has been previously stored in a string as the title. This data can be in ASCII characters, or even in binary or decimal equivalents. The two formats, A-block and I-block, are described below.

Making a Title in A-Block Format

A-block format allows you to use a string of data as a title. A-block format also requires that this string be of a known length; the length is sent to the spectrum analyzer. To place the title in a string, see Example 2.

Example 2

```
10        DIM A$[15]
20        A$="THIS IS A TITLE"
```

A-block format also requires that you send the length of the title, in bytes. When using Hewlett-Packard BASIC, this task is easily accomplished. See Example 3.

Example 3

```
10        DIM A$[15]
20        A$="THIS IS A TITLE"
30        OUTPUT 718 USING "#,K,W,K";"TITLE#A",LEN(A$),A$,";"
40        END
```

Line 30 sends to the analyzer the TITLE command; the "#A" to specify that the title is in A-block format; the string length; and the contents of the string, which is the actual title. The USING statement specifies that some of the data will be sent as characters (K) and some as a 16-bit word (W). The character data is the spectrum analyzer command (TITLE #A) and the title (in A$). The length of the trace (LEN(A$)) is sent as one 16-bit word that is made up of two 8-bit bytes. The "#" sign in the USING statement suppresses any end-of-line characters.

Making a Title in I-Block Format

I-block format, like A-block format, also allows you to use string data as a title. With I-block, however, you can send a string of indefinite length. The spectrum analyzer will continue to accept data (up to 32 characters) until an end-or-identify (EOI) signal is sent to the spectrum analyzer. See Example 4.

Example 4

```
10      DIM A$[15]
20      A$="THIS IS A TITLE"
30      OUTPUT 718 USING "#,K";"TITLE#I",A$,END
40      END
```

This example is much like the previous one. For I-block format, you must place the title in a string. However, you do not send the title length. Line 30 sends all character data; thus, the USING statement specifies "K" format only. "TITLE #I" activates the analyzer TITLE function and specifies that the title is in I-block format. "A$" sends the title; and the END statement, which is sent with the last byte of title data, activates the end-or-identify control line. Again, the "#" sign in the USING statement suppresses any end-of-line characters.

CHAPTER 7

See Also Chapter 7-A

GENERATING PLOTS REMOTELY

In addition to the plot functions available from the spectrum analyzer front panel, the HP 8562A/B also allows you to generate plots remotely. This chapter describes how to combine plot commands to generate plots.

PLOTTER REQUIREMENTS

Be sure your plotter satisfies the following requirements to successfully execute the programming examples in this chapter.

1. The HP 8562A/B supports the following plotters: the HP 7470A, HP 7475A, HP 7550A, HP 9872A/B/C, and the HP 7440A ColorPro. Be sure that the HP 7550A Plotter is in "standard" mode.

2. Set the plotter to address five (see Figure 7.1). If you cannot locate the address switch on the plotter, refer to the plotter's operation manual. If you want to use a different plotter address for remote operation, be sure to modify the examples accordingly. Remember, to generate plots from the spectrum analyzer front panel, you must reset the address to five.
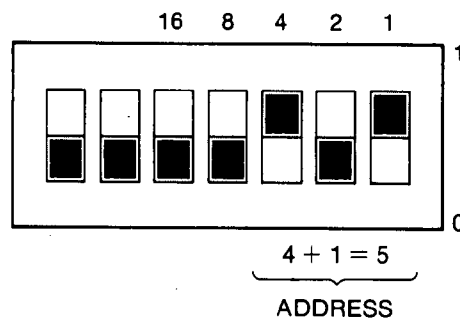
Fig. 7.1. Plotter address set to five.

3. Know how to select the scaling points on your plotter. The scaling points (referred to as the P1 and P2 plotter coordinates) define the lower-left and upper-right corners of the plot (see Figure 7.2). These coordinates define the size of the plot. Table 7.1 shows the scaling points for several Hewlett-Packard plotters.
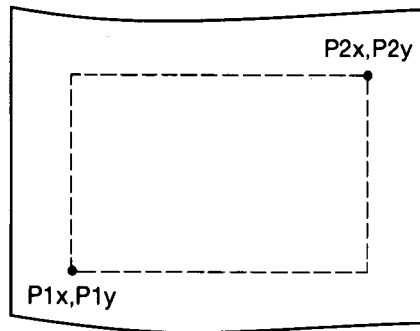
Fig. 7.2. P1 and P2 coordinates.

	TYPICAL SCALING POINTS		PLOTTING RANGE	
Plotter	P1x,P1y	P2x,P2y	X-Axis	Y-Axis
7440	200,200	7400,11000	0 to 7544	−39800 to +51000
7475A	250,279	10250,7479	0 to 10300	0 to 7650
9872C	520,380	15720,10380	0 to 16000	0 to 11400

Table 7.1. Scaling points for various plotters.

MAKING A BASIC PLOT

To make a basic plot, choose P1 and P2 coordinates for the plot size you desire and set the plotter to these values. The typical coordinates shown in Table 7.1 create a plot with approximately 1″ margins on an 8 1/2″ × 11″ sheet of paper. (Many plotters have default values for this size of paper.) You can enter coordinates in a program directly, or query the plotter for the values. The latter method is used in the example program below. To generate a plot, connect the plotter via HP-IB to the computer and execute Example 1.

Example 1

```
10        OUTPUT 705;"OP;"
20        ENTER 705;P1x,P1y,P2x,P2y
30        OUTPUT 718;"PLOT ";P1x;",";P1y;",";P2x;",";P2y;";"
40        SEND 7;UNL LISTEN 5 TALK 18 DATA
50        END
```

Line 10 of the example above queries the plotter for its P1 and P2 coordinates, and Line 20 enters these values into variables. Line 30 sends the spectrum analyzer PLOT command and the plotter coordinates. Line 40 sends the following statements over the HP-IB interface. UNL sets all instruments on the HP-IB to unlisten mode; LISTEN 5 sets only the plotter to listen mode. TALK 18 specifies the spectrum analyzer as the talker; it can then send its display contents to the plotter. Since the controller's HP-IB interface must not interfere with the plot, the DATA statement puts the controller HP-IB interface on standby and sets the attention line low.

Example 1 illustrates the statements required to generate a plot. However, there is no provision to indicate to the controller when the plot is finished. Example 2 uses a spectrum analyzer "command complete" service request to indicate when the plot is done (service requests are discussed in Chapter 9). When the spectrum analyzer PLOT command is finished, a "command complete" service request is triggered and signals that the plot is done.

Example 2

```
10         OUTPUT 705;"OP;"
20         ENTER 705;P1x,P1y,P2x,P2y
30         ON INTR 7 GOTO Done
40         ENABLE INTR 7;2
50         OUTPUT 718;"RQS 16;"
60         OUTPUT 718;"PLOT ";P1x;",";P1y;",";P2x;",";P2y;";"
70         SEND 7;UNL LISTEN 5 TALK 18 DATA
80  Idle:    GOTO Idle
90  Done:         S_poll=SPOLL(718)
100        OUTPUT 718;"RQS 0;"
110        PRINT "COMMAND IS COMPLETE"
120        END
```

Lines 10 and 20 obtain the P1 and P2 coordinates, as in the previous example. Line 30 commands the controller to go to the subroutine "Done" when an interrupt occurs. Line 40 enables the controller to receive service request interrupts. On Line 50, the RQS command specifies that a "command complete" condition will generate a service request. Lines 60 and 70 plot the display contents. Line 80 keeps the controller on Line 80 of the program until the plot is finished and the PLOT command satisfies the "command complete" condition. When the plot is finished, the controller continues to the subroutine "Done." Done performs a serial poll on the spectrum analyzer and reads the generated service request. This also clears the analyzer of this request. Line 100 returns the spectrum analyzer service requests to their initial condition. Line 110 prints on the computer screen that the plot is done.

PLOTTING OPTIONS

Perhaps you do not want the entire display contents transferred to the plotter. You may want to plot only a trace, or only a trace and the screen annotation. The spectrum analyzer PLOTSRC command specifies the display contents you want to plot. Choose to plot the entire display, Trace A, Trace B, the annotation, or the graticule. Example 3 illustrates how to plot Trace A and the annotation.

Example 3

```
10        OUTPUT 705;"OP;"
20        ENTER 705;P1x,P1y,P2x,P2y
30        OUTPUT 718;"PLOTSRC TRA;RQS 16;PLOT ";P1x;",";P1y;",";P2x;",";P2y;
          ";RQS 0;"
40        Done=0
50        IF Done=0 THEN GOSUB Wait_plot
60        Done=0
70        OUTPUT 718;"PLOTSRC ANNT;RQS 16;PLOT ";P1x;",";P1y;",";P2x;",";P2y;
          ";RQS 0;"
80        IF Done=0 THEN GOSUB Wait_plot
90          PRINT "COMMAND IS COMPLETE"
100         STOP
110       Wait_plot:    Done=1
120                     ON INTR 7 GOTO Go_back
130                     ENABLE INTR 7;2
140                     SEND 7;UNL LISTEN 5 TALK 18 DATA
150       Idle:   GOTO Idle
160       Go_back:      S_poll=SPOLL(718)
170                     RETURN
180         END
```

Another available plot function, the PLOTORG command, specifies whether the plotter P1 and P2 coordinates are the origins for the entire analyzer display or for its graticule. If you choose the graticule as the origin and plot only the graticule, you can, in effect, create graph paper especially for analyzer plots. Using paper with preprinted graticule lines can save plotting time. When you use this paper, be sure to set the PLOTORG command in reference to the graticule ("PLOTORG GRT") and use the P1 and P2 coordinates that you used to create the graticule lines.

CHAPTER 7A

PRINTING REMOTELY

In addition to print functions available from the front panel, the HP 8562A/B allows remote printing. This chapter describes how you can print remotely.

PRINTER REQUIREMENTS

The HP 8562A/B supports the following printers: the HP 3630A PaintJet printer, HP 2225A/B/D ThinkJet printer, and many other printers with IEEE-488 interface and raster graphics.

Set the printer address to one (see Figure 7A.1). If you want to use a different remote address, be sure to modify the example accordingly. Remember, to print from the spectrum analyzer front panel, you must reset the address to one.

Fig. 7A.1. Printer address set to one.

PRINTING

To print, connect the printer via HP-IB to the computer and execute example 1.

Example 1

```
10        OUTPUT 718;"PRINT"
20        SEND 7; UNL LISTEN 1 TALK 18 DATA
30        END
```

HP 8562A: 2805A & Above; HP 8562A: 2809A & Above

Line 10 of the example sends the spectrum analyzer PRINT command to the printer. Line 20 sends the following statements over the HP-IB interface: UNL sets all the instruments on the HP-IB to unlisten mode, LISTEN 1 sets only the printer to listen mode; TALK 18 specifies the spectrum analyzer as the talker. It can then send its display contents to the printer. Since the controller's HP-IB interface must not interfere with the print, the DATA statement puts the controller HP-IB interface on standby and sets the attention line low.

Example 1 illustrates the statements required to print remotely. However, there is no provision to indicate to the controller when printing is finished. Example 2 uses a spectrum analyzer "command complete" service request to indicate when the printing is done (service requests are discussed in Chapter 9). When the spectrum analyzer PRINT command is finished, a "command complete" service request is triggered and signals that the printing is done.

Example 2

```
10        ON INTR 7 GOTO Done
20        ENABLE INTR 7;2
30        OUTPUT 718;"RQS 16;"
40        OUTPUT 718;"PRINT"
50        SEND 7;UNL LISTEN 1 TALK 18 DATA
60   Idle:  GOTO Idle
70   Done:  S_poll=SPOLL(718)
80        OUTPUT 718;"RQS 0;"
90        PRINT "COMMAND IS COMPLETE"
100       END
```

Line 10 commands the controller to go the subroutine "Done" when the interrupt occurs. Line 20 enables the controller to receive the service request interrupts. On line 30, the RQS command specifies that a "command complete" condition will generate a service request. Lines 40 and 50 print the display contents. Line 60 keeps the controller on line 60 until the printing is finished and the PRINT command satisfies the "command complete" condition.

When the printing is finished, a service request interrupt is generated, sending the controller to the "Done" subroutine. "Done" performs a serial poll on the spectrum analzyer. This clears the analyzer of the service request. Line 80 returns the spectrum analyzer service requests to their initial condition. Line 90 prints on the computer screen that the printing is finished.

PRINTING OPTIONS

PRINT   At the execution of the PRINT command, the display is printed on the HP 2225A/B/D ThinkJet printer, HP 3630A PaintJet printer (in black and white only), and many other printers with IEEE-488 interface and raster graphics capability.

PRINT 0   Same as PRINT

PRINT 1   At the execution of the PRINT 1 command, the display is printed on the HP 3630A PaintJet printer. Colors of the printed trace are fixed by the spectrum analyzer.

NOTE

If the HP 3630A PaintJet printer is not connected at the execution of the PRINT 1 command, erroneous information will be printed.

CHAPTER 8

TRACE DATA TRANSFERS

An important part of spectrum analyzer remote operation is receiving and sending trace data via HP-IB. This chapter describes the various formats available for transferring trace data to and from a computer.

The HP 8562A/B provides five formats: real number (P) format, binary (B) format, A-block format, I-block format, and measurement units (M) format. How to transfer data to and from a computer with each format is described below.

TRANSFER REQUIREMENTS

The three requirements listed here apply to all trace data transfers, regardless of the format selected.

1. Trace length

HP 8562A/B traces are composed of 601 data points, or trace elements. This is the length of all traces and cannot be changed. When transferring trace data to or from a computer, set the dimension of trace-data arrays to 601 elements.

2. Trace conditions

Trace data is of little value if you do not also know the trace conditions from which the data was taken. The five conditions that you must store in addition to the trace data are the start and stop frequencies, the reference level, the amplitude scaling, and the absolute amplitude units. You may want to store additional conditions such as the resolution bandwidth, attenuation, or sweep time. Example 1 below queries the spectrum analyzer for the trace conditions shown on the display and stores them. Example 2 shows how to return this data to the analyzer. These procedures, which you may find useful, are used throughout the programming examples in this chapter.

Example 1

```
10      SUB Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
20      OUTPUT 718;"FA?;FB?;RL?;RB?;VB?;ST?;LG?;AUNITS?;"
30      ENTER 718 USING "K";Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$
40      SUBEND
```

Example 2

```
10        SUB Enter_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
20        OUTPUT 718;"FA ";Fa;"HZ;"
30        OUTPUT 718;"FB ";Fb;"HZ;"
40        OUTPUT 718;"AUNITS ";Aunits$;";"
50        OUTPUT 718;"RB ";Rb;"HZ;"
60        OUTPUT 718;"VB ";Vb;"HZ;"
70        OUTPUT 718;"ST ";St;"SEC;"
80        IF Lg=0 THEN
90        OUTPUT 718;"LN;"
100         ELSE
110         OUTPUT 718;"LG ";Lg;"DB;"
120         END IF
130         SUBEND
```

3. Specify the data format before transferring data.

Use the TDF command to specify the format before sending data from the spectrum analyzer to the computer. The examples in this chapter illustrate how to use this command. For more information, refer to the Language Reference section of this manual.

The examples in this chapter use the TRA command. This command transfers data to and from Trace A. A TRB command is also available for transferring Trace B data. It is possible to read data from Trace A and then send it to Trace B, and vice versa. For simplicity, this capability is not reflected in the programming examples in this chapter.

FORMATS

P-Format

The real number, or "P" format allows you to receive or send trace data in a real-number format. This is the default format when the instrument is powered up. Numbers are in dBm, dBmV, dBμV, volts, or watts. Be sure to include the amplitude units with the trace data (use the AUNITS command or the trace conditions procedure included in this chapter). Real-number data may be an advantage if you wish to use the data later in a program. However, data transfers using P-format tend to be slow and take up a lot of memory (compared to binary format, in some cases P-format can take up to four times the amount of memory).

The following programming example illustrates how to send trace data to a computer. Refer to Example 3, below.

Example 3

```
10      REAL A(1:601)
20      OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
30      CALL Get_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
40      OUTPUT 718;"TDF P;TRA?;"
50      ENTER 718;A(*)
60      END
70      SUB Get_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
80      OUTPUT 718;"FA?;FB?;RL?;RB?;VB?;ST?;LG?;AUNITS?;"
90      ENTER 718 USING "K";Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$
100     SUBEND
```

Line 10 dimensions array A to 601 elements (one element for each point of trace data). The array is dimensioned using the REAL statement, allowing each array element to accept real-number data. Line 20 sets the analyzer to a desired state. Line 30 calls the subprogram that queries the spectrum analyzer for the required state data. Line 40 specifies the P-format (TDF P), then queries the analyzer for the data in Trace A (TRA?). The data is entered into the array on Line 50. You can use the data in a program or store it on a disk for later use.

Example 4 illustrates how to return data from a computer to the spectrum analyzer.

Example 4

```
10      REAL A(1:601)
20      OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
30      CALL Get_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
40      OUTPUT 718;"TDF P;TRA?;"
50      ENTER 718;A(*)
60      PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
70      PAUSE
80      OUTPUT 718;"IP;TDF P;TS;VIEW TRA;"
90      CALL Enter_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
100     OUTPUT 718;"TRA ";
110     FOR I=1 TO 600
120     OUTPUT 718;A(I);"DBM,";
130     NEXT I
140     OUTPUT 718;A(601);"DBM;"
150     END
```

Note that lines 10-50 effectively repeat Example 3. This is to ensure that Example 4 will run properly; trace data does not need to be output twice. Sending the trace data begins on Line 80. Line 80 presets the analyzer, readies the spectrum analyzer to accept data into Trace A, and selects the P-format. Line 90 sets the analyzer to the stored trace conditions. Lines 100-140 enter the stored trace data into Trace A. When sending trace data into the analyzer using P-format, the data points must be entered into the analyzer one point at a time. Note that each point is followed by the amplitude units (in this case, dBm). If the specified amplitude units for the trace data are the same as the amplitude units currently selected for the analyzer, you may omit the amplitude units in the above program. When sending trace data into the analyzer using P-format, each point is terminated with the amplitude units (in this case, dBm).

B-Format (output only)

The binary, or B, format provides the fastest data transfer and requires the least amount of memory to store data. Each data point is transferred in binary as two 8-bit bytes. The data points are in the internal representation of measurement data. Binary data can also be easily converted into measurement data. If speed and memory are important considerations, you may prefer B-format to P-format.

Example 5 shows how to transfer data in B-format from the spectrum analyzer to a computer.

Example 5

```
10        INTEGER Tra_binary(1:601)
20        ASSIGN @Sa_bin TO 718;FORMAT OFF
30        OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
40        CALL Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
50        OUTPUT 718;"TDF B;TRA?;"
60        ENTER @Sa_bin;Tra_binary(*)
70        END
```

Line 10 dimensions the array TRA__BINARY to 601 elements. Here, the INTEGER statement dimensions each array element as two bytes (remember, each data point transferred in B-format is sent as two 8-bit bytes). On Line 20, the spectrum analyzer address is assigned to "@Sa_bin." Because the trace data is transferred in the format of two 8-bit bytes and this format is also the internal format of the computer, no number builder is needed to transfer the binary data. The number builder is turned off whenever the spectrum analyzer is addressed as "@Sa__bin." Line 40 enters the instrument state conditions. Line 50 selects B-format, then queries the spectrum analyzer for Trace A data. Line 60 enters the data into the array Tra__binary.

To convert a trace-data point from binary to a real, logarithmic number (e.g., dBm), use the equation below:

$$n = RL - 10 \times \text{Log Scale} + \text{Log Scale} \times (x/600)$$
$$= RL + \text{Log Scale}(x/60 - 10)$$

where: x = binary data in an array element
 RL = reference level in dBm, dBmV, or dBμV
 Log Scale = the dB per division log scale selected on the spectrum analyzer.

Example 6 converts binary values to measurement data and prints them on the computer display.

Example 6

```
10          INTEGER Trace_a(1:601)
20          DIM Real_num(1:601)
30          Ref_lvl=0 ! 0 DBM REFERENCE LEVEL
40          Log_scale=10 ! 10/DIV LOG SCALE
50          OUTPUT 718;"TDF B;TRA?;"
60          ENTER 718 USING "#,W";Trace_a(*)
70          MAT Real_num= Trace_a
80          FOR X=1 TO 601
90          Real_num(X)=Ref_level+Log_scale*(Real_num(X)/60-10)
100         NEXT X
110         END
```

For converting linear data, use this equation:

$$n = RL(x/600)$$

where: x = binary data in an array element

RL = reference level, in volts or watts

These equations are useful when you are interested in viewing only a few points of data, rather than an entire trace. B-format saves time and memory, and these equations provide a means to view the data, if necessary.

One important note. It is not possible to return data to the analyzer using binary format. You must use either A-block or I-block format. These two formats are described below.

A-Block Format

A-block format is similar to binary format in that each data point is sent as two 8-bit bytes (this, too, is in the internal representation of measurement data). A-block format also transfers a four-byte header before the 601 points of trace data. These bytes are the ASCII characters "#," "A," and a two-byte length field equal to 1202. The first two characters indicate that the transferred data is in A-block format. "1202" indicates the length of the trace data, expressed in bytes. As previously mentioned, trace data is composed of 601 trace elements. Each trace element is transferred as one word that is composed of two 8-bit bytes. Thus, 601 words contains 1202 bytes. 1202 is the trace length sent. You may want to keep this format and trace length information separate from the actual trace data. Refer to Example 7.

Example 7

```
10        INTEGER Tra_binary(1:601)
20        DIM Header$[4]
30        OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
40        CALL Get_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
50        OUTPUT 718;"TDF A;TRA?;"
60        ENTER 718 USING "#,4A,601(W)";Header$,Tra_binary(*)
70        END
```

Like B-format, the array in Line 10 is created using the INTEGER statement. Line 20 creates a string, Header$. The header will be placed in this string, separate from the trace data. Line 50 specifies the data format, then queries for the contents of Trace A. Line 60 places the header in Header$ and places 601 points of trace data in Tra__binary. Header$ will contain the "#A" and two non-printing characters that represent in binary the integer 1202. The first non-printing character is CHR$(4), and the second non-printing character is CHR$(178). Since this string does not contain desired trace data, you can discard it. The USING statement specifies that four header characters will be transferred, followed by 601 16-bit words, which are the actual trace data. The "#" sign within the USING statement suppresses any end-of-line signals that may occur before the last trace-data byte is sent.

To send trace data from the computer to the analyzer, refer to Example 8.

Example 8

```
10        INTEGER Tra_binary(1:601)
20        DIM Header$[4]
30        OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
40        CALL Get_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
50        OUTPUT 718;"TDF A;TRA?;"
60        ENTER 718 USING "#,4A,601(W)";Header$,Tra_binary(*)
70        PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
80        PAUSE
90        OUTPUT 718;"IP;TS;VIEW TRA;"
100        CALL Enter_data(Fa,Fb,R1,Rb,Vb,St,Lg,Aunits$)
110        OUTPUT 718;"TDF A;"
120        OUTPUT 718 USING "#,K,W,601(W)";"TRA#A",1202,Tra_binary(*),";"
130       END
```

Line 90 presets the analyzer and sets Trace A to view mode. Line 100 returns the state data to the analyzer. Line 110 sets the data format to A-block. Line 120 sends the TRA command, the format information and the trace data. The USING statement specifies that the data "TRA#A" will be sent as characters, followed by a word ("1202") and 601 16-bit words (the actual trace data). Remember, you must send "#A" to indicate the format and "1202" to indicate the length of the trace, in bytes. The "#" sign within the USING statement suppresses any end-of-line signals characters.

I-Block Format

Data points transferred in the I-block format are sent as two 8-bit bytes in the internal representation of measurement data. In addition to transferring trace data, I-block format also transfers the characters "#" and "I." These characters indicate that the trace data is in I-block format. Like the A-block format examples, when sending the trace data to the computer, you may want to keep these two characters separate from the trace data. Refer to Example 9.

Example 9

```
10          INTEGER Tra_binary(1:601)
20          DIM Header$[2]
30          OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
40          CALL Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
50          OUTPUT 718;"TDF I;TRA?;"
60          ENTER 718 USING "#,2A,601(W)";Header$,Tra_binary(*)
70          END
```

Like the examples for the A-block format, you store format information in a string (Header$) and store the desired trace data in an integer array (Tra_binary).

Returning the trace data to the analyzer requires an important instruction. The "I" in the term I-block refers to the ability of the spectrum analyzer to accept data of "indefinite" length when using I-block format. Even though the analyzer uses only 601 points of trace data, the I-block format lets you send any number of data points. The spectrum analyzer will continue to accept data until an end-of-instruction (EOI) signal is sent to it. Hewlett-Packard Series 200/300 BASIC allows you to send an EOI with the last data byte using the END command. Refer to Example 10.

Example 10

```
10          INTEGER Tra_binary(1:601)
20          DIM Header$[2]
30          OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
40          CALL Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
50          OUTPUT 718;"TDF I;TRA?;"
60          ENTER 718 USING "#,2A,601(W)";Header$,Tra_binary(*)
70          PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
80          PAUSE
90          OUTPUT 718;"IP;TS;VIEW TRA;"
100           CALL Enter_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
110           OUTPUT 718;"TDF I;"
120           OUTPUT 718 USING "#,K,601(W)";"TRA#I",Tra_binary(*) END
130         END
```

By now most of this program should look familiar. Line 120 requires some explanation, however. The END statement appearing after the array Tra__binary sends to the spectrum analyzer the last data byte stored in the array, with the HP-IB EOI line set "true," as required by I-block format.

M-Format (output only)

The measurement units, or M, format transfers trace data in the internal format used by the spectrum analyzer. Refer to Figure 8.1. The displayed amplitude of each element falls on one of 600 vertical points (with 600 equal to the reference level). For example, the peak of the signal in Figure 8.1 is equal to −10 dBm, or one division below the reference level. In measurement units, it is equal to 540 (600 − 60 = 540). There are also 10 additional points of overrange. Measurements units, then, range from 0 to 610. The advantage of M-format is that it transfers data as ASCII characters, allowing you to view the data directly. The data points are separated by commas.

To send trace data to the computer, see Example 11.

Example 11

```
10          INTEGER A(1:601)
20          OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
30          CALL Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
40          OUTPUT 718;"TDF M;TRA?;"
50          ENTER 718;A(*)
60          PRINT A(*)
70          END
```

RL = 0 dBm

600

Peak = 10 dBm or
540 Display Units

0
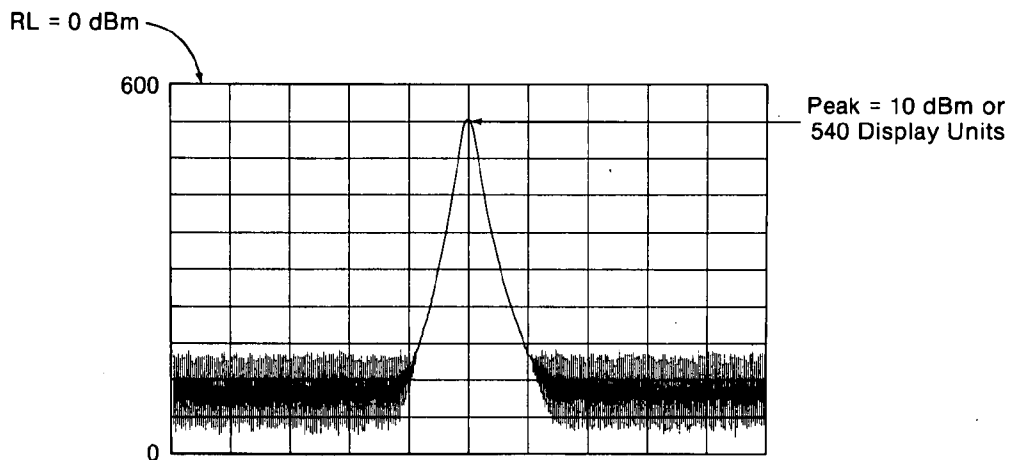
Fig. 8.1.

CHAPTER 9

SERVICE REQUESTS

In Chapter 7, you were introduced to service requests (SRQs). You saw how a service request can interrupt a normal program sequence in order to attend to an event outside of the regular program sequence. In Chapter 7, the service request indicated when the plotter had finished plotting the contents of the spectrum analyzer display. Service requests have other applications as well. For example, while the spectrum analyzer is making a remote measurement, the computer can be processing numeric data or attending to some other task. When the analyzer is finished with its task, it can then interrupt the computer, signaling that the task is done. Or, a service request can be used to indicate that a specific event has occurred; the computer can then branch to another routine. This chapter describes the controller statements and analyzer commands used to generate service request routines.

THE STATUS REGISTER

The status register is a register in the spectrum analyzer. The bits in this register summarize the conditions that can create a service request. See Table 9.1. Each condition is assigned to a bit in the status register. The decimal equivalent of that bit is also included. The conditions have been selected by Hewlett-Packard as appropriate spectrum analyzer service requests. For example, when the spectrum analyzer becomes uncalibrated, a message is generated to indicate this condition. You can use this "message generated" event to trigger a service request, causing the computer to branch to a subprogram. The subprogram can then alert you of the spectrum analyzer's uncalibrated state. If you want to be notified to any errors that occur during remote operation, the "error present" service request can cause branching to a subroutine that notifies you an error has occurred and perhaps prints the errors.

BIT NUMBER	DECIMAL EQUIVALENT	ANALYZER STATE	DESCRIPTION
7	128		Not used
6	64	RQS	Not used
5	32	ERROR PRESENT	Set when error present
4	16	COMMAND COMPLETE	Any command is completed
3	8		Not used
2	4	END OF SWEEP	Set when any sweep is completed
1	2	MESSAGE	Set when display message appears
0	1	TRIGGER	Trigger is activated

Table 9.1. HP 8562A/B Status Register

MASKING SERVICE REQUESTS

Use Table 9.1 to select the condition or conditions that will generate service requests and interrupt the program sequence. Once you have selected the desired conditions, use the spectrum analyzer RQS command to specify these conditions. You will want to "mask" or blank the conditions that you do not use. Use the decimal equivalents of the desired bits to set the bit mask. The following program line sets a bit mask for the "command complete" condition.

```
10          OUTPUT 718;"RQS 16;"
```

Once RQS is executed, all conditions other than "command complete" are no longer recognized as service request conditions. Note, however, that bit six of the status byte is the universal service request bit. This bit signals to the computer which instrument on the HP-IB (in this case, the spectrum analyzer) has generated an interrupt condition, specifically a service-request interrupt. The spectrum analyzer service-request commands (RQS, SRQ, and STB) have no effect on this bit. If desired, you can add the decimal value of bit six to the value in the RQS command (e.g., 64 + 16 = 80; then send "RQS 80;"), but this is not necessary.

COMPUTER INTERRUPT STATEMENTS

Now that the spectrum analyzer is prepared to trigger service requests, you must prepare the computer to accept this type of interrupt. Use the BASIC statements ON INTR...GOTO or CALL or GOSUB and ENABLE INTR. ON INTR...GOTO causes the computer to branch to a subroutine or some other part of the program when an interrupt is generated. ENABLE INTR enables the computer to accept an interrupt. These two commands appear below.

```
10          OUTPUT 718;"RQS 16;"
20          ON INTR 7 GOTO Srq
30          ENABLE INTR 7;2
```

In this example, Line 30 indicates that if an interrupt appears (ON INTR 7), the computer is to go to the subroutine Srq (GOTO Srq). The "7" specifies the interface select code; in this case, it refers to the Hewlett-Packard Interface Bus (HP-IB). Line 40 enables the computer to accept an interrupt. Here, the "7" again specifies the HP-IB select code. The semicolon is part of the BASIC statement ENABLE INTR. The "2" indicates that the interrupt is specifically a service request interrupt, which is asserted from the SRQ line of the HP-IB. From Line 10, you know the interrupt will be a service request triggered from a command complete condition.

Now that the spectrum analyzer and computer can assert and accept service-request interrupts, choose an event that will trigger the service request and create a subroutine to handle the interrupt. In the example below, the take sweep command (TS) is used to trigger a command complete signal. (Since ten video-averaging sweeps are desired, this signal does not occur until after the selected number of averages is complete.) This service request will cause the computer to go to the subroutine Srq. The subroutine identifies the type of service request and prints it on the computer screen. See Example 1, below.

Example 1

```
10          OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20          OUTPUT 718;"VAVG 10;RQS 16;"
30          ON INTR 7 GOTO Srq
40          ENABLE INTR 7;2
50          OUTPUT 718;"TS;"
60    Idle:    GOTO Idle
70    Srq:  Sbyte=SPOLL(718)
80          PRINT Sbyte
90          PRINT "VIDEO AVERAGING IS COMPLETE"
100           OUTPUT 718;"RQS 0;"
110           LOCAL 718
120   END
```

Line 10 sets the desired instrument state. Note that the instrument is set to single-sweep mode. This allows the video averages to happen only when the take-sweep command is sent. Line 20 selects the number of video averages desired. It is not until after the VAVG command is sent that the RQS command is sent. This ensures that no previous commands can accidently generate an SRQ. Line 30 indicates to go to the routine "Srq" when an interrupt occurs. Line 40 enables the computer to accept the interrupt. Line 50 sends the take-sweep command; during the ten video averages that will now occur, the computer remains on Line 60. When the video averaging is complete, TS is complete and the "command complete" condition is satisfied. The computer then branches to the subroutine Srq. Here, on Line 70, the SPOLL statement causes the computer to read the decimal equivalent of the generated service request into the variable Sbyte. The computer then prints the value, alerting you that the interrupt has occurred. On Line 100, the status register is returned to its initial state (i.e., no conditions are masked).

READING SERVICE REQUEST DATA

In the above example, you used the serial-poll statement (SPOLL) to read the service request data into a variable. The HP 8562A/B STB command also reads service request data. Example 2 shows how.

Example 2

```
10        OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20        OUTPUT 718;"VAVG 10;RQS 16;"
30        ON INTR 7 GOTO Srq
40        ENABLE INTR 7;2
50        OUTPUT 718;"TS;"
60     Idle:    GOTO Idle
70     Srq:OUTPUT 718;"STB?;";
80        ENTER 781;Sbyte
90          PRINT Sbyte
100         PRINT "VIDEO AVERAGING IS COMPLETE"
110         OUTPUT 718;"RQS 0;"
120         LOCAL 718
130     END
```

Line 20 sets the bit mask so that only the "command complete" condition is set. On Line 70, once the "command complete" condition is satisfied (in this case, after ten video averages), the STB command queries the spectrum analyzer for the service request data. The data is then entered into variable Sbyte and printed. The value returned is the decimal equivalent of the generated service request.

Reading Service Requests From More Than One Instrument

Most instruments that can be controlled remotely have service request capability similar to that in the HP 8562A/B. You may want to take advantage of this capability in other instruments as well as in the spectrum analyzer. If you have more than one instrument on a bus that can generate a service request, you need to modify the above program to look for interrupts from more than one instrument. See Example 3.

Example 3

```
10          OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20          OUTPUT 718;"VAVG 10;RQS 16;"
30          ON INTR 7 GOSUB Srq
40          ENABLE INTR 7;2
50          OUTPUT 718;"TS;"
60    Idle:    GOTO Idle
70    Srq:  Sbyte_1=SPOLL(718)
80          Sbyte_2=SPOLL(705)
90          IF BIT(Sbyte_1,6)=1 THEN
100            PRINT "SERVICE REQUEST",Sbyte_1,"ON ADDRESS 18"
110            OUTPUT 718;"RQS 0;"
120            LOCAL 718
130            STOP
140          END IF
150          IF BIT(Sbyte_2,6)=1 THEN
160            PRINT "SERVICE REQUEST",Sbyte_2,"ON ADDRESS 5"
170          END IF
180          ENABLE INTR 7;2
190          RETURN
200         END
```

In this example, you execute the SPOLL command for each instrument that may cause a service request interrupt; in this case, the analyzer or an instrument that is set to address 5. Once the instruments are queried for interrupts, the IF...THEN statements provide a way to branch to the appropriate routine.

TESTING SERVICE REQUEST ROUTINES

In the previous programming examples, you knew that a service request would be generated when the VAVG command was completed. You could easily test the program and make sure that it worked. However, service requests may not always be so predictable; this can make a program difficult to test. The spectrum analyzer SRQ command automatically triggers any service request you choose. Of course, as with other service requests, you must set the bit mask before executing the SRQ command. See Example 4.

Example 4

```
10        OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20        OUTPUT 718;"RQS 16;"
30        ON INTR 7 GOTO Srq
40        ENABLE INTR 7;2
50        OUTPUT 718;"SRQ 16;"
60    Idle:   GOTO Idle
70    Srq:         Sbyte=SPOLL(718)
80                 PRINT Sbyte
90               PRINT "INTERRUPT GENERATED"
100          OUTPUT 718;"RQS 0;"
110          LOCAL 718
120       END
```

Here, on Line 50, a "command complete" service request is immediately generated, and you can be sure that the routine will work.

SUMMARY

The main points to using service requests are highlighted below.

1. Choose the conditions for generating service requests.
2. Set a bit mask that enables only these chosen conditions.
3. Prepare the computer to accept service requests. Use the ON INTR... GOTO and ENABLE INTR statements.
4. Once an interrupt is triggered, use the analyzer STB command or the SPOLL statement to read the interrupt.

CHAPTER 10

TRACE MATH IN THE HP 8562A/B

Trace math in the HP 8562A/B allows easy application of correction data to a trace. Trace math in the HP 8562A/B is performed either in dBm units, when in log mode, or in volts, when in linear mode. Sometimes trace-math results are not intuitive; an explanation of what occurs follows.

ADDING AND SUBTRACTING IN DBM

The HP 8562A/B trace-math scheme allows easy addition and subtraction of correction values in dBm units. For example, to correct for 3 dB of loss in Trace A data values, you can add or subtract Trace B, which has been preloaded with +3 dBm or −3 dBm as its data values. The two traces can then be added or subtracted using "APB;" or "AMB ON;" and thus eliminate the effects of the loss.

Note that in the example above, the result is an addition or subtraction of dBm and not an addition or subtraction of power. Consider a trace data value of −50 dBm and a second trace data value of −50 dBm. When the two values are added using the APB command, the result is −50 dBm + −50 dBm = −100 dBm. However, if two −50 dBm power sources at two different frequencies are physically summed, the result is a power of −47 dBm. To further illustrate this point, if Trace A is at 3.0 dBm and Trace B is at 7.0 dBm, performing "APB;" moves Trace A to 10.0 dBm (i.e., Trace A would move up on the screen). On the other hand, if Trace A is at −10 dBm and Trace B is at −6.0 dBm, performing "APB" drops Trace A data to −16 dBm, even though Trace B is 4.0 dBm higher in power in both cases. As you can see, the HP 8562A/B is not adding and subtracting physical values, but rather providing an efficient method for calculations in dBm units.

Use AMBPL to Correct Data

The AMBPL command provides the most versatile method for applying correction data to a trace. AMBPL subtracts the contents of Trace B from the contents of Trace A and adds the result to the display line. Consider characterising the response of a device under test in a swept-measurement system. Enter the response of the system in Trace B. Insert the device into the system, then enter this response into Trace A. Use AMBPL to subtract the system response from the response with the device under test; the result is the response of the device under test, which is centered about the display line. So, to correct data, use Trace B to store a copy of the uncorrected response and subtract this from new data in Trace A; the result is a corrected response.

If the two traces are identical, as in the following example, result of subtracting these two traces will equal 0 dBm. Note, however, that if the reference level is less than 0 dBm, the results will be off the screen, or even clipped (clipping is described at the end of this chapter). The display line is added to return the result to the screen, with no clipping occurring. Since you can specify the position of the display line, you can move the corrected data to any on-screen position.

Example 1 illustrates how to correct data remotely. Before running this example, connect the calibration signal to the RF input.

Example 1

```
10        OUTPUT 718;"IP;SNGLS;CF 299.995MHZ;SP 20KHZ;RB 10KHZ;LG
          5DB;TS;"
20        OUTPUT 718;"CLRW TRA; CLRW TRB;TS;TS;"
30        OUTPUT 718;"VIEW TRB;DL -16DBM;"
40        OUTPUT 718;"AMBPL ON;"
50        END
```

Line 10 executes an instrument preset, then uses the calibration signal to simulate uncorrected data. The program sets the reference level to −10 dBm, the span to 20 kHz, the center frequency to 299.995 MHz, the resolution bandwidth to 10 kHz, the log scale to 5 dB, and the sweep to single mode. Line 20 sets Traces A and B to clear-write mode. The program then executes the take-sweep command twice; this places the trace data in both traces. Line 30 sets Trace B to view mode in order to freeze the data in this trace. Use the display line to indicate where you want the corrected data to appear on the screen; for this example, the display line is set to −16 dBm. Line 40 executes the function AMBPL. Trace B is subtracted from Trace A; since the traces are identical, the result is a flat response equal to 0 dBm. Note, however, that the reference level is at −10 dBm; if this were the end of the calculation, you would not be able to see the result. The display line is added to move the response to −16 dBm and onto the screen where you can view the result.

ADDING AND SUBTRACTING IN VOLTS

In linear mode, all trace math is executed in positive-voltage units. This means that the APB command moves Trace A data up the screen, while the AMB command moves Trace A data down the screen (assuming Trace B contains non-zero data).

To illustrate the difference between trace math in log mode and in linear mode, run Example 2. Here, both Trace A and Trace B are set to mid-screen values. When in log mode, the result of executing "AMB ON;" appears at the top of the screen. When in linear mode, the result appears at the bottom of the screen.

Example 2

```
10      ! PUT TRACES ON SCREEN
20      INTEGER Atrace(1:601)
30      FOR I=1 TO 601
40      Atrace(I)=300
50      NEXT I
51      OUTPUT 718;"IP;LG 10DB;SNGLS;TS;"
60      OUTPUT 718 USING "#,K,W,601(W),K";"TDF A;TRA#A",1202,Atrace(*),";"
61      OUTPUT 718 USING "#,K,W,601(W),K";"TDF A;TRB#A",1202,Atrace(*),";"
71      OUTPUT 718;"AMB ON;"
72      PRINT "PRESS CONTINUE"
74  PAUSE
75      OUTPUT 718;"LN;SNGLS;TS;"
82      OUTPUT 718 USING "#,K,W,601(W),K";"TDF A;TRA#A",1202,Atrace(*),";"
83      OUTPUT 718 USING "#,K,W,601(W),K";"TDF A;TRB#A",1202,Atrace(*),";"
93      OUTPUT 718;"AMB ON;"
103     PAUSE
113     END
```

TRACE DATA LIMITS

The displayed amplitude of each trace element falls in one of 600 data points (see Figure 10.1). There are an additional 10 points of overrange. The HP 8562A/B clips results that exceed these limits. The overrange is equal to 1/6 of a division above the reference level. Also, the same clipping algorithm is applied to correction data in a trace (e.g., correction data that you enter into Trace B). For example, if the reference level is 0 dBm the scale is equal to 10 dB per division, the correction values must be within the range of +1.66 dBm to −100.00 dBm (1/6 of 10 dB is equal to 1.66 dB).
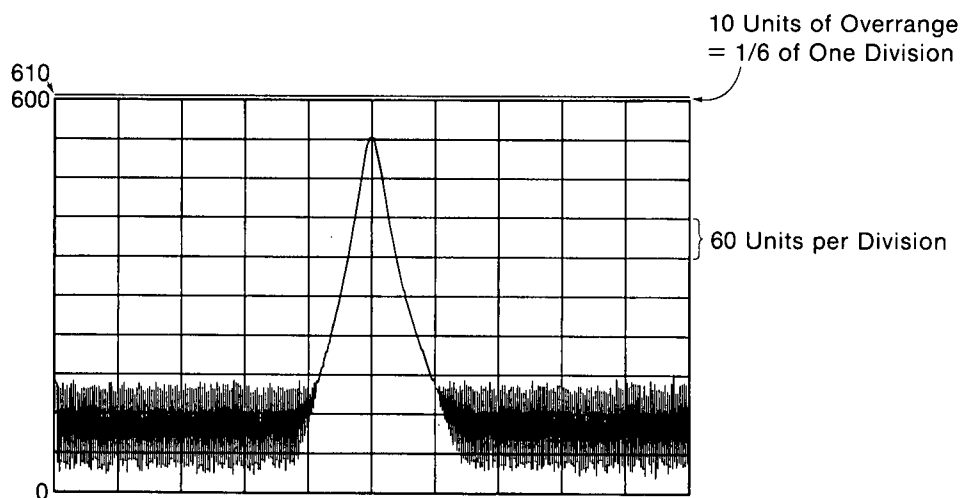
Fig. 10.1. HP 8562A/B display units.

CHAPTER 11

INPUT AND OUTPUT BUFFERS

Features of the HP 8562A/B include the input and output data buffers. This chapter describes how to take advantage of the buffers and how to avoid potential programming pitfalls.

BENEFITS OF AN OUTPUT BUFFER

The 64-character input buffer allows you to send several data queries to the spectrum analyzer using only one OUTPUT statement. The 64-character ouput-data buffer holds queried values so that you can read them into variables using only one ENTER statement. This is a more efficient method than using one OUTPUT statement per query and one ENTER statement per value read. See Example 1.

Example 1

```
10      OUTPUT 718;"IP;SNGLS;MKPX 6DB;MKPT -65DB; FA 270MHZ;FB 1200MHZ;TS;"
20      OUTPUT 718;"MKPK HI;MKD;MKPK NR;MKF?;MKA?;"
30      ENTER 718 USING "K";Mka,Mkf
40      PRINT Mka,Mkf
50      END
```

Example 1 reads the difference in frequency and amplitude between two peaks, then enters the values into variables. Note the order of the queries and entries. The first query is the first value to come out of the output-data buffer; you read the values into variables in the same order that you queried the spectrum analyzer.

Whenever you execute a query, be sure to read that value out. If you do not read it out, you will get that value returned for your next query. See Example 2.

Example 2

```
10        OUTPUT 718;"CF?;";
20        OUTPUT 718;"AT UP;RL?;"
30        ENTER 718;R1
40        PRINT R1
50        END
```

In Example 2, even though you wanted to read the reference level, the printed value is equal to the center frequency. The center frequency had been left in the output-data buffer and was the first value to come out of the buffer.

If you are entering multiple values into multiple variables with one ENTER statement, use a "K" format with the ENTER statement. The HP 8562A/B separates queried values by a line feed with an end-or-identify (EOI) asserted; "K" format recognizes that a new value starts after each line feed with EOI. If you omit the USING statement, the ENTER statement will terminate on the first EOI encountered and generate an error.

BUFFER SPACE

The maximum number of characters that the output-data buffer can hold is 64. In Example 1, the query "MKD?" filled seven character spaces in the output-data buffer. The returned value, "−33.34," fills six spaces; the line feed that separates this value from the next one fills the seventh space. This method is used to enter all queries into the output-data buffer. You can continue to query the analyzer until the queries fill all 64 spaces. The input buffer fills similarly. The query "AT?;" fills four spaces in the input data buffer. The input buffer can hold as many commands as will fill its 64 character capacity. Note that the length of returned frequency values are dependent upon the current resolution bandwidth and frequency counter resolution.

PREVENTING TIMEOUTS

A program can pause unexpectedly when the output data buffer is completely filled with query values, the input buffer is completely filled with commands, and the spectrum analyzer is currently executing a query. Under this set of conditions, the program will pause indefinitely. The spectrum analyzer is trying to complete the query, but there is simply no more room in the output-data buffer for any more query data and no place to hold the query in the input buffer. If you have a timeout statement in the program, a timeout will occur. To prevent this situation, do not allow query values or commands to stack up in the buffers. Query for only a few values, then read them into variables before you send more queries. If you must leave the output buffer full, do not send more than 64 characters of commands with one OUTPUT statement.

A program may also pause unexpectedly while the spectrum analyzer is executing a command that takes a long time to complete. Consider executing the take-sweep (TS) command when the selected sweep time is equal to 100 seconds. In this case, the TS command requires 100 seconds before it is completed. While this command is executing, the input data buffer fills with 64 characters of commands. When the buffer is full, if there are any remaining commands in that OUTPUT statement, the program will pause. It will start again when the TS command is complete; the spectrum analyzer can then begin processing the commands in the buffer, and the remaining commands in the OUTPUT statement will move into the input data buffer. If you have a timeout statement in your program, the timeout may occur; this depends on whether the timeout setting is shorter than the pause in the program.

SYNCHRONIZING YOUR PROGRAM

You can use spectrum analyzer queries to synchronize a program. For example, when executing a TS command, if you want to know when the TS command is complete, execute the DONE command immediately after TS. The DONE query is satisfied only after the sweep has been completed. In fact, you can use any query in this manner. No query operation can take place until after the previous command is complete.

CLEARING THE BUFFERS

If you use the output-data buffer correctly, the buffer should be clear after the last ENTER statement is executed. But if you want to ensure that the buffer is empty, execute the device clear statement CLEAR 718 or the interface clear statement CLEAR 7. If your program is returning incorrect values, use this statement to clear the buffer; then look through your program for any missing ENTER statements. Or, use CLEAR at the beginning of a program. CLEAR flushes out the output data and input-data buffers; however, it also executes an instrument preset.

SUMMARY

Figure 11.1 illustrates the input and output data buffers. Below, the causes for the analyzer not accepting data are highlighted.

INPUT DATA BUFFER (64 characters max.)

Command Execution ← | 1 | 2 | 3 | 4 | 5 | 6 | 7 ⌇ ⌇ 58 | 59 | 60 | 61 | 62 | 63 | 64 | ← Data In from Controller

OUTPUT DATA BUFFER (64 characters max.)

Query Values → | 1 | 2 | 3 | 4 | 5 | 6 | 7 ⌇ ⌇ 58 | 59 | 60 | 61 | 62 | 63 | 64 | → Data Out to Controller
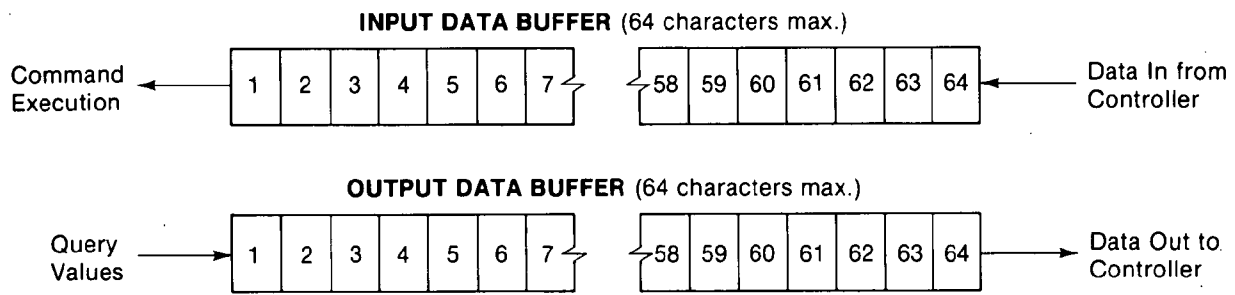
The spectrum analyzer will stop accepting data under these non exclusive conditions:

1. A sweep or lengthy command is not done and the input buffer is full.

2. The output buffer is full and the input buffer is full and the command currently executed is a query.

Fig. 11.1. Buffer summary.

CHAPTER 12

LANGUAGE NOTATION

This chapter contains the language notation for HP 8562A/B programming commands.

SYNTAX CONVENTIONS

Circle or Oval: contains literal characters (except for SP, which denotes a space).
Rectangle: syntax elements which are defined below.
Solid Line: represents the recommended path.
Dotted Line: represents an optional path. These paths are not recommended.
Space: use spaces anywhere in the data stream, except within alpha identifiers or while accepting binary data.
Comma: use commas to separate parameters. Spaces are allowed, but not recommended.
Semicolon: use semicolons to terminate commands. Other terminators are available (line feed, carriage return, space, and comma) but are not recommended.

QUERY RESPONSES

Expected query responses are provided for each command, where applicable. For information on how to query the spectrum analyzer for values, refer to Chapter 11 of this manual.

ELEMENTS IN RECTANGULAR BOXES

number: reals or integers. Defined for each command where used.
delimiter: string delimiters. ! " $ % & ' / : < = > @ \
data byte: character or numerical data. Defined for each command where used.
msb/lsb length: character or numerical data. Defined for each command where used.

SECONDARY KEYWORDS

NOTE

After executing a command with "EP" as a secondary keyword, select a numeric value using the spectrum analyzer DATA keys, STEP keys, or knob. When using the DATA keys, be sure to terminate the value with a units key (such as ⬚Hz , ⬚dBm , etc.). When using the STEP keys or the knob, terminate the value with ⬚HOLD .

SECONDARY KEYWORD SUMMARY

A	ampere (unit);A-block data format
ALL	all (marker off,plot screen)
AM	amplitude modulation (DEMOD)
ANNT	annotation
AUTO	automatic operation
B	8-bit byte output format
CURR	current (IF adjustment)
DB	relative decibel (unit)
DBM	absolute decibel milliwatt (unit)
DBMV	absolute decibel millivolt (unit)
DBUV	absolute decibel microvolt (unit)
DM	absolute decibel milliwatt (unit)
DN	decrement the parameter
DSP	display
EP	enable parameter for front panel operator entry
EXT	external
FAV	frequency analog voltage (sweep output)
FM	frequency modulation (DEMOD)
FREE	free run
FULL	full band span width
GHZ	gigahertz (unit)
GRT	graticule
GZ	gigahertz (unit)
HARM	harmonic number (frequency diagnostic)
HI	highest
HZ	hertz
I	I-block data format
INT	internal (reference, mixer mode)
KHZ	kilohertz (unit)
KZ	kilohertz (unit)
LAST	previous state before a change
LAST SPAN	previous span before a change
LINE	line, as in power line
LO	local oscillator (frequency diagnostic)

M	ASCII display data output format
MA	milliamp (unit)
MAN	manual operation
MHZ	megahertz (unit)
MS	millisecond (unit)
MSEC	millisecond (unit)
MROLL	main roller oscillator (frequency diagnostic)
MV	millivolt (unit)
MW	milliwatt (unit)
MZ	megahertz (unit)
NEG	negative peak detection
NH	next highest
NL	next left
NR	next right
NRM	normal rosenfell detection
OA	function query (same as ?)
OFF	turn function off
ON	turn function on
OROLL	offset roller oscillator (frequency diagnostic)
P	real number output format
POS	positive peak detection
PWRON	sets same state as turning power on
0	off
1	on
RAMP	sweep ramp voltage (sweep output)
S	second (unit)
SC	second (unit)
SEC	second (unit)
SMP	sample detection
TRA	display trace A
TRB	display trace B
UA	microamp (unit)
UP	increment the parameter
UV	microvolt (unit)
US	microsecond (unit)
V	volt (unit)
VID	video
W	watt (unit)
XROLL	transfer roller oscillator (frequency diagnostic)
ZERO	zero span
?	returns a query response containing the value or state of the associated parameter (same as OA)

CHAPTER 13

PROGRAMMING CODES

(functional index)

Alternate commands common to the HP 8562A/B and the HP 8566/8568A are shown in parentheses (). For further information see the section on Backward-Compatible Commands in this guide.

Amplitude Control

AT	Specifies input attenuation.
AT AUTO	Couples input attenuation (CA).
AUNITS	Specifies amplitude units for input, output and display.
LG	Selects log scale.
LN	Selects linear scale.
MKRL	Moves active marker amplitude to reference level (E4).
ML	Specifies mixer level.
RL	Specifies reference level.
RLCAL	Calibrates reference level.
ROFFSET	Specifies reference level offset.

Bandwidth Control

RB	Specifies resolution bandwidth.
RB AUTO	Couples resolution bandwidth (CR).
RBR	Specifies the coupling ratio of resolution bandwidth and frequency span.
VB	Specifies video bandwidth.
VB AUTO	Couples video bandwidth (CV).
VBR	Specifies coupling ratio of video bandwidth and resolution bandwidth.

Coupling Control

AUTOCPL	Auto couple all controls.
AT AUTO	Auto couple the RF attenuator (CA).
RB AUTO	Auto couple resolution bandwidth (CR).
SS AUTO	Auto couple center frequency step size (CS).
ST AUTO	Auto couple sweep time (CT).
VB AUTO	Auto couple video bandwidth (CV).
RBR	Specifies coupling ratio of resolution bandwidth and frequency span.
VBR	Specifies coupling ratio of video bandwidth and resolution bandwidth.

Demodulation

DEMOD	Demodulation.
DEMODAGC	Demodulation auto gain control.
DEMODT	Demodulation time.
SQUELCH	Squelch control for demodulation.
VOL	Sets speaker volume.

Display Control

ANNOT	Turns annotation on or off. Preset condition is on.
AUNITS	Specifies amplitude units for input, output, and display.
DL	Specifies display line level in dBm.
DLE	Turns display line on and off (L0).
FDSP	Turns all frequency display annotation off. Power-on preset is only way to turn back on.
GRAT	Turns graticule on or off. Preset condition is on.
LG	Selects log scale.
LN	Selects linear scale.
TH	Specifies display threshold value.

External Mixing

CNVLOSS	Sets reference level offset to compensate for external mixer conversion loss.
FULBAND	Sets start and stop frequencies for full waveguide bands.
HNLOCK	Locks to specified harmonic number.
HNUNLK	Unlocks the specified harmonic number.
IDCF	Sets center frequency to frequency of SIGID.
IDFREQ	Returns frequency of identified signal.
MBIAS	Specifies the bias level for external mixers.
MKPX	Specifies minimum excursion for peak identification. Default value is 6 dB.
MXRMODE	Specifies either internal or external mixing.
SIGID	Identifies signals for external mixing frequency bands.

Frequency Control

CF	Specifies center frequency.
SS AUTO	Couples center frequency step size (CS).
FA	Specifies start frequency.
FB	Specifies stop frequency.
FOFFSET	Specifies frequency offset.
FREF	Specifies the frequency reference source.
FS	Specifies full frequency span as defined by instrument state.
FULBAND	Sets the start and stop frequency for full waveguide band. (external mixing only)
MKFCR	Specifies resolution of frequency counter.
SP	Specifies frequency span.
SS	Specifies center frequency step size.

Information and Service Diagnostics

ADJALL	Initiates power-on adjustment sequence.
ADJCRT	Initiates CRT adjustment patterns.
ADJIF	Initiates IF adjustment sequence.
ERR?	Returns list of instrument error codes.
ET?	Elapsed time.
FDIAG	Returns frequency of specified oscillator.
ID?	Returns the HP model number of analyzer used (HP 8562A/B).
PSDAC	Returns preselector DAC setting at frequency of marker.
REV?	Returns analyzer revision number.
RLCAL	Calibrates reference level.
RQS	Returns decimal weighting of status byte bits which are enabled during service request.
SER?	Returns analyzer serial number.

Instrument State Control

IP	Sets instrument parameters to preset values.
RCLS	Recalls previously saved state (RC).
PSTATE	Protect saved states (save lock).
SAVES	Saves current state of the analyzer in the specified register (SV).

Marker Control

MKA	Amplitude of active marker (MA).
MKCF	Enters marker frequency into center frequency (E2).
MKD	Moves delta marker to specified frequency (M3).
MKDR	Marker delta reciprocal, readout in time.
MKF	Frequency of active marker (MF).
MKFC	Counts marker frequency for greater resolution (See MKFCR).
MKFCR	Specifies resolution of marker frequency counter.
MKMIN	Moves marker to minimum signal detected.
MKN	Moves marker to specified frequency or center screen (M2).
MKNOISE	Returns average noise value at marker, normalized to 1 Hz bandwidth.
MKOFF	Turns the active marker off (M1).
MKPK	Moves marker to signal peak (E1).
MKPT	Specifies marker peak threshold.
MKPX	Specifies minimum excursion for peak identification. Default value is 6 dB.
MKRL	Moves active marker to reference level (E4).
MKSP	Moves marker delta frequency into span.
MKSS	Moves marker frequency to center frequency step size (E3).
MKSWP	Marker sweep.
MKT	Positions marker at point corresponding to the time from beginning of sweep.
MKTRACE	Moves marker to same position on another trace.
MKTRACK	Turns marker signal track on (MT1) or off (MT0).

Plotter Output

PLOT	Sends analyzer display to a plotter.
PLOTORG	Scaling points for plot.
PLOTSRC	Specifies plot source.

Preselector Control

PP   Peaks preselector.
PSDAC   Preselector peak data.

Printer Output
PRINT   *Sends the analyzer display to printer (See change sheet.)*

Service Request

RQS   Specifies the decimal weighting of status byte bits which are allowed during service request. Set to 0 with powerup or device clear.

SRQ   Sets service request if operand bits are allowed by RQS.

STB   Returns the decimal equivalent of the bits set in the status byte.

BIT	DECIMAL	DEFINITION
7	—	Not used.
6	64	Request service.
5	32	Error present in error register.
4	16	Command complete
3	—	Not used.
2	4	End of sweep.
1	2	Message occurred.
0	0	Cleared.

Sweep and Trigger Control

CONTS   Selects continuous sweep mode (S1).
ST   Specifies sweep time.
ST AUTO Couples sweep time.
SNGLS   Selects single sweep mode (S2).
TM   Selects trigger mode: free run (T1), video (T4), line (T2), external (T3).
TS   Takes a sweep.
VTL   Video trigger level.

Synchronization

TS   Takes a sweep.
DONE?   Returns a 1 when task has been completed.

Trace Functions

Processing

BLANK	Stores and blanks specified trace register (A4|B4).
CLRW	Clear-writes specified trace register (A1|B1).
MINH	Holds the minimum trace register values.
MXMH	Max holds the specified trace register (A2|B2).
RCLT	Recall specified trace data.
SAVET	Save specified trace data.
TRA	Input/output trace A.
TRB	Input/output trace B.
VIEW	Views specified trace register (A3|B3).

Math

AMB	A-B into A (C1|C2).
AMBPL	A-B + DL into A.
APB	A+B into A.
AXB	Exchanges A and B (EX).
BML	B-DL into B (BL).
VAVG	Turns video averaging on or off.

Other

AUNITS	Specifies amplitude units for input, output, and display.
DET	Specifies input detector type.
TITLE	Writes specified ASCII characters in title block area of display.

Operator Entry

HD	Holds or disables data entry and blanks active function CRT readout.

Output Format Control

AUNITS	Specifies amplitude units for input, output, and display.
MKA?	Returns marker amplitude (MA).
MKF?	Returns marker frequency (MF).
SWPOUT	Specifies the sweep output.
TRA?	Outputs trace A (TA).
TRB?	Outputs trace B (TB).
TDF	Selects trace data output format as binary (B) or real numbers (P) in Hz, volts, dB or watts. Preset is P.

CHAPTER 14

PROGRAMMING COMMANDS

This chapter contains the HP 8562A/B programming commands. Each spectrum analyzer command is described here. Before using this part of the manual, you may wish to refer to Chapter 5 of the Pocket Operating Guide or Chapters 6-11 of this manual.

ADJALL
LO AND IF ADJUSTMENTS

SYNTAX
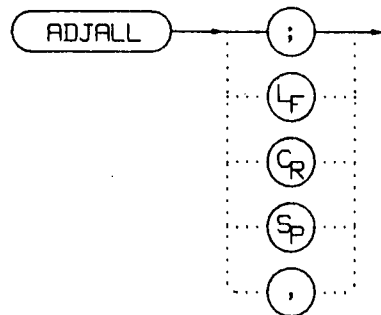
DESCRIPTION

The ADJALL command activates the local oscillator (LO) and intermediate frequency (IF) alignment routines. These are the same routines that occur when **LINE** is switched on. Commands following ADJALL are not executed until after the analyzer has finished the alignment routines.

EXAMPLE

```
10        OUTPUT 718;"ADJALL;";
20        END
```

ADJCRT
ADJUST CRT ALIGNMENT

SYNTAX
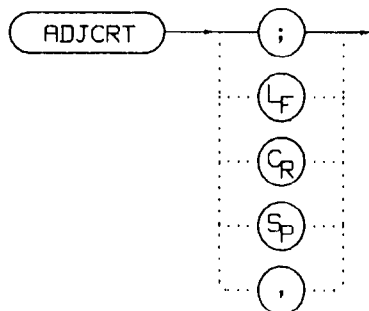
DESCRIPTION

The ADJCRT command activates a CRT adjustment pattern, shown in Figure 14.1. Use the X POSN, Y POSN, and TRACE ALIGN adjustments (available from the rear panel) to align the display. Place the CRT stencil that has been included with the spectrum analyzer on the CRT. Use X POSN and Y POSN to move the display horizontally and vertically, respectively. Use TRACE ALIGN to line the trace within the graticule. To remove the pattern from the screen, execute the IP command.
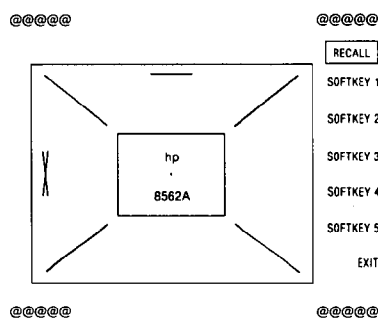
Fig. 14.1. CRT alignment pattern. X POSN moves the display left and right; Y POSN moves the display up and down. TRACE ALIGN rotates the display.

EXAMPLE

```
10        OUTPUT 718;"ADJCRT;";
20        OUTPUT 2;CHR$(255)&"K";
30        PRINT TABXY(0,1);"PLACE STENCIL ON ANALYZER DISPLAY"
40        PRINT TABXY(0,3);"USE X POSN AND Y POSN "
50        PRINT TABXY(0,4);"TO LINE UP THE DISPLAY WITH THE STENCIL"
60        INPUT "THEN PRESS ENTER",Ans$
70        OUTPUT 718;"IP;";
80        END
```

ADJIF
ADJUST IF

SYNTAX

```
                                              ┌──( FULL )──┐
                                          ┌───( CURR )─────┤
                                      ┌───────( ? )────────┤
                              ┌──( SP )──┬──( 0 )──┐        │
( ADJIF )──┬──────────────────┘          └──( 1 )──┴────────┤
           │                                                │
           └──────────( SP )──┬──( ON )──┬──────────────────( ; )───────►
                              └──( OFF )─┘                    ┊
                                                          ┈┈( LF )┈┈
                                                          ┈┈( CR )┈┈
                                                          ┈┈( SP )┈┈
                                                          ┈┈( , )┈┈
```
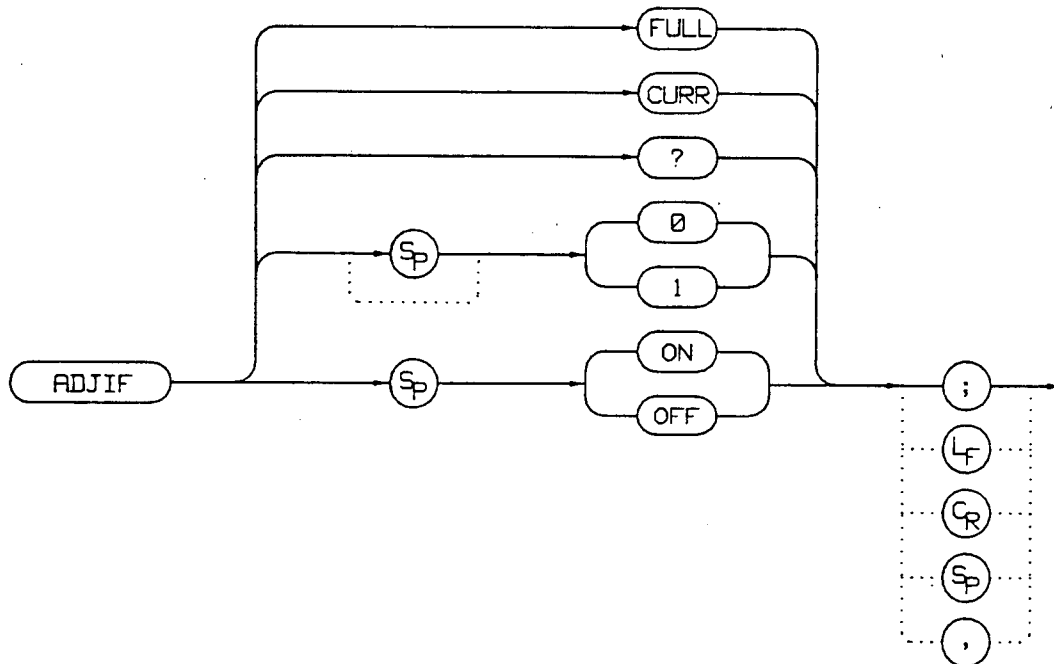
DESCRIPTION

The ADJIF command turns the automatic IF adjustment on or off. This function is normally on. Because the IF is continuously adjusting, IF calibration is seldom necessary. When the IF adjustment is not active, an "A" appears on the left side of the display.

PARAMETERS

FULL: IF adjustment is done for all IF settings
CURR: IF adjustment is done only for the IF settings currently displayed
OFF: Turns the IF adjustment off
ON: Reactivates the IF adjustment

PRESET STATE

On

QUERY RESPONSE
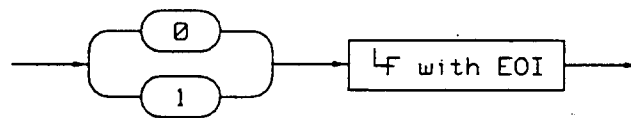
EXAMPLE

```
10      OUTPUT 718;"ADJIF OFF;";
20      OUTPUT 718;" ADJIF?;";
30      ENTER 718;Adjif
40      PRINT Adjif
50      END
```

AMB
TRACE A MINUS TRACE B

SYNTAX
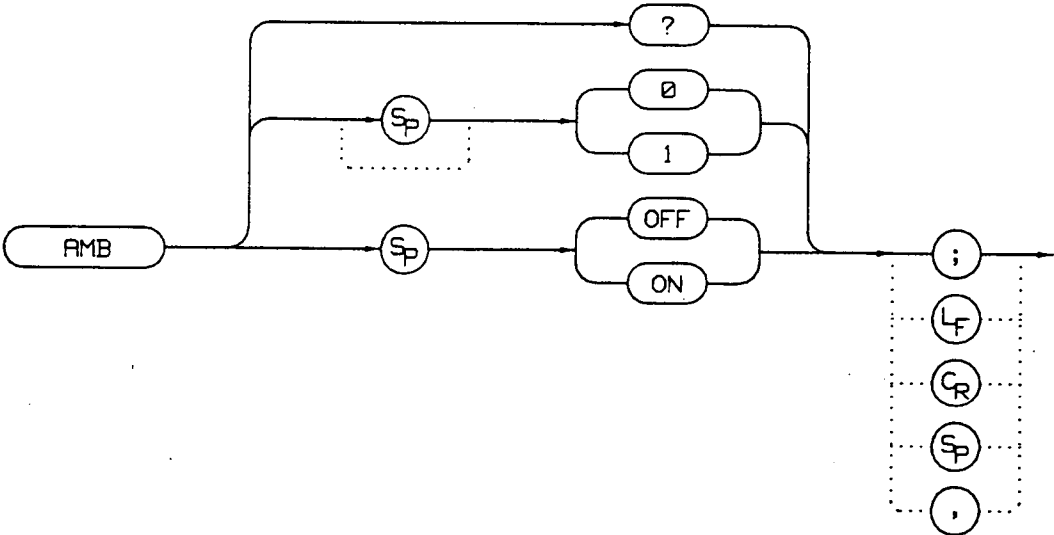
DESCRIPTION

The AMB command subtracts the contents of Trace B from Trace A and places the result, in dBm (when in log mode), in Trace A. When in linear mode, the result is in volts. If Trace A is in clear-write or max-hold mode, this function is continuous. When this function is active, an "M" appears on the left side of the display. The command AMBPL overrides AMB. For more information on trace math, refer to Chapter 10.

NOTE

The displayed amplitude of each trace element falls in one of 600 data points. There are 10 points of overrange, which corresponds to 1/6 of a division of overrange. When adding or subtracting trace data, any results exceeding this limit are clipped at the limit.
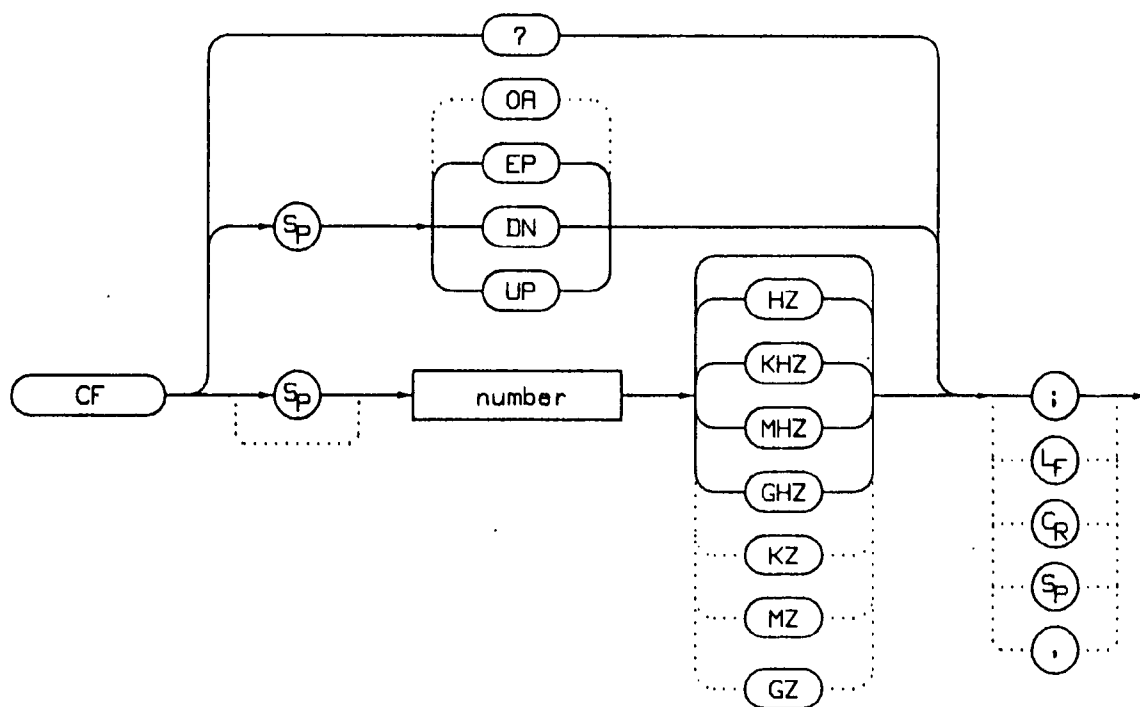
PRESET STATE

Off

QUERY RESPONSE

```
        ┌───── 0 ─────┐     ┌──────────────┐
────────┤             ├─────┤ ⌐F with EOI  ├────────
        └───── 1 ─────┘     └──────────────┘
```
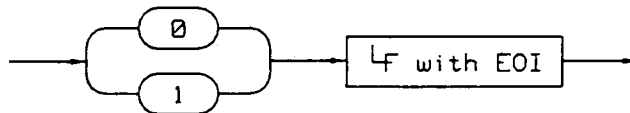
EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"CLRW TRB;TS;VIEW TRB; AMB ON;"
30        OUTPUT 718;"AMB?"
40        ENTER 718;Amb
50        PRINT Amb
60        END
```

AMBPL
TRACE A MINUS TRACE B PLUS DISPLAY LINE

SYNTAX
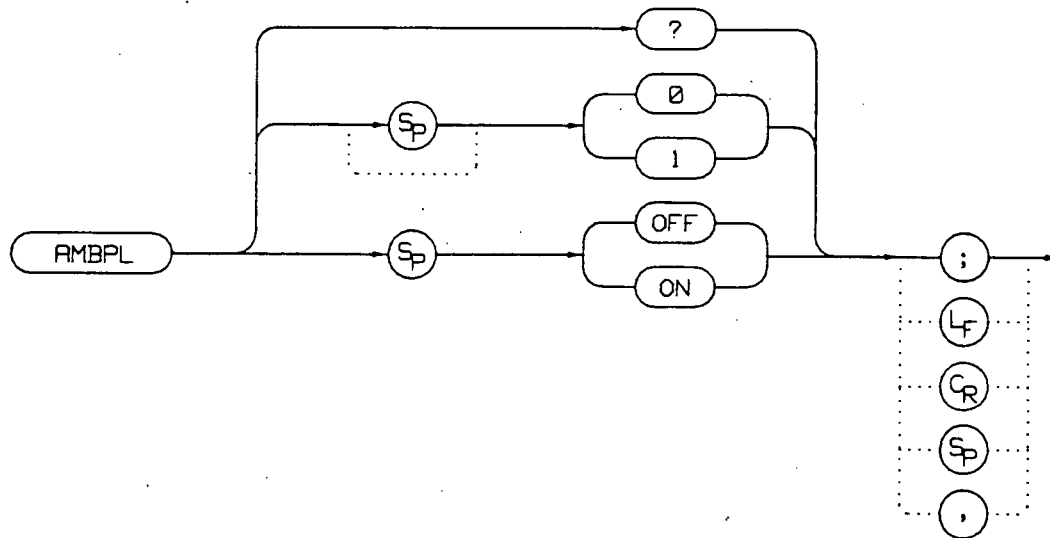
DESCRIPTION

The AMBPL command subtracts the contents of Trace B from Trace A, adds the display line to this value, and stores the result, in dBm (when in log mode), in Trace A. When in linear mode, the result is in volts. If Trace A is in clear-write or max-hold mode, this function is continuous. When this function is active, an "M" appears on the left side of the display. AMBPL overrides the AMB command.

NOTE

The displayed amplitude of each trace element falls in one of 600 data points. There are 10 points of overrange, which corresponds to 1/6 of a division of overrange. When adding or subtracting trace data, any results exceeding this limit are clipped at the limit.

PRESET STATE

Off
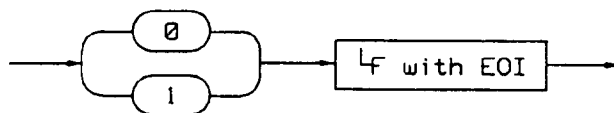
QUERY RESPONSE

EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"CLRW TRB;TS;VIEW TRB;DL -50DBM;"
30        OUTPUT 718;"AMBPL ON;"
40        OUTPUT 718;"AMBPL?;"
50        ENTER 718;Ambpl
60        PRINT Ambpl
70        END
```

ANNOT
ANNOTATION ON/OFF

SYNTAX

DESCRIPTION

The ANNOT command turns the display annotation off or on.

PRESET STATE

On

QUERY RESPONSE
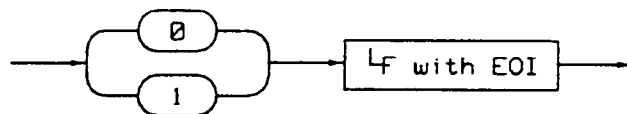
EXAMPLE

```
10      OUTPUT 718;"IP;"
20      OUTPUT 718;"ANNOT OFF;"
30      OUTPUT 718;"ANNOT?;"
40      ENTER 718;Annot
50      PRINT Annot
60      END
```

APB
TRACE A PLUS TRACE B

SYNTAX
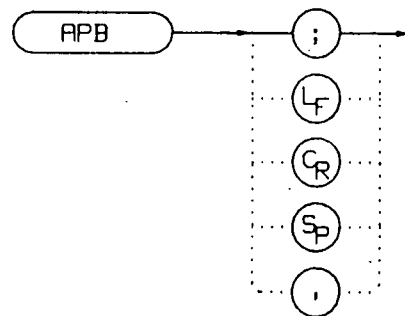
DESCRIPTION

The APB command adds the contents of Trace A to Trace B and stores the result, in dBm (when in log mode), in Trace A. When in linear mode, the results are in volts. Trace A is placed in view mode. This command is done immediately and not on a repetitive basis.

NOTE

The displayed amplitude of each trace element falls in one of 600 data points. There are 10 points of overrange, which corresponds to 1/6 of a division of overrange. When adding or subtracting trace data, any results exceeding this limit are clipped at the limit.

EXAMPLE

```
10      OUTPUT 718;"IP;SNGLS;"
20      OUTPUT 718;"TS;VIEW TRA;CLRW TRB;TS;VIEW TRB;"
30      OUTPUT 718;"APB;BLANK TRB;"
40      END
```

AT
INPUT ATTENUATION

SYNTAX
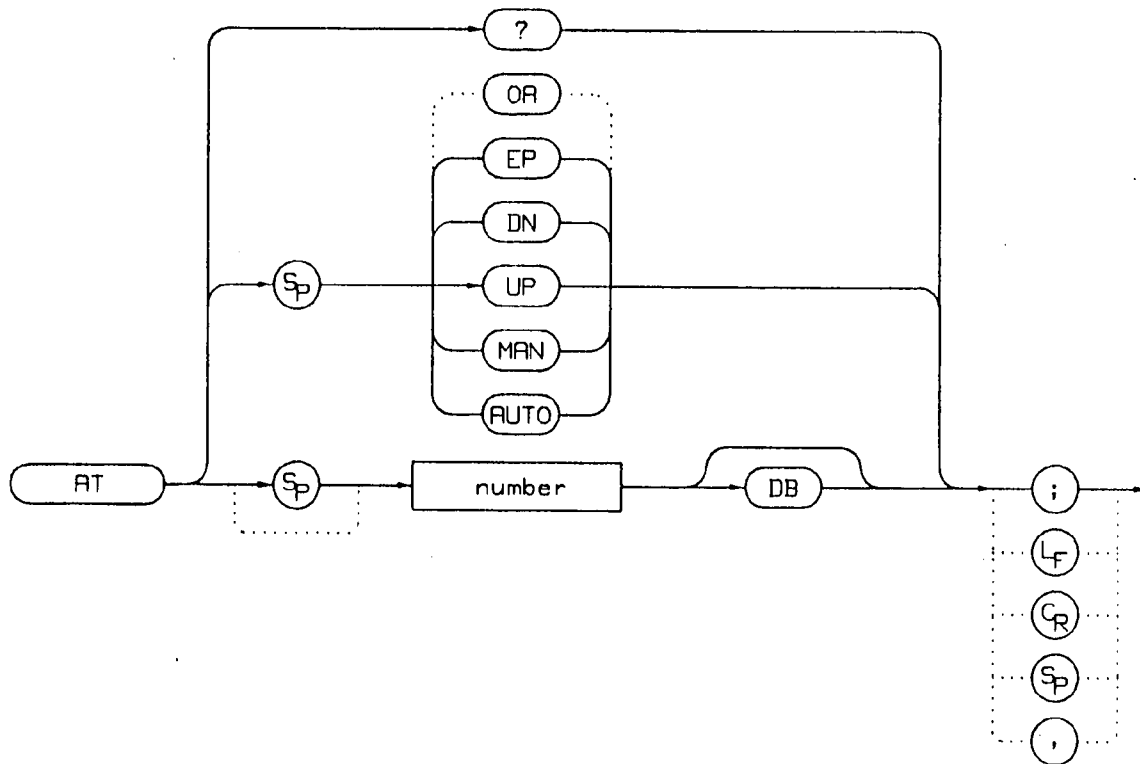
DESCRIPTION

The AT command sets the amount of attenuation between the input and the first mixer.

The attenuation may be set to 0 dB only by numeric entry.

PARAMETERS

number: integer from 0 to 70, in decade increments. Numbers are rounded up to the nearest decade.
AUTO: sets the attenuation to coupled mode.
MAN: sets the attenuation to manual mode.
UP/DN: changes the attenuation by 10 dB.

PRESET STATE

Coupled mode, 10 dB

QUERY RESPONSE

```
──→┤  number  ├──────→┤ ⌐F with EOI ├──→
```
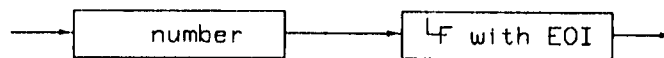
EXAMPLE

```
10        OUTPUT 718;"AT UP;"
20        OUTPUT 718;"AT?"
30        ENTER 718;At
40        PRINT At
50        END
```

AUNITS
ABSOLUTE AMPLITUDE UNITS

SYNTAX
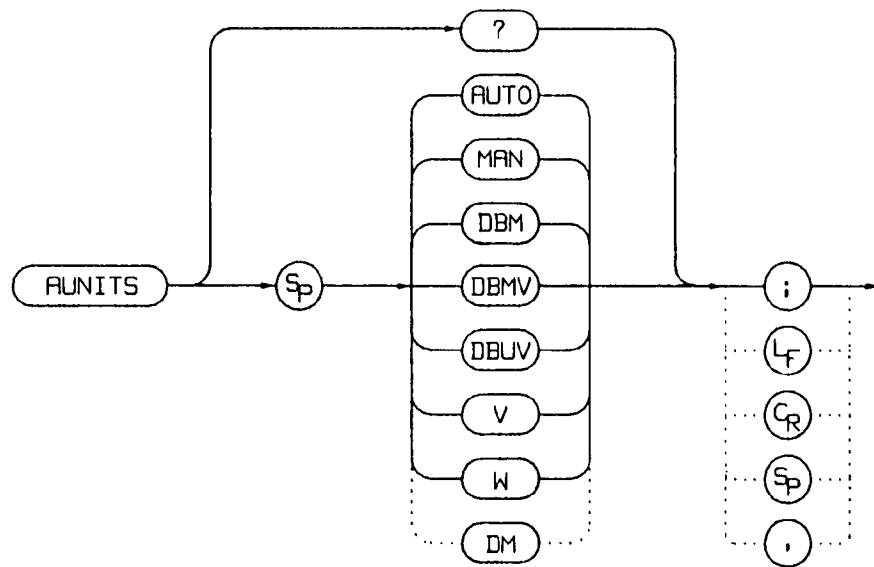
DESCRIPTION

The AUNITS command sets the absolute amplitude units for the input signal and the display. AUNITS will affect the query responses of the following commands: MKA, TRA/TRB (when in P-format), DL, RL, SQUELCH, TH, and VTL.

PARAMETERS

AUTO: sets amplitude units to coupled mode. For a log scale, the units default to dBm; for a linear scale, units default to volts.
MAN: sets amplitude units to manual mode.

● **PRESET STATE**

Coupled mode, dBm

QUERY RESPONSE
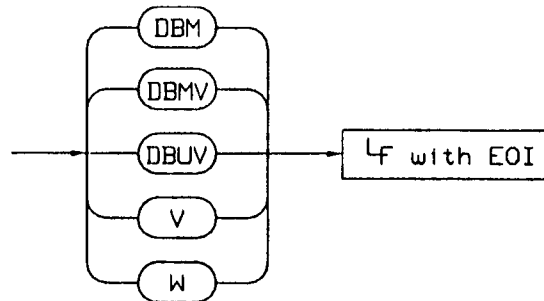
● **EXAMPLE**

```
10      OUTPUT 718;"AUNITS DBUV;"
20      OUTPUT 718;"AUNITS?;"
30      ENTER 718;Aunits$
40      END
```

●

AUTOCPL
AUTO COUPLED

SYNTAX
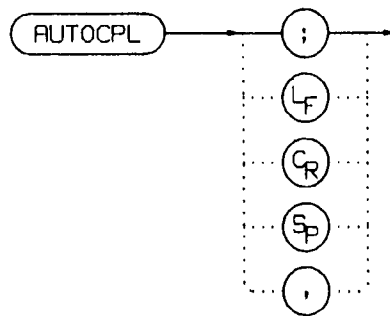
DESCRIPTION

The AUTOCPL command sets the video bandwidth, the resolution bandwidth, the input attenuator, the sweep time, and the center frequency step-size to coupled mode. These functions can be recoupled individually or all at once. The spectrum analyzer chooses appropriate values for these functions. The video bandwidth and resolution bandwidth are set according to the coupled ratios stored under the softkeys VBW:RBW or RBW:SPAN or the ratios selected using the RBR or VBR commands. If no ratios are chosen, default ratios (0.011 and 1.0, respectively) are used instead.

EXAMPLE

```
10      OUTPUT 718;"AUTOCPL;"
20      END
```

AXB
TRACE A EXCHANGE TRACE B

SYNTAX
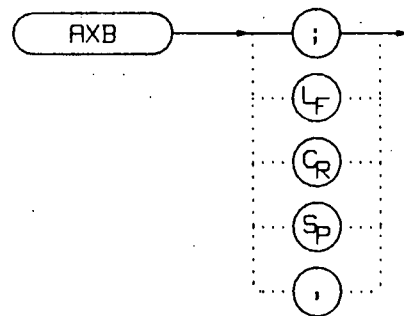
DESCRIPTION

The AXB command exchanges the contents of Trace A with those of Trace B. If the traces are in clear-write or max-hold mode, the mode is changed to view. Otherwise, the traces remain in their initial mode.

EXAMPLE

```
10      OUTPUT 718;"AXB;"
20      END
```

BLANK
BLANK TRACE

SYNTAX
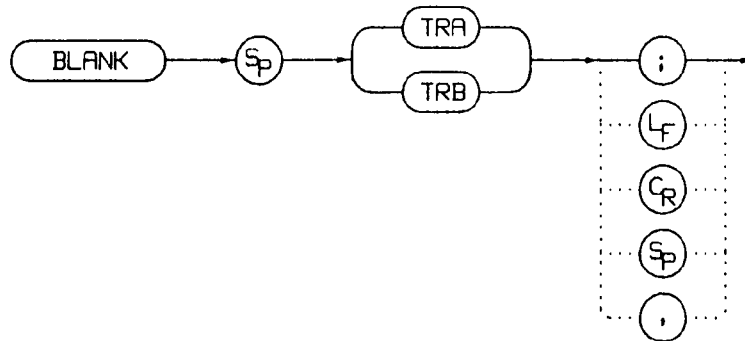
DESCRIPTION

The BLANK command blanks the chosen trace from the display. The current contents of the trace remain in the trace but are not updated.

EXAMPLE

```
10      OUTPUT 718;"BLANK TRA;"
20      OUTPUT 718;"CLRW TRB;"
30      END
```

BML
TRACE B MINUS DISPLAY LINE

SYNTAX
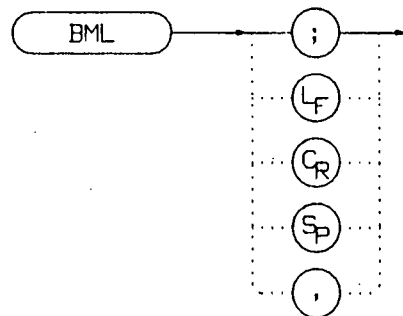
DESCRIPTION

The BML command subtracts the display line from Trace B and places the result in dBm, when in log mode, in Trace B, which is then set to view mode. In linear mode, the results are in volts.

NOTE

The displayed amplitude of each trace element falls into one of 600 data points. There are 10 additional points of overrange, which corresponds to 1/6 of a division. When adding or subtracting trace data, any results exceeding the limits are clipped at that limit.

EXAMPLE

```
10      OUTPUT 718;"IP;"
20      OUTPUT 718;"BLANK TRA;"
30      OUTPUT 718;"CLRW TRB;TS;DL -50DBM;"
40      OUTPUT 718;"BML;"
50      END
```

CF
CENTER FREQUENCY

SYNTAX

```
                              ?
                            ( OA )
                            ( EP )
              ( SP )        ( DN )
                            ( UP )
                                         ( HZ )
                                         ( KHZ )
  ( CF )     ( SP )      number          ( MHZ )          ( ; )
                                         ( GHZ )          ( LF )
                                         ( KZ )           ( CR )
                                         ( MZ )           ( SP )
                                         ( GZ )           ( . )
```

DESCRIPTION

The CF command sets the center frequency and sets the spectrum analyzer to center frequency/span mode. The span remains constant; the start and stop frequencies change as the center frequency changes.

PARAMETERS

number: real from 0 to 22 E+9 (18 E+9 to 325 E+9 in external mixer mode).
UP/DN: 10% of the frequency span or the amount set by the SS command.

PRESET STATE

12.38 GHz (HP 8562A)
1.45 GHz (HP 8562B)

QUERY RESPONSE

EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"CF 300MHZ;SP 20MHZ;TS;"
30        OUTPUT 718;"CF?;"
40        ENTER 718;Cf
50        PRINT Cf
60        END
```

CLRW
CLEAR WRITE

SYNTAX
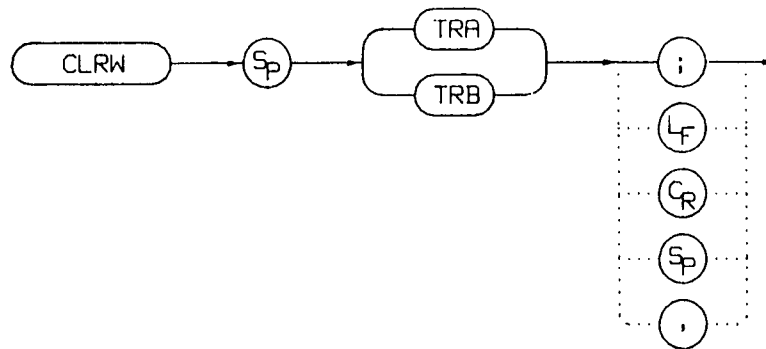
DESCRIPTION

The CLRW command sets the chosen trace to clear-write mode. This mode sets each element of the chosen trace to the bottom-screen value; then new data from the detector is put in the trace with each sweep.

EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"BLANK TRA;CLRW TRB;"
30        END
```

CNVLOSS
CONVERSION LOSS

SYNTAX
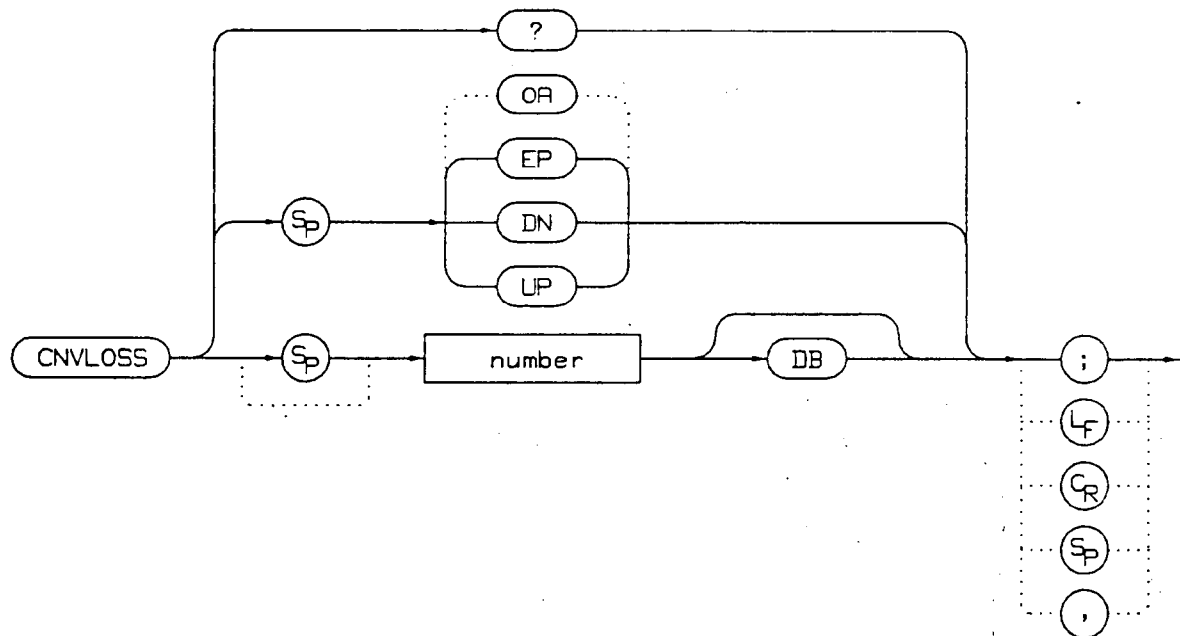
DESCRIPTION

The CNVLOSS command compensates for losses outside the instrument when in external mixer mode (such as losses within connector cables, external mixers, etc.). CNVLOSS specifies the mean conversion loss for the current harmonic band. In a full frequency band (such as band K), the mean conversion loss is defined as the minimum loss plus the maximum loss for that band divided by two. Adjusting for conversion loss allows the system to remain calibrated, (i.e., the displayed amplitude values have the conversion loss incorporated into them). The default value for any band is 30 dB. The spectrum analyzer must be in external-mixer mode in order for this command to work. When in internal-mixer mode, quering CNVLOSS returns a zero.

PARAMETERS

number: any real
UP/DN: 0.1 dB

PRESET STATE

30 dB

QUERY RESPONSE
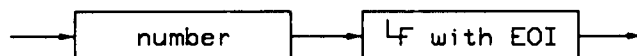
EXAMPLE

```
10        OUTPUT 718;"IP;MXRMODE EXT;"
20        INPUT "ENTER THE DESIRED FREQUENCY BAND (KAQUVEWFDGY OR J)",Fulband$
30        OUTPUT 718;"FULBAND ";Fulband$;";"
40        INPUT "ENTER IN THE DESIRED CENTER FREQUENCY IN GHZ",Cf
50        INPUT "ENTER IN THE CONVERSION LOSS FOR THAT FERQUENCY",Loss
60        OUTPUT 718;"CF ";Cf;"GHZ;SP 10 MHZ;"
70        OUTPUT 718;"CNVLOSS ";Loss;"DB;"
80        END
```

SYNTAX
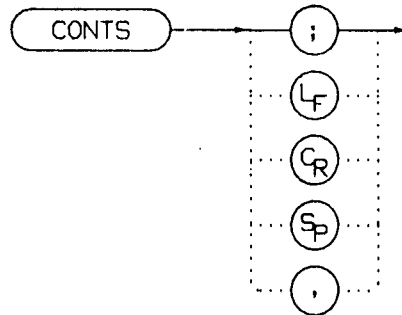
DESCRIPTION

The CONTS command activates the continuous-sweep mode. This mode enables another sweep at the completion of the current sweep once the trigger conditions are met.

PRESET STATE

On

EXAMPLE

```
10          OUTPUT 718;"CONTS;"
20          END
```

DEMOD
DEMODULATION

SYNTAX
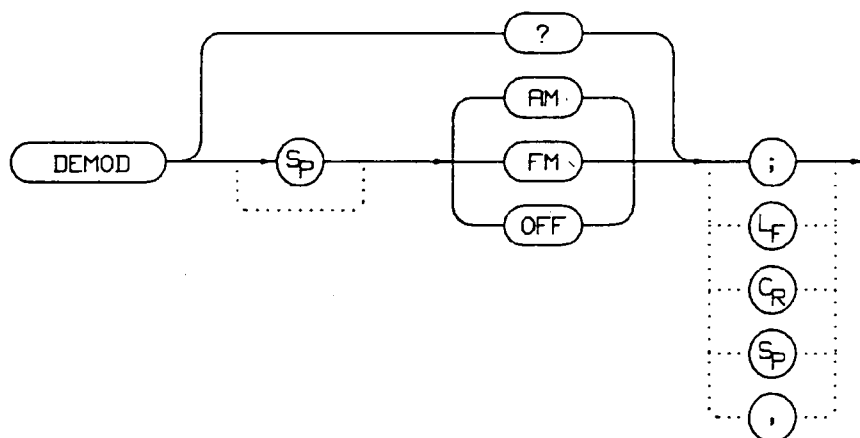
DESCRIPTION

The DEMOD command activates either AM or FM demodulation or turns the demodulation off. Place a marker on a desired signal and then activate DEMOD; demodulation takes place on this signal. If no marker is on, DEMOD automatically places a marker at the center of the trace and demodulates the frequency at that marker position. Use the VOL command to activate the speaker and listen.

PRESET STATE

Off
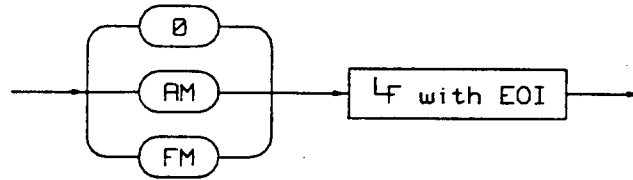
QUERY RESPONSE

EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
30        OUTPUT 718;"MKN EP;"
40        PRINT "MOVE MARKER TO SIGNAL TO BE DEMODULATED; PRESS HOLD"
50        PRINT "THEN PRESS CONTINUE"
60        PAUSE
70        INPUT "ENTER DEMODULATION TIME (.1 SEC - 60 SEC)",Dtime
80        OUTPUT 718;"DEMODT ";Dtime;"SEC;"
90        OUTPUT 718;"DEMOD FM;"
100        LOCAL 718
110        PRINT "ADJUST VOLUME AND SQUELCH AS NECESSARY"
120       END
```

DEMODAGC
DEMODULATION AUTOMATIC GAIN CONTROL

SYNTAX
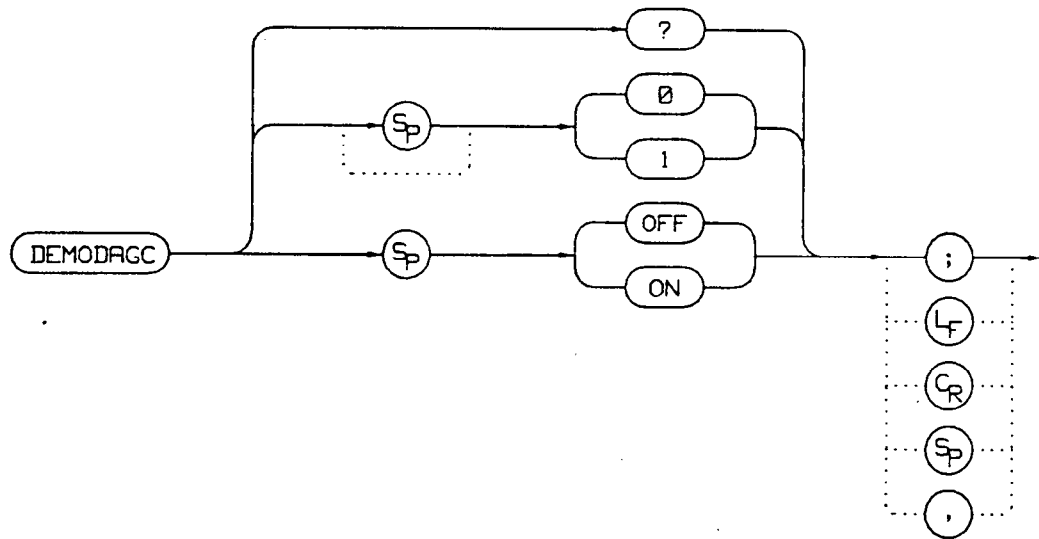
DESCRIPTION

The DEMODAGC command turns the demodulation automatic gain control (AGC) on or off. The AGC keeps the volume of the speaker relatively constant during AM demodulation. AGC is available only during AM demodulation and when the frequency span is greater than 0 Hz.

PRESET STATE

Off

QUERY RESPONSE
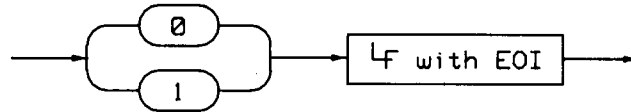
EXAMPLE

```
10          OUTPUT 718;"IP;"
20          OUTPUT 718;"FA 550KHZ;FB 1600KHZ;"
30          OUTPUT 718;"MKN EP;"
40          PRINT "MOVE MARKER TO SIGNAL TO BE DEMODULATED; PRESS HOLD"
50          PRINT "THEN PRESS CONTINUE"
60          PAUSE
70          INPUT "ENTER DEMODULATION TIME (.1 - 60 SEC)",Dtime
80          OUTPUT 718;"DEMODT ";Dtime;"SEC;"
90          OUTPUT 718;"DEMOD AM;DEMODAGC ON;"
100          LOCAL 718
110         PRINT "ADJUST VOLUME AND SQUELCH AS NECESSARY"
120         END
```

DEMODT
DEMODULATION TIME

SYNTAX
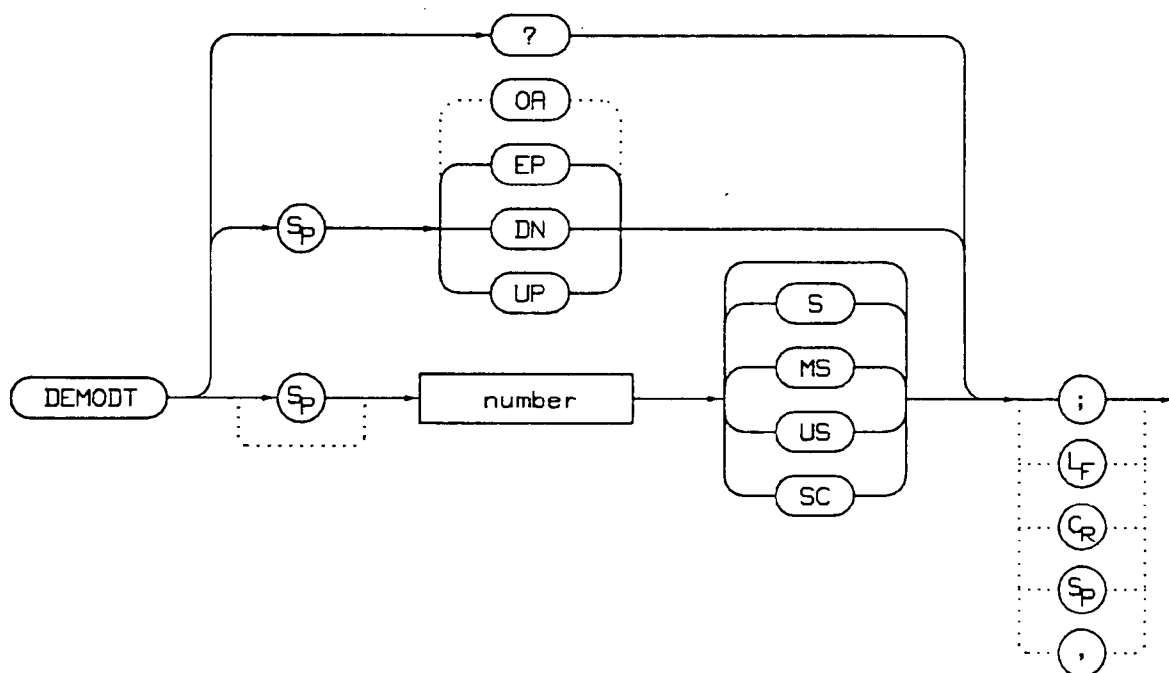
DESCRIPTION

The DEMODT command selects the amount of time that the sweep pauses at the marker to demodulate a signal. The default value is 1 second. When the frequency span equals 0 Hz, demodulation is continuous.

PARAMETER

number: real from 100 E-3 to 60.
UP/DN: increments in a 1, 2, 5, 10 sequence.

PRESET STATE

Off

QUERY RESPONSE

EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
30        OUTPUT 718;"MKN EP;"
40        PRINT "MOVE MARKER TO SIGNAL TO BE DEMODULATED; PRESS HOLD"
50        PRINT "THEN PRESS CONTINUE"
60        PAUSE
70        INPUT "ENTER DEMODULATION TIME (.1 SEC - 60 SEC)",Dtime
80        OUTPUT 718;"DEMODT ";Dtime;"SEC;"
90        OUTPUT 718;"DEMOD FM;"
100        LOCAL 718
110        PRINT "ADJUST VOLUME AND SQUELCH AS NECESSARY"
120       END
```

DET
DETECTION MODES

SYNTAX
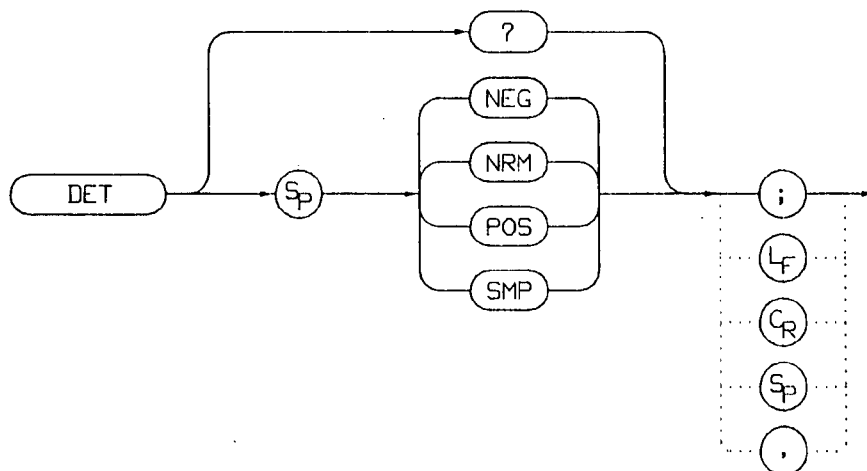
DESCRIPTION

The DET command specifies the IF detector used for acquiring measurement data. This is normally a coupled function, in which the spectrum analyzer selects the appropriate detector mode. Four modes are available: normal, positive, negative, and sample. The modes are described below. When a mode other than normal is chosen, a "D" appears on the left side of the display.

PARAMETERS

NEG: selects the negative peak detector. The minimum signal values are displayed.

NRM: selects the normal peak detector, which displays both positive and negative peak values. The noise floor is made up of alternately selecting the positive peak and negative peak detectors. When a signal is encountered, the positive peak detector is used.

POS: selects the positive peak detector. The maximum signal values are displayed.

SMP: selects the sample mode, which places the instantaneous signal value of the a/d conversion in memory.

If no detector mode is specified, the following rules determine the chosen detector.

      1: If video averaging or marker noise functions are on, or if the video bandwidth is less than 300 Hz, the detector is set to sample mode.

      2: If the maximum-hold trace mode is on, the positive peak detector is used.

      3: If the minimum-hold trace mode is on, the negative peak detector is used.

      4: If none of the above rules apply, the normal detector is used.

      5: If more than one of the above rules apply, the first rule listed determines the detector used.

PRESET STATE

Coupled mode, normal detector

QUERY RESPONSE
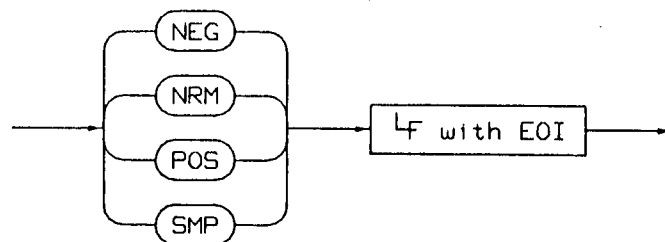
EXAMPLE

```
10        INPUT "SELECT A DETECTOR MODE (NEG, NRM, POS, OR SMP)",Det$
20        OUTPUT 718;"DET ";Det$;";"
30        PRINT "CHOSEN DETECTOR MODE IS ",Det$
40        END
```

DL
DISPLAY LINE

SYNTAX
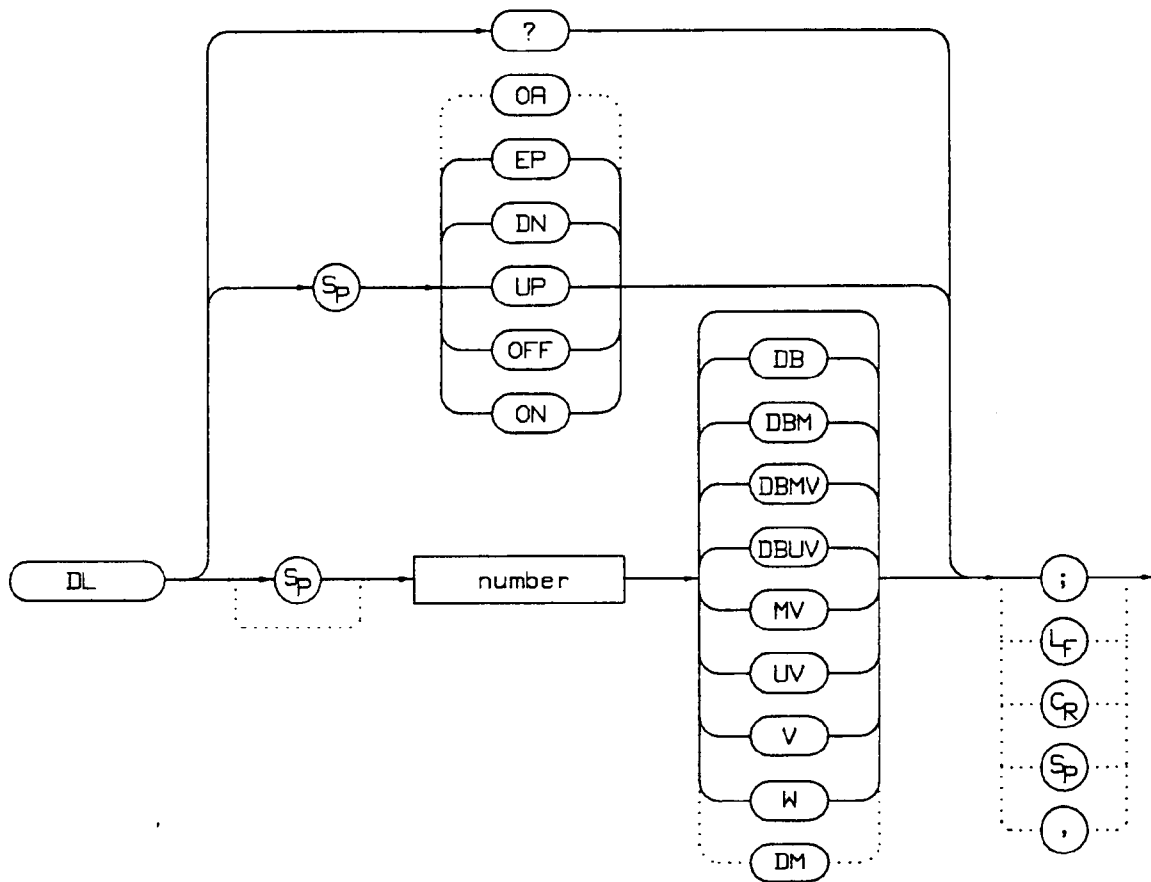
DESCRIPTION

The DL command activates a horizontal display line for use as a visual aid or for computational purposes. The default value is 0 dBm.

PARAMETERS

number: real. Dependent upon the selected amplitude units.
UP/DN: changes the display line by one vertical division

PRESET STATE

Off

QUERY RESPONSE
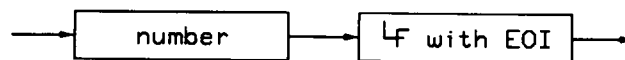
EXAMPLE

```
10      INPUT "ENTER START FREQUENCY, IN MHZ",Fa
20      INPUT "ENTER STOP FREQUENCY, IN MHZ",Fb
30      OUTPUT 718;"AUNITS DBUV;"
40      OUTPUT 718;"FA ";Fa;"MHZ;"
50      OUTPUT 718;"FB ";Fb;"MHZ;"
60      OUTPUT 718;"DL 48DBUV;"
70      END
```

DONE
DONE

SYNTAX
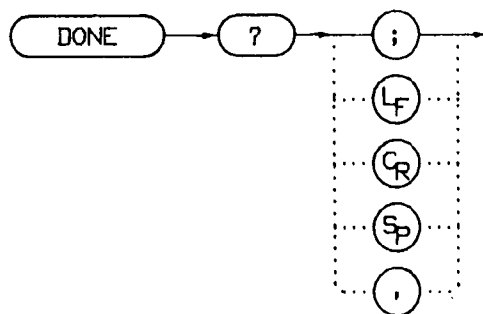
DESCRIPTION

The DONE command sends a "1" to the controller when all commands in a command string entered before DONE have been completed. Sending a TS command before DONE ensures that the spectrum analyzer will complete a full sweep before continuing on in a program.

QUERY RESPONSE
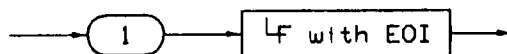
EXAMPLE

```
10      OUTPUT 718;"IP;CF 12GHZ;SP 2GHZ;TS;DONE?;"
20      ENTER 718;Done
30      PRINT "COMMAND STRING IS DONE"
40      END
```

ERR
ERROR

SYNTAX

```
( ERR )──▶( ? )──▶──┬──( ; )──▶──
                    ┊···(L_F)···┊
                    ┊···(C_R)···┊
                    ┊···(S_P)···┊
                    └···( , )···┘
```
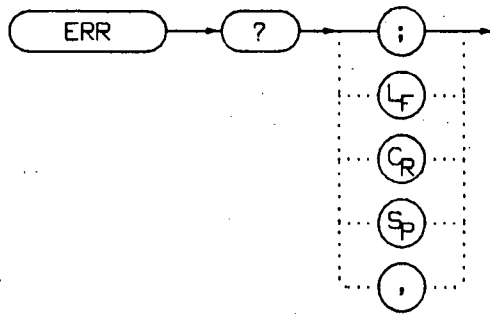
DESCRIPTION

The ERR command outputs a list of errors present. An error code of 0 means there are no errors present. For a list of HP-IB remote-operation error codes and descriptions, refer to Appendix B. For other error codes, refer to the Installation and Support Manual. Executing ERR clears all HP-IB errors. For best results, enter error data immediately after querying for errors.

PRESET STATE

Remote error list cleared. (Persistent errors are reentered into the error list.)

QUERY RESPONSE

```
──┬──[ number ]──┬──▶──[ L_F with EOI ]──▶──
  └──────( , )───┘
```
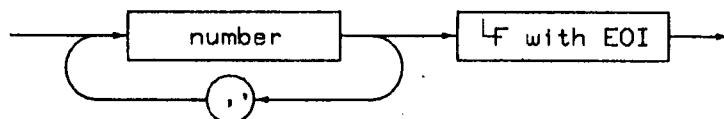
EXAMPLE

```
10          DIM Err$[200]
20          OUTPUT 718;"ERR?;"
30          ENTER 718;Err$
40          PRINT Err$
50          Position_comma=POS(Err$,",")
60          IF Position_comma>0 THEN
70             !MULTIPLE ERRORS
80            First_error=VAL(Err$)
90            PRINT First_error
100            Err$=Err$[POS(Err$,",")+1]
110            REPEAT
120               Position_comma=POS(Err$,",")
130               Next_error=VAL(Err$)
140               PRINT Next_error
150               IF Position_comma THEN Err$=Err$[POS(Err$,",")+1]
160            UNTIL Position_comma=0
170         ELSE
180            Err=VAL(Err$)
190            IF Err<>0 THEN
200             PRINT Err
210             ELSE
220             PRINT "NO ERRORS"
230             END IF
240        END
```

ET
ELAPSED TIME

SYNTAX

```
( ET )──▶( ? )──▶( ; )──────▶
                  ┊···(L_F)···┊
                  ┊···(C_R)···┊
                  ┊···(S_P)···┊
                  ┊····( , )··┊
```
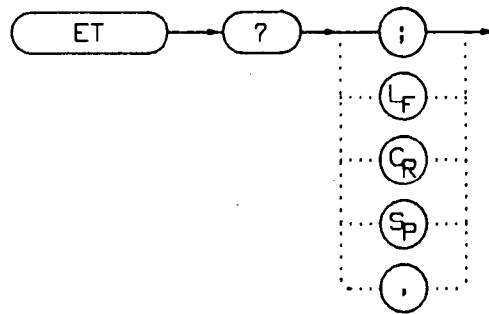
DESCRIPTION

The ET command returns to the controller the elapsed time (in hours) since the last servicing. This value is reset to 0 by Hewlett-Packard at the time of servicing.

QUERY RESPONSE

```
───▶│ number │──▶│ L_F with EOI │──▶
```
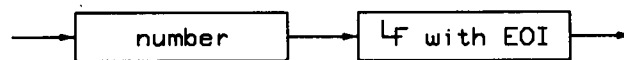
EXAMPLE

```
10      DIM Et$[5]
20      OUTPUT 718;"ET?;"
30      ENTER 718;Et$
40      PRINT Et
50      END
```

FA
START FREQUENCY

SYNTAX
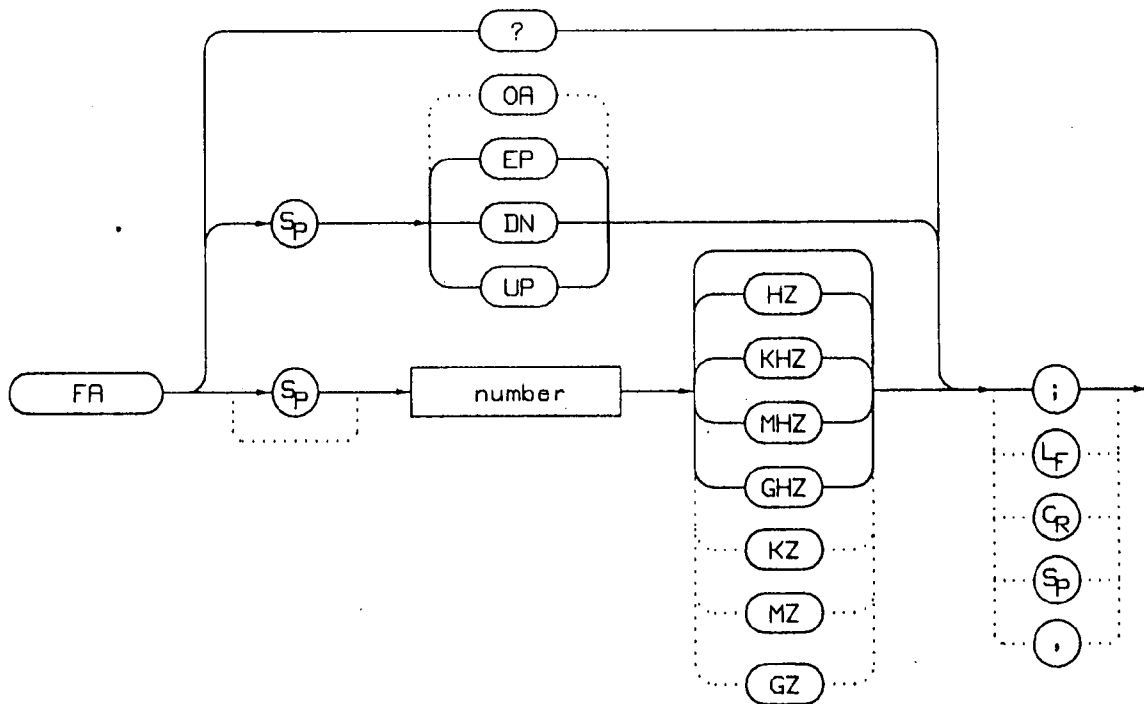
DESCRIPTION

The FA command sets the start frequency and sets the spectrum analyzer to start frequency/stop frequency mode. If the start frequency exceeds the stop frequency, the stop frequency is set equal to the start frequency. The center frequency and span change with changes in the start frequency.

PARAMETERS

number: real from 0 to 22 E+9 (18 E+9 to 325 E+9 in external mixer mode).
UP/DN: increments in 10% of span.

PRESET STATE

2.75 GHz (HP 8562A)
0 Hz (HP 8562B)

QUERY RESPONSE

```
            ┌──────────┐         ┌──────────────┐
  ──────────┤  number  ├─────────┤ ⌐F with EOI  ├────────▶
            └──────────┘         └──────────────┘
```

EXAMPLE

```
10        OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
20        OUTPUT 718;"FA?;"
30        ENTER 718;Fa
40        PRINT Fa
50        END
```

FB
STOP FREQUENCY

SYNTAX
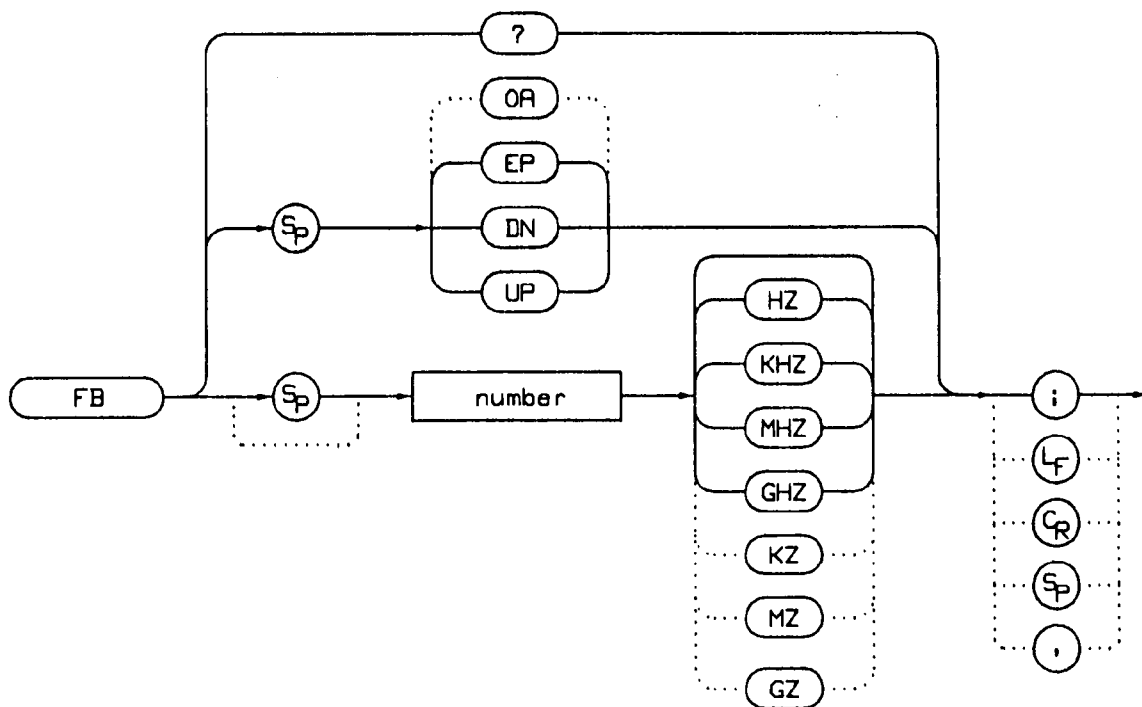
DESCRIPTION

The FB command sets the stop frequency and sets the spectrum analyzer to start frequency/stop frequency mode. If the stop frequency is less than the start frequency, the start frequency is set equal to the stop frequency. The center frequency and span change with changes in the stop frequency.

PARAMETERS

number: real from 0 to 22 E+9 (18 E+9 to 325 E+9 in external mixer mode).
UP/DN: increments in 10% of span.

PRESET STATE

22.0 GHz (HP 8562A)
2.9 GHz (HP 8562B)

QUERY RESPONSE
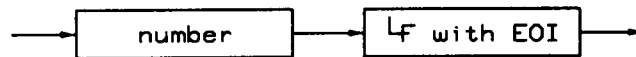
EXAMPLE

```
10      OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
20      OUTPUT 718;"FB?;"
30      ENTER 718;Fb
40      PRINT Fb
50      END
```

FDIAG
FREQUENCY DIAGNOSTICS

SYNTAX
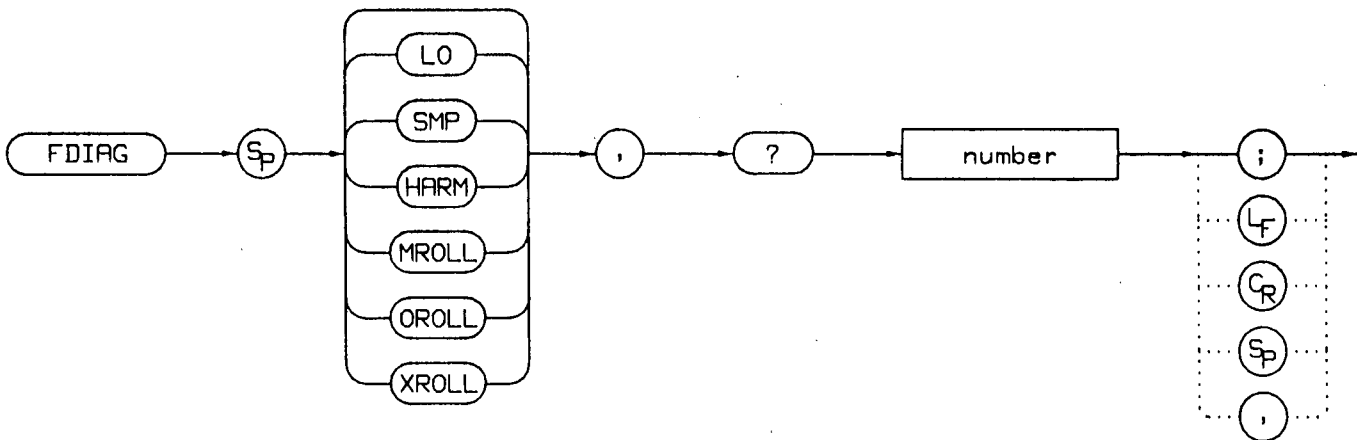
DESCRIPTION

The FDIAG command activates the frequency diagnostic routine, which returns the frequency of the specified oscillator.

PARAMETERS

LO: returns the first local oscillator frequency corresponding to the current start frequency.
SMP: returns the sampling oscillator corresponding to the current start frequency.
HARM: returns the sampler harmonic number corresponding to the current start frequency.
MROLL: returns the main roller oscillator frequency corresponding to the current start frequency.
OROLL: returns the offset roller oscillator frequency corresponding to the current start frequency.
XROLL: returns the transfer roller oscillator frequency corresponding to the current start frequency.

NOTE

In multiband sweeps, the above frequencies correspond to the band being swept when the command is executed.

QUERY RESPONSE

```
  ───────┤  number  ├──────┤ ⌐f with EOI ├──────▶
```
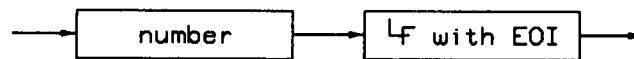
EXAMPLE

```
10        OUTPUT 718;"FDIAG SMP,?;"
20        ENTER 718;Fdiag
30        PRINT "DIAGNOSTIC FREQUENCY IS ",Fdiag
40        END
```

FDSP
FREQUENCY DISPLAY OFF

SYNTAX
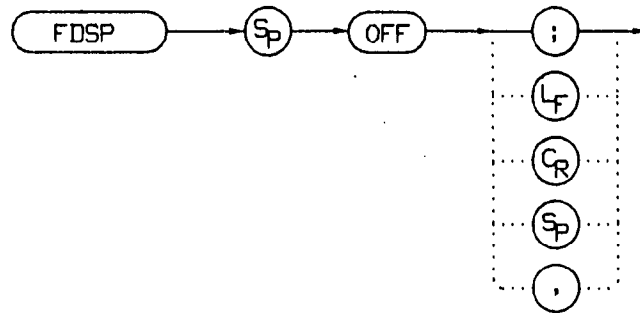
DESCRIPTION

The FDSP command turns off all annotation that describes the spectrum analyzer frequency setting. This includes the start and stop frequencies, the center frequency, the frequency span, marker readouts, the center frequency step-size, and signal identification to center frequency. To retrieve the frequency data, query the spectrum analyzer. To reactivate the annotation, execute the IP command.

PRESET STATE

Off

QUERY RESPONSE
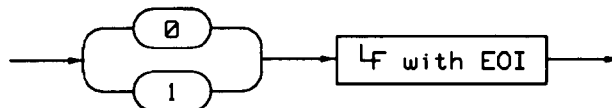
EXAMPLE

```
10        OUTPUT 718;"FDSP OFF;"
20        OUTPUT 718;"FDSP?;"
30        ENTER 718;Fdsp
40        PRINT Fdsp
50        END
```

FOFFSET
FREQUENCY OFFSET

SYNTAX
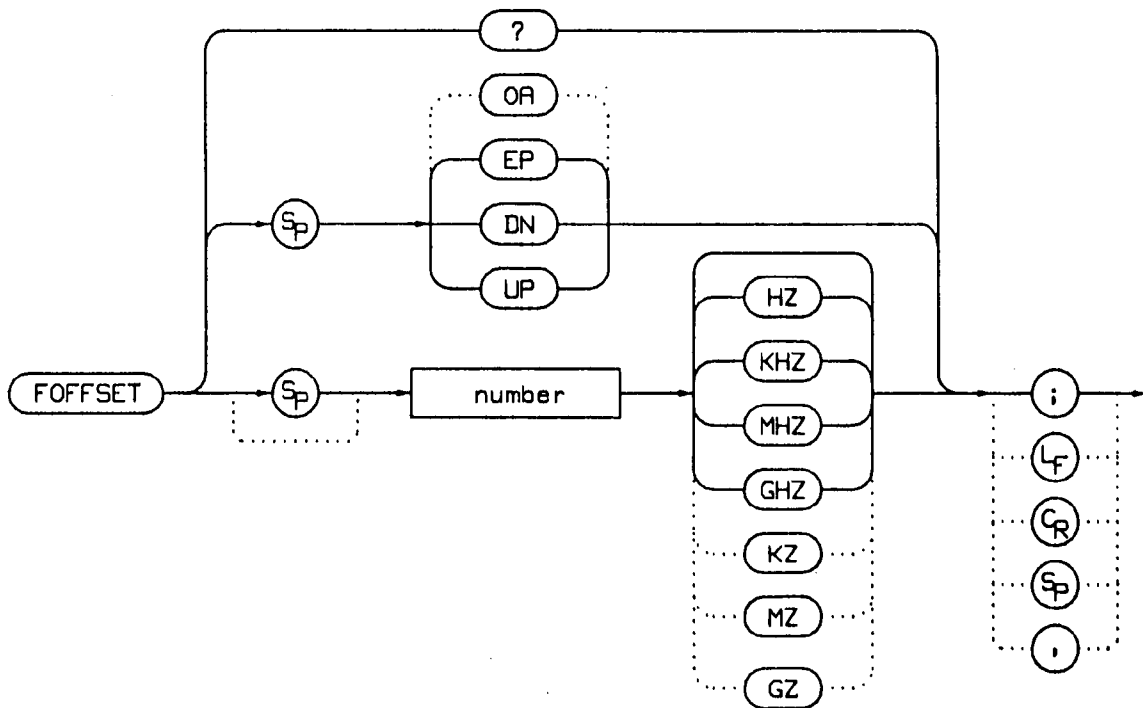
DESCRIPTION

The FOFFSET command adds a specified offset to the displayéd absolute-frequency values, including marker-frequency values. It does not affect the frequency range of the sweep, nor does it affect relative frequency readouts. When this function is active, an "F" appears on the left side of the display.

PARAMETERS

number: real from 0 to 22 E+9.
UP/DN: changes by 20% of span.

PRESET STATE

Off

QUERY RESPONSE
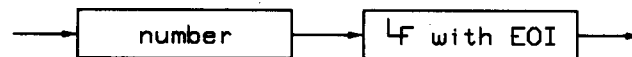
EXAMPLE

```
10      INPUT "ENTER DESIRED FREQUENCY OFFSET IN HERTZ",Foffset
20      OUTPUT 718;"FOFFSET ";Foffset;"HZ;"
30      OUTPUT 718;"FOFFSET?;"
40      ENTER 718;Foffset
50      PRINT "THE FREQUENCY OFFSET IS",Foffset,"HZ"
60      END
```

FREF
FREQUENCY REFERENCE

SYNTAX
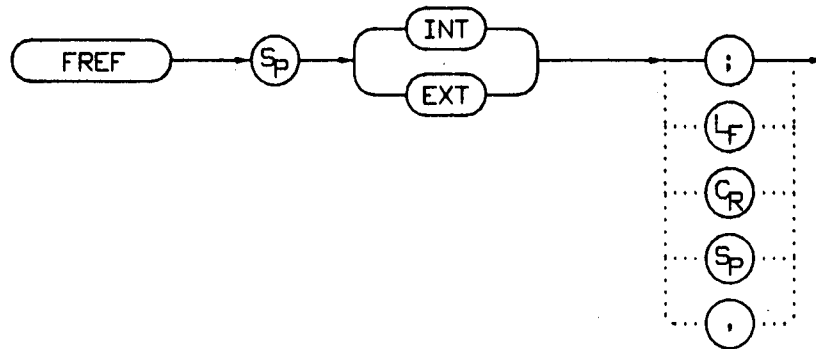
DESCRIPTION

The FREF command specifies the frequency reference source. Select either the internal frequency reference (INT) or supply your own external reference (EXT). An external reference must be 10 MHz ($\pm$100 Hz) at a minimum amplitude of 0 dBm. Connect the external reference to J9 on the rear panel. When the external mode is selected, an "X" appears on the left edge of the display.

PRESET STATE

Internal

QUERY RESPONSE
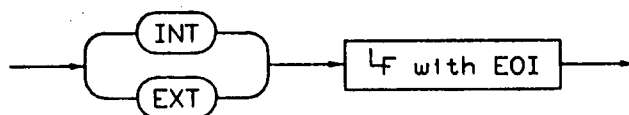
EXAMPLE

```
10        INPUT "WHAT IS THE FREQUENCY REFERENCE SOURCE (INT OR EXT)",Src$
20        OUTPUT 718;"FREF ";Src$;";"
30        PRINT "SOURCE SELECTED IS",Src$
40        END
```

FS
FULL SPAN

SYNTAX
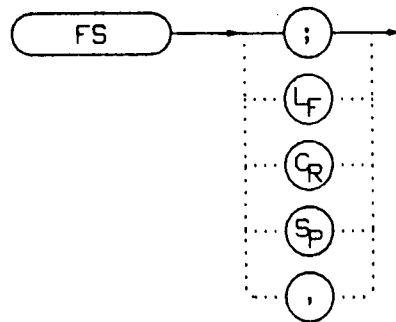
DESCRIPTION

The FS command selects the full frequency span as defined by the instrument. The full span for low band (0-2.9 GHz) is 2.9 GHz; for high band (2.75-22 GHz), the full span is 19.25 GHz.

EXAMPLE

```
10      OUTPUT 718;"FS;"
20      END
```

FULBAND
FULL BAND

SYNTAX
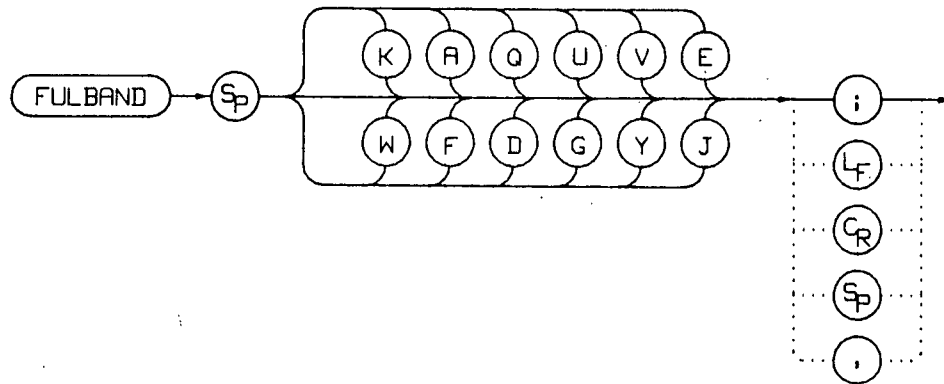
DESCRIPTION

The FULBAND command selects a commonly-used, external-mixer frequency band, as shown in Table 14.1. The harmonic lock function (HNLOCK) is also set; this locks the harmonic of the chosen band.

FREQUENCY BAND	FREQUENCY RANGE (GHz)	MIXING HARMONIC	CONVERSION LOSS
K	18.0 – 26.5	6 –	30 dB
A	26.5 – 40.0	8 –	30 dB
Q	33.0 – 50.0	10 –	30 dB
U	40.0 – 60.0	10 –	30 dB
V	50.0 – 75.0	14 –	30 dB
E	60.0 – 90.0	16 –	30 dB
W	75.0 – 110.0	18 –	30 dB
F	90.0 – 140.0	24 –	30 dB
D	110.0 – 170.0	30 –	30 dB
G	140.0 – 220.0	36 –	30 dB
Y	170.0 – 260.0	44 –	30 dB
J	220.0 – 325.0	54 –	30 dB

Table 14.1. External-mixer frequency bands.

EXAMPLE

```
10        OUTPUT 718;"IP;MXRMODE EXT;"
20        INPUT "ENTER THE DESIRED FREQUENCY BAND (KAQUVEWFDGY OR J)",Fulband$
30        OUTPUT 718;"FULBAND ";Fulband$;";"
40        OUTPUT 718;"MKN EP;"
50        PRINT "POSITION THE MARKER ON THE DESIRED SIGNAL"
60        PRINT "PRESS HOLD, THEN PRESS CONTINUE"
70        PAUSE
80        OUTPUT 718;"SNGLS;TS;SIGID AUTO;DONE?;"
90        ENTER 718;Done
100        OUTPUT 718;"IDFREQ?;"
110        ENTER 718;Idfreq
120        IF Idfreq<>0 THEN
130        PRINT Idfreq
140        ELSE
150        PRINT "NO SIGNAL FOUND"
160        END IF
170       END
```

GRAT
GRATICULE ON/OFF

SYNTAX
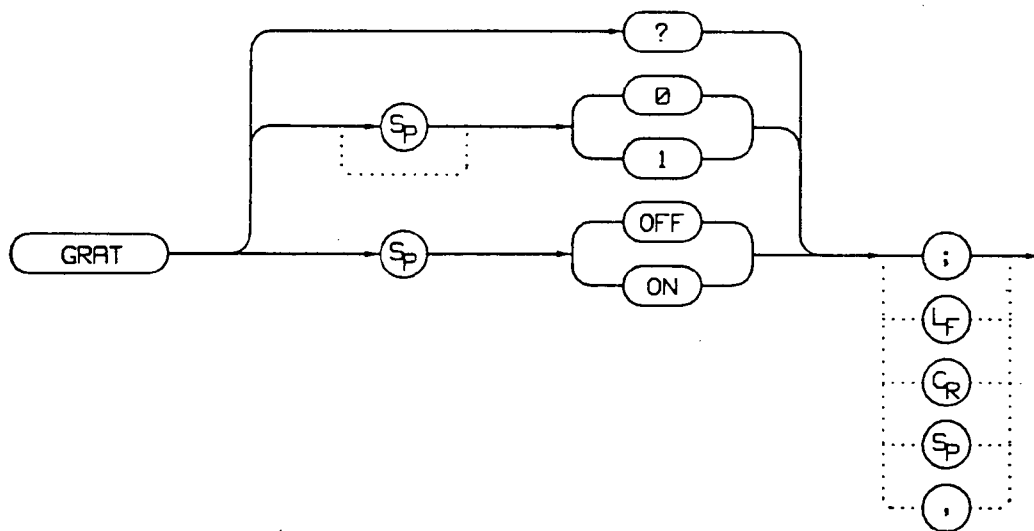
DESCRIPTION

The GRAT command turns the display graticule on or off.

PRESET STATE

On

QUERY RESPONSE
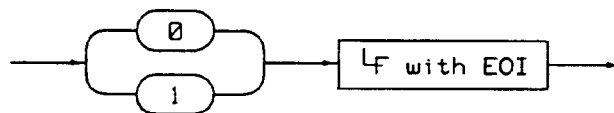
EXAMPLE

```
10        OUTPUT 718;"GRAT OFF;"
20        OUTPUT 718;"GRAT?;"
30        ENTER 718;Grat
40        PRINT Grat
50        END
```

<div align="right">

HD
HOLD

</div>

SYNTAX
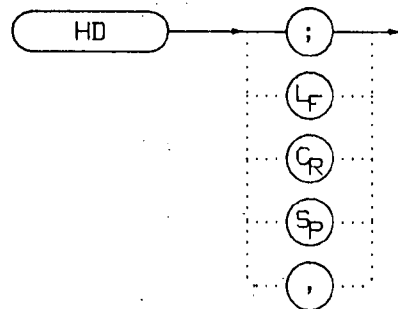
DESCRIPTION

The HD command freezes the active function at its current value. If no function is active, no operation takes place.

EXAMPLE

```
10        OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;HD;"
20        END
```

HNLOCK
HARMONIC NUMBER LOCK

SYNTAX
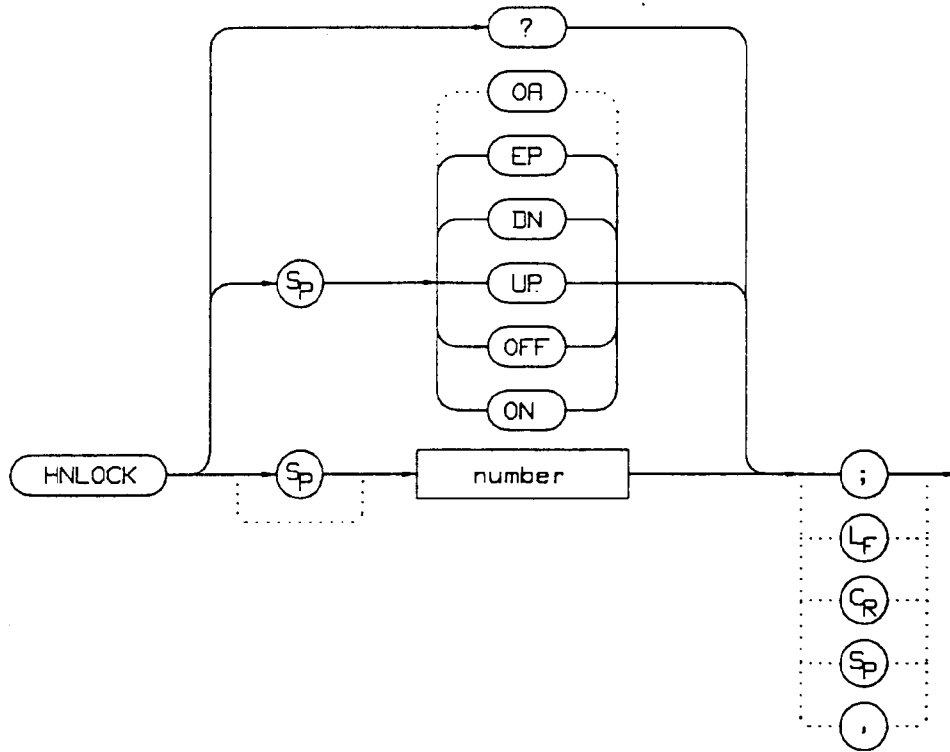
DESCRIPTION

The HNLOCK command locks a chosen harmonic so only that harmonic is used to sweep an external frequency band. To select a frequency band, use a harmonic number or refer to the FULBAND command. Table 14.2 shows the frequency bands and the harmonics that sweep each band. Note that HNLOCK also works in internal-mixing modes.

Once FULBAND or HNLOCK are set, only center frequencies and spans that fall within the frequency band of the current harmonic may be entered. When the FS command is activated, the span is limited to the frequency band of the selected harmonic.

MIXER MODE	FREQUENCY RANGE (GHz)	MIXING HARMONIC
INTERNAL	2.75 - 6.46	1 -
	5.69 - 13.03	2 -
	12.36 - 19.70	3 -
	19.03 - 22.10	4 -
EXTERNAL	18.00 - 26.50	6 -
	26.50 - 40.00	8 -
	33.00 - 50.00	10 -
	40.00 - 60.00	10 -
	50.00 - 75.00	14 -
	60.00 - 90.00	16 -
	75.00 - 110.00	18 -
	90.00 - 140.00	24 -
	110.00 - 170.00	30 -
	140.00 - 220.00	36 -
	170.00 - 260.00	44 -
	220.00 - 325.00	54 -

Table 14.2. Frequency bands and the corresponding LO harmonic.

PARAMETERS

number: integer from 1 to 54 (for best results, choose from harmonic numbers shown in Table 14.2).
UP/DN: increments of 1.

PRESET STATE

Off

QUERY RESPONSE
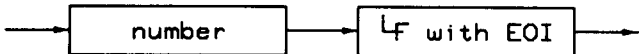
EXAMPLE

```
10       OUTPUT 718;"IP;MXRMODE EXT;"
20     - INPUT "SELECT THE START FREQUENCY, IN GHZ",Fa
30       INPUT "SELECT THE STOP FREQUENCY, IN GHZ",Fb
40       INPUT "ENTER HARMONIC DESIRED TO SWEEP RANGE",Harm
50       OUTPUT 718;"FA ";Fa;"GHZ;"
60       OUTPUT 718;"FB ";Fb;"GHZ;"
70       OUTPUT 718;"HNLOCK ";Harm;";"
80       END
```

HNUNLK
UNLOCK HARMONIC NUMBER

SYNTAX

```
HNUNLK ─────────┬──────( ; )────────►
                ├····( LF )····
                ├····( CR )····
                ├····( SP )····
                └····( , )····
```
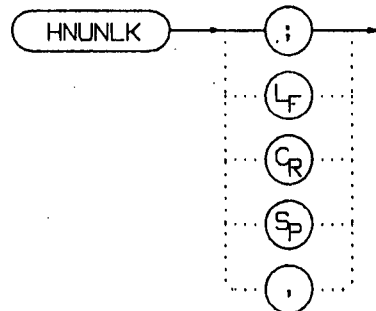
DESCRIPTION

The HNUNLK command unlocks the harmonic number, allowing you to select frequencies and spans outside the range of the locked harmonic number. Also, when HNUNLK is executed, more than one harmonic can then be used to sweep across a desired span. For example, sweep a span from 18 GHz to 40 GHz. In this case, the analyzer will automatically sweep first using 6-, then using 8-.

EXAMPLE

```
10        OUTPUT 718;"IP;MXRMODE EXT;FULBAND Q;"
20        OUTPUT 718;"FA 18GHZ;FB 40GHZ;"
30        OUTPUT 718;"HNUNLK;"
40        END
```

ID
OUTPUT IDENTIFICATION

SYNTAX
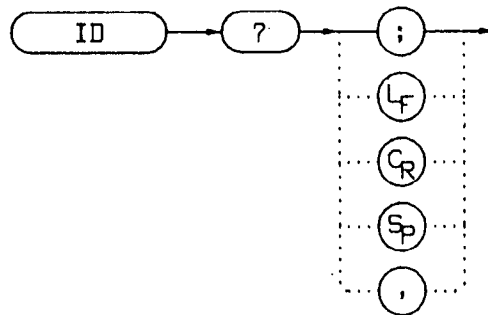
DESCRIPTION

The ID command returns the model number of the spectrum analyzer (HP 8562A or HP 8562B) and any options installed.

QUERY RESPONSE
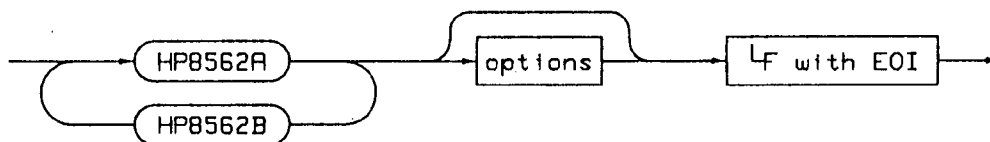
EXAMPLE

```
10        DIM Id$[8]
20        OUTPUT 718;"ID?;"
30        ENTER 718;Id$
40        PRINT Id$
50        END
```

IDCF
SIGNAL IDENTIFICATION TO CENTER FREQUENCY

SYNTAX

```
   IDCF  ────────────( ; )──────────▶
              ┊        ( L )
              ┊        ( CR )
              ┊        ( SP )
              ┊        ( , )
```
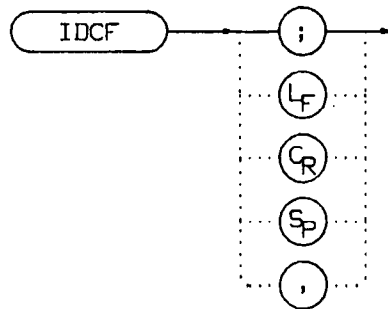
DESCRIPTION

The IDCF command sets the center frequency to the frequency obtained from the command SIGID. SIGID must be in AUTO mode and have found a valid result for this command to execute properly. For use on signals less than 22 GHz.

EXAMPLE

```
10       OUTPUT 718;"SIGID AUTO;"
20       OUTPUT 718;"IDCF;"
30       OUTPUT 718;"CF?;"
40       ENTER 718;Cf
50       PRINT Cf
60       END
```

IDFREQ
SIGNAL IDENTIFIED FREQUENCY

SYNTAX
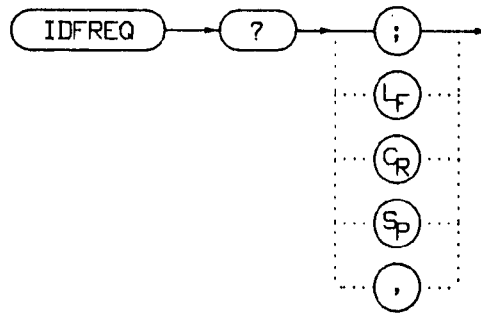
DESCRIPTION

The IDFREQ command returns the frequency of the last identified signal. After an instrument preset or an invalid signal identification, IDFREQ returns a 0.

QUERY RESPONSE
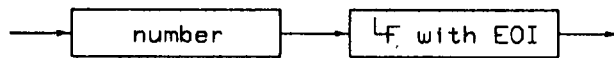
EXAMPLE

```
10      OUTPUT 718;"IDFREQ?;"
20      ENTER 718;Idfreq
30      PRINT Idfreq
40      END
```

SYNTAX
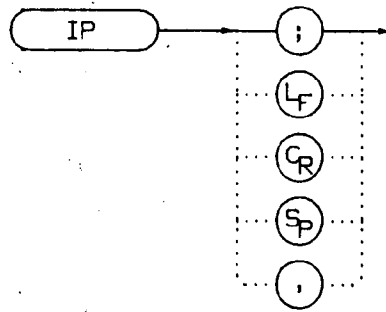
DESCRIPTION

The IP command sets the spectrum analyzer to a known, predefined state, shown in Table 14.3. IP does not affect the contents of any data or trace registers or stored preselector data. IP does not clear the input or output data buffers; to clear these, execute the statement CLEAR 718. Include the TS command after IP when the next command will operate on trace data (such as TRA).

FUNCTION	STATE
FREQ MODE	CENTER-SPAN
CENTER FREQ	12.38 GHz (HP 8562A); 1.45 GHz (HP 8562B)
SPAN	19.25 GHz (HP 8562A); 1.45 GHz (HP 8562B)
CF STEP	1.93 GHz, AUTO
FREQ OFFSET	0 MHz, OFF
10 MHz REF	INTERNAL
REFERENCE LEVEL	0 dBm
INPUT ATTENUATION	10 dB, AUTO
MAX MIXER LEVEL	−10 dBm
REF LEVEL OFFSET	0 dBm, OFF
VERTICAL SCALE	10 dB/DIV.
UNITS	dBm, AUTO
AUTO IF ADJUST	ON
DETECTOR	NORMAL
RESOLUTION BW	1 MHz, AUTO
VIDEO BW	1 MHz, AUTO
VBW/RBW RATIO	1
RBW/SPAN RATIO	.011
VIDEO AVERAGE	100, OFF
SWEEP TIME	400 ms, AUTO
TRIGGER MODE	CONTINUOUS
TRIGGER SOURCE	FREE-RUN
VIDEO TRIG LEVEL	0 dBm
SWEEP OUTPUT	0-10V LO-SWEEP RAMP
MARKER MODE	OFF
NOISE MARKER	OFF
SIGNAL TRACK	OFF
PEAK THRESHOLD	−120 dBm
PEAK EXCURSION	6 dB
FREQUENCY COUNTER	OFF
FREQUENCY COUNTER RESOLUTION	10 kHz
TRACE A	CLEAR-WRITE
TRACE B	BLANK
TRACE-DATA	FORMAT P
A−B−>A	OFF
A−B+DISPLAYLINE−>A	OFF
DISPLAY LINE	0 dBm, OFF
THRESHOLD	−90 dBm, OFF
GRATICULE	ON
ANNOTATION	ON
FREQUENCY DISPLAY OFF	CLEAR
DEMODULATION	FM OFF AM OFF
DEMODULATION TIME	1 sec
SQUELCH	OFF
SQUELCH LEVEL	−120 dBm
AGC	OFF
VOLUME	0
SIGNAL IDENTIFICATION	OFF
MIXER	INT
EXT MIXER LO HARMONIC	6
MIXER CONV LOSS	30.0 dBm
BAND LOCK	OFF
EXT MIXER BIAS	0 mA

Table 14.3. HP 8562A/B preset state.

EXAMPLE

```
10          OUTPUT 718;"IP;SNGLS;"
20          END
```

LG
LOGARITHM SCALE

SYNTAX
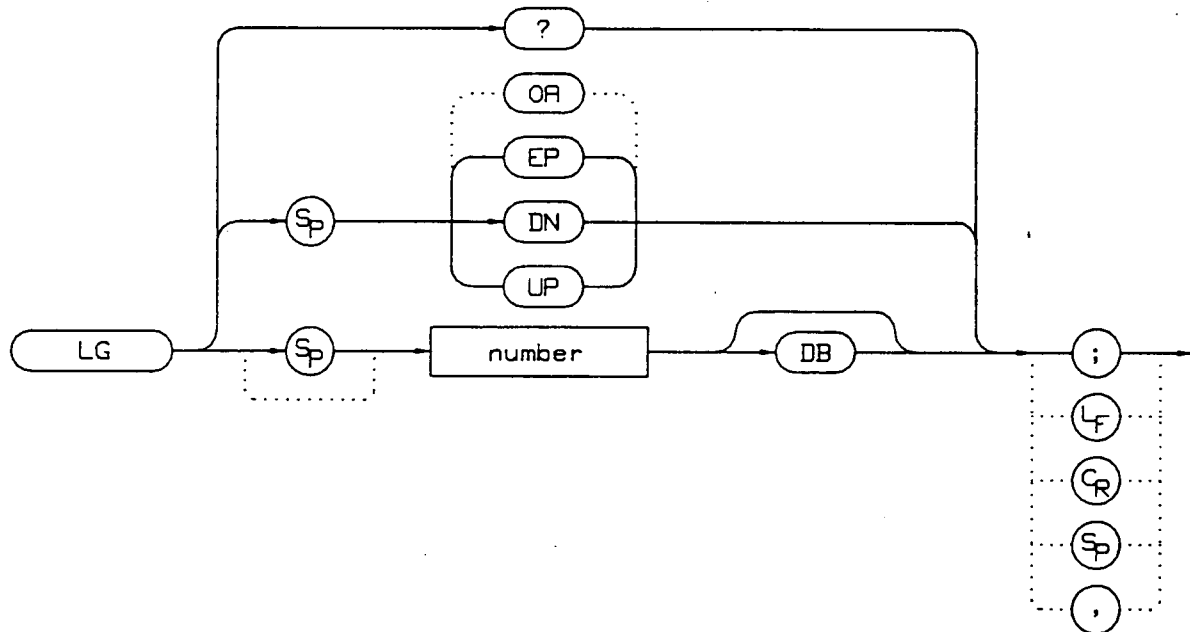
DESCRIPTION

The LG command selects a 1, 2, 5, or 10 dB logarithmic amplitude scale. When in linear mode, querying LG returns a zero.

PARAMETERS

number: 1, 2, 5, or 10.
UP/DN: increments in a 1, 2, 5, 10 sequence.

PRESET STATE

10 dB/div

QUERY RESPONSE
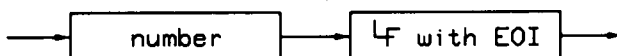
EXAMPLE

```
10      OUTPUT 718;"LG 10DB;"
20      OUTPUT 718;"AUNITS DBMV;"
30      OUTPUT 718;"TS;MKPK HI;MKRL;"
40      OUTPUT 718;"LG 2DB;"
50      END
```

LN
LINEAR SCALE

SYNTAX
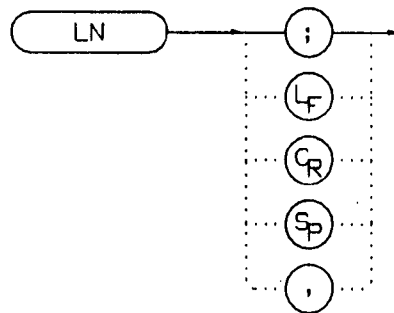
DESCRIPTION

The LN command selects a linear amplitude scale. Measurements made on a linear scale can be read out in volts or watts.

EXAMPLE

```
10       OUTPUT 718;"LN;"
20       END
```

MBIAS
MIXER BIAS

SYNTAX
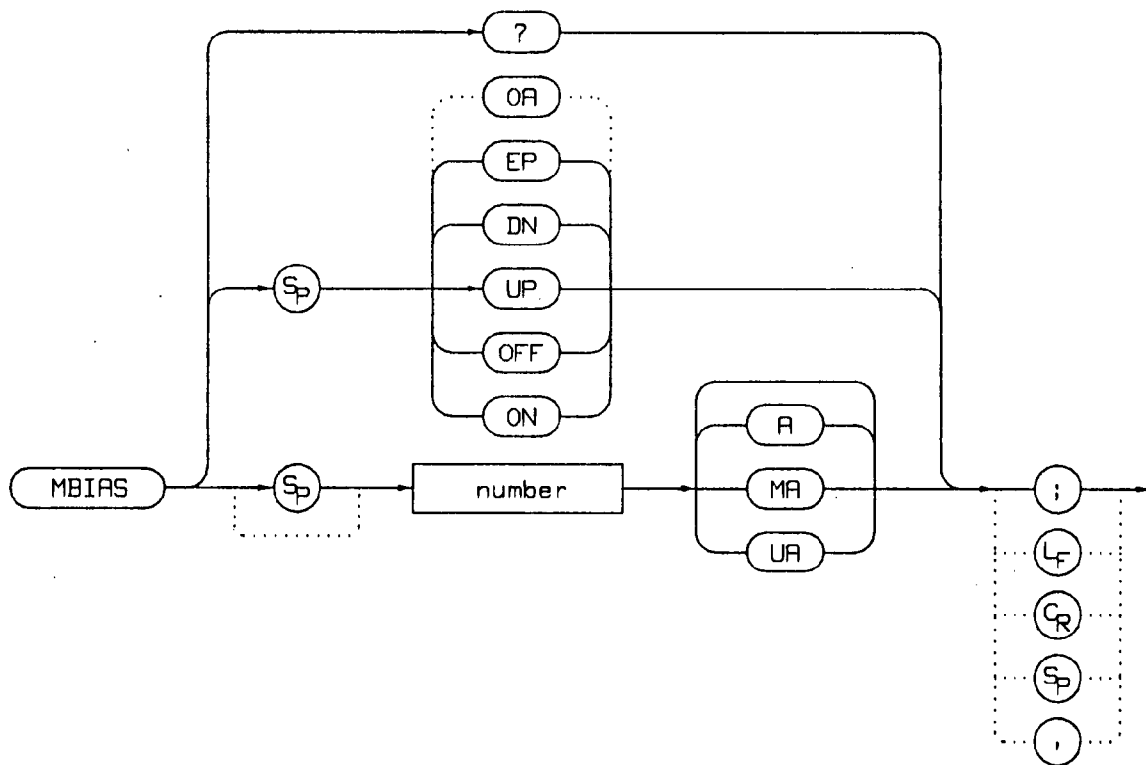
DESCRIPTION

The MBIAS command sets the bias for an external mixer that requires diode bias for efficient mixer operation. The bias, which is provided on the center conductor of the IF input, is activated when MBIAS is executed. A "+" or "−" appears on the left edge of the spectrum analyzer display, indicating that positive or negative bias is on. When the bias is turned off, MBIAS is set to 0.

```
CAUTION
```

The open-circuit voltage can be a great as ±3.5 V through a source resistance of 300 ohms. Such voltage may appear when recalling an instrument state in which an active bias has been stored.

NOTE

The bias value that appears on the spectrum analyzer display is expressed in terms of short-circuit current (i.e., the amount of current that would flow if the IF line were shorted to ground). The actual amount of current flowing into the mixer will be less.

PARAMETERS

number: any real.
UP/DN: increments of 0.01 mA.

PRESET STATE

Off

QUERY RESPONSE
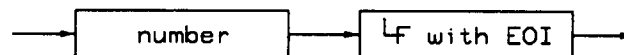
EXAMPLE

```
10      OUTPUT 718;"IP;MXRMODE EXT;FULBAND U;"
20      OUTPUT 718;"MKN EP;"
30      PRINT "MOVE THE MARKER TO THE DESIRED SIGNAL"
40      PRINT "PRESS HOLD THEN PRESS CONTINUE"
50      PAUSE
60      INPUT "ENTER THE BIAS VALUE, IN MA",Bias
70      OUTPUT 718;"MBIAS ";Bias;"MA;"
80      OUTPUT 718;"MBIAS EP;"
90      PRINT "ADJUST BIAS IF NECESSARY"
100       PRINT "PRESS HOLD THEN PRESS CONTINUE"
110       PAUSE
120       OUTPUT 718;"SIGID AUTO;TS; DONE?;"
130       ENTER 718;Done
140       PRINT Done
150     END
```

MINH
MINIMUM HOLD

SYNTAX
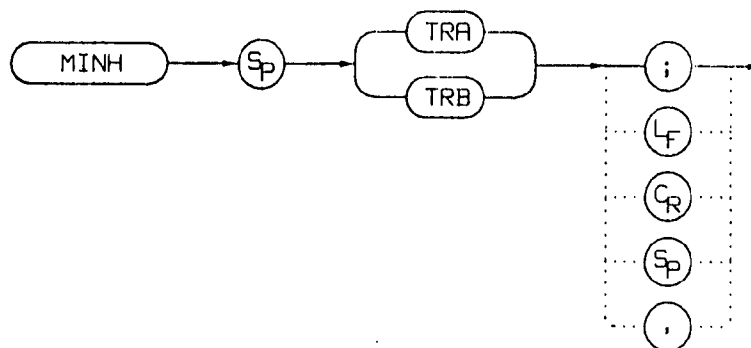
DESCRIPTION

The MINH command updates the chosen trace with the minimum signal level detected at each trace-data point from subsequent sweeps. This function employs the negative peak detector (refer to the DET command).

EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;"
20        INPUT "ENTER START FREQUENCY, IN MHZ",Fa
30        INPUT "ENTER STOP FREQUENCY, IN MHZ",Fb
40        OUTPUT 718;"FA ";Fa;"MHZ;"
50        OUTPUT 718;"FB ";Fb;"MHZ;"
60        OUTPUT 718;"TS;MINH TRA;"
70        OUTPUT 718;"TS;MKPK HI;MKD;"
80        OUTPUT 718;"TS;MKPK NH;MKA?;AUNITS?;"
90        ENTER 718 USING "K";Difference,Aunits$
100       PRINT "DIFFERENCE IN AMPLITUDE IS ",Difference,Aunits$
110       END
```

MKA
MARKER AMPLITUDE

SYNTAX
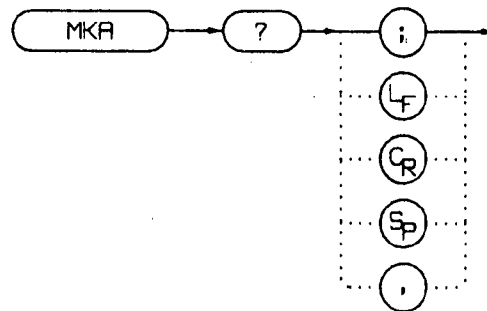
DESCRIPTION

The MKA command returns the amplitude of the active marker. If no marker is active, MKA places a marker at the center of the trace and returns that amplitude value.

QUERY RESPONSE
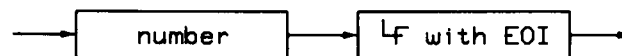
EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;"
20        INPUT "ENTER IN DESIRED CENTER FREQUENCY, IN MHZ",Cf
30        INPUT "ENTER IN DESIRED FREQUENCY SPAN,IN MHZ",Sp
40        OUTPUT 718;"CF ";Cf;"MHZ;"
50        OUTPUT 718;"SP ";Sp;"MHZ;"
60        OUTPUT 718;"TS;MKPK HI;"
70        OUTPUT 718;"MKA?;AUNITS?;"
80        ENTER 718 USING "K";Mka,Aunits$
90        PRINT "HIGHEST PEAK IS",Mka,Aunits$
100       END
```

MKCF
MARKER TO CENTER FREQUENCY

SYNTAX
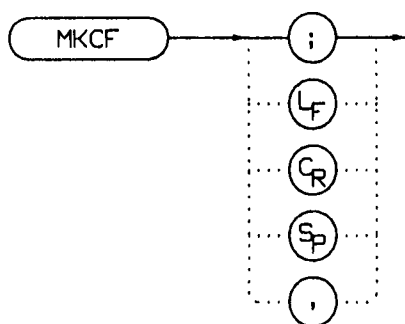
DESCRIPTION

The MKCF command sets the center frequency to the frequency value of an active marker.

EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;";
20        INPUT "ENTER IN DESIRED START FREQUENCY, IN MHZ",Fa
30        INPUT "ENTER IN DESIRED STOP FREQUENCY,IN MHZ",Fb
40        OUTPUT 718;"FA ";Fa;"MHZ;"
50        OUTPUT 718;"FB ";Fb;"MHZ;"
60        OUTPUT 718;"TS;MKPK HI;MKCF;TS;"
70        END
```

MKD
MARKER DELTA

SYNTAX
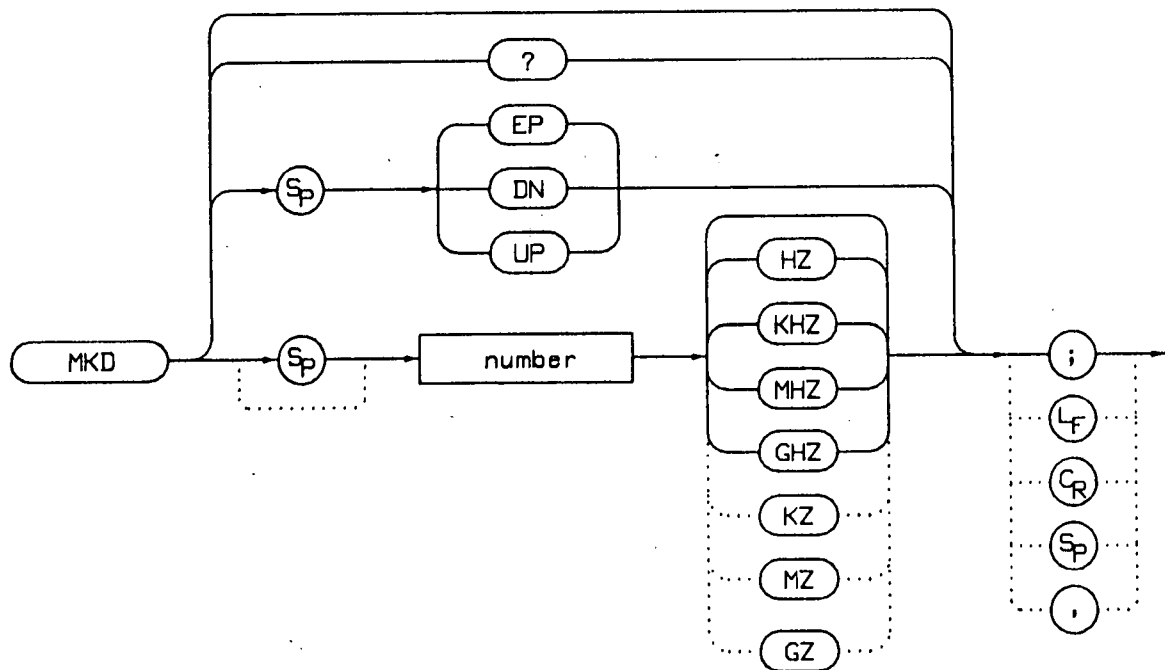
DESCRIPTION

The MKD command places a second marker on the trace. The number specifies the distance in frequency or time (when in zero span) between the two markers.

PARAMETERS

number: real from 12.9 E+9 to 2.9 E+9 in low band or from −22.9 E+9 to 22 E+9 in high band (-3.7 E+9 to 307 E+9 in external mixer mode).
UP/DN: increments in 10% of span.

QUERY RESPONSE

```
   ┌──────────┐    ┌──────────────┐
──→│  number  ├──→─┤ ⌐F with EOI  ├──→
   └──────────┘    └──────────────┘
```

EXAMPLE

```
10        OUTPUT 718;"IP;CF 450MHZ;SP 400MHZ;"
20        OUTPUT 718;"TS;MKPK HI;MKD 300MHZ;"
30        OUTPUT 718;"MKPK HI;MKD;MKPK NH;MKD?;"
40        ENTER 718;Mkd
50        PRINT Mkd
60        END
```

MKDR
RECIPROCAL OF MARKER DELTA

SYNTAX
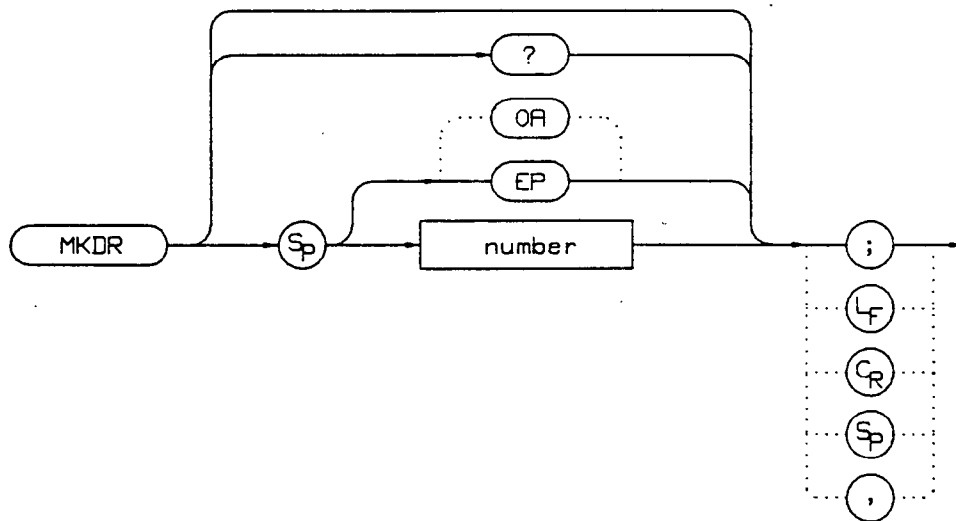
DESCRIPTION

The MKDR command returns the reciprocal of the frequency or time (when in zero span) difference between two markers.

QUERY RESPONSE

EXAMPLE

```
10      OUTPUT 718;"CF 300MHZ;SP 200MHZ;;"
20      OUTPUT 718;"TS;MKPK HI;MKD;MKPK NH;MKDR?;"
30      ENTER 718;Period
40      PRINT "THE TIME PERIOD IS ",Period
50      END
```

MKF
MARKER FREQUENCY

SYNTAX
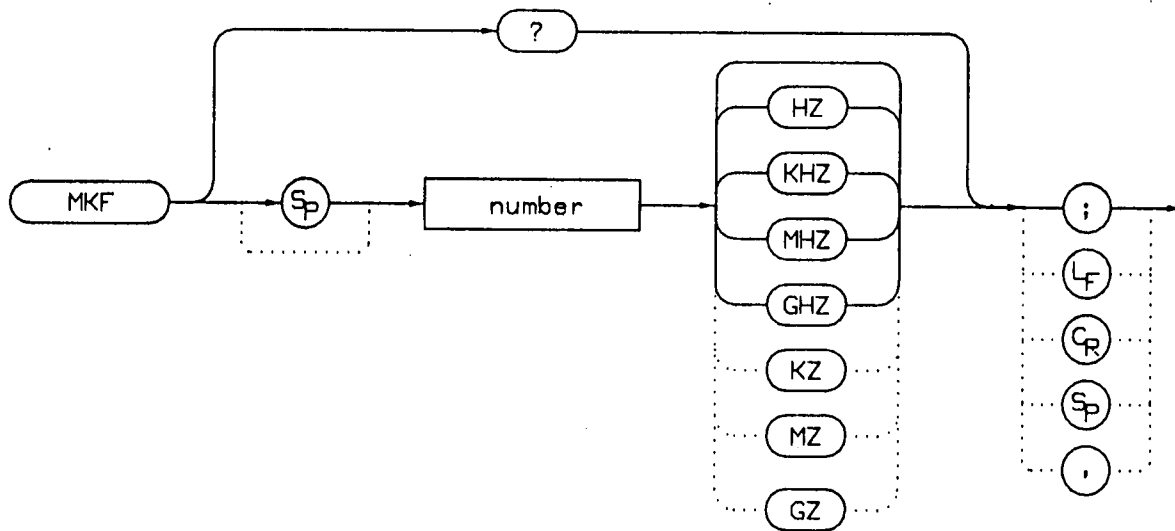
DESCRIPTION

The MKF command places an active marker on the chosen frequency or can be queried to return the frequency of the active marker.

PARAMETERS

number: real from 0 to 22 E+9.

QUERY RESPONSE

```
    ┌──────────┐      ┌──────────────┐
──→─┤  number  ├──→──┤  ⌐F with EOI ├──→──
    └──────────┘      └──────────────┘
```
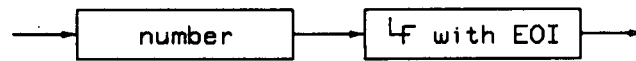
EXAMPLE

```
10        OUTPUT 718;"CF 300MHZ;SP 20MHZ;MKF 290MHZ;"
20        OUTPUT 718;"TS;MKPK HI;MKF?;"
30        ENTER 718;Marker_freq
40        PRINT Marker_freq
50        END
```

MKFC
FREQUENCY COUNTER

SYNTAX
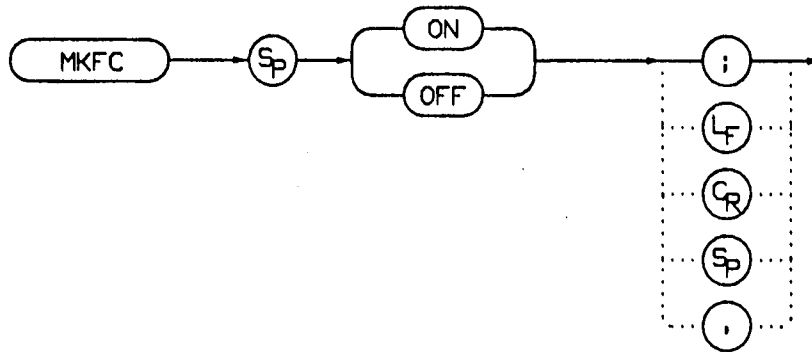
DESCRIPTION

The MKFC command activates a frequency counter that counts the frequency of the active marker or the difference in frequency between two markers. If no marker is active, MKFC places a marker at the center of the trace and counts that marker frequency. The frequency counter provides a more accurate frequency reading; it pauses at the marker, counts the value, then continues the sweep. To adjust the frequency counter resolution, use the MKFCR command.

PRESET STATE

Off

EXAMPLE

```
10        INPUT "ENTER IN THE DESIRED CENTER FREQUENCY, IN MHZ",Freq
20        INPUT "ENTER IN THE DESIRED FREQUENCY SPAN, IN MHZ",Span
30        OUTPUT 718;"IP;CF ";Freq;"MHZ;"
40        OUTPUT 718;"SP ";Span;"MHZ;"
50        INPUT "ENTER IN DESIRED FREQUENCY-COUNTER RESOLUTION, IN HZ",Resolut
          ion
60        OUTPUT 718;"MKFCR ";Resolution;"HZ;",
70        OUTPUT 718;"MKN EP;"
80        PRINT "PLACE THE MARKER ON THE DESIRED SIGNAL"
90        PRINT "PRESS HOLD THEN PRESS CONTINUE"
100        PAUSE
110        OUTPUT 718;"MKFC ON;"
120       END
```

MKFCR
FREQUENCY COUNTER RESOLUTION

SYNTAX
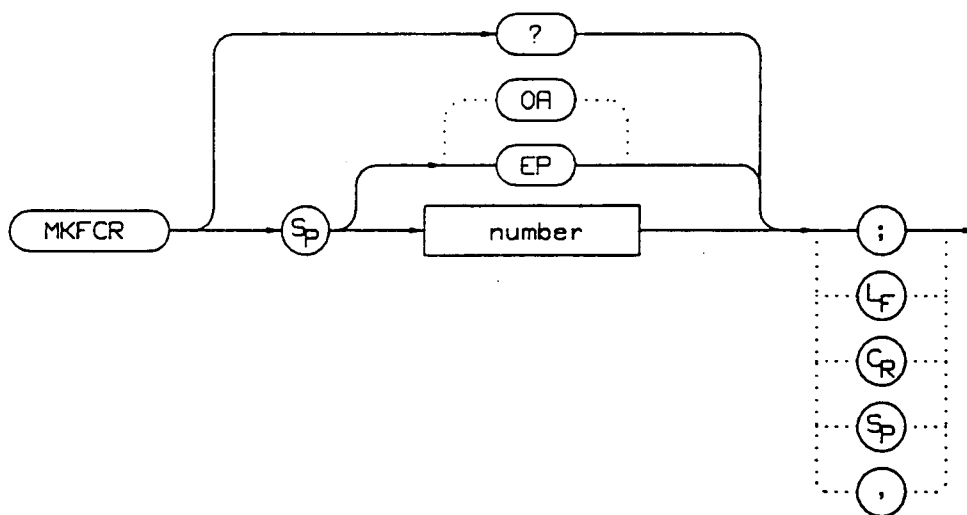
DESCRIPTION

The MKFCR command specifies the resolution of the frequency counter. Refer to the MKFC command. The default value is 10 kHz.

PARAMETERS

number: 10 Hz to 1 MHz, in powers of ten.

QUERY RESPONSE
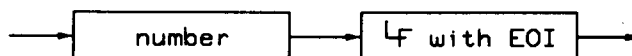
EXAMPLE

```
10       INPUT "ENTER IN THE DESIRED CENTER FREQUENCY, IN MHZ",Freq
20       INPUT "ENTER IN THE DESIRED FREQUENCY SPAN, IN MHZ",Span
30       OUTPUT 718;"IP;CF ";Freq;"MHZ;"
40       OUTPUT 718;"SP ";Span;"MHZ;"
50       INPUT "ENTER IN DESIRED FREQUENCY-COUNTER RESOLUTION, IN HZ", Resolut
         ion
60       OUTPUT 718;"MKFCR ";Resolution;"HZ;",
70       OUTPUT 718;"MKN EP;"
80       PRINT "PLACE THE MARKER ON THE DESIRED SIGNAL"
90       PRINT "PRESS HOLD THEN PRESS CONTINUE"
100       PAUSE
110       OUTPUT 718;"MKFC ON;"
120       OUTPUT 718;"MKF?;"
130       ENTER 718;Freq_count
140       PRINT "FREQUENCY IS",Freq_count,"HZ"
150      END
```

MKMIN
MARKER TO MINIMUM

SYNTAX
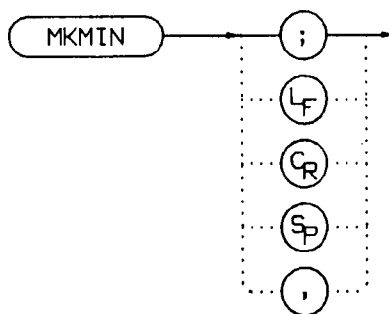
DESCRIPTION

The MKMIN command places an active marker on the minimum signal detected on a trace.

EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;"
20        INPUT "ENTER IN THE START FREQUENCY, IN MHZ",Start_freq
30        INPUT "ENTER IN THE STOP FREQUENCY, IN MHZ",Stop_freq
40        OUTPUT 718;"FA ";Start_freq;"MHZ"
50        OUTPUT 718;"FB ";Stop_freq;"MHZ;"
60        OUTPUT 718;"TS;MKPK HI;MKD;MKMIN;TS;MKF?;"
70        ENTER 718;Delta_freq
80        OUTPUT 718;"MKA?;"
90        ENTER 718;Delta_amp
100       PRINT "DIFFERENCE IN FREQUENCY IS ",Delta_freq,"HZ"
110       PRINT "DIFFERENCE IN AMPLITUDE IS",Delta_amp,"DB"
120       END
```

MKN
MARKER NORMAL

SYNTAX
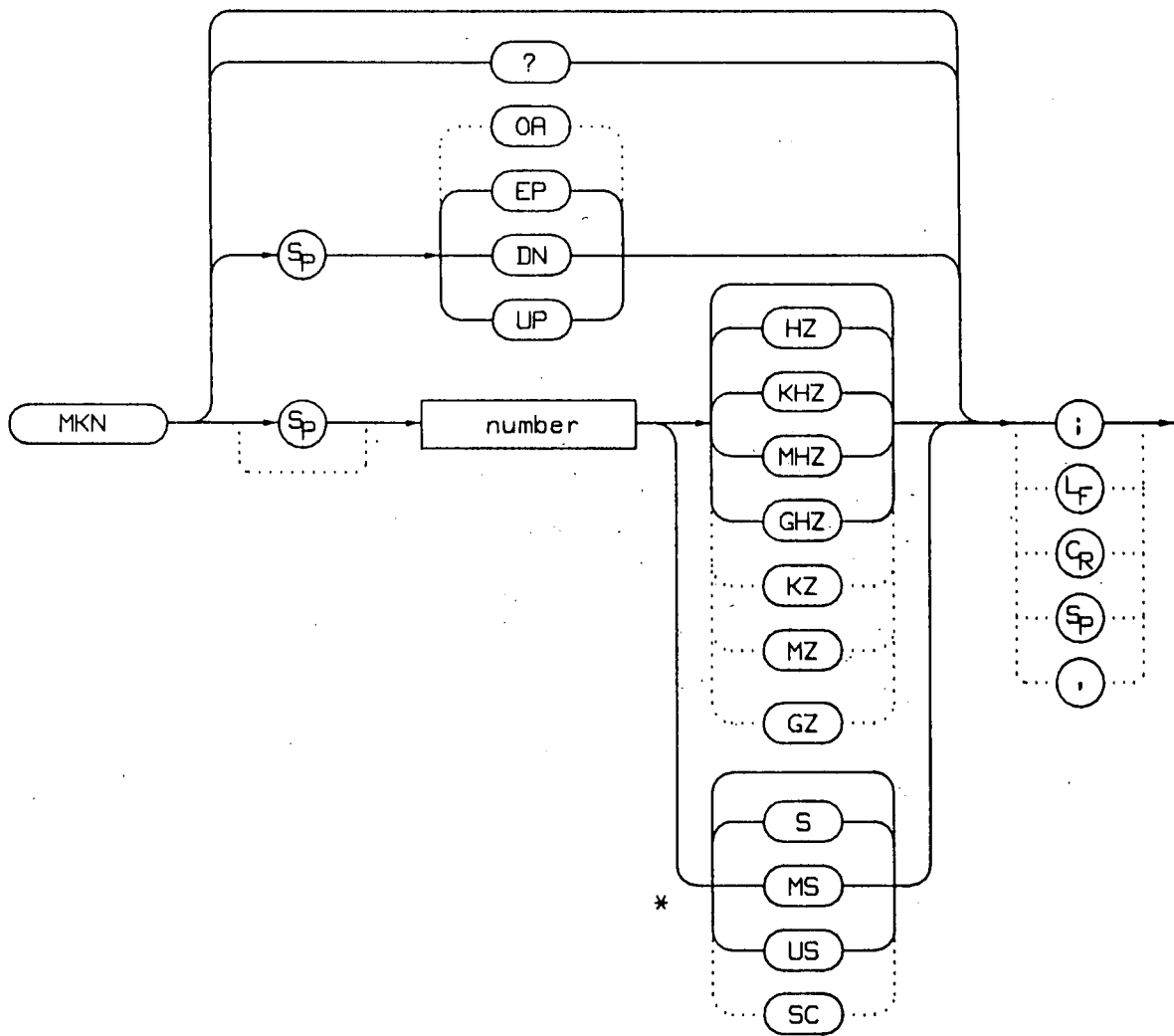
DESCRIPTION

The MKN command places an active marker on the specified frequency. If no frequency is specified, MKN places the marker at the center of the trace. When in zero span, querying MKN returns the center frequency.

PARAMETERS

number: real from 0 to 22 E+9 (18 E+9 to 325 E+9 in external mixer mode).
UP/DN: increments in 10% of span.

QUERY RESPONSE
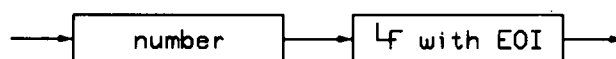
EXAMPLE

```
10      INPUT "ENTER IN THE START FREQUENCY, IN MHZ",Start_freq
20      INPUT "ENTER IN THE STOP FREQUENCY, IN MHZ",Stop_freq
30      OUTPUT 718;"IP;FA ";Start_freq;"MHZ"
40      OUTPUT 718;"FB ";Stop_freq;"MHZ;"
50      OUTPUT 718;"MKN EP;"
60      PRINT "PLACE THE MARKER ON THE DESIRED SIGNAL"
70      PRINT "PRESS HOLD THEN PRESS CONTINUE"
80      PAUSE
90      OUTPUT 718;"MKN?;"
100      ENTER 718;Mkn
110      PRINT "MARKER FREQUENCY IS ",Mkn,"HZ"
120     END
```

MKNOISE
MARKER NOISE

SYNTAX
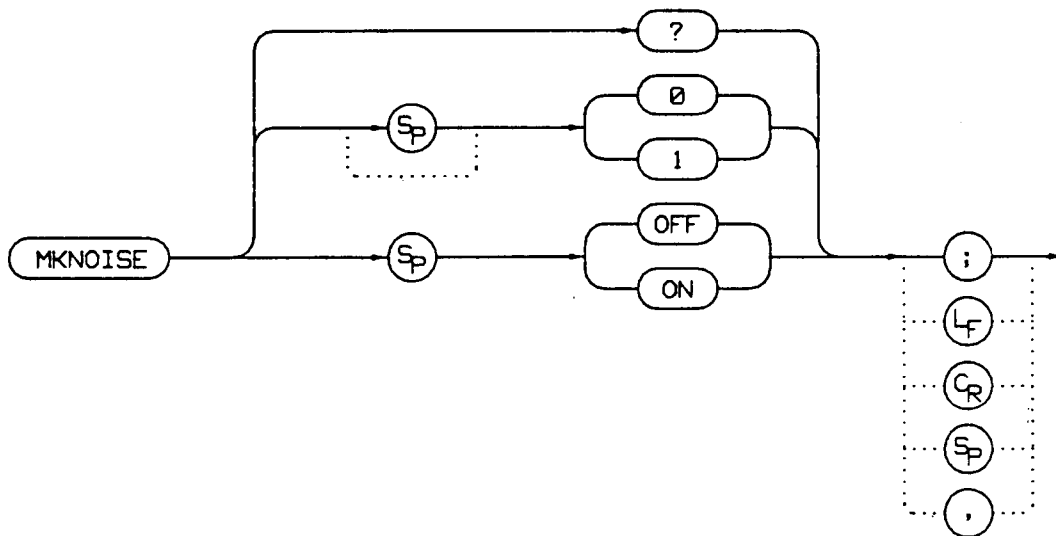
DESCRIPTION

MKNOISE sets the detector mode to sample and computes the average of 32 data points (16 points on one side of the marker, the marker itself, and 15 points on the other side of the marker). This average is corrected for effects of the log amplifier, bandwidth shape factor, IF detector, and resolution bandwidth. If two markers are on (whether in marker delta mode or 1/marker delta mode), MKRNOISE works on the active marker and not on the anchor marker. This allows you to directly measure signal-to-noise ratio. In linear mode, the value returned is equal to $\frac{V_1}{V_2} \times \frac{1}{\sqrt{RBW}}$ (RBW=resolution bandwidth). To query the value, use the MKA command.

PRESET STATE

Off

QUERY RESPONSE
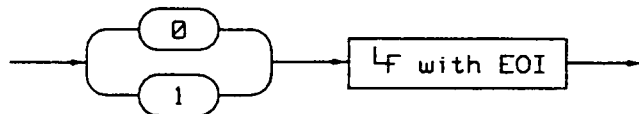
EXAMPLE

```
10      OUTPUT 718;"CF 300MZ;SP 10MZ;DET SMP;TS; MKPK HI;MKA?;"
20      ENTER 718;Amp_1
30      OUTPUT 718;"MKD UP UP;MKNOISE ON;MKA?;MKNOISE OFF;"
40      ENTER 718;Amp_2
50      DISP Amp_2
70      C_to_n=Amp_1-Amp_2
80      PRINT "CARRIER TO NOISE RATIO IN 1 HZ BANDWIDTH IS ";C_to_n;" DB"
90      END
```

MKOFF
MARKER OFF

SYNTAX

```
  ┌─────────┐    ┌──┐    ┌─────┐         ┌───┐
──┤ MKOFF   ├──┬─┤SP├────┤ ALL ├───┬──┬──┤ ; ├──────►
  └─────────┘  │ └──┘    └─────┘   │  ┊  └───┘
              └──────────────────┘  ┊  ┌───┐
                                    ┊..┤ LF├..
                                    ┊  └───┘
                                    ┊  ┌───┐
                                    ┊..┤ CR├..
                                    ┊  └───┘
                                    ┊  ┌───┐
                                    ┊..┤ SP├..
                                    ┊  └───┘
                                    ┊  ┌───┐
                                    ┊..┤ , ├..
                                       └───┘
```
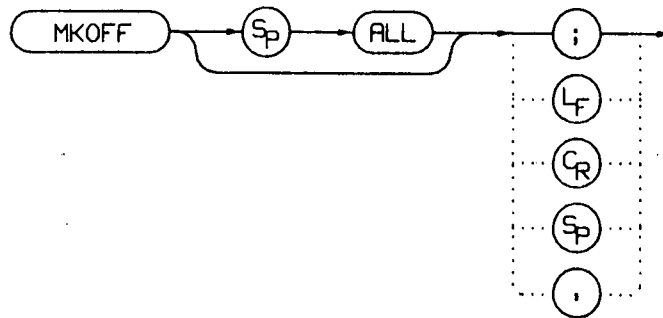
DESCRIPTION

The MKOFF command turns off the active marker or, if specified, turns off all markers.

EXAMPLE

```
10      OUTPUT 718;"MKOFF ALL;"
20      END
```

MKPK
PEAK SEARCH

SYNTAX
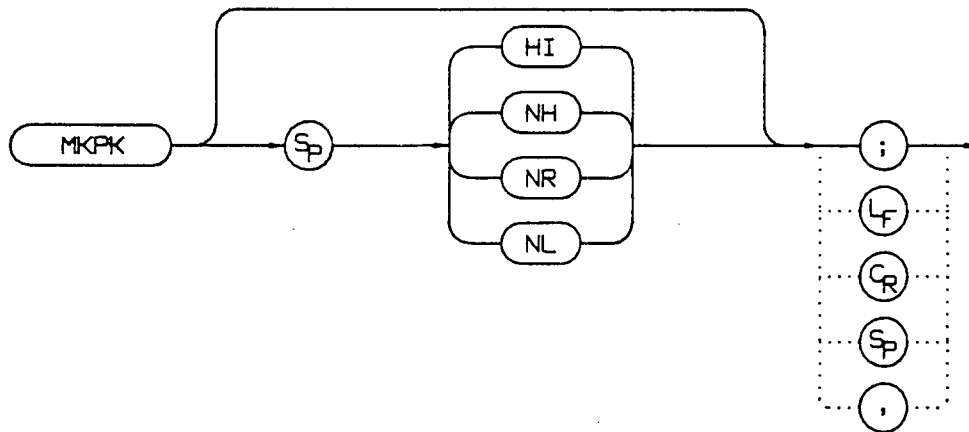
DESCRIPTION

The MKPK command places a marker on the highest point on a trace, the next-highest point, the next-left peak, or the next-right peak. The default is HI (highest point). The trace peaks must meet the criteria of the marker threshold and peak excursion functions in order for a peak to be found. See also the MKPT and MKPX commands.

PARAMETERS

HI: finds the highest point on a trace.
NH: finds the next-highest point on a trace.
NR: finds the next-right peak.
NL: finds the next-left peak.
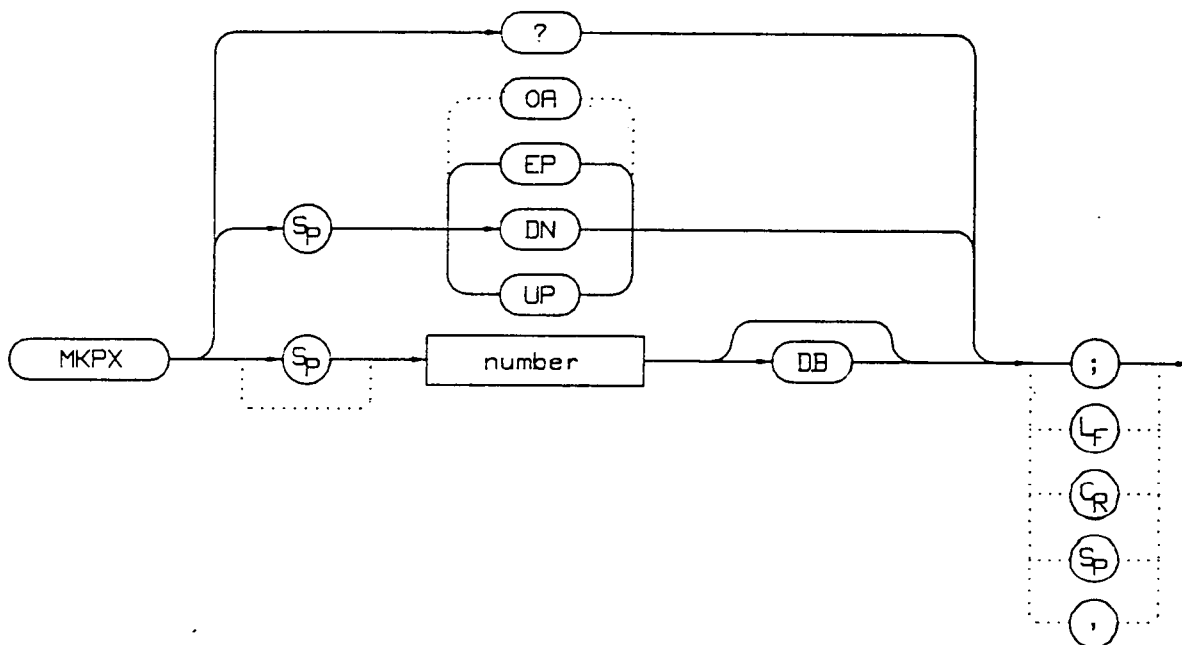
EXAMPLE

```
10      OUTPUT 718;"IP;SNGLS;"
20      INPUT "ENTER START FREQUENCY, IN MHZ",Start_freq
30      INPUT "ENTER STOP FREQUENCY, IN MHZ",Stop_freq
40      OUTPUT 718;"FA ";Start_freq;"MHZ;"
50      OUTPUT 718;"FB ";Stop_freq;"MHZ;"
60      OUTPUT 718;"TS;MKPK HI;MKD;TS;MKPK NH;"
70      OUTPUT 718;"MKA?;"
80      ENTER 718;Delta_amplitude
90      OUTPUT 718;"MKF?;"
100     ENTER 718;Delta_freq
110     PRINT "DIFFERENCE IN FREQUENCY IS ",Delta_freq,"HZ"
120     PRINT "DIFFERENCE IN AMPLITUDE IS ",Delta_amplitude,"DB"
130     END
```

MKPT
MARKER THRESHOLD

SYNTAX
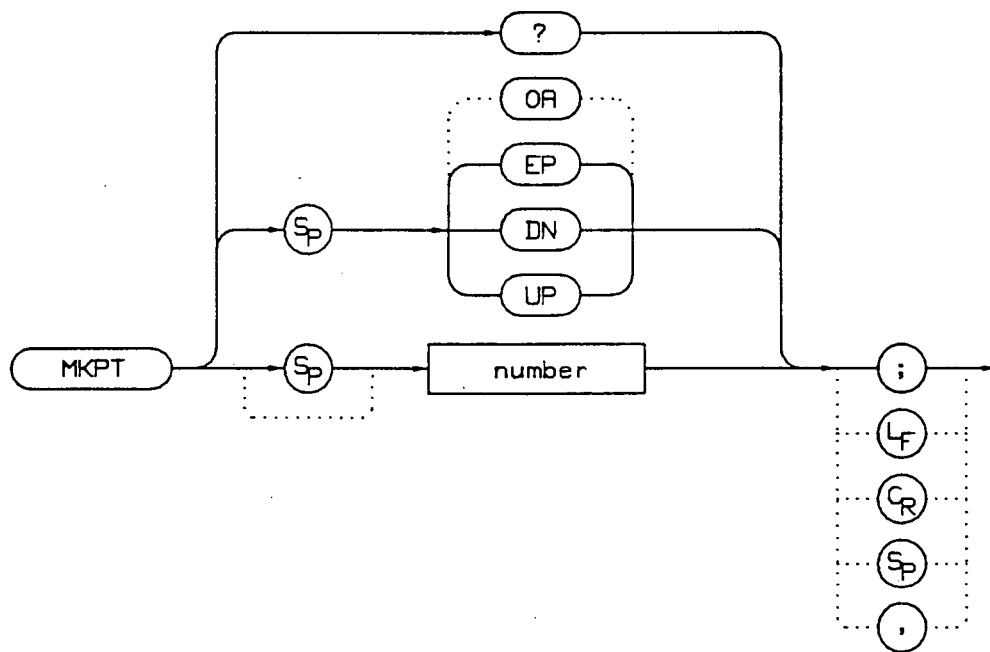
DESCRIPTION

The MKPT command sets the minimum amplitude level from which a peak on the trace can be detected. The default value is −120 dBm. See also the MKPX command.

Any portion of a peak that falls below the peak threshold is also used to satisfy the peak excursion criteria. For example, a peak that is equal to 3 dB above the threshold when the peak excursion is equal to 6 dB will be found if the peak extends an additional 3 dB or more below the threshold level.

PARAMETERS

number: real from −120 to 30.
UP/DN: increments of 10 dB.

QUERY RESPONSE
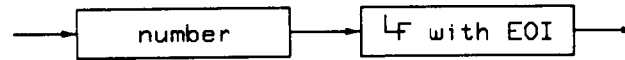
```
┌──────────┐      ┌────────────┐
──→│  number  │──→──│ LF with EOI │──→
   └──────────┘      └────────────┘
```

EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;"
20        INPUT "ENTER START FREQUENCY, IN MHZ",Start_freq
30        INPUT "ENTER STOP FREQUENCY, IN MHZ",Stop_freq
40        INPUT "ENTER IN MARKER THRESHOLD, IN DB",Thresh
50        OUTPUT 718;"FA ";Start_freq;"MHZ;"
60        OUTPUT 718;"FB ";Stop_freq;"MHZ;"
70        OUTPUT 718;"MKPT ";Thresh;"DB;"
80        OUTPUT 718;"TS;MKPK HI;"
90        END
```

MKPX
PEAK EXCURSION

SYNTAX

```
                                    ( ? )
                                   ( OR )
                                   ( EP )
                  ( Sp )           ( DN )
                                   ( UP )
( MKPX )      ( Sp )    number        ( DB )      ( ; )
                                                  ( LF )
                                                  ( CR )
                                                  ( Sp )
                                                  ( , )
```

DESCRIPTION

The MKPX command defines what constitutes a peak on a trace. The chosen value specifies the amount that a trace must increase monotonically, then decrease monotonically, in order to be a peak. For example, if the peak excursion is 5 dB, the amplitude of the sides of a candidate peak must descend at least 5 dB in order to be considered a peak (see Figure 14.2). The default value is 6 dB.

Any portion of a peak that falls below the peak threshold is also used to satisfy the peak excursion criteria. For example, a peak that is equal to 3 dB above the threshold when the peak excursion is equal to 6 dB will be found if the peak extends an additional 3 dB or more below the threshold level.

Figure 14.2. MKPX determines which signals are considered peaks.

PARAMETERS

number: real from 0.1 to 99.
UP/DN: 1 vertical division of the display.

QUERY RESPONSE

EXAMPLE

```
10        OUTPUT 718;"IP;FA 250MHZ;FB 1300MHZ;"
20        INPUT "ENTER IN PEAK EXCURSION, IN DB ",Excursion
30        OUTPUT 718;"MKPX ";Excursion;"DB;"
40        OUTPUT 718;"TS;MKPK HI;;MKA?;"
50        ENTER 718;Mka
60        OUTPUT 718;"MKF?;"
70        ENTER 718;Mkf
80        IF Mka<>0 THEN
90        PRINT "PEAK FOUND AT ",Mkf
100        PRINT "PEAK AMPLITUDE IS",Mka
110        ELSE
120        PRINT "NO PEAKS FOUND"
130        END IF
140        END
```

MKRL
MARKER TO REFERENCE LEVEL

SYNTAX
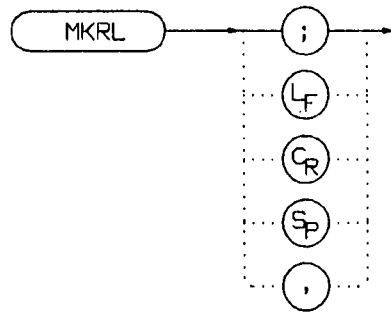
DESCRIPTION

The MKRL command sets the reference level to the amplitude of an active marker. If no marker is active, MKRL places a marker at the center of the trace and uses that marker amplitude to set the reference level.

EXAMPLE

```
10      OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;"
20      OUTPUT 718;"TS;MKPK HI;MKRL;TS;"
30      OUTPUT 718;"RL?;AUNITS?;"
40      ENTER 718 USING "K";Ref_level,Aunits$
50      PRINT "REFERENCE LEVEL IS",Ref_level,Aunits$
60      END
```

MKSP
MARKER DELTA TO SPAN

SYNTAX

```
( MKSP )──────►────────( ; )────────►
                    ┊····( L_F )····┊
                    ┊····( C_R )····┊
                    ┊····( S_P )····┊
                    └····( , )····┘
```
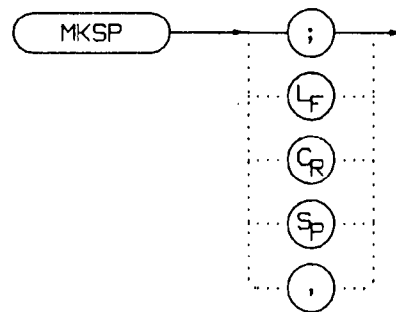
DESCRIPTION

The MKSP command sets the frequency span equal to the frequency difference between two markers on a trace. The start frequency is set equal to the frequency of the left-most marker and the stop frequency is set equal to the frequency of the right-most marker.

EXAMPLE

```
10      INPUT "CONNECT THE 300 MHZ CALIBRATOR TO THE INPUT",Ans$
20      OUTPUT 718;"IP;SNGLS;FA 270MHZ;FB 1275MHZ;TS;"
30      OUTPUT 718;"MKPK HI;MKD;MKPK NH;TS;MKSP;TS;"
40      END
```

MKSS
MARKER TO CENTER FREQUENCY STEP-SIZE

SYNTAX
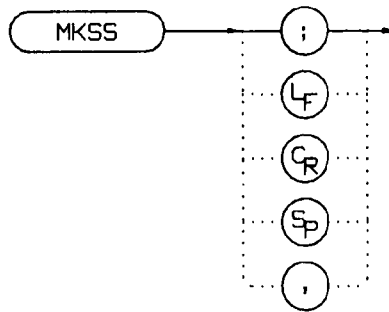
DESCRIPTION

The MKSS command sets the center frequency step-size equal to the frequency value of the active marker.

EXAMPLE

```
10          INPUT "CONNECT THE 300 MHZ CALIBRATOR TO THE INPUT",Ans$
20          OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
30          OUTPUT 718;"MKPK HI;MKSS;MKD;CF UP;TS;MKPK HI;"
40          OUTPUT 718;"MKA?;"
50          ENTER 718;Delta_amplitude
60          OUTPUT 718;"MKF?;"
70          ENTER 718;Delta_freq
80          PRINT "DIFFERENCE IN AMPLITUDE IS",Delta_amplitude,"DB"
90          PRINT "DIFFERENCE IN FREQUENCY IS ",Delta_freq,"HZ"
100         END
```

MKT
MARKER TIME

SYNTAX
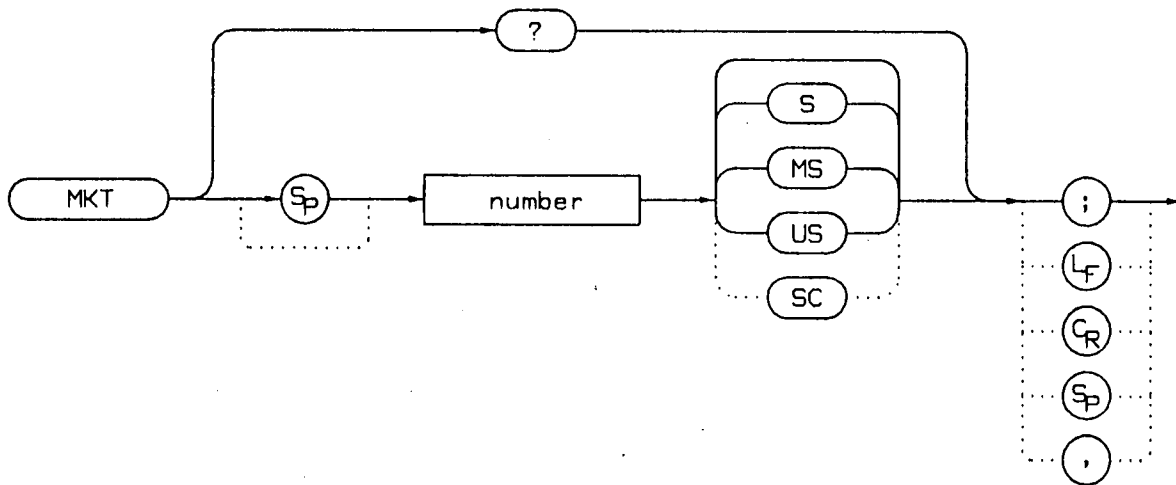
DESCRIPTION

The MKT command places a marker at a position that corresponds to a specified point in time during the sweep.

PARAMETERS

number: real from 0 to the current sweep time.

PRESET STATE

Off

QUERY RESPONSE
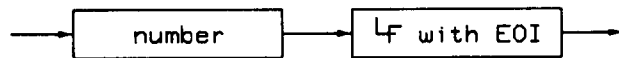
EXAMPLE

```
10      OUTPUT 718;"ST 2SEC;MKT 1.6SEC;"
20      END
```

MKTRACK
SIGNAL TRACK

SYNTAX
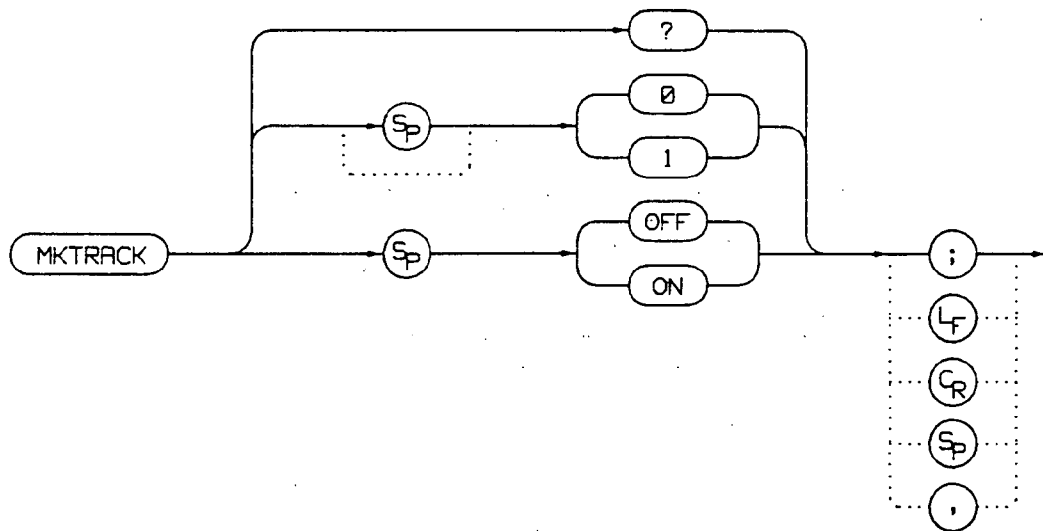
DESCRIPTION

The MKTRACK command locates the active marker and sets the center frequency to the marker value. This is done after every sweep, thus maintaining the marker value at the center frequency. This allows you to quickly "zoom in" from a wide span to a narrow one, without losing the signal from the screen. Or, use MKTRACK to keep a slowly drifting signal centered on the display. When this function is active, a "K" appears on the left edge of the display.

PRESET STATE

Off

QUERY RESPONSE

```
        ┌──┌─────┐──┐
────────┤  │  0  │  ├────────→┌─────────────┐────────→
        │  └─────┘  │         │ ⌐F with EOI │
        │  ┌─────┐  │         └─────────────┘
        └──│  1  │──┘
           └─────┘
```
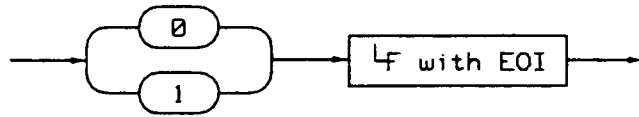
EXAMPLE

```
10      INPUT "ENTER IN CENTER FREQUENCY, IN MHZ",Freq
20      INPUT "ENTER IN FREQUENCY SPAN, IN MHZ",Span
30      OUTPUT 718;"IP;"
40      OUTPUT 718;"CF ";Freq;"MHZ;TS;"
50      OUTPUT 718;"MKTRACK ON;"
60      OUTPUT 718;"SP ";Span;"MHZ;TS;"
70      OUTPUT 718;"MKTRACK OFF;"
80      END
```

ML
MIXER LEVEL

SYNTAX
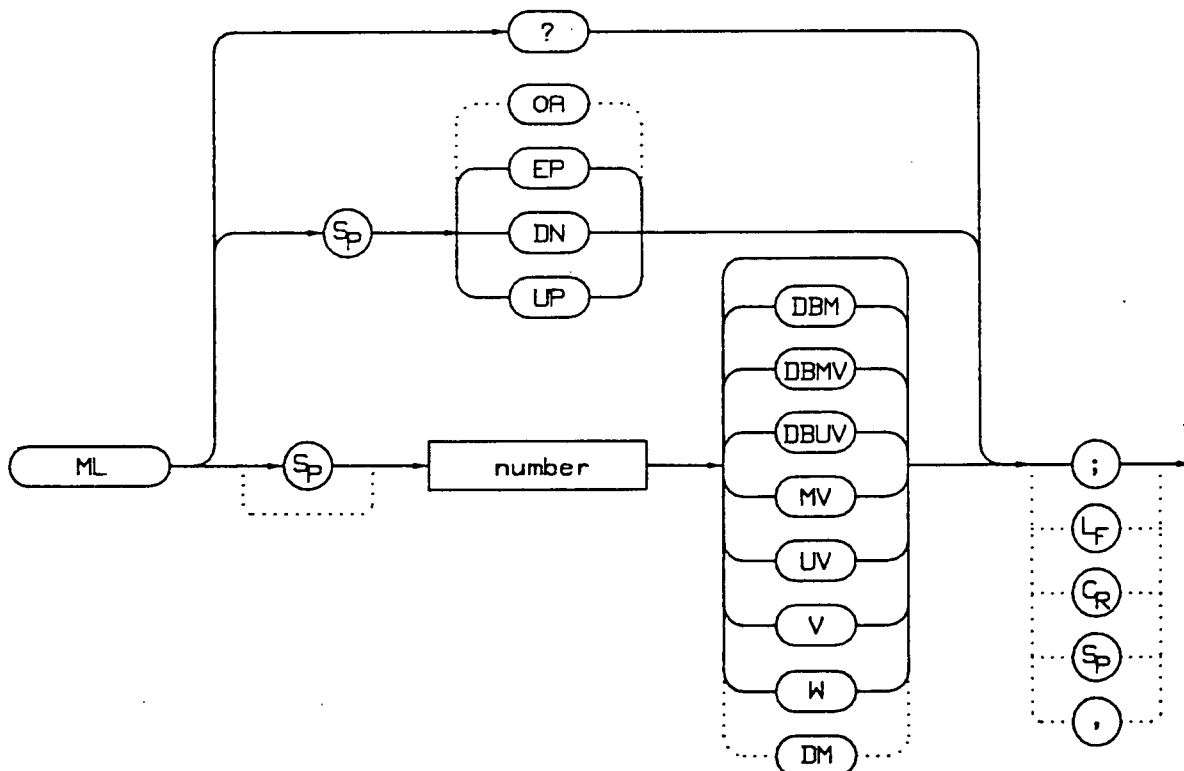
DESCRIPTION

The ML command specifies the maximum signal level that is at the input mixer. The attenuator automatically adjusts to ensure this level is not exceeded.

PARAMETERS

number: integer from −80 to −10, in decade increments. Numbers round down to the nearest decade.
UP/DN: increments by 10 dB.

PRESET STATE

−10 dBm

QUERY RESPONSE

```
  ──────▶│  number  │──────▶│ ⌐F with EOI │──────▶
```
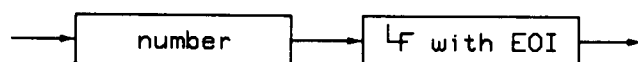
EXAMPLE

```
10        OUTPUT 718;"ML -40 DBM;"
20        OUTPUT 718;"ML?;";
30        ENTER 718;M1
40        PRINT M1
50        END
```

MXMH
MAXIMUM HOLD

SYNTAX
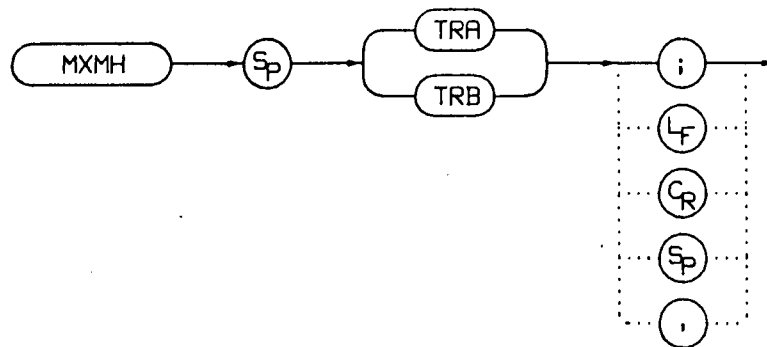
DESCRIPTION

The MXMH command updates the chosen trace with the maximum signal level detected at each trace-data point from subsequent sweeps. This function employs the positive peak detector (refer to the DET command). The detector mode can be changed, if desired, after max hold is initialized.

EXAMPLE

```
10      OUTPUT 718;"BLANK TRA;CLRW TRB;MXMH TRB;"
20      END
```

MXRMODE
MIXER MODE

SYNTAX
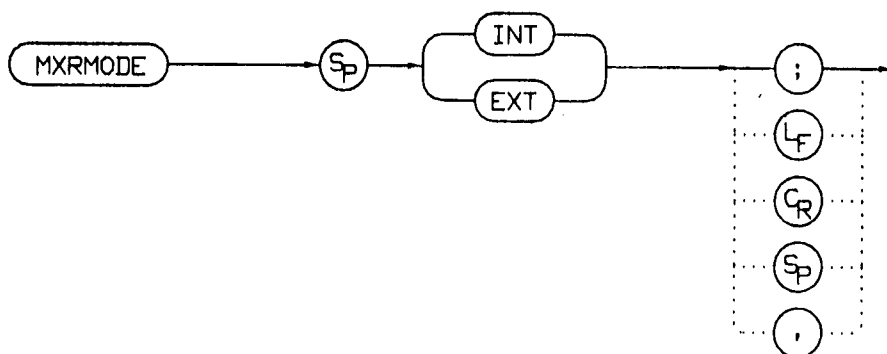
DESCRIPTION

The MXRMODE command specifies the mixer mode. Select either the internal mixer (INT) or supply an external mixer (EXT).

PRESET STATE

Internal

EXAMPLE

```
10      INPUT "ENTER THE MIXER MODE (INT OR EXT)",Mode$
20      OUTPUT 718;"MXRMODE ";Mode$;";"
30      END
```

PLOT
PLOT DISPLAY

SYNTAX
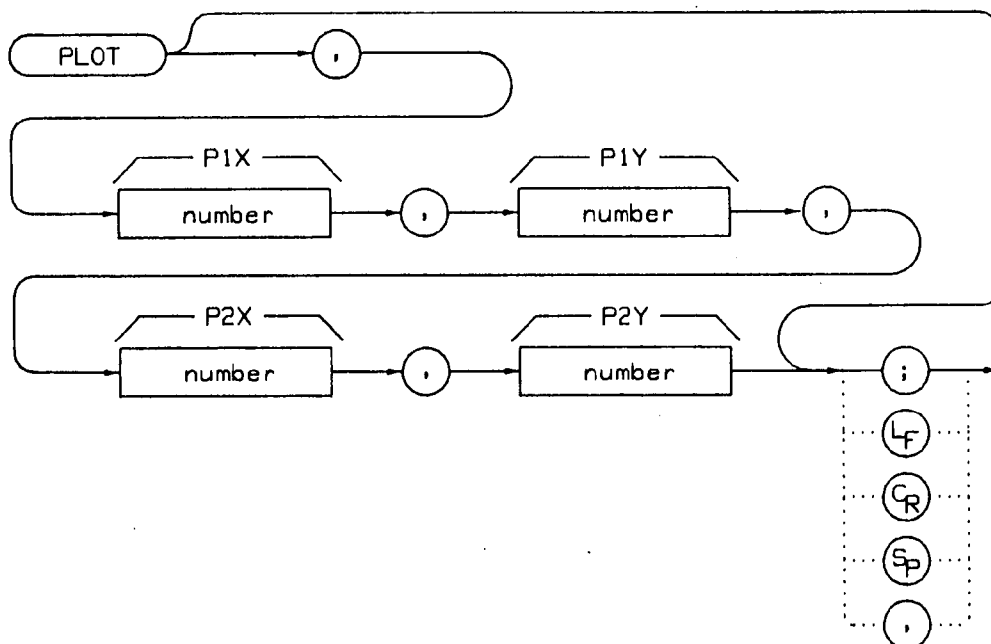
DESCRIPTION

The PLOT command copies the specified display contents onto any HP-GL plotter. Set the plotter address to five, select the P1 and P2 positions, and then execute the plot command. P1 and P2 correspond to the lower-left and upper-right plotter positions, respectively. If P1 and P2 are not specified, default values (either preloaded from power-up or sent in via a previous plot command) are used. Once PLOT is executed, no subsequent commands are executed until PLOT is done. For more information, refer to Chapter 7.

PARAMETERS

P1X, P1Y: plotter-dependent values that specify the lower-left plotter position.
P2X, P2Y: plotter-dependent values that specify the upper-right plotter position.

EXAMPLE

```
10        OUTPUT 705;"OP;"
20        ENTER 705;P1x,P1y,P2x,P2y
30        ON INTR 7 GOTO Done
40        ENABLE INTR 7;2
50        OUTPUT 718;"RQS 16;"
60        OUTPUT 718;"PLOT ";P1x;",";P1y;",";P2x;",";P2y;";"
70        SEND 7;UNL LISTEN 5 TALK 18 DATA
80   Idle:   GOTO Idle
90   Done:        S_poll=SPOLL(718)
100          OUTPUT 718;"RQS 0;"
110          PRINT "COMMAND IS COMPLETE"
120       END
```

PRINT
PRINT DISPLAY

SYNTAX
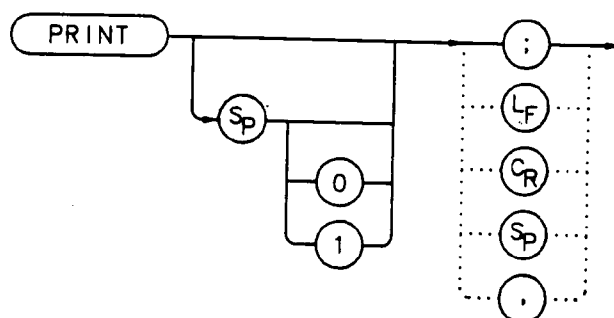
DESCRIPTION

The PRINT command copies the specified display contents onto HP 2225A/B/D ThinkJet, HP 3630A PaintJet, or any other printer with HP-IB interface and raster graphics capability. Set the printer address to one. Once PRINT is executed, no subsequent commands are executed until PRINT is done. For more information, refer to Chapter 7A.

PRINT	At the execution of the PRINT command, the display is printed on the HP 2225A/B/D ThinkJet, HP 3630A PaintJet (in black and white only), and many other printers with IEEE-488 interface and raster graphics capability.
PRINT 0	Same as PRINT
PRINT 1	At the execution of the PRINT 1 command, the display is printed on the HP 3630A PaintJet printer. Colors of the printed trace are fixed by the spectrum analyzer.

NOTE

If the HP 3630A PaintJet printer is not connected at the execution of the PRINT 1 command, erroneous information will be printed.

EXAMPLE

```
10       ON INTR 7 GOTO Done
20       ENABLE INTR 7;2
30       OUTPUT 718;"RQS 16;"
40       OUTPUT 718;"PRINT"
50       SEND 7;UNL LISTEN 1 TALK 18 DATA
60   Idle:  GOTO Idle
70   Done:  S_poll=SPOLL(718)
80       OUTPUT 718;"RQS 0;"
90       PRINT "COMMAND IS COMPLETE"
100      END
```

PLOTORG
DISPLAY ORIGINS

SYNTAX
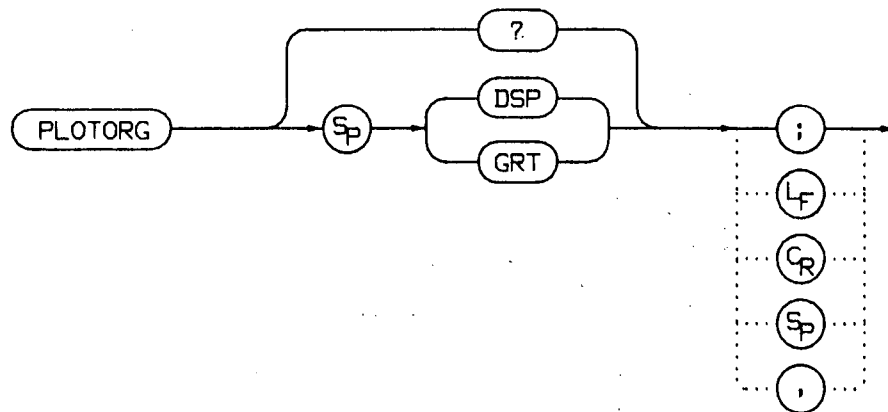
DESCRIPTION

The PLOTORG command specifies whether the P1 and P2 plotter settings are the origin for the display graticule or for the entire display. GRT allows you to position the output plot, such as Trace A, on a pre-printed graticule (obtained from the PLTSRC command) and to save plotting time. For more information on P1 and P2 settings, see the PLOT command, or refer to Chapter 7.

PARAMETERS

DSP: references P1 and P2 to the corners of the entire display.
GRT: references P1 and P2 to the corners of the graticule.

QUERY RESPONSE
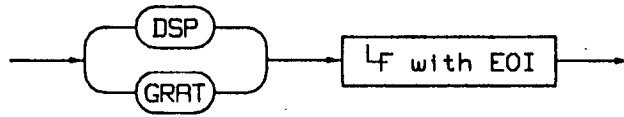
EXAMPLE

```
10        OUTPUT 705;"OP;"
20        ENTER 705;P1x,P1y,P2x,P2y
30        OUTPUT 718;"PLOTORG GRT;"
40        OUTPUT 718;"PLOT ";P1x;",";P1y;",";P2x;",";P2y;";"
50        SEND 7;UNL LISTEN 5 TALK 18 DATA
60        END
```

PLOTSRC
PLOT SOURCE

SYNTAX
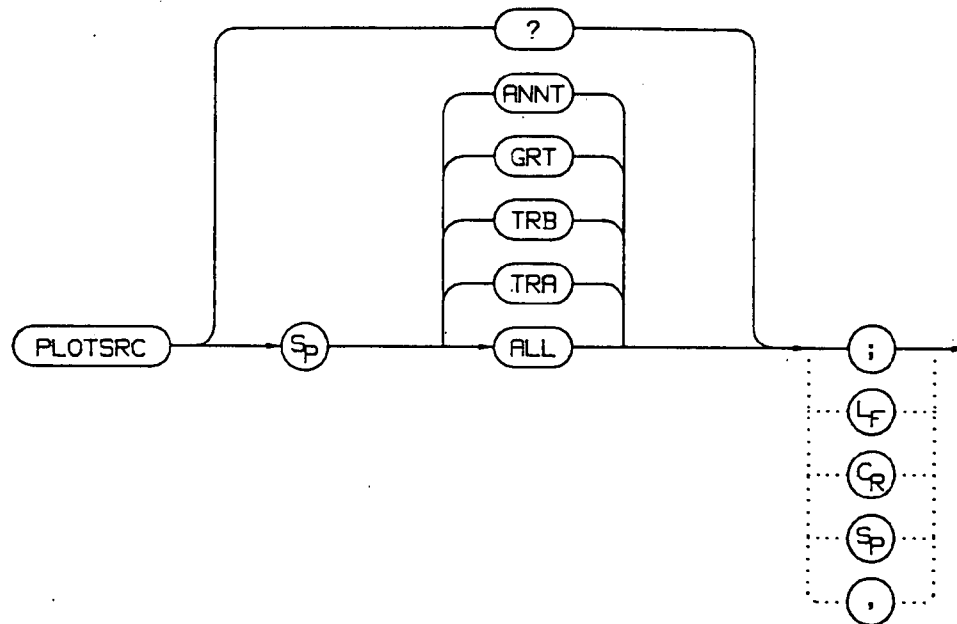
DESCRIPTION

The PLOTSRC command specifies the source for the PLOT command.

PARAMETERS

ALL: plots the entire display.
TRA: plots only Trace A.
TRB: plots only Trace B.
GRT: plots only the graticule.
ANNT: plots only the annotation.

PRESET STATE

All

QUERY RESPONSE

```
    ┌─( ALL )─┐
    ├─( TRA )─┤
────┼─( TRB )─┼──→ [ LF with EOI ] ──→
    ├─( GRT )─┤
    └─(ANNT )─┘
```

EXAMPLE

```
10        OUTPUT 705;"OP;"
20        ENTER 705;P1x,P1y,P2x,P2y
30        OUTPUT 718;"PLOTSRC TRA;RQS 16;PLOT ";P1x;",";P1y;",";P2x;",";P2y;
          ";RQS 0;"
40        Done=0
50        IF Done=0 THEN GOSUB Wait_plot
60        Done=0
70        OUTPUT 718;"PLOTSRC ANNT;RQS 16;PLOT ";P1x;",";P1y;",";P2x;",";P2y;
          ";RQS 0;"
80        IF Done=0 THEN GOSUB Wait_plot
90          PRINT "COMMAND IS COMPLETE"
100         STOP
110     Wait_plot:      Done=1
120                     ON INTR 7 GOTO Go_back
130                     ENABLE INTR 7;2
140                     SEND 7;UNL LISTEN 5 TALK 18 DATA
150     Idle:   GOTO Idle
160     Go_back:        S_poll=SPOLL(718)
170                     RETURN
180       END
```

PP
PRESELECTOR PEAK

SYNTAX
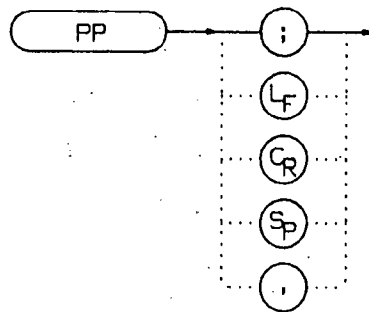
DESCRIPTION

The PP command peaks the preselector. Set the desired trace to clear-write mode, place a marker on a desired signal, then execute PP. The peaking routine zooms to zero span, peaks the preselector tracking, then returns to the original position. To read the new preselector peaking number, use the PSDAC command. Commands following PP are not executed until after the analyzer has finished peaking the preselector.

EXAMPLE

```
10        OUTPUT 718;"CF 3GHZ;SP 500KHZ;"
20        OUTPUT 718;"TS;MKPK HI;MKCF;TS;PP;"
30        END
```

PSDAC
PRESELECTOR DAC NUMBER

SYNTAX
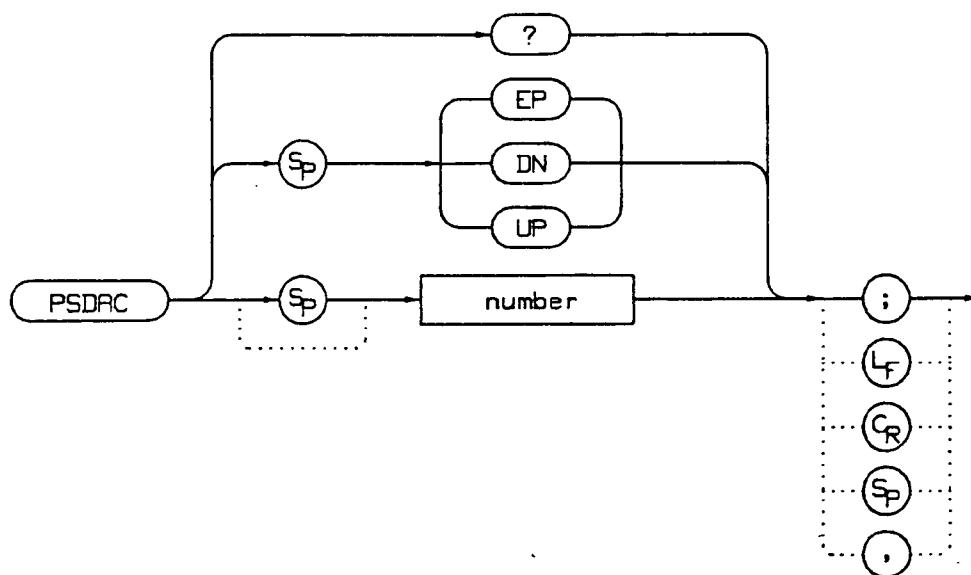
DESCRIPTION

The PSDAC command returns the preselector peak DAC number.

PARAMETERS

number: integer from 0 to 255.
UP/DN: increments of 1.

QUERY RESPONSE

```
┌──────────┐        ┌──────────────┐
│  number  │   →    │ ⌐F with EOI  │   →
└──────────┘        └──────────────┘
```
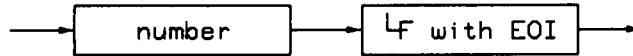
EXAMPLE

```
10        OUTPUT 718;"CF 3GHZ;SP 500KHZ;"
20        OUTPUT 718;"TS;MKPK HI;MKCF;TS;PP;"
30        OUTPUT 718;"PSDAC?;"
40        ENTER 718;Dac_number
50        PRINT "PRESELECTOR DAC NUMBER IS",Dac_number
60        END
```

PSTATE
PROTECT STATE

SYNTAX
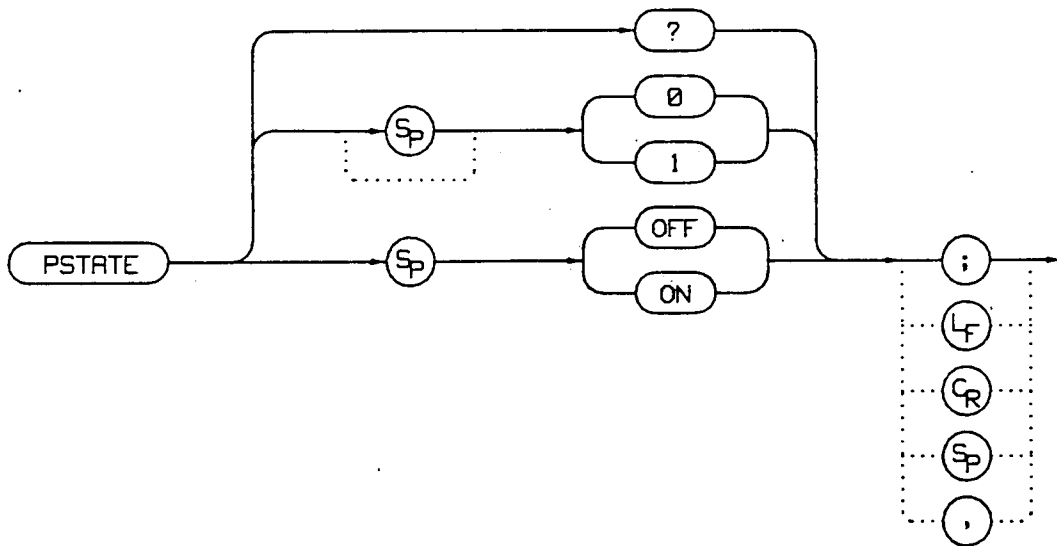
DESCRIPTION

The PSTATE command prevents storing any new data in the state or trace registers. When PSTATE is ON, the registers are "locked"; the data in them cannot be erased or overwritten, although the data can be recalled. To "unlock" the registers, and store new data, set PSTATE to OFF.

PRESET STATE

Off

QUERY RESPONSE
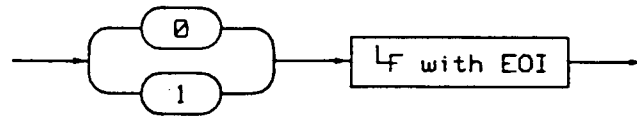
EXAMPLE

```
10      OUTPUT 718;"PSTATE ON;"
20      OUTPUT 718;"PSTATE?;"
30      ENTER 718;State
40      PRINT State
50      OUTPUT 718;"PSTATE OFF;"
60      END
```

RB
RESOLUTION BANDWIDTH

SYNTAX
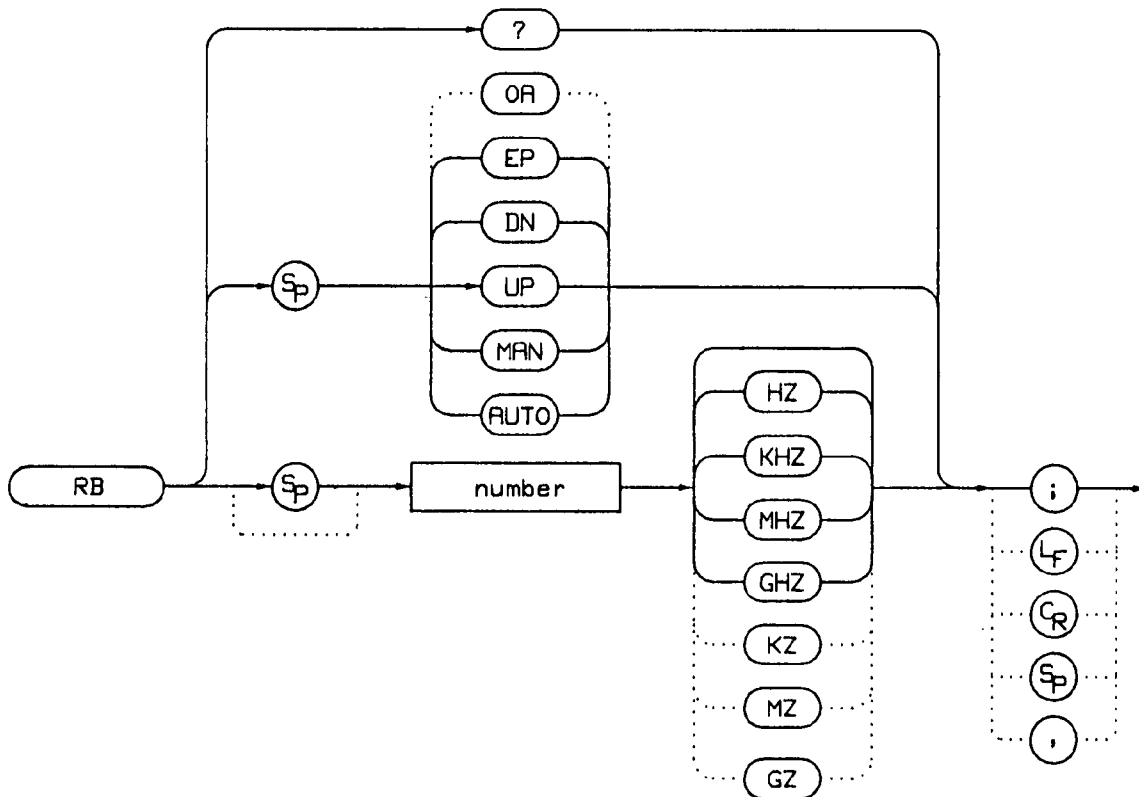
DESCRIPTION

The RB command sets the resolution bandwidth. This is normally a coupled function that is selected according to the ratio selected by the RBR command. If no ratio is selected, a default ratio (0.011) is used. The bandwidth, which ranges from 100 Hz to 1 MHz, may also be selected manually.

PARAMETERS

number: integer from 100 to 1 E+6. Numbers are rounded to the nearest bandwidth.
UP/DN: increments in a 1, 3, 10 sequence.
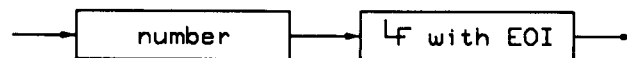
PRESET STATE

Coupled mode, 1 MHz

QUERY RESPONSE

EXAMPLE

```
10          OUTPUT 718;"IP;"
20          OUTPUT 718;"CF 12GHZ;SP 2GHZ;"
30          INPUT "SELECT THE RESOLUTION BANDWIDTH, IN KHZ",B_width
40          OUTPUT 718;"RB ";B_width;"KHZ;"
50          OUTPUT 718;"RB?;";
60          ENTER 718;B_width
70          PRINT "SELECTED BANDWIDTH IS ",B_width,"KHZ"
80          END
```
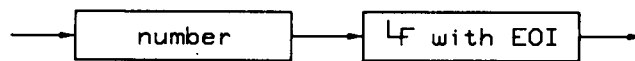
RBR
RESOLUTION BANDWIDTH TO SPAN RATIO

SYNTAX
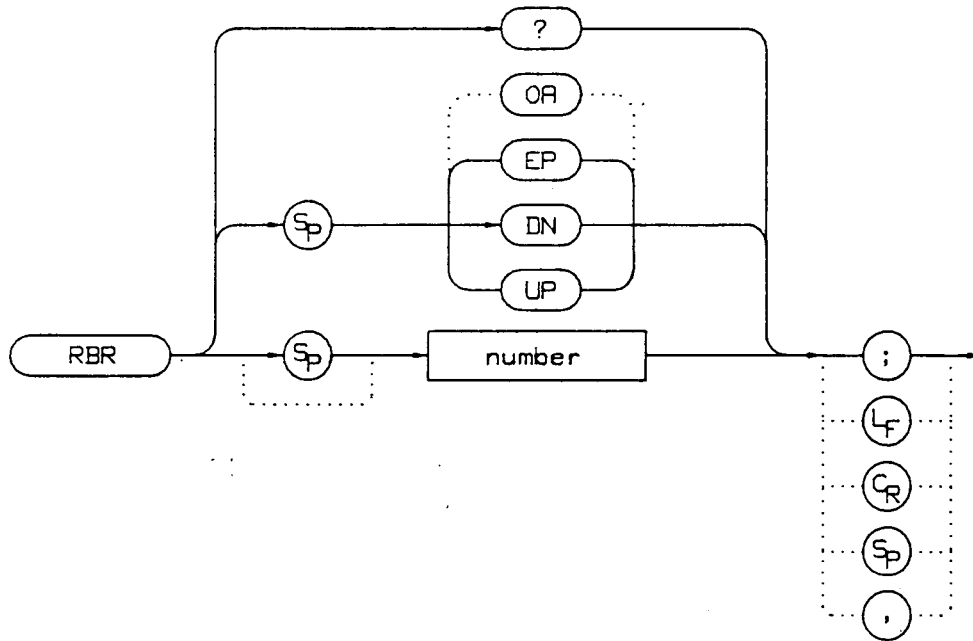
DESCRIPTION

The RBR command specifies the coupling ratio between the resolution bandwidth and the frequency span. The ratio ranges from 0.002 to 0.10 in a 1, 2, 5 sequence. The default ratio is 0.011
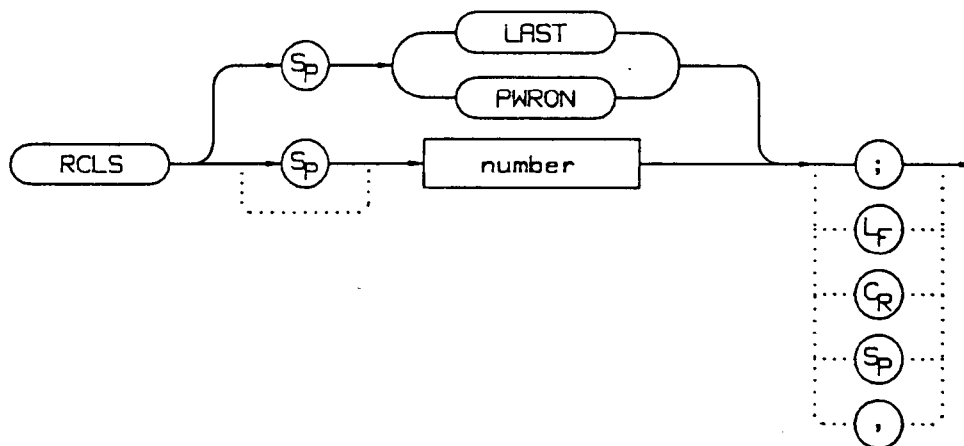
QUERY RESPONSE

EXAMPLE

```
10          OUTPUT 718;"IP;"
20          OUTPUT 718;"CF 12GHZ;SP 2GHZ;"
30          INPUT "SELECT THE RESOLUTION BANDWIDTH TO SPAN RATIO",B_ratio
40          OUTPUT 718;"RBR ";B_ratio;";"
50          INPUT "SELECT THE RESOLUTION BANDWIDTH, IN KHZ",B_width
60          OUTPUT 718;"RB ";B_width;"KHZ;"
70          OUTPUT 718;"RB?;";
80          ENTER 718;B_width
90          PRINT "SELECTED BANDWIDTH IS ",B_width,"KHZ"
100         END
```

RCLS
RECALL STATE

SYNTAX

DESCRIPTION

The RCLS command recalls to the display a previously-saved instrument state.

PARAMETERS

number: integer from 0 to 9. Numbers less than zero default to zero; numbers greater than nine default to nine.
LAST: recalls the instrument state that existed previous to executing the IP command or switching [LINE] off.
PWR ON: sets the instrument state to the same state that occurred when [LINE] was switched on. This state was originally saved using the SAVES command.
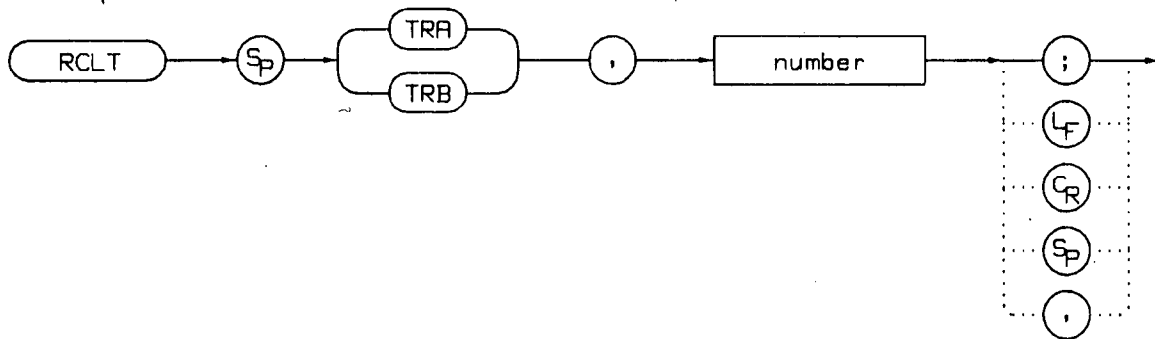
EXAMPLE

```
10      OUTPUT 718;"SAVES 7;"
20      OUTPUT 718;"IP;"
30      OUTPUT 718;"RCLS 7;"
40      END
```

RCLT
RECALL TRACE

SYNTAX

DESCRIPTION

The RCLT command recalls previously-saved trace data to the display.

PARAMETERS

TRA: recalls the trace data to Trace A.
TRB: recalls the trace data to Trace B.
number: integer from 0 to 7. Numbers less than zero default to zero; numbers greater than seven default to seven.
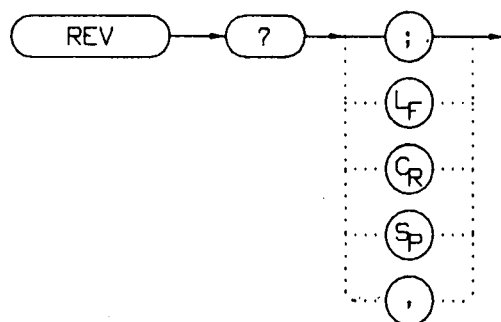
EXAMPLE

```
10        OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;"
20        OUTPUT 718;"SAVET TRA,7;"
30        OUTPUT 718;"IP;"
40        OUTPUT 718;"RCLT TRB,7;"
50        END
```

REV
REVISION NUMBER

SYNTAX

DESCRIPTION

The REV command sends to the computer the revision date code of the spectrum analyzer firmware.
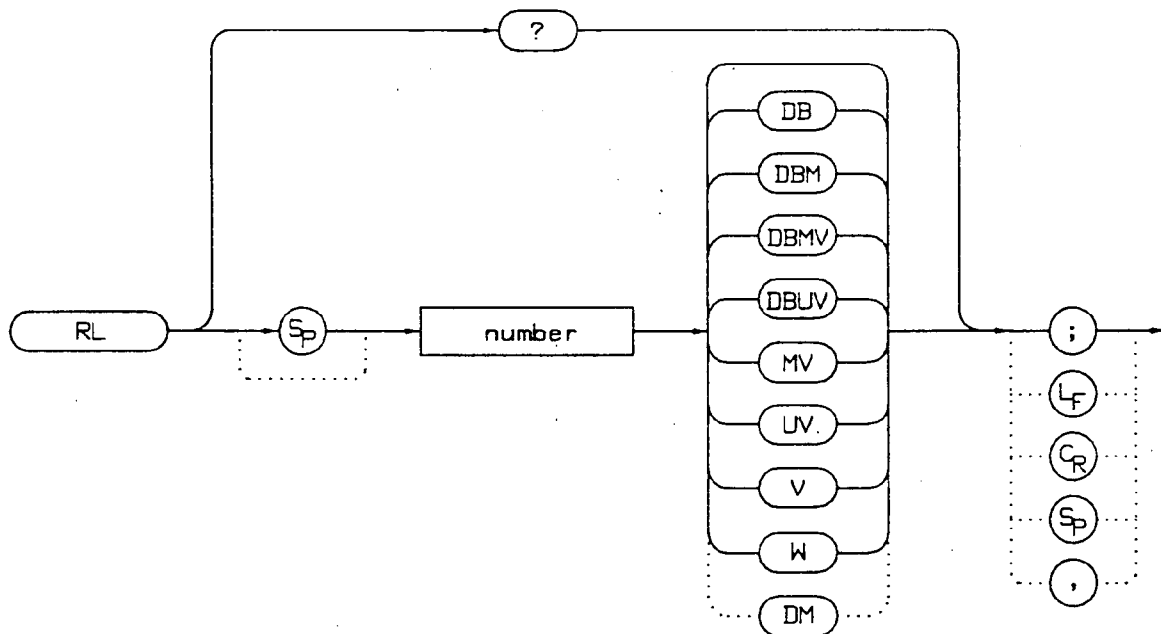
QUERY RESPONSE

EXAMPLE

```
10      DIM A$[6]
20      OUTPUT 718;"REV?;"
30      ENTER 718;A$
40      PRINT A$
50      END
```

RL
REFERENCE LEVEL

SYNTAX

DESCRIPTION

The RL command sets the reference level. The reference level is the top horizontal line on the graticule. For best measurement accuracy, place the peak of a signal of interest on the reference level line. The spectrum analyzer input attenuator is coupled to the reference level and automatically adjusts to avoid compression of the input signal. Table 14.4 shows the minimum reference level for each band and amplitude scale. When switching bands, the reference level may be automatically increased if the current level is not available for the new band. Refer also to AUNITS.

	MINIMUM REFERENCE LEVEL	
BAND	LOG SCALE	LINEAR SCALE
1 kHz – 2.9 GHz	−120.0 dBm	2.2μV
2.75 GHz – 6.46 GHz	−120.0 dBm	2.2μV
5.8 GHz – 13 GHz	−115.0 dBm	4.0μV
12.4 GHz – 19.7 GHz	−105.0 dBm	12.6μV
19.1 GHz – 22 GHz	−100.0 dBm	22.4μV

Table 14.4. Frequency ranges and minimum reference level.

PARAMETERS

number: dependent upon the chosen amplitude units.
UP/DN: increments by one vertical division in log mode and in a 1, 2, 5, 10 sequence in linear mode.

QUERY RESPONSE

PRESET STATE
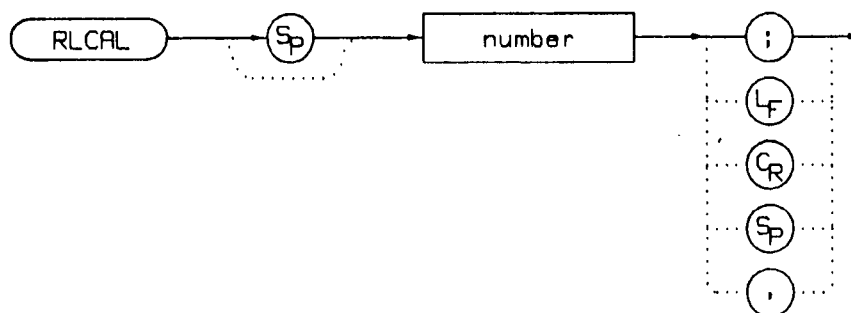
0 dBm

EXAMPLE

```
10      OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;"
20      OUTPUT 718;"TS;MKPK HI;MKRL;TS;"
30      OUTPUT 718;"RL?;"
40      ENTER 718;Ref_level
50      PRINT "REFERENCE LEVEL IS",Ref_level,"DB"
60      END
```

RLCAL
REFERENCE LEVEL CALIBRATION

SYNTAX

DESCRIPTION

The RLCAL command allows you to calibrate the reference level remotely or check the current calibration. To calibrate the reference level, connect the 300 MHz calibration signal to the RF input. Set the center freqency to 300 MHz, the frequency span to 20 MHz, and the reference level to −10 dBm. Use the RLCAL command to move the reference level to the input signal. When the signal peak falls directly on the reference-level line, the reference level is calibrated. Storing this value in the analyzer in EEROM can be done only from the front panel.

PARAMETER

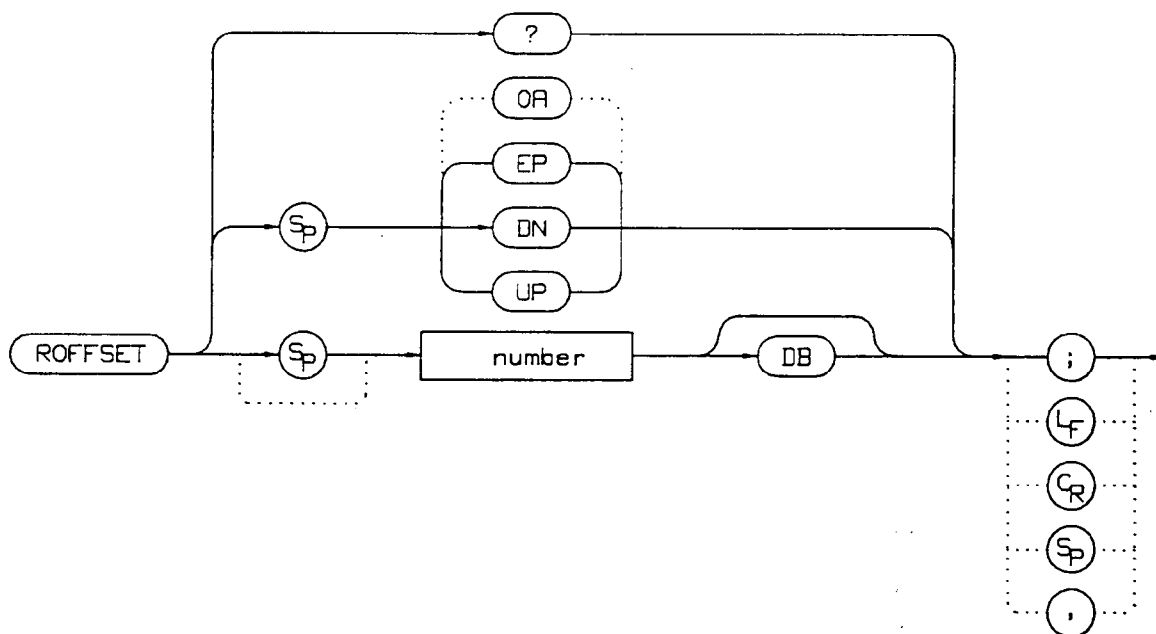number: integer from −255 to 255.

EXAMPLE

```
10      INTEGER Rlcal
20      INPUT "CONNECT CAL SIGNAL TO RF INPUT AND PRESS CONITNUE",A$
30      OUTPUT 718;"IP;TS;CF 300MHZ;SP 100KHZ;RL ODBM;TS;"
40      OUTPUT 718;"MKPK HI;MKA?;"
50      ENTER 718;Mkamptd
60      OUTPUT 718;"RLCAL?;"
70      ENTER 718;Rlcal
80      Rlcal=Rlcal-INT((Mkamptd+10)/.17)
90      OUTPUT 718;"RLCAL ";Rlcal;";"
100     END
```

ROFFSET
AMPLITUDE REFERENCE OFFSET

SYNTAX

DESCRIPTION

The ROFFSET command introduces an offset to all amplitude readouts (e.g., the reference level and marker amplitude). The offset is in dB, regardless of the selected scale and units. The offset can be useful to account for gains of losses in accessories connected to the input of the analyzer. When this function is active, an "R" appears on the left edge of the display.

PARAMETER

number: real from −100 to 100.
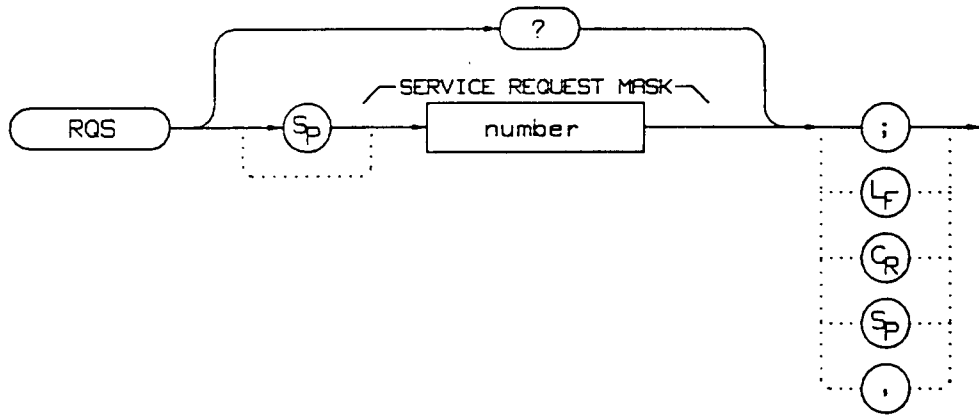UP/DN: increments of one vertical division.

PRESET STATE

Off

QUERY RESPONSE

```
          ┌──────────┐      ┌──────────────┐
 ─────────┤  number  ├──────┤  ⌐F with EOI ├─────────
          └──────────┘      └──────────────┘
```

EXAMPLE

```
10          INPUT "ENTER REFERENCE LEVEL OFFSET",Roffset
20          OUTPUT 718;"ROFFSET ";Roffset;"DB;"
30          OUTPUT 718;"ROFFSET?;"
40          ENTER 718;Roffset
50          PRINT "AMPLITUDE OFFSET IS ",Roffset
60          END
```

RQS
REQUEST SERVICE CONDITIONS

SYNTAX

DESCRIPTION

The RQS command sets a bit mask that specifies which service requests can interrupt a program sequence. Each service request has a corresponding bit number and decimal equivalent of that bit number, as shown in Table 14.5. Use the decimal equivalents to set the bit mask. For example, to set a mask for bits four and five, add the decimal equivalents (16 + 32 = 48), then send the command "RQS 48." For more service request information, refer to Chapter 9.
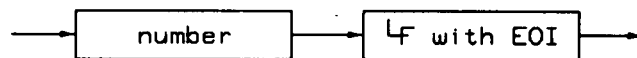
QUERY RESPONSE
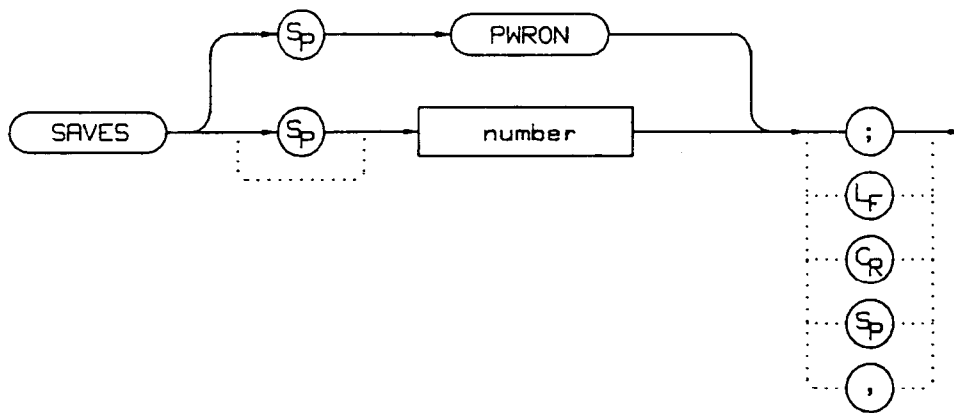
EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20        OUTPUT 718;"VAVG 10;RQS 16;"
30        ON INTR 7 GOTO Srq
40        ENABLE INTR 7;2
50        OUTPUT 718;"TS;"
60   Idle:    GOTO Idle
70   Srq:  Sbyte=SPOLL(718)
80         PRINT Sbyte
90         PRINT "VIDEO AVERAGING IS COMPLETE"
100         OUTPUT 718;"RQS 0;"
110         LOCAL 718
120      END
```

SAVES
SAVE STATE

SYNTAX

DESCRIPTION

The SAVES command saves the currently-displayed instrument state in the specified state register.
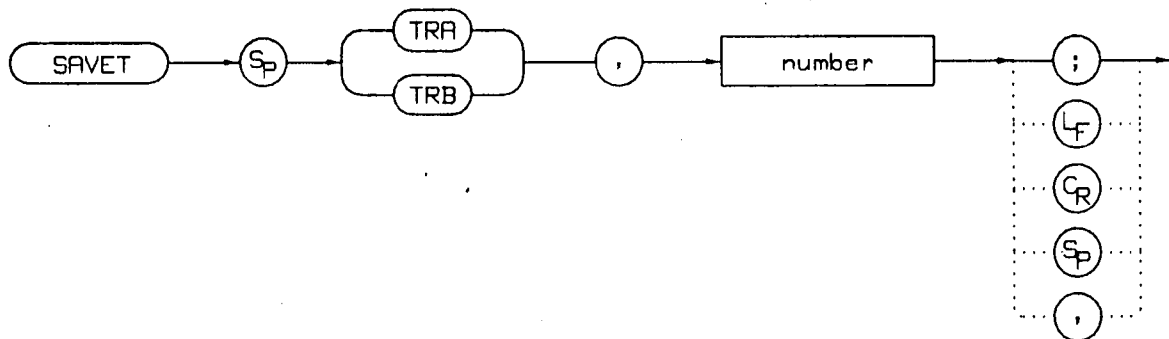
PARAMETERS

number: integer from 0 to 9. Numbers less than zero default to zero; numbers greater than nine default to nine.
PWRON: sets the spectrum analyzer to the current state when ▌LINE▌ is switched on.

EXAMPLE

```
10      OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;"
20      OUTPUT 718;"SAVES PWRON;"
30      END
```

SAVET
SAVE TRACE

SYNTAX

DESCRIPTION

The SAVET command saves the selected trace in the specified trace register.

PARAMETERS

TRA: stores the contents of Trace A.
TRB: stores the contents of Trace B.
number: integer from 0 to 7. Numbers less than zero default to zero; numbers greater than seven are not allowed.
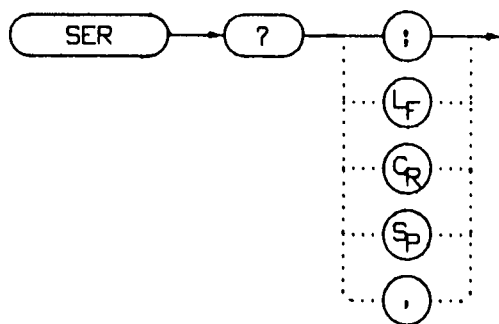
EXAMPLE

```
10      INPUT "SELECT THE TRACE YOU WISH TO SAVE (TRA OR TRB)",Save_trace$
20      INPUT "SELECT THE REGISTER NUMBER",Reg_number
30      OUTPUT 718;"SAVET ";Save_trace$;", ";Reg_number;";"
40      END
```
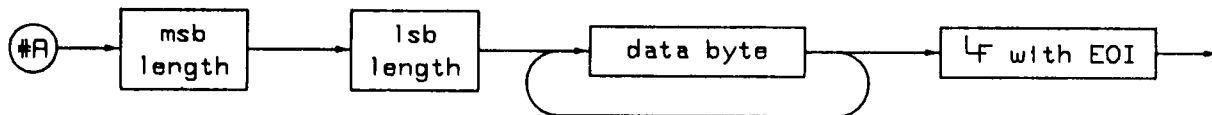
SER
SERIAL NUMBER

SYNTAX

DESCRIPTION

The SER command returns the spectrum analyzer serial number to the computer.

QUERY RESPONSE
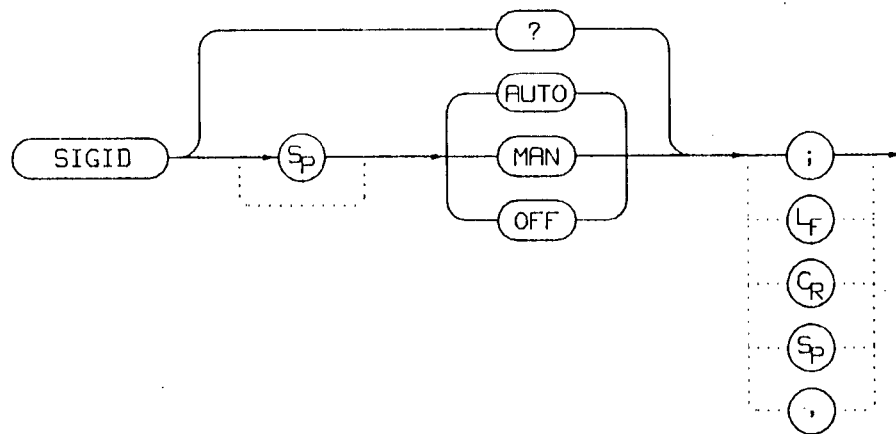

EXAMPLE

```
10      DIM Ser$[20]
20      OUTPUT 718;"SER?;"
30      ENTER 718;Ser$
40      PRINT Ser$
50      END
```

SIGID
SIGNAL IDENTIFICATION

SYNTAX

DESCRIPTION

The SIGID command identifies signals for the external mixing frequency bands.

Two signal identification methods are available. AUTO employs the image response method for locating correct mixer responses. Place a marker on the desired signal, then activate SIGID AUTO. The frequency of a correct response appears in the active function block. Use this mode before executing the IDCF command.

The second method of signal identification, MAN, shifts responses both horizontally and vertically. A correct response is shifted horizontally by less than 80 kHz.

To ensure accuracy in MAN mode, limit the frequency span to less than 20 MHz.

QUERY RESPONSE
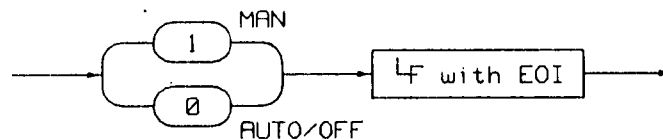
EXAMPLE

```
10        OUTPUT 718;"SIGID AUTO;"
20        OUTPUT 718;"IDCF;"
30        OUTPUT 718;"CF?;"
40        ENTER 718;Cf
50        PRINT Cf
60        END
```

SNGLS
SINGLE SWEEP

SYNTAX
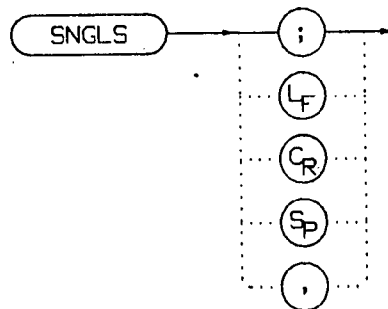
DESCRIPTION

The SNGLS command selects the single-sweep mode. This mode allows only one sweep when trigger conditions are met. When this function is active, an "S" appears on the left edge of the display.

EXAMPLE

```
10      OUTPUT 718;"IP;SNGLS;"
20      END
```

SP
FREQUENCY SPAN

SYNTAX
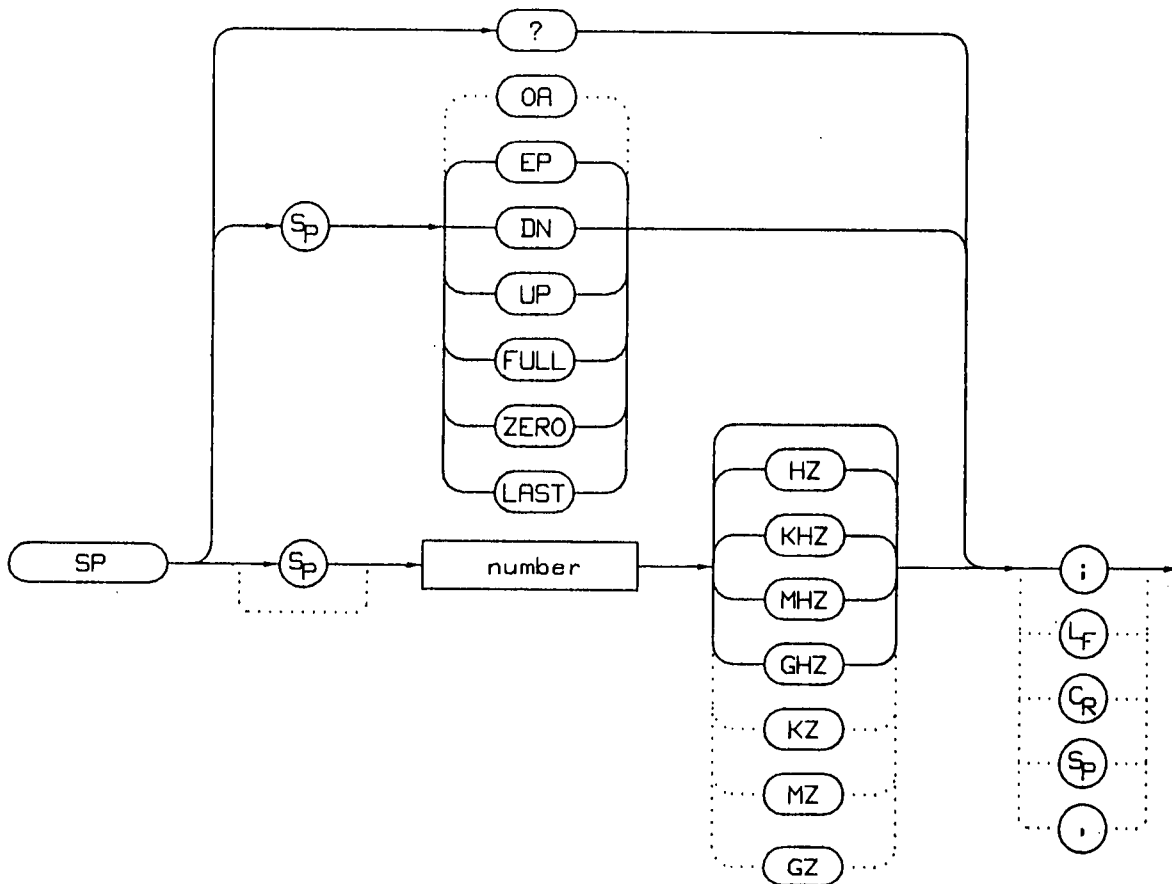
DESCRIPTION

The SP command sets the frequency span. The center frequency does not change with changes in the frequency span; start and stop frequencies do change. Setting the frequency span to 0 Hz effectively allows an amplitude vs. time mode in which to view signals. This is especially useful for viewing modulation. Querying SP will leave the analyzer in center frequency/span mode.

NOTE

The low band of the spectrum analyzer ranges from 1 kHz to 2.9 GHz. The upper band ranges from 2.75 to 22 GHz. The frequency span cannot be set to overlap both bands at the same time. For example, to sweep a range from 2.0 to 3.5 GHz, use the low band to sweep from 2.0 to 2.9 GHz and use the upper band to sweep from 2.9 to 3.5 GHz.

PARAMETERS

number: real from 0 to 2.9 E+9 in low band, 2.75 E+9 to 19.25 E+9 in high band (18 E+9 to 307 E+9 in external mixer mode).
UP/DN: increments in a 1, 2, 5 sequence.

PRESET STATE

Full span; 19.25 GHz (HP 8562A)
full span; 1.45 GHz (HP 8562B)

QUERY RESPONSE
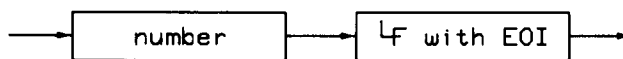
EXAMPLE

```
10      OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;"
20      OUTPUT 718;"SP UP;SP?;"
30      ENTER 718;Span
40      PRINT Span
50      END
```

SQUELCH
SQUELCH

SYNTAX
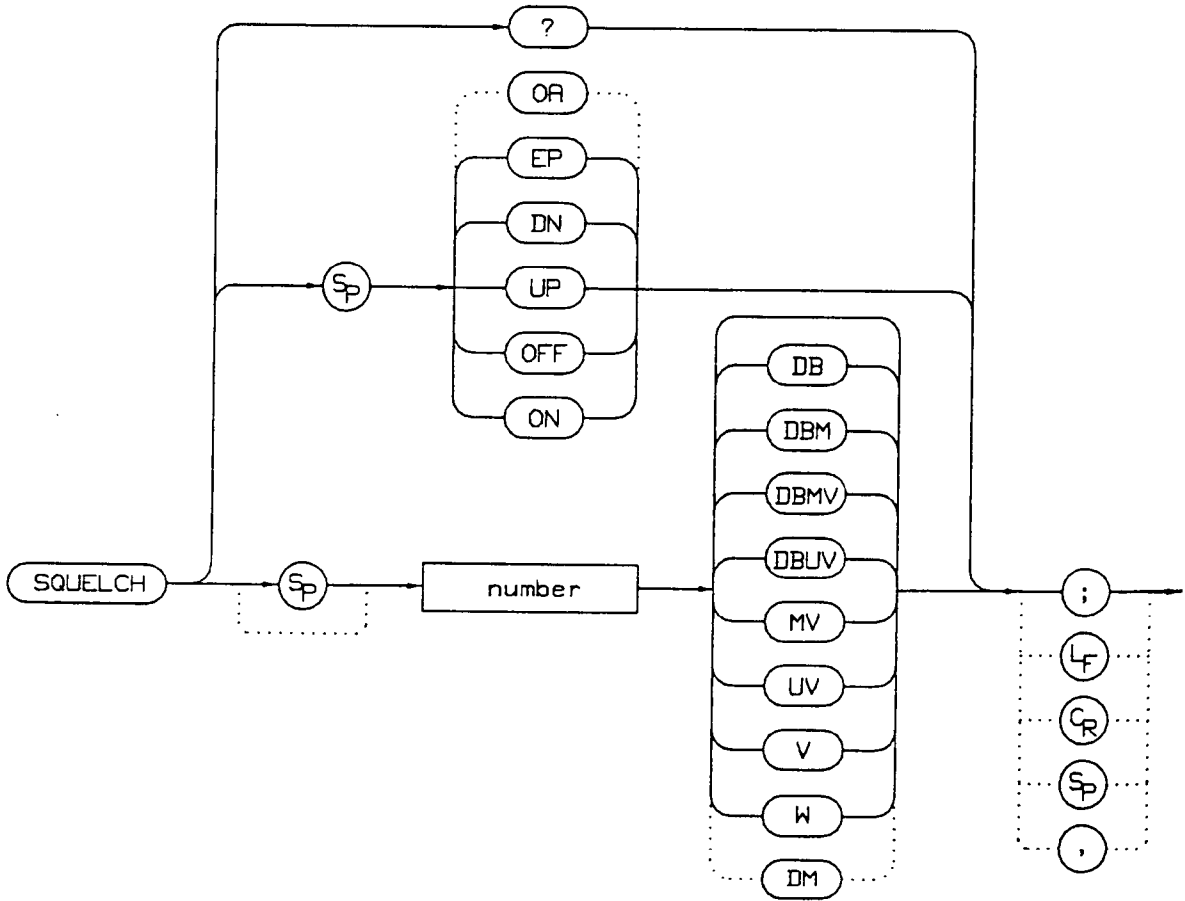
DESCRIPTION

The SQUELCH command adjusts the squelch level for demodulation. When this function is on, a dashed line appears on the display indicating the squelch level. A marker must be active and above the squelch line for demodulation to occur. Refer to the DEMOD command. The default value is −120 dBm.

PARAMETERS

number: real from −220 to 30.
UP/DN: increments by 1 vertical division.

PRESET STATE

Off

QUERY RESPONSE

EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
30        OUTPUT 718;"MKN EP;"
40        PRINT "MOVE MARKER TO SIGNAL TO BE DEMODULATED"
50        PRINT "PRESS HOLD; THEN PRESS CONITNUE"
60        PAUSE
70        INPUT "ENTER DEMODULATION TIME (.1 SEC - 60 SEC)",Dtime
80        OUTPUT 718;"DEMODT ";Dtime;"SEC;"
90        OUTPUT 718;"SQUELCH EP;"
100        INPUT "ADJUST SQUELCH AS NECESSARY; PRESS HOLD, THEN ENTER",A$
110        OUTPUT 718;"DEMOD FM;"
120        LOCAL 718
130       END
```

SRQ
SERVICE REQUEST

SYNTAX
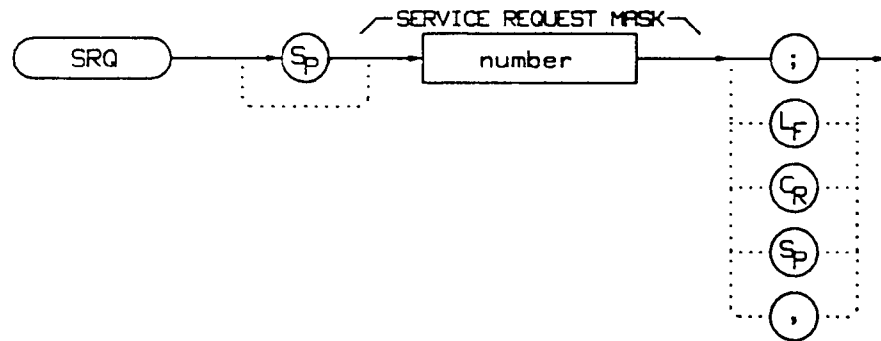
DESCRIPTION

The SRQ command triggers a service request. This command allows you to force a service request and test a program designed to handle service requests. However, the service request can be triggered only if it is first masked using the RQS command. For more service request information, refer to Chapter 9.

EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20        OUTPUT 718;"RQS 16;"
30        ON INTR 7 GOTO Srq
40        ENABLE INTR 7;2
50        OUTPUT 718;"SRQ 16;"
60    Idle:     GOTO Idle
70    Srq:          Sbyte=SPOLL(718)
80                  PRINT Sbyte
90                PRINT "INTERRUPT GENERATED"
100           OUTPUT 718;"RQS 0;"
110           LOCAL 718
120       END
```

SYNTAX
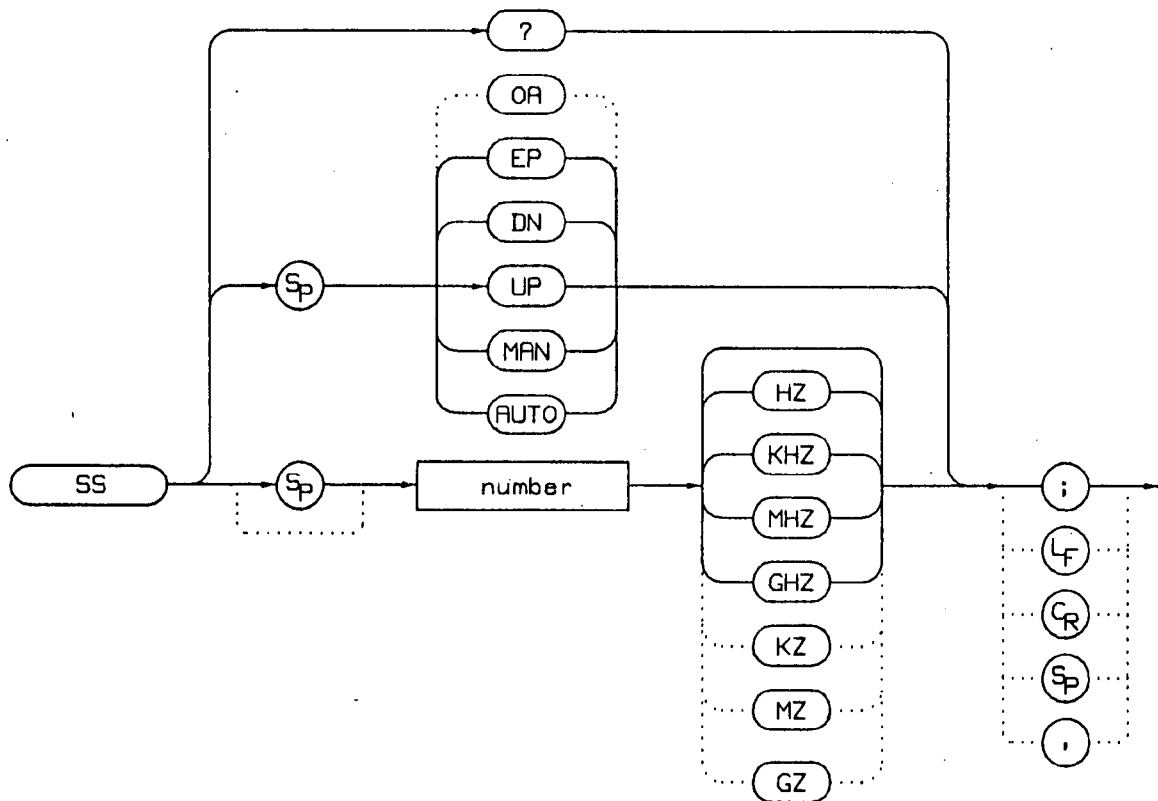
DESCRIPTION

The SS command sets the center frequency step-size. This is normally a coupled function. After entering a step size, execute the CF command using the UP or DN parameter. The center frequency adjusts by the selected step size. This function is useful for quickly tuning to the harmonics of an input signal. The default value is 10% of span.

PARAMETERS

number: real from 100 to 22 E+9.
UP/DN: increments in a 1, 2, 5, 10 sequence.

QUERY RESPONSE

```
  ──────▶│  number  │────▶│ ⌐F with EOI │────▶
```
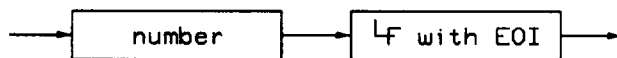
EXAMPLE

```
33      CLEAR 718
40      OUTPUT 718;"IP;SNGLS;CF300MHZ;SP20MZ;TS;"
50      OUTPUT 718;"MKPK HI;MKRL;TS;MKF?;MKA?;"
60      ENTER 718 USING "K";Mk_freq,Mk_amp
70      OUTPUT 718;"SS ";Mk_freq;"HZ"
80      OUTPUT 718;"CF UP;TS;MKPK HI;MKA?;"
90      ENTER 718;Mk_amp1
100     PRINT "The fundamental is ";Mk_amp-Mk_amp1;" db above the first harmonic"
110     END
```

ST
SWEEP TIME

SYNTAX
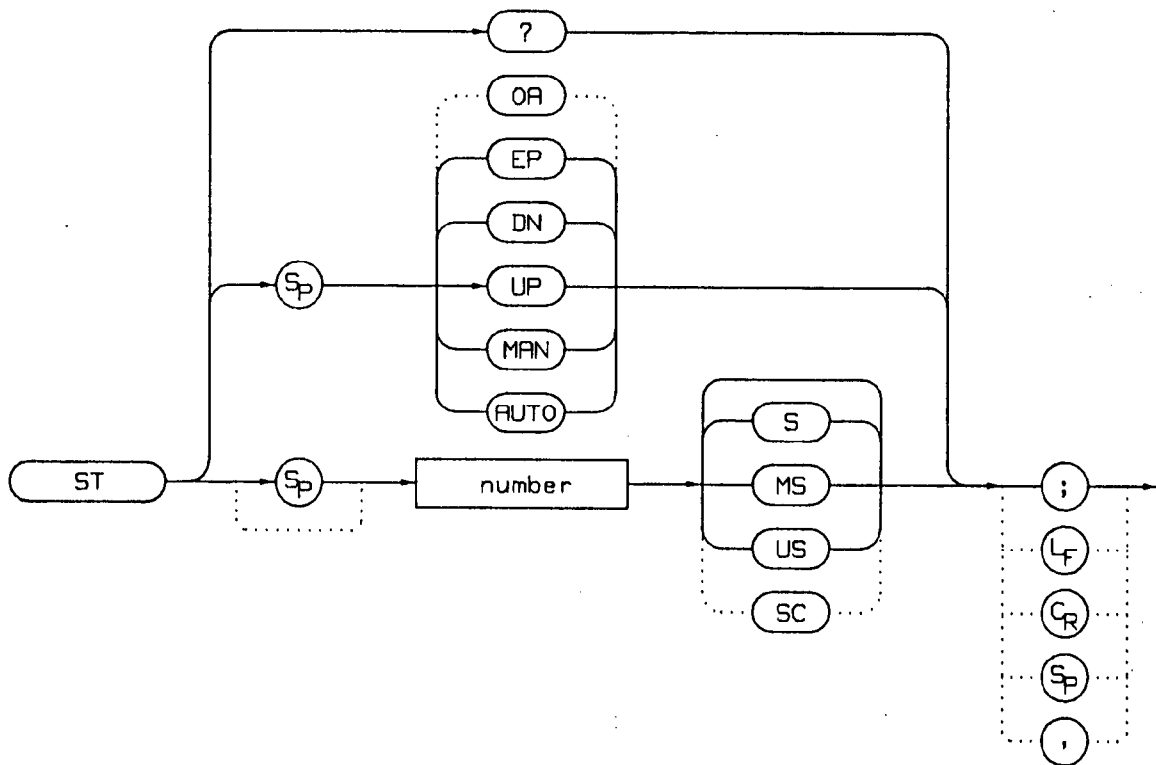
DESCRIPTION

The ST command sets the sweep time. This is normally a coupled function which is automatically set to the optimum value allowed by the current instrument settings. Or, specify the sweep time. Note that when the specified sweep time is too fast for the current instrument settings, the instrument is no longer calibrated and the message "MEASUREMENT UNCAL" appears on the display.

PARAMETERS

number: real from 50 E-3 to 100 when the span is greater than 0 Hz; 50 E-6 to 60 when the span equals 0 Hz.
UP/DN: increments in a 1, 2, 5, 10 sequence.

PRESET STATE

Coupled mode; 50 msec

QUERY RESPONSE

EXAMPLE

```
10      OUTPUT 718;"ST 500MSEC;"
20      OUTPUT 718;"ST DN;"
30      OUTPUT 718;"ST?;";
40      ENTER 718;St
50      PRINT St
60      END
```

STB
STATUS BYTE QUERY

SYNTAX

```
( STB )──▶( ? )──┬──( ; )──────▶
                 ├···( L̵F )···
                 ├···( C̵R )···
                 ├···( S̵P )···
                 └···( , )···
```
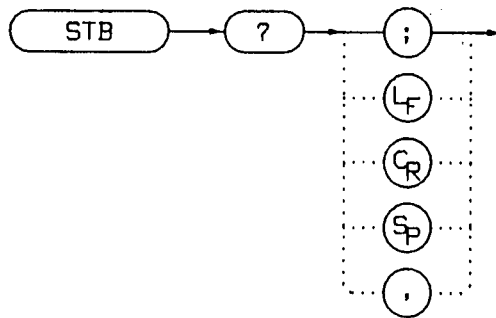
DESCRIPTION

The STB command returns to the controller the decimal equivalent of the bits set in the status byte (see the RQS and SRQ commands). STB is equivalent to a serial poll command. The RQS and associated bits are cleared in the same way that a serial poll command would clear them. For more information, refer to Chapter 9.
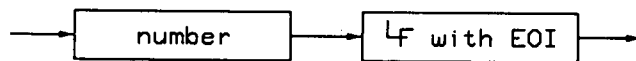
QUERY RESPONSE

```
──▶[ number ]──▶[ L̵F with EOI ]──▶
```

EXAMPLE

```
10        OUTPUT 718;"IP;SNGLS;CF 300MHZ;SP 20MHZ;TS;"
20        OUTPUT 718;"VAVG 10;RQS 16;"
30        ON INTR 7 GOTO Srq
40        ENABLE INTR 7;2
50        OUTPUT 718;"TS;"
60     Idle:    GOTO Idle
70     Srq:OUTPUT 718;"STB?;";
80         ENTER 781;Sbyte
90           PRINT Sbyte
100            PRINT "VIDEO AVERAGING IS COMPLETE"
110            OUTPUT 718;"RQS 0;"
120            LOCAL 718
130        END
```

SWPOUT
SWEEP OUTPUT

SYNTAX

```
SWPOUT ──── Sp ──┬── FAV ──┬──── ;
                 └── RAMP ──┘     ⌐F
                                  CR
                                  Sp
                                  ,
```
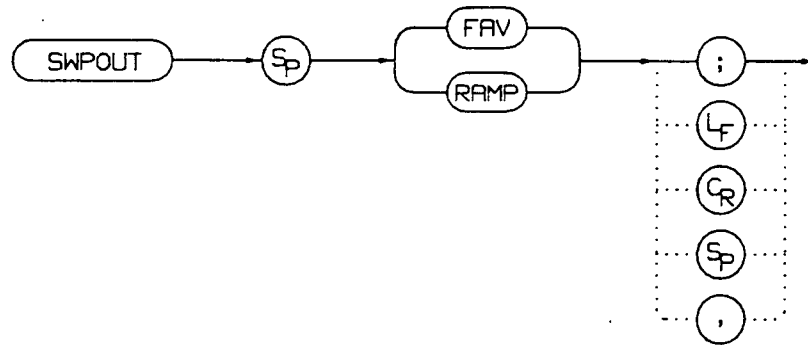
DESCRIPTION

The SWPOUT command selects the sweep-related signal that is available from J8 on the rear panel. FAV provides a DC ramp of 0.5V/GHz from 0-22 GHz. RAMP provides a 0-10 V ramp corresponding to the sweep ramp that tunes the first local oscillator (LO). In multiband sweeps, one ramp is provided for each frequency band.

PRESET STATE

0.5 V/GHz (FAV)

QUERY RESPONSE

```
──┬── FAV ──┬──── ⌐F with EOI ────
  └── RAMP ──┘
```
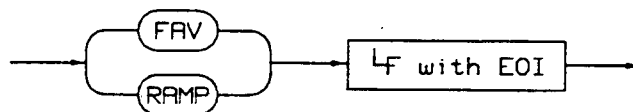
EXAMPLE

```
10      INPUT "SELECT THE SIGNAL OUTPUT OF J8 (RAMP OR FAV)",Sig_out$
20      OUTPUT 718;"SWPOUT ";Sig_out$;";"
30      OUTPUT 718;"SWPOUT?;"
40      ENTER 718;Sig_out$
50      PRINT "SELECTED SIGNAL OUTPUT IS ",Sig_out$
60      END
```

TDF
TRACE DATA FORMAT

SYNTAX
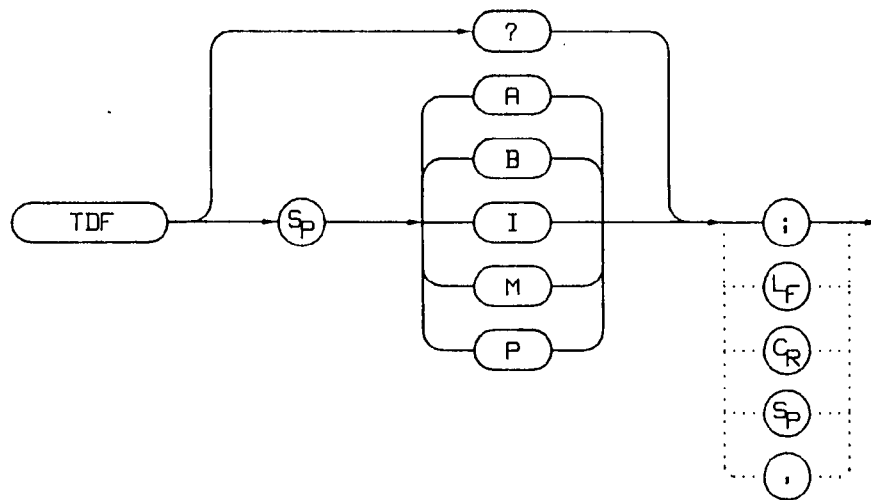
DESCRIPTION

The TDF command selects the format used to input and output trace data (see the TRA/TRB command or refer to Chapter 8). You must specify the desired format when transferring data from the spectrum analyzer to a computer; this is optional when transferring data to the analyzer.

PARAMETERS

A: specifies A-block data format.
B: specifies binary data format.
I: specifies I-block data format.
M: specifies ASCII data format.
P: specifies real number output format. Numbers are in Hz, Volts, Watts, dBm, dBmV, dBμV, dBV, or seconds.
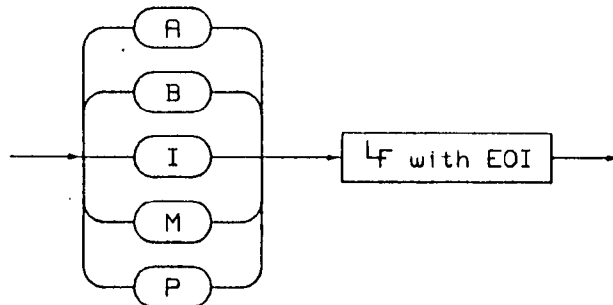
QUERY RESPONSE

EXAMPLE

```
10        REAL A(1:601)
20        OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
30        CALL Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
40        OUTPUT 718;"TDF P;TRA?;"
50        ENTER 718;A(*)
60        PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
70        PAUSE
80        OUTPUT 718;"IP;TDF P;TS;VIEW TRA;"
90        CALL Enter_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
100        OUTPUT 718;"TRA ";
110        FOR I=1 TO 600
120        OUTPUT 718;A(I);"DBM,";
130        NEXT I
140        OUTPUT 718;A(601);"DBM;"
150       END
```

TH
THRESHOLD

SYNTAX
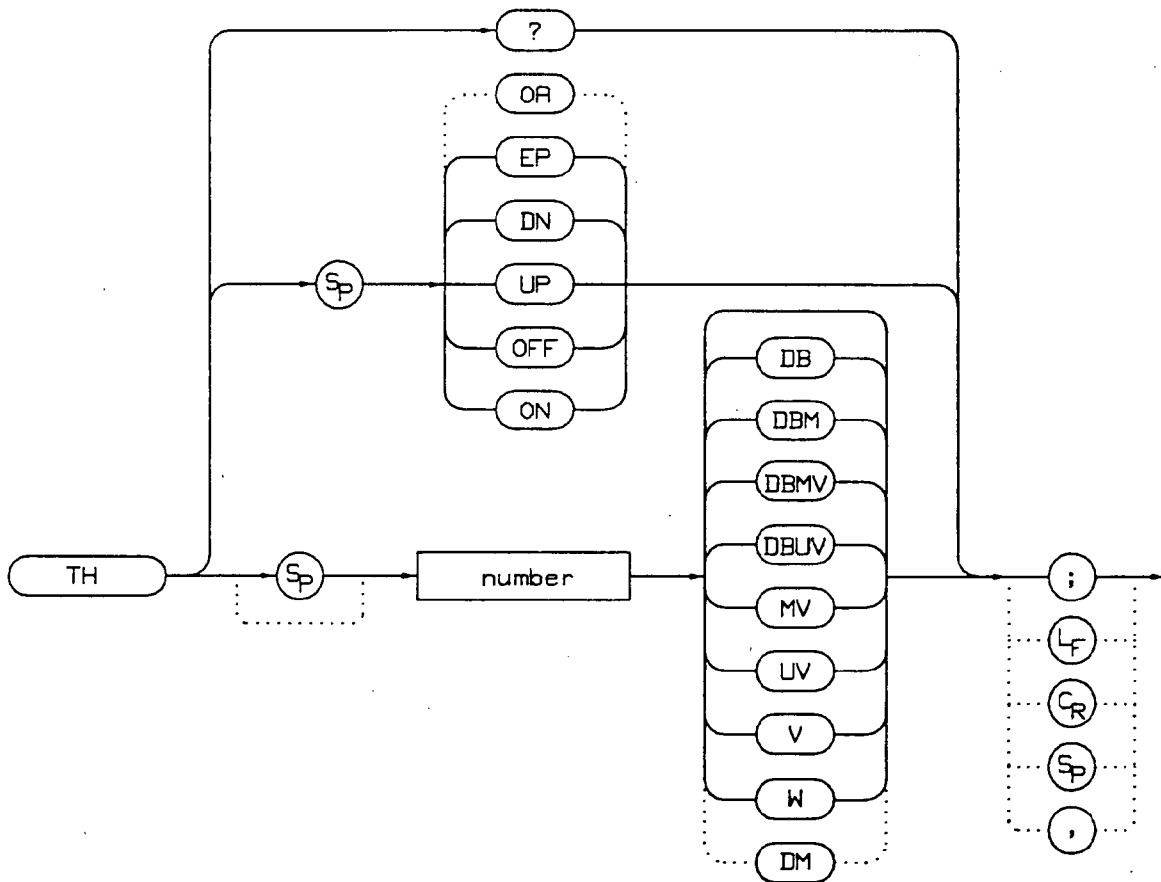
DESCRIPTION

The TH command sets the minimum amplitude level and clips data at this value. Default value is −90 dBm. See also MKPT. MKPT does not clip data below its threshold.

NOTE

When a trace is in view or max-hold mode, if the threshold is raised above any of the trace data, the data below the threshold will be permanently lost.

PARAMETERS

number: real from −220 to 30.
UP/DN: increments by one vertical division.

PRESET STATE

Off

QUERY RESPONSE
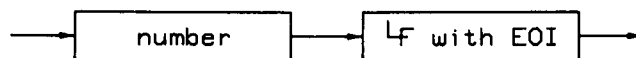
EXAMPLE

```
10        OUTPUT 718;"TH EP;"
20        PRINT "SELECT THE THRESHOLD ON THE ANALYZER"
30        PRINT "PRESS HOLD THEN PRESS CONTINUE"
40        PAUSE
50        END
```

TITLE
TITLE ENTRY

SYNTAX
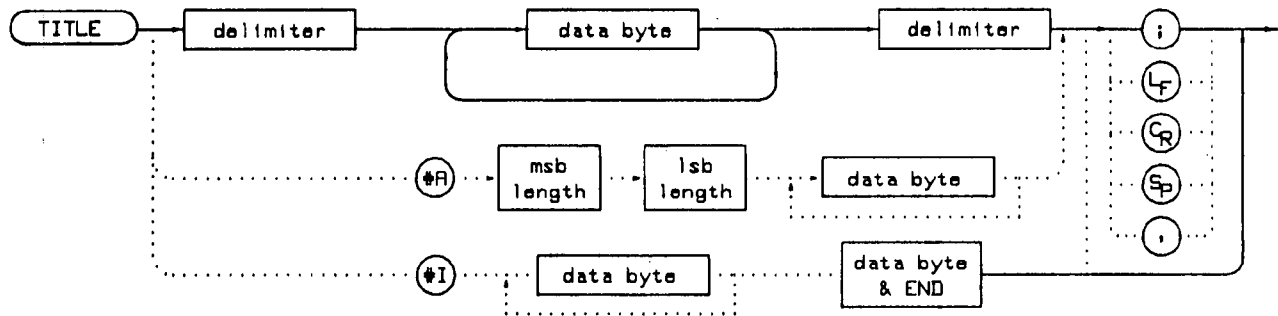
DESCRIPTION

The TITLE command places character data in the title area of the display, which is in the upper-right corner. A title can be up to two rows of sixteen characters each and can include the special characters shown in Table 14.6. Carriage return and line feed characters are not recommended. For more information on creating titles, refer to Chapter 6 of this manual.

CODE	CHARACTER
60	≪
62	≫
168	⇐
169	⇒
225	α
226	β
237	μ
240	π
241	θ
242	ρ
243	σ
244	τ
247	ω
249	Δ

Table 14.6. Special printing characters.

PARAMETER

msb/lsb: represents the length of the title as two 8-bit bytes.

EXAMPLE

```
10      OUTPUT 718;"TITLE@This is a title@;"
20      END
```

TM
TRIGGER MODE

SYNTAX

TM — SP — [?] [EXT / FREE / LINE / VID] — ; — (LF / CR / SP / ,)
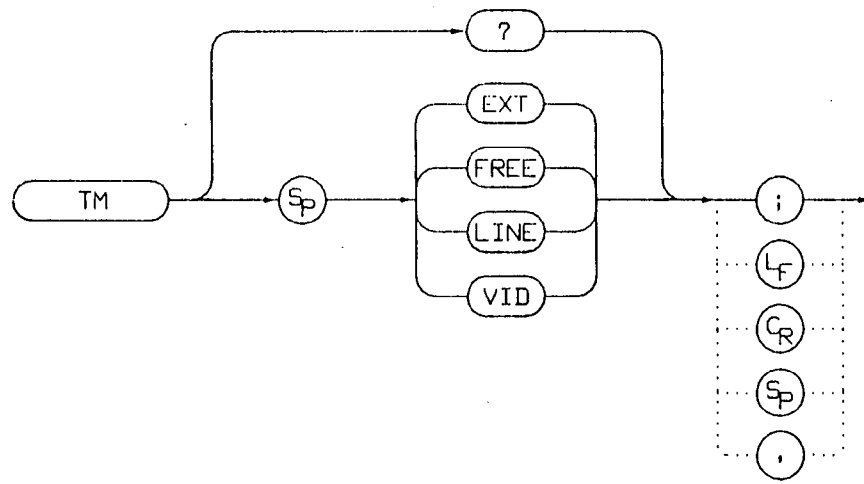
DESCRIPTION

The TM command selects a trigger mode. Selected trigger conditions must be met in order for a sweep to occur. The available trigger modes are listed below. When any trigger mode other than free run is selected, a "T" appears on the left edge of the display.

PARAMETERS

EXT: selects the external mode. Connect an external trigger source to J5 on the rear panel of the spectrum analyzer. The source must range from 0 to 5 V (TTL). The trigger occurs on the rising, positive edge of the signal (about 1.5 V).

FREE: selects the free-run mode. Sweep triggers occur as fast as the spectrum analyzer will allow.

LINE: selects the line mode. Sweep triggers occur at intervals synchronized to the line frequency.

VID: selects the video mode. Sweep triggers occur whenever the positively-sloped part of the input signal passes through the video trigger level. This trigger level can be changed (refer to the VTL command), and a dashed line appears on the screen to denote the selected level.

PRESET STATE

Free-run mode

QUERY RESPONSE
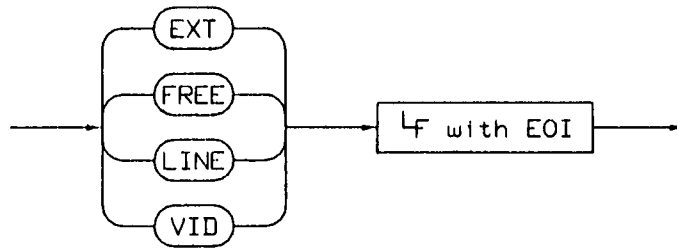
EXAMPLE

```
10      OUTPUT 718;"TM VID;"
20      OUTPUT 718;"VTL -20DBM;"
30      END
```

TRA/TRB
TRACE DATA INPUT/OUTPUT

SYNTAX
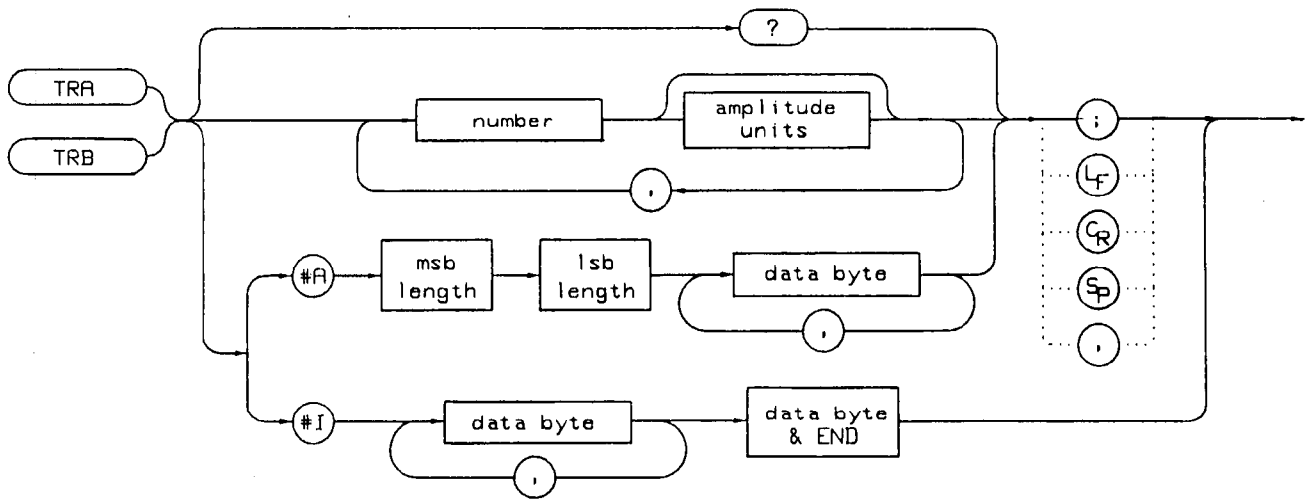
DESCRIPTION

The TRA and TRB commands provide a method for transferring trace data to or from a computer. The available data formats are real number (P) format, binary (B) format, A-block format, I-block format, or measurement units (M) format. Transfers to the computer must be completed within 30 seconds or the transfer will be aborted. For instructions on transferring data and more examples, refer to Chapter 8.

PARAMETER

msb/lsb: represents the length of the trace as two 8-bit bytes.

QUERY RESPONSE
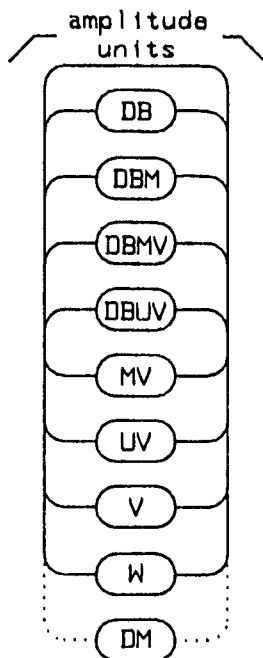
```
        amplitude
         units
       ┌─ DB ─┐
       ├─ DBM ─┤
       ├─ DBMV ─┤
       ├─ DBUV ─┤
       ├─ MV ─┤
       ├─ UV ─┤
       ├─ V ─┤
       ├─ W ─┤
       └···· DM ····┘
```

EXAMPLE

```
10       REAL A(1:601)
20       OUTPUT 718;"IP;CF 300MHZ;SP 20MHZ;SNGLS;TS;"
30       CALL Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
40       OUTPUT 718;"TDF P;TRA?;"
50       ENTER 718;A(*)
60       PRINT "PRESS CONTINUE TO RETURN DATA TO THE ANALYZER"
70       PAUSE
80       OUTPUT 718;"IP;TDF P;TS;VIEW TRA;"
90       CALL Enter_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
100       OUTPUT 718;"TRA ";
110       FOR I=1 TO 600
120       OUTPUT 718;A(I);"DBM,";
130       NEXT I
140       OUTPUT 718;A(601);"DBM;"
150      END
```

TS
TAKE SWEEP

SYNTAX
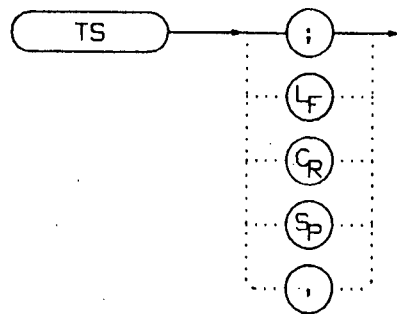
DESCRIPTION

TS commands the spectrum analyzer to take one full sweep across the trace display. Commands following TS are not executed until after the analyzer has finished the trace sweep. This ensures that the instrument is set to a known condition before subsequent commands are executed. For information on how to synchronize a program using TS and the DONE command, refer to Chapter 11.

EXAMPLE

```
10      OUTPUT 718;"IP;SNGLS;"
20      OUTPUT 718;"TS;DONE?;"
30      ENTER 718;Done
40      PRINT Done
50      END
```

VAVG
VIDEO AVERAGE

SYNTAX
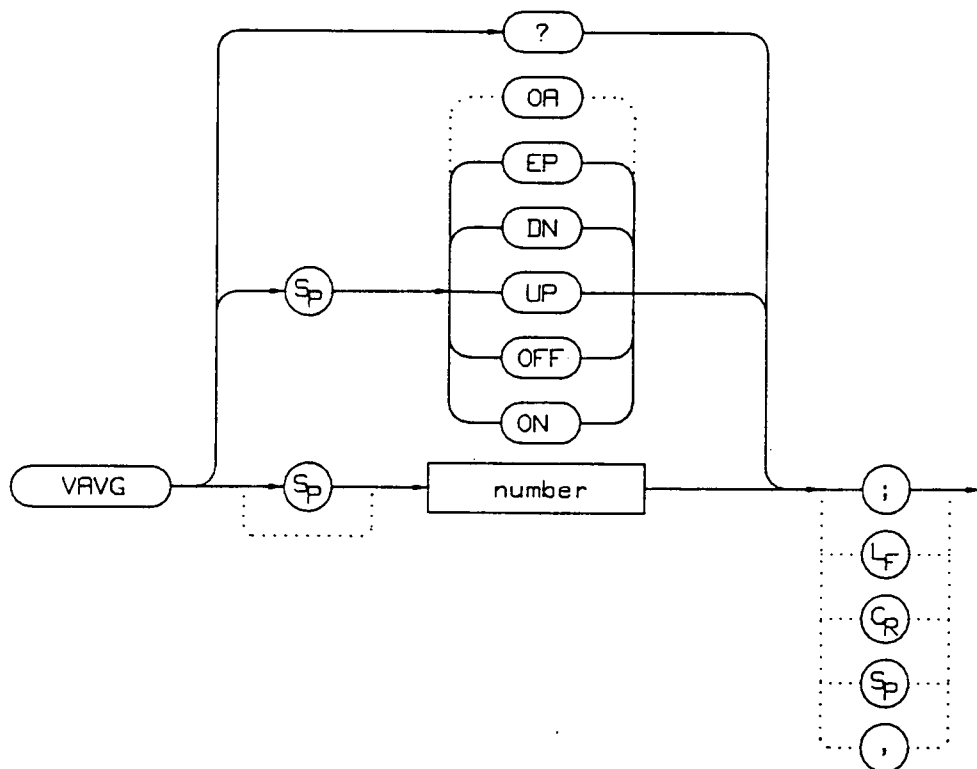
DESCRIPTION

The VAVG command activates the video averaging function. Video averaging smooths the displayed trace without using a narrow bandwidth. VAVG sets the IF detector to sample mode (see the DET command) and smooths the trace by averaging successive traces with each other. If desired, you can change the detector mode after VAVG is executed.

Video averaging is available only for Trace A, and Trace A must be in clear-write mode for VAVG to operate. After VAVG is executed, the number of sweeps that have been averaged appears at the top of the analyzer screen.

Using video averaging allows you to view changes to the entire trace much faster than using narrow video filters. Narrow video filters require long sweep times, which may not be desired. Video averaging, though requiring more sweeps, uses faster sweep times; in some cases, it can produce a smooth trace faster than a video filter.

PARAMETERS

number: integer from 1 to 999.
UP/DN: increments by 1.

PRESET STATE

100

QUERY RESPONSE
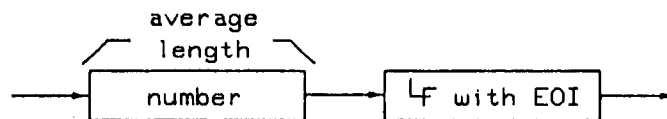
EXAMPLE

```
10      OUTPUT 718;"SNGLS;VAVG 20;TS;"
20      END
```

VB
VIDEO BANDWIDTH

SYNTAX
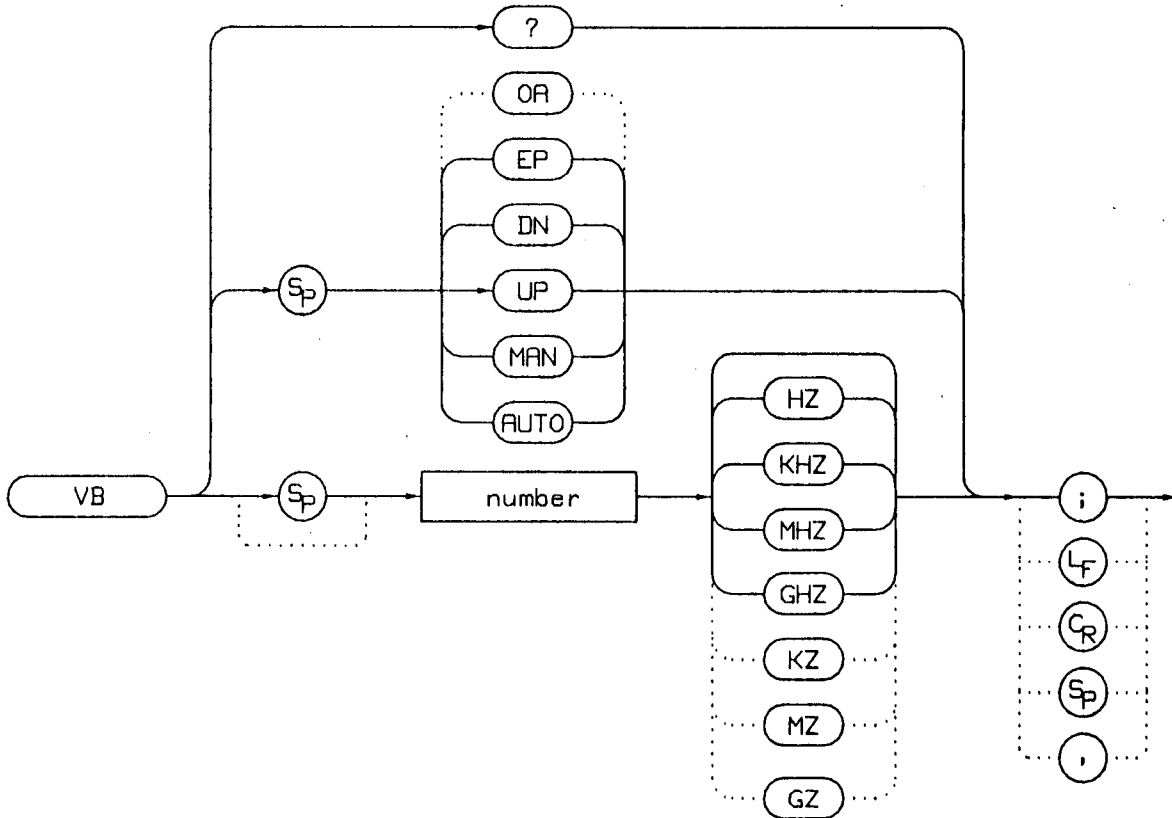
DESCRIPTION

The VB command specifies the video bandwidth. This is normally a coupled function that is selected according to the ratio selected by the VBR command. (If no ratio is selected, a default ratio, 1.0, is used instead.) Video bandwidth filters (or smooths) post-detected video information. The bandwidth, which ranges from 1 Hz to 3 MHz, may also be selected manually. If the specified video bandwidth is less than 300 Hz, the IF detector is set to sample mode.

PARAMETERS

number: integer from 1 to 1 E+6.
UP/DN: increments in a 1, 3, 10 sequence.
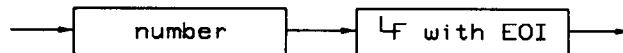
PRESET STATE

Coupled mode, 1 MHz

QUERY RESPONSE

```
 ── number ── ⌐F with EOI ──
```

EXAMPLE

```
10      OUTPUT 718;"IP;"
20      OUTPUT 718;"CF 12GHZ;SP 2GHZ;"
30      INPUT "SELECT THE VIDEO BANDWIDTH, IN KHZ",B_width
40      OUTPUT 718;"VB ";B_width;"KHZ;"
50      OUTPUT 718;"VB?;";
60      ENTER 718;B_width
70      PRINT "SELECTED BANDWIDTH IS ",B_width,"HZ"
80      END
```

VBR
VIDEO BANDWIDTH TO RESOLUTION BANDWIDTH RATIO

SYNTAX
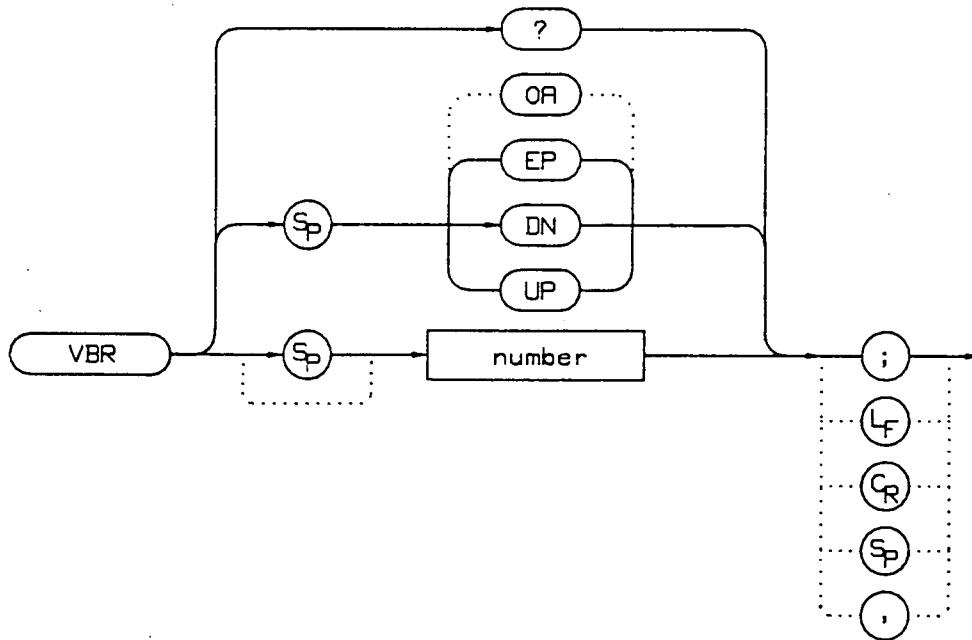
DESCRIPTION

The VBR command specifies the coupling ratio between the video bandwidth and the resolution bandwidth. The ratio ranges from 0.003 to 3 in a 1, 3, 10 sequence. The default ratio is 1.

QUERY RESPONSE
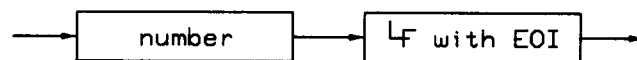
EXAMPLE

```
10        OUTPUT 718;"IP;"
20        OUTPUT 718;"CF 12GHZ;SP 2GHZ;"
30        INPUT "SELECT THE VIDEO BANDWIDTH TO RESOLUTION BANDWIDTH RATIO",
          B_ratio
40        OUTPUT 718;"VBR ";B_ratio;";"
50        INPUT "SELECT THE VIDEO BANDWIDTH, IN KHZ",B_width
60        OUTPUT 718;"VB ";B_width;"KHZ;"
70        OUTPUT 718;"VB?;";
80        ENTER 718;B_width
90        PRINT "SELECTED BANDWIDTH IS ",B_width,"HZ"
100       END
```

VIEW
VIEW TRACE

SYNTAX
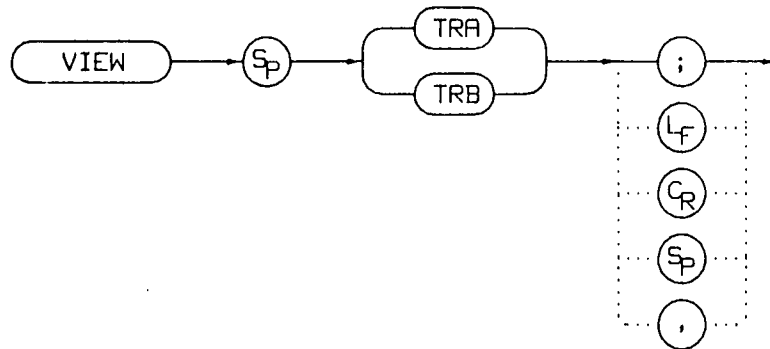
DESCRIPTION

The VIEW command displays the current contents of the selected trace, but does not update the contents.

EXAMPLE

```
10      OUTPUT 718;"CLRW TRA;TS;VIEW TRA;"
20      END
```

VTL
VIDEO TRIGGER LEVEL

SYNTAX

```
                                    ┌──────( ? )──────────────────┐
                                    │                             │
                              ┌···( OR )···┐                      │
                              │   ( EP )   │                      │
              ┌──( S⁄P )──────┤   ( DN )   ├──────────────────────┤
              │               │   ( UP )   │                      │
              │               └────────────┘   ┌──( DBM )──┐      │
              │                                 │  (DBMV)   │      │
              │                                 │  (DBUV)   │      │
──( VTL )─────┤                                 │  ( MV )   │      │
              │   ┌···( S⁄P )···┐  ┌─────────┐  │  ( UV )   │      │
              └───┤            ├──┤ number  ├──┤  (  V  )  ├──────┤──( ; )──────►
                  └············┘  └─────────┘  │  (  W  )  │      │      ·( L⁄F )·
                                               └···( DM )···┘      │      ·( C⁄R )·
                                                                   │      ·( S⁄P )·
                                                                   │       ·( , )·
```
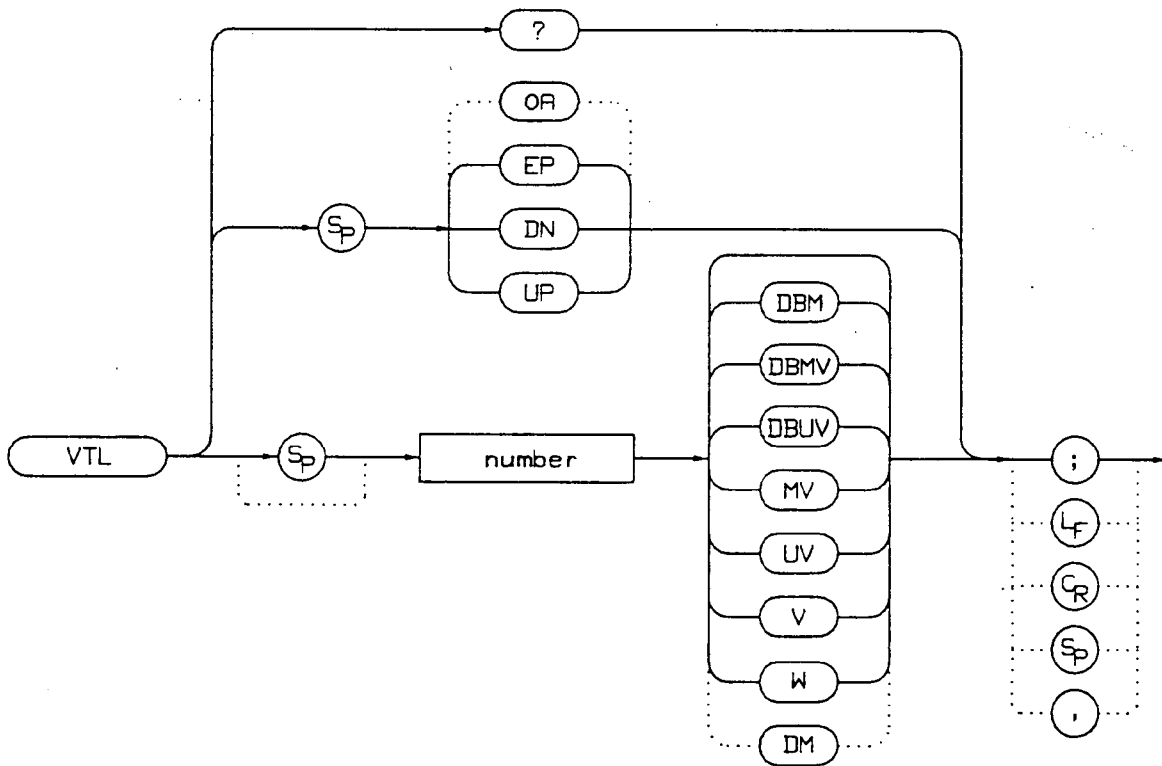
DESCRIPTION

The VTL command sets the video trigger level when the trigger mode is set to VIDEO (refer to the TM command). A dashed line appears on the display to indicate the level. The default value is 0 dBm.

PARAMETERS

number: real from −220 to 30.
UP/DN: increments by 1 vertical division.

QUERY RESPONSE

```
  ┌──────────┐     ┌──────────────┐
──┤  number  ├────►┤ ⌐F with EOI  ├──►
  └──────────┘     └──────────────┘
```
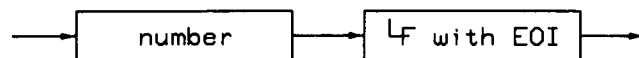
EXAMPLE

```
10      OUTPUT 718;"TM VID;"
20      OUTPUT 718;"VTL -20DBM;"
30      END
```

APPENDIX A

PROGRAMMING COMMANDS VS. FRONT-PANEL KEY

PROGRAMMING COMMANDS

COMMAND	NAME	KEY
ADJALL	Execute Turn-on Adjustments	
ADJCRT	CRT Adjustment Pattern	CRT ADJ PATTERN
ADJIF	Execute IF Adjustments	FULL IF ADJ
AMB	Trace A Minus Trace B	A-B→A
AMBPL	Trace A Minus Trace B Plus Display Line	A-B+DL→A
ANNOT	Annotation On/Off	ANNOT ON OFF
APB	Trace A Plus Trace B	A+B→A
AT	Input Attenuator	ATTEN ON OFF
AUNITS	Absolute Amplitude Units	UNITS
AUTOCPL	Autocouple All "AUTO" Functions	ALL
AXB	Trace A Exchange Trace B	A EXCH B
BLANK	Blank Trace	BLANK A, BLANK B
BML	Trace A Minus Display Line	B-DL→B
CF	Center Frequency	CENTER, **FREQUENCY**
CLRW	Clear/Write Trace	CLR-WRT A, CLR-WRT B
CNVLOSS	External Mixer Conversion Loss	CONV LOSS
CONTS	Continuous Sweep	CONT
DEMOD	Demodulation	AM DEMOD ON OFF
		FM DEMOD ON OFF
DEMODAGC	Demodulation Automatic Gain Control	
DEMODT	Demodulation Time	. DEMOD TIME
DET	Detection Mode	DETECTOR MODES
DL	Display Line	DISP LINE ON OFF
DONE	Done	
ERR	Command Error	
ET	Elapsed Time	ELAPSED TIME
FA	Start Frequency	START FREQ
FB	Stop Frequency	STOP FREQ
FDIAG	Frequency Diagnostics	FREQ DIAGNOSE
FDSP	Frequency Display	FREQ DSP ON OFF
FOFFSET	Frequency Offset	FREQ OFFSET
FREF	Frequency Reference	10 MHz INT EXT
FS	Full Span	FULL SPAN
FULBAND	Full Band	FULL BAND
GRAT	Graticule On/Off	GRAT ON OFF

HD	Hold	�|HOLD|◗
HNLOCK	Harmonic Number Lock	LOCK ON OFF
HNUNLK	Unlock Harmonic Number	LOCK ON OFF
ID	Output Identification	
IDCF	Signal Identification Frequency to Center Frequency	SIG ID → CF
IDFREQ	Signal Identification to Frequency Found	
IP	Instrument Preset	RECALL PWR ON, PRESET
LG	Logrithmic Display Scale	LOG dB/DIV
LN	Linear Display Scale	LINEAR
MBIAS	Mixer Bias	BIAS
MINH	Minimum Trace Hold	
MKA	Marker Amplitude	
MKCF	Marker to Center Frequency	MARKER → CF
MKD	Marker Delta	MARKER DELTA
MKDR	Marker Delta Reciprocal	MARKER 1/DELTA
MKF	Marker Frequency	
MKFC	Marker Frequency Count	COUNTER ON OFF
MKFCR	Marker Frequency Count Resolution	COUNTER RES
MKMIN	Marker to Minimum	
MKN	Marker Normal	MARKER NORMAL
MKNOISE	Marker Noise	MKRNOISE ON OFF
MKOFF	Marker Off	|OFF|
MKPK	Marker Peak Search	PEAK SEARCH ◗|PEAK SEARCH|◗
MKPX	Marker Peak Excursion	PEAK EXCURSN
MKREAD	Marker Readout	
MKRL	Marker to Reference Level	MARKER→ REF LVL
MKSP	Marker Delta to Span	MKRΔ→ SPAN
MKSS	Marker to Center Frequency Step Size	MARKER→ CF STEP
MKT	Marker Time	MARKER 1/DELTA (when span > 0Hz)
MKTRACK	Marker Signal Track	SIG TRK ON OFF
ML	Mixer Level	MAX MXR LVL
MXMH	Maximum Hold	MAX HOLD A MAX HOLD B
OP	Output Display Parameters	
P1P2	Set P1, P2, of Display	PLOT ORG DSP GRAT
PLOT	Plot Display	PLOT ALL
PP	Preselector Peak	PRESEL AUTO PEAK
PRESEL	Preselector Data	RECALL PRSEL PK FACTORY PRSEL PK
PSTATE	Protect State	SAVELOCK ON OFF
RB	Resolution Bandwidth	RES BW AUTO MAN
RBR	Resolution Bandwidth to Span Ratio	RBW:SPAN
RCLS	Recall State Register	RECALL STATE
RCLT	Recall Trace Register	RECALL TRACE
REV	Output Revision Number	

RL	Reference Level	REF LVL, ▮AMPLITUDE▮
RLCAL	Reference Level Calibration	REF LVL CAL
ROFFSET	Reference Level Offset	REF LVL OFFSET
RQS	Request Service Conditions	
SAVES	Save State	SAVE STATE
SAVET	Save Trace	SAVE TRACE
SER	Serial Number	
SIGDEL	Signal Amplitude Delta	
SIGID	Signal Identify	SIG ID ON OFF
SNGLS	Single Sweep	SINGLE
SP	Frequency Span	▮SPAN▮
SQUELCH	Squelch for Demodulation	SQUELCH
SRQ	Service Request	
SS	Center Frequency Step Size	CF STEP AUTO MAN
ST	Sweep Time	SWP TIME AUTO MAN
STB	Status Byte Query	
SWPOUT	Sweep Output	REAR PANEL OUTPUT
TDF	Trace Data Format (Parameter Units ASCII or Binary)	
TITLE	Title Entry	SCREEN TITLE
TM	Trigger Mode	▮TRIGGER▮
TRA	Trace A Data Input/Output	
TRB	Trace B Data Input/Output	
TS	Take Sweep	
VAVG	Video Average	VID AVG ON OFF
VB	Video Bandwidth	VIDEO BW AUTO MAN
VBR	Video Bandwidth Resolution Bandwidth Ratio	VBW:RBW
VIEW	View Trace	VIEW A, VIEW B
VOL	Volume	VOLUME, ▮(())▮, ▮(())▮
VTL	Video Trigger Level	VIDEO

APPENDIX B

HP-IB ERRORS

Table B.1 contains the possible error messages that can appear in the lower-right corner of the HP 8562A/B display during remote operation. Another aid for determining programming errors is the "ERRORS" softkey. If an HP-IB error is generated in the HP 8562A/B during remote operation, the softkey "ERRORS" appears on the analyzer screen. Press this key to read the errors. The cause of the error appears in the active function block. After reviewing the errors, press CLR ALL & EXIT to return the previous spectrum analyzer display.

ERROR CODE	ERROR	PROBABLE CAUSE
100	NO PWRON	Power-on state not valid; a default state was loaded instead
101	NO STATE	Recalled state not valid or not saved
106	ABORTED!	Aborted operation
107	HELLO ??	No HP-IB listener on bus
108	TIME OUT	Controller time out
109	CTRLFAIL	Take control of HP-IB failed
110	NOT CTRL	Not a controller
111	# ARGMTS	Command does not have enough arguments
112	??CMD??	Command not recognized
113	FREQ NO!	Command cannot have frequency units
114	TIME NO!	Command cannot have time units
115	AMPL NO!	Command cannot have amplitude units
116	?UNITS??	Units not recognized
117	NOP NUM	Command cannot have numeric units
118	NOP EP	Enable parameter cannot be used
119	NOP UPDN	Up/down are not valid arguments for the command
120	NOP ONOF	On/off are not valid arguments for the command
121	NOP ARG	Auto/man are not valid arguments for the command
122	NOP TRC	Trace register not valid for the command
123	NOP ABLK	A-block not valid for the command
124	NOP IBLK	I-block not valid for the command
125	NO STRNG	Strings are not valid for the command
126	NO ?	Query is not allowed for the command
127	BAD DTMD	Detector mode is not valid
128	PK WHAT?	Peak-search parameter is not valid
129	PRE TERM	Premature termination
130	BAD TDF	Arguments are valid only for the TDF command
131	?? AM/FM	AM/FM are not valid arguments for the command
132	!FAV/RMP	FAV/RAMP are not valid arguments for the command
133	!INT/EXT	INT/EXT are not valid arguments for the command
134	??? ZERO	ZERO is not a valid argument for the command
135	??? CURR	CURR is not a valid argument for the command
136	??? FULL	FULL is not a valid argument for the command
137	??? LAST	LAST is not a valid argument for the command
138	!GRT/DSP	GRT/DSP is not a valid argument for the command
139	PLOTONLY	Use argument only with the PLOT command
140	?? PWRON	PWRON is not a valid argument for the command
141	BAD ARG	Argument is valid only for the FDIAG command
142	BAD ARG	Query is expected for the FDIAG command
143	NO PRESL	Preselector hardware is required
144	NEXT 44	Next error space

Table B.1. HP 8562A/B HP-IB errors.

APPENDIX C

BACKWARD-COMPATIBLE COMMANDS

The following list of commands are used by the HP 8566A and 8568A spectrum analyzers and are recognized by the HP8562A/B. This allows the 8562A/B to use programs written for these Hewlett-Packard spectrum analyzers with only minor modifications. It is recommended that only the 8562A/B programming commands be used when writing new programs.

Old Command	HP 8562A/B Command	Description	Old Command	HP 8562A/B Command	Description
A1	CLRW TRA	Clear-Write Trace A	E4	MKRL	Marker to Reference Level
A2	MXMH TRA	Maximum Hold Trace A	EX	AXB	Exchange Trace A and Trace B
A3	VIEW TRA	Store-View Trace A	GZ	GHZ	Gigahertz (unit)
			KZ	KHZ	Kilohertz (unit)
A4	BLANK TRA	Blank Trace A	L0	DL OFF	Display Line off
B1	CLRW TRB	Clear-Write Trace B	LB	TEXT	Write text to display
B2	MXMH TRB	Maximum Hold Trace B	M1	MKOFF	Marker off
			M2	MKN	Marker Normal on
B3	VIEW TRB	Store-View Trace B	M3	MKD	Marker Delta on
B4	BLANK TRB	Blank Trace B	MA	MKA?	Query Marker Amplitude
BL	BML	Trace B minus Display Line	MF	MKF?	Query Marker Frequency
C1	AMB OFF	Trace A minus Trace B off	MZ	MHZ	Megahertz (unit)
C2	AMB ON	Trace A minus Trace B on	MT0	MKTRACK OFF	Marker Track off
			MT1	MKTRACK ON	Marker Track on
CA	AT AUTO	Couples the RF attenuator	PRSDAC	PSDAC	Query Preselector DAC number
CR	RB AUTO	Couples the resolution bandwidth	RC	RCLS	Recall Instrument State
CS	SS AUTO	Couples the center frequency step size	S1	CONTS	Continuous Sweep
			S2	SNGLS	Single Sweep
CT	ST AUTO	Couples the sweep time	SV	SAVES	Save Instrument State
CV	VB AUTO	Couples the video bandwidth	T1	TM	Trigger Mode Free Run
E1	MKPK HI	Marker to highest peak	T2	TM LIN	Trigger Mode Line
E2	MKCF	Marker to Center Frequency	T3	TM EXT	Trigger Mode External
E3	MKSS	Marker Frequency to Center Frequency Step Size	T4	TM VID	Trigger Mode Video
			TA	TRA?	Trace A Data
			TB	TRB?	Trace B Data