

Hewlett-Packard

8562A

Operation and Programming Manual

TABLE OF CONTENTS

HP 8562A/B Documentation Description	2
How to Use This Manual	3

MANUAL OPERATION

1 INSTRUMENT OVERVIEW

The Front Panel	1-1
Display Annotation	1-3
The Rear Panel	1-4

2 FREQUENCY, SPAN, AND AMPLITUDE FUNCTIONS

Frequency	2-1
Span	2-3
Amplitude	2-4

3 MARKER FUNCTIONS

Marker Priority	3-1
Marker On	3-2
Marker Off	3-3
Peak Search	3-3
Marker →	3-5

4 INSTRUMENT STATE FUNCTIONS

Preset	4-1
Frequency Counter	4-3
Demodulation	4-4
Save	4-6
Module	4-7
Recall	4-8
Internal Mixing	4-10
Preselector Peaking	4-10
External Mixing	4-11

5 CONTROL FUNCTIONS

Sweep	5-1
Auto Couple	5-2
Bandwidth	5-3
Trace	5-4
Trigger	5-6
Display	5-7
Trace Math in the HP 8562A/B	5-9
Adding and Subtracting in dBm	5-9
Adding and Subtracting in Volts	5-10
Trace Data Limits	5-10

MENU FOLDOUT

REMOTE OPERATION

6 CREATING SCREEN TITLES

No-Format Method	6-1
Format Methods	6-2

7 GENERATING PLOTS REMOTELY

Plotter Requirements	7-1
Making a Basic Plot	7-2
Plotting Options	7-3

8 TRACE DATA TRANSFERS

Transfer Requirements	8-1
Formats	8-2

9 SERVICE REQUESTS

The Status Register	9-1
Masking Service Requests	9-2
Computer Interrupt Statements	9-2
Reading Service Request Data	9-3
Testing Service Request Routines	9-5
Summary	9-6

10 TRACE MATH IN THE HP 8562A/B

Adding and Subtracting in dBm	10-1
Adding and Subtracting in Volts	10-2
Trace Data Limits	10-3

11 INPUT AND OUTPUT BUFFERS

Benefits of an Output Buffer	11-1
Buffer Space	11-2
Preventing Timeouts	11-2
Synchronizing Your Program	11-3
Clearing the Buffers	11-3
Summary	11-3

LANGUAGE REFERENCE

12 LANGUAGE NOTATION

Syntax Conventions	12-1
Query Responses	12-1
Elements in Rectangular Boxes	12-1
Secondary Keywords	12-2
Secondary Keyword Summary	12-2

13 PROGRAMMING CODES (FUNCTIONAL INDEX)

14 PROGRAMMING COMMANDS

APPENDIX A

Programming Command Summary	A-1
-----------------------------------	-----

APPENDIX B

HP-IB Errors	B-1
--------------------	-----

APPENDIX C

Backward-Compatible Commands	C-1
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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.

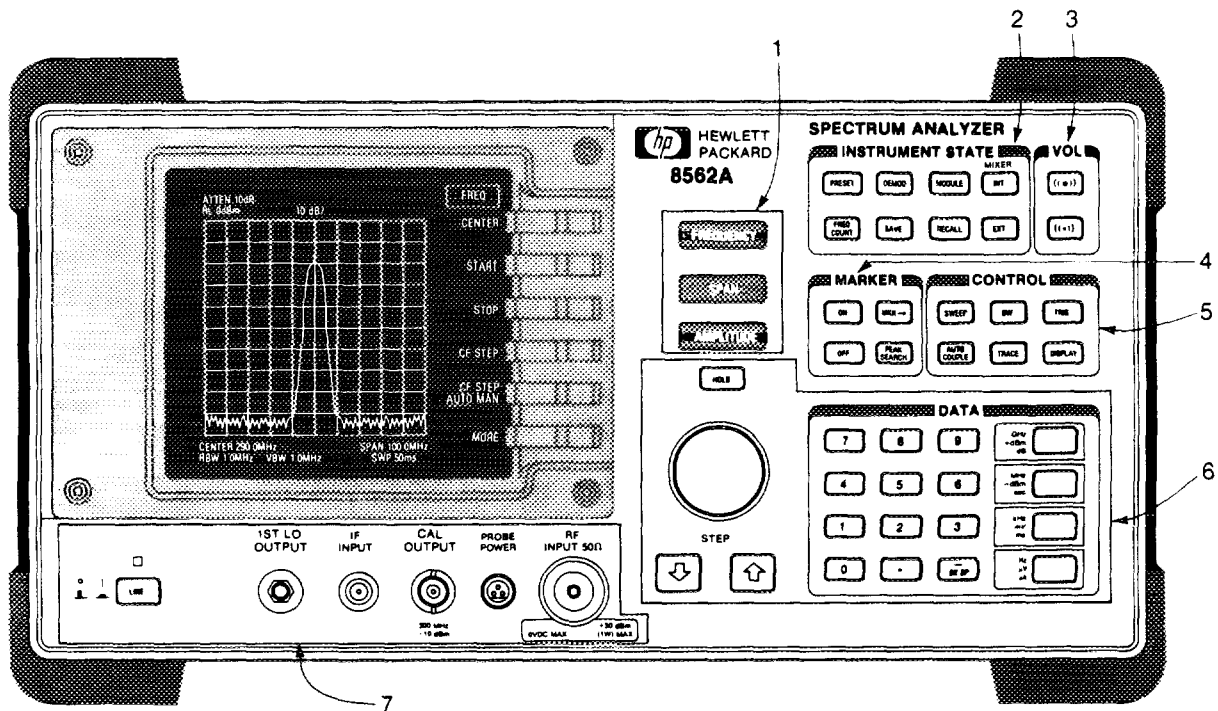
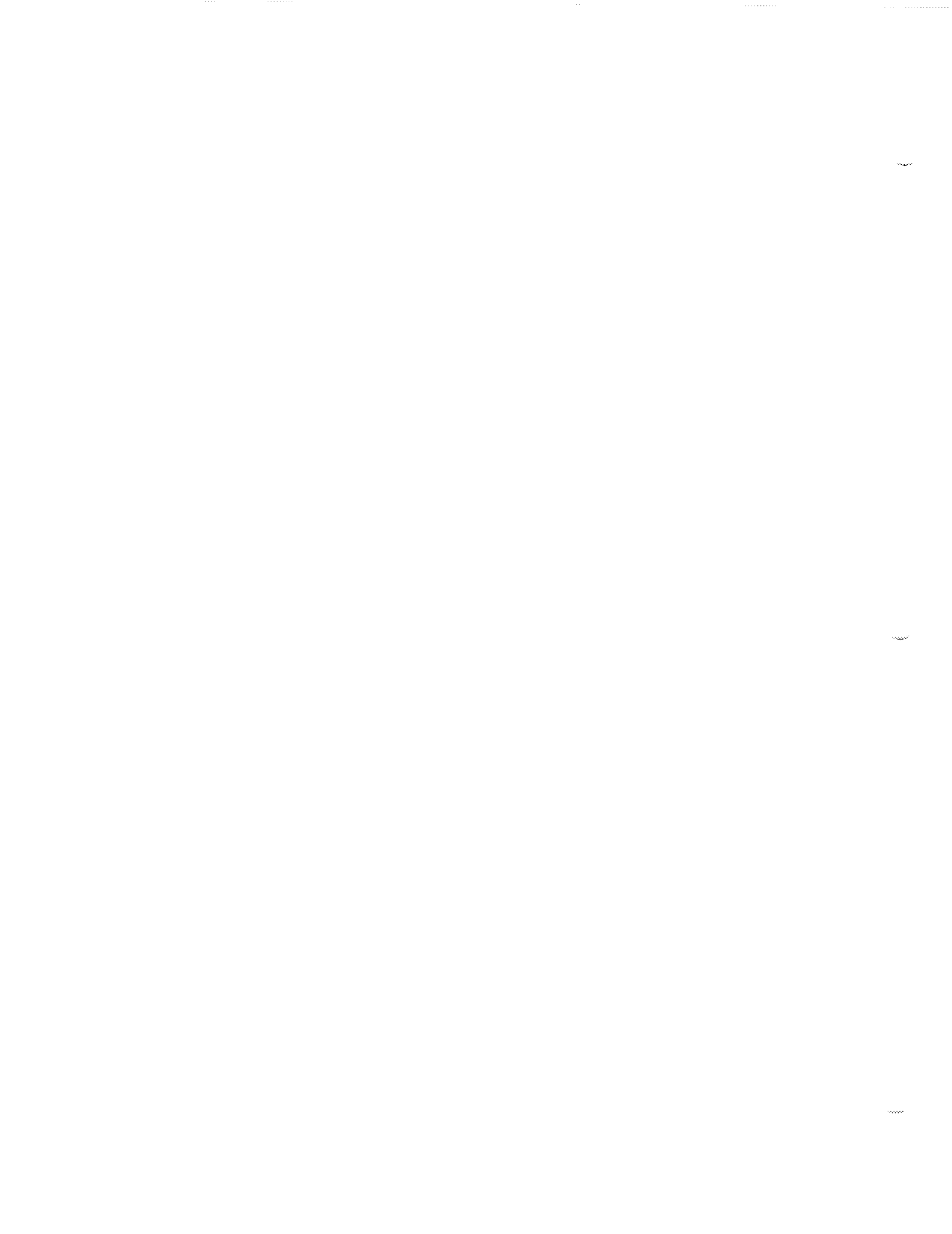




Fig. 1.1. HP 8562A/B front panel.

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.



MANUAL OPERATION

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 sweep time, 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.






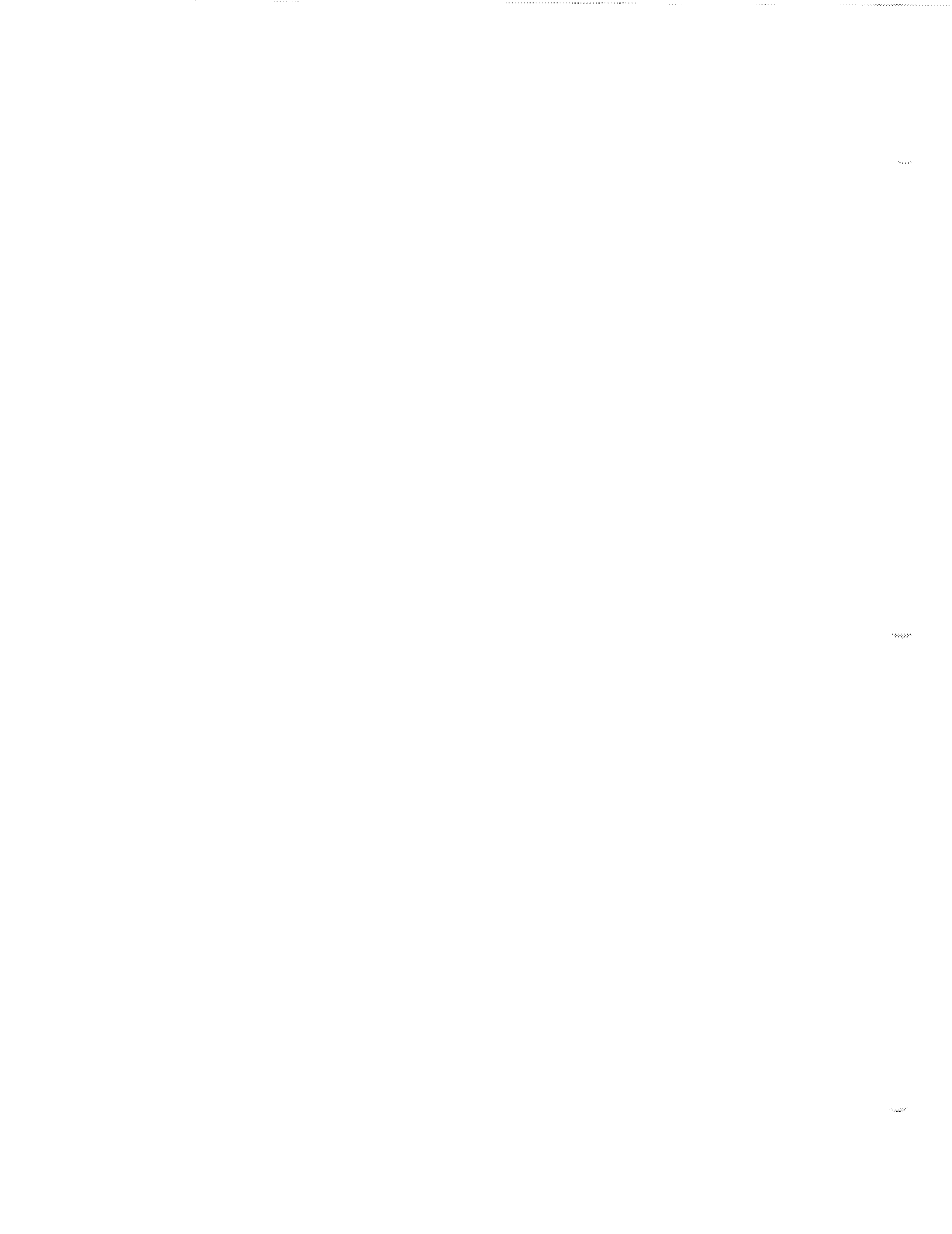
CONNECTOR	FREQUENCY RANGE	AMPLITUDE/ VOLTAGE LIMITS
 RF INPUT	1 kHz - 22 GHz (up to XX GHz with external mixers)	0 Vdc Max +10 dBm Max
 PROBE POWER	—	+15V, -12V (150 mA max)
 CALIBRATOR OUTPUT	300 MHz	-10 dBm
 IF INPUT	321.4 MHz	0 Vdc Max
 LO OUTPUT	3 GHz - 6.81 GHz	+16 dBm

Table 1.1. Front-panel connector data.



Display Annotation

Figure 1.2 illustrates the display annotation.

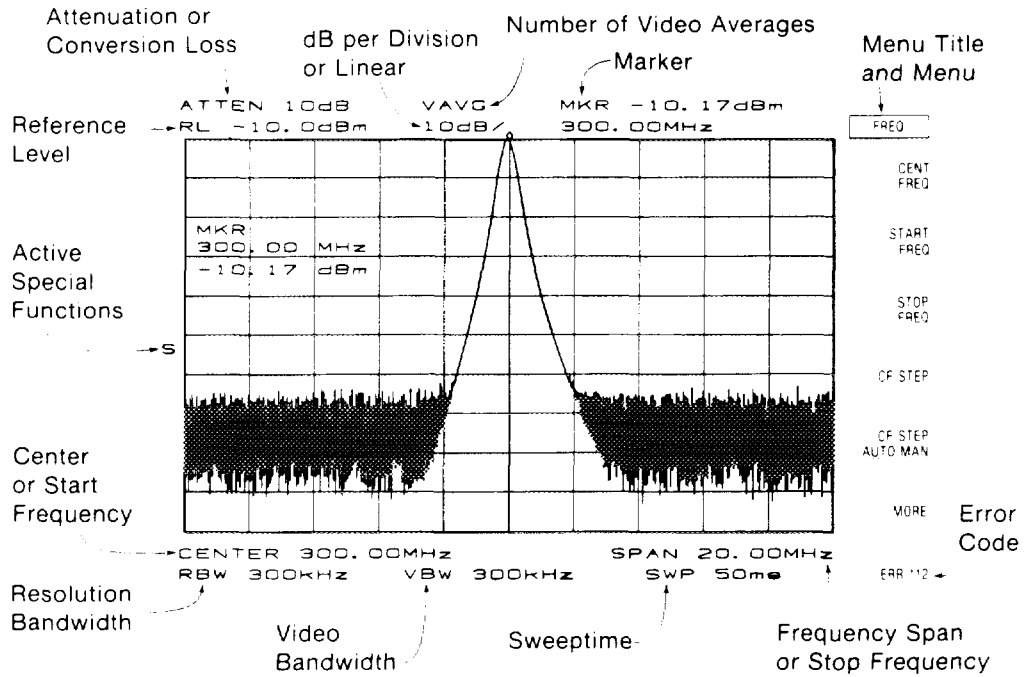


Fig. 1.2. Display annotation.

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

MANUAL OPERATION

THE REAR PANEL

The following paragraphs describe the functions available from the rear panel, as shown in Figure 1.3.

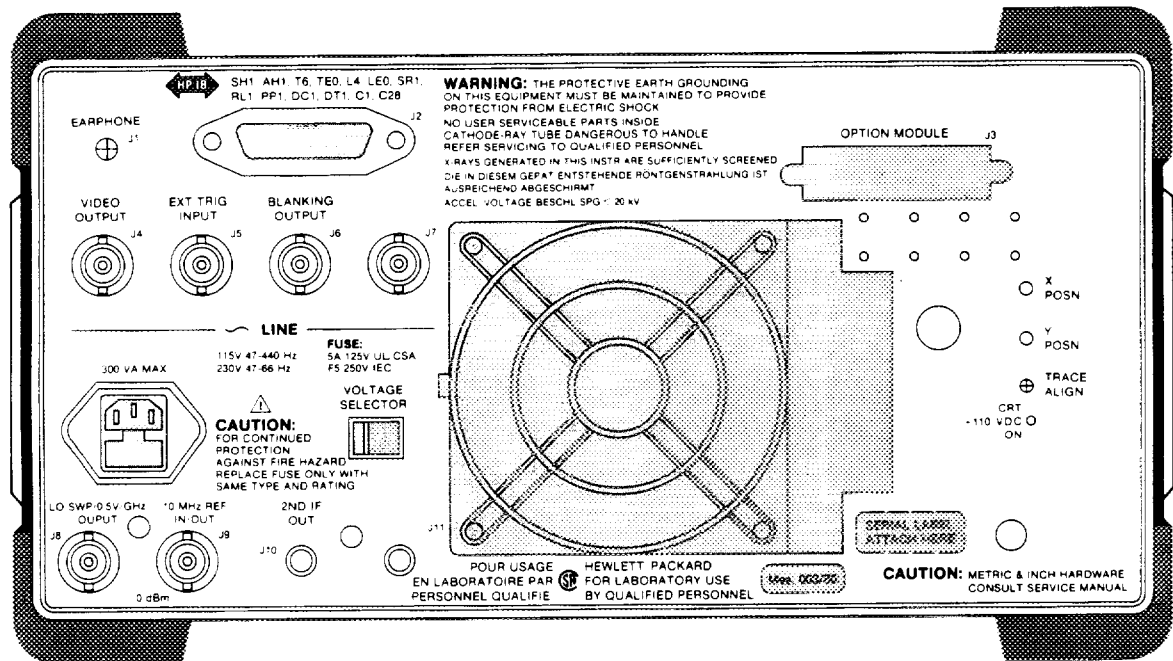


Fig. 1.3. HP 8562A/B rear panel.

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.

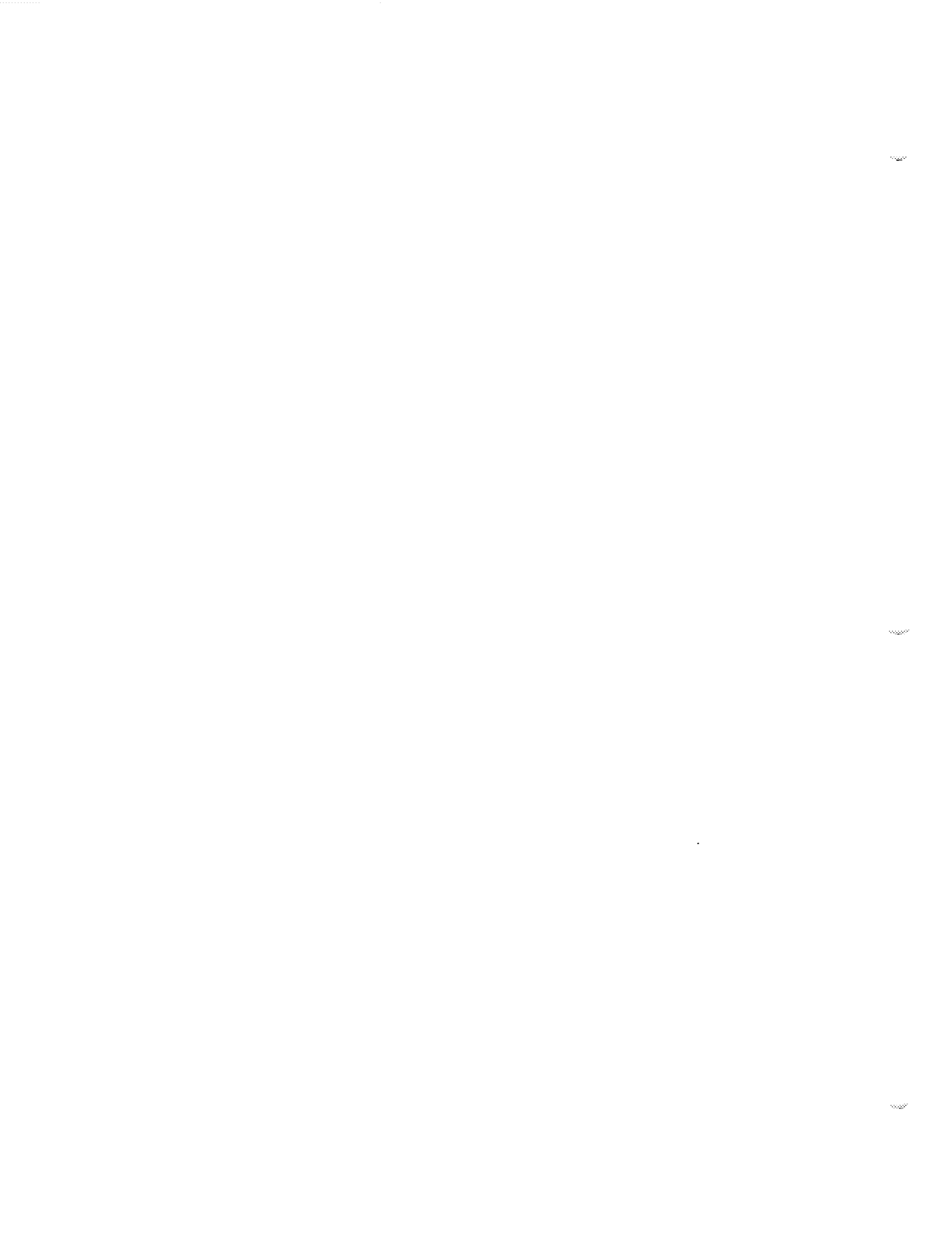
J5 provides an external trigger input. The input signal range is 0-5 V (TTL). When the trigger is in external mode, the instrument sweep triggers on the rising, positive edge of the signal (about 1.5 V).

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.

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.

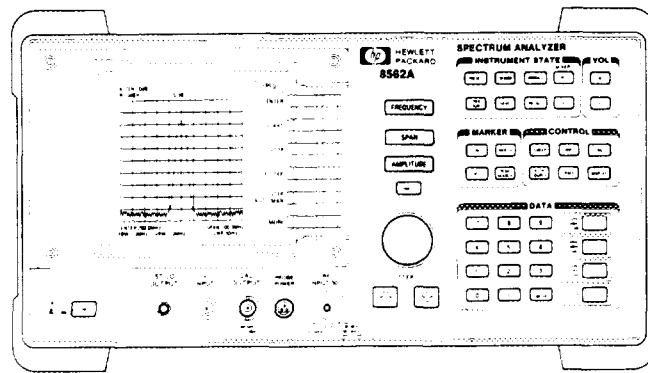
X POSN, Y POSN, and TRACE ALIGN allow you to align the spectrum analyzer CRT using a special CRT pattern. Refer to the softkey CRT ADJ PATTERN under the **RECALL** menu, or consult the Installation and Support Manual.



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

MANUAL OPERATION

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.
- 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 \pm 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.

- 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.
- 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 SWEEP 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.

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

MANUAL OPERATION

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

IF ADJ ON OFF allows you to turn the automatic IF adjustment ON or OFF. This function 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 IF STATE executes a routine that adjusts only the current state of the IF system.

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

PREV MENU accesses the previous menu of softkeys.

UNITS accesses additional amplitude functions, which are described below.

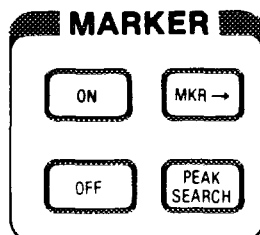
UNITS AUTO MAN selects amplitude units automatically (AUTO) or manually (MAN). When in AUTO mode, the default units are dBm (in log scale) or VOLTS (in linear scale). The following units are available from this menu:

dBm (absolute decibel above 1 milliwatt)
dB μ V (absolute decibel above 1 microvolt)
dBmV (absolute decibel above 1 millivolt)
VOLTS
WATTS

PREV MENU accesses the previous menu of softkeys.

MANUAL OPERATION

ON



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.

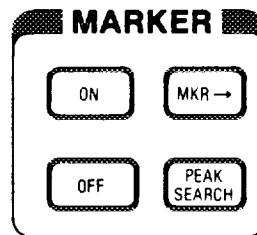
An example of how to use MARKER 1/DELTA appears in Appendix E of the Pocket Operating Guide.

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.

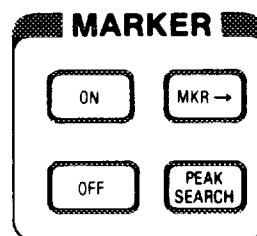
SIG TRK ON OFF turns the signal tracking function ON or OFF. The signal track function keeps the active marker on the signal where it has been initially placed and sets the center frequency to its value. This is done after every sweep, thus maintaining the marker signal at the center frequency. This 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

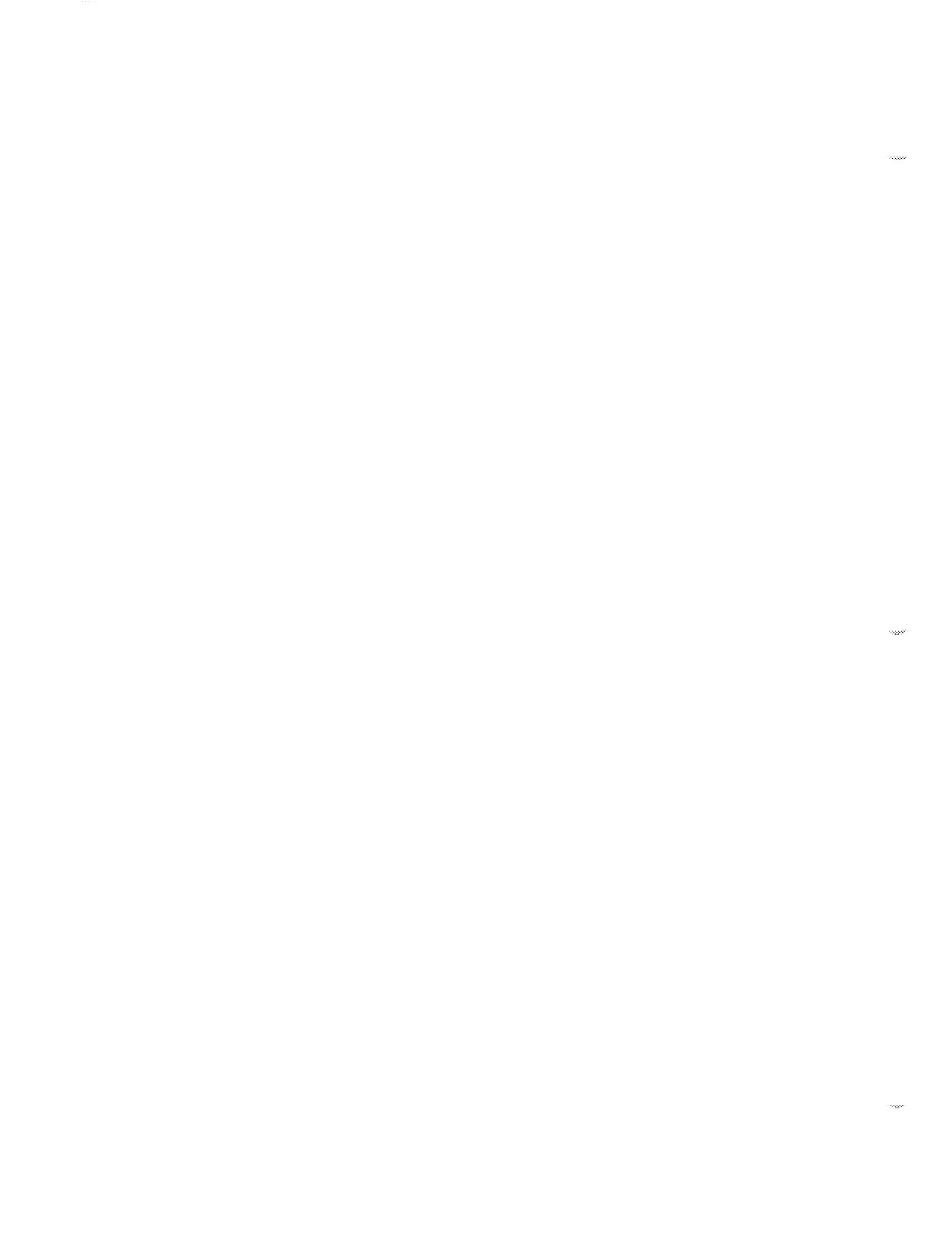


PEAK SEARCH places a marker on the highest point of a trace and accesses a menu of marker functions. The frequency and amplitude of the marker are displayed in the upper-right corner of the screen; **PEAK SEARCH** does not alter the active function. In most cases, **PEAK SEARCH** does not find the LO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

MANUAL OPERATION

- MARKER →** sets the center frequency equal to the marker frequency. This function provides a quick way 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.
- CF**
- 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.
- NEXT PEAK** moves the active marker to the next highest trace point relative to the current marker position. 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 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.
- MORE** accesses additional marker functions, which are described below.
- NEXT PK RIGHT** finds the next peak to the right of the current marker position. The trace peak must meet the current peak excursion and peak threshold criteria in order to be considered a peak.
- NEXT PK LEFT** finds the next peak to the left of the current marker position. The trace peak must meet the current peak excursion and peak threshold criteria in order to be considered a peak.
- PEAK EXCURSN** defines what constitutes a peak on a trace. To enter a value, use the DATA keys, STEP keys, 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.



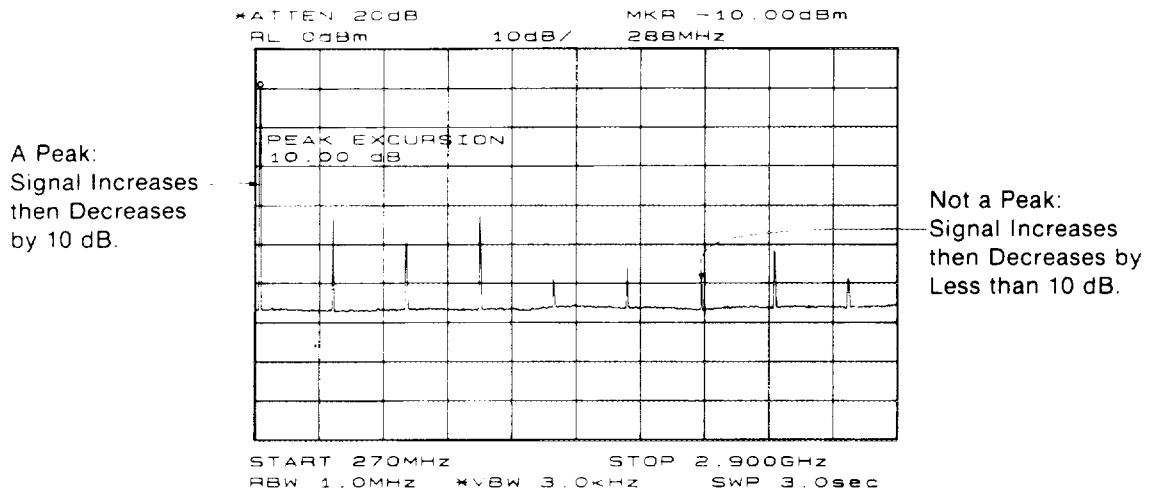
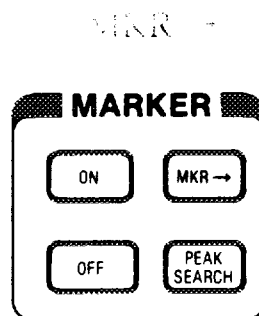


Fig. 3.1. PEAK EXCURSN defines the peaks on a trace.

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 -> 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.

MKRA → 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 function.

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

MKRA → CF STEP sets the center frequency step-size equal to the difference in frequency between the two markers. **MKRA → 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.



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

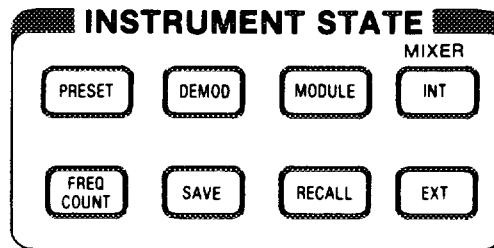
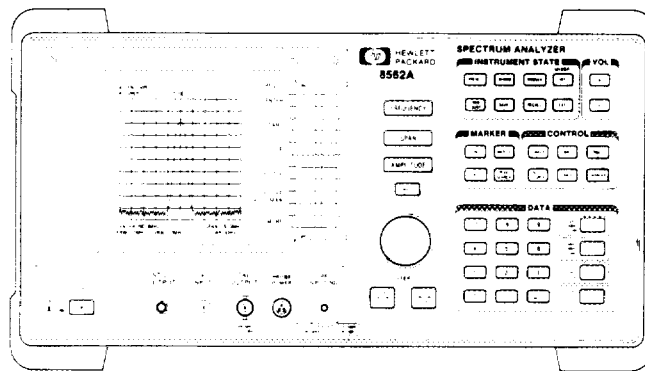
- MKR1/Δ→** sets the center frequency equal to the frequency corresponding to the time period designated by the two markers. **MKR1/Δ→ CF** does not change the active function.
- MKR1/Δ→** sets the center frequency step size equal to the frequency corresponding to the time period designated by the two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



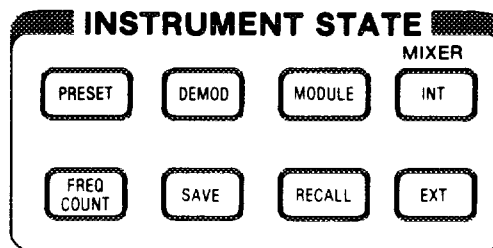
CHAPTER 4

INSTRUMENT STATE FUNCTIONS

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



PRESET



MANUAL OPERATION

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.

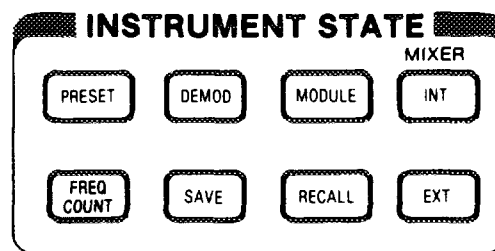
FUNCTION	STATE
FREQ MODE	CENTER-SPAN
CENTER FREQ	12.38 GHz (HP 8562A); 1.45 GHz (HP 8562B)
SPAN	19.25 GHz (HP 8562A); 1.45 GHz (HP 8562B)
CF STEP	1.93 GHz, AUTO
FREQ OFFSET	0 MHz, OFF
10 MHz REF	INTERNAL
REFERENCE LEVEL	0 dBm
INPUT ATTENUATION	10 dB, AUTO
MAX MIXER LEVEL	-10 dBm
REF LEVEL OFFSET	0 dBm, 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

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



- RECALL PWR ON** sets the instrument state to the same state that occurred when **LINE** was switched on. This state must be saved initially under the **SAVE** key.
- LAST STATE** recalls the instrument state that existed previous to pressing **PRESET** or turning off the power.
- REALIGN LO & IF** activates the automatic local oscillator (LO) and intermediate frequency (IF) alignment routines. These are the same routines that occur when **LINE** is switched on. When this function 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 measurements made by the instrument may not meet published specifications.
- HP-IB ADDRESS** displays the current HP-IB address in the active function block. To change the address, use 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 activates 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 ON OFF** allows you to activate (ON) or deactivate (OFF) the counter mode. The counted value appears in the upper-right corner of the display.
- COUNTER RES** adjusts the resolution of the frequency-count measurement. The resolution ranges from 10 Hz to 1 MHz in decade increments. The default value is 10 kHz.

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.

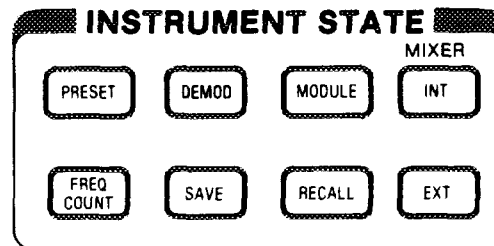
The marker reads data from the currently active trace. (An active trace is one in either the clear-write or max-hold mode; this may be either Trace A or Trace B.) If both traces are active, or if both traces are in view mode, the marker reads data from Trace A.

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 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



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 ON OFF turns FM demodulation ON or OFF. If no marker is active and the frequency span is greater 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 bandwidth 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 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.

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

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

The following softkeys complete the **DEMOD** menu.

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.

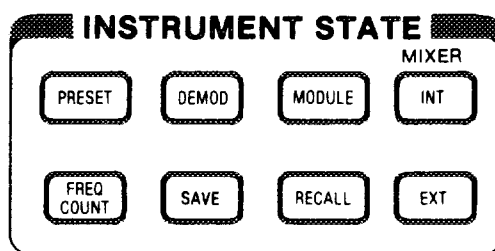
NEXT PEAK moves the active marker to the next highest trace point relative to the current marker position. This function finds successively lower peaks when the key is pressed repeatedly.

MORE accesses a menu of additional demodulation functions.

MANUAL OPERATION

- DEMOD TIME** adjusts the duration of demodulation between successive sweeps when the span is greater than 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 and SQUELCH ON OFF** adjust the squelch level. The value is displayed in the active function block, in dBm. The squelch level is also indicated by a dashed line across the display. A marker must be active and above the squelch line for demodulation to occur when squelch is on; in zero span, squelch is inactive.
- AGC ON OFF** switches the automatic gain control (AGC) ON or OFF. The AGC keeps the volume relatively constant during AM demodulation. AGC is available only during AM demodulation and when the frequency span is greater than 0 Hz.
- PREV MENU** displays the previous menu of softkeys.

SAVE



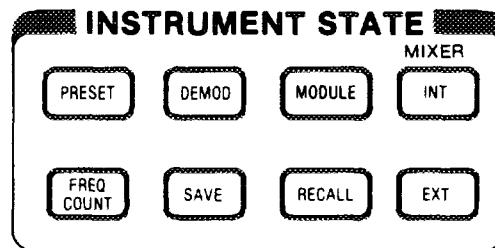
SAVE accesses a menu of softkeys that allow you to save instrument-state data and trace data. These functions are described below.

SAVE STATE displays a menu of registers in which the current instrument state can be stored. Registers 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 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."

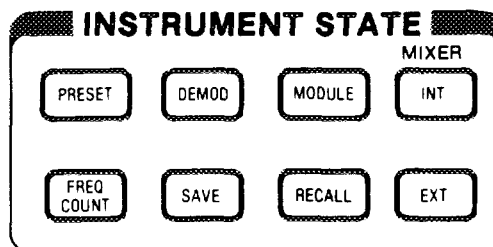
- PWR ON STATE** saves the current instrument state in the power-on register. The spectrum analyzer will then be set to this state whenever **LINE** is switched on. The same state can be retrieved with **RECALL PWR ON** (available from the **PRESET** menu).
- SAVE TRACE A** displays a menu of registers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



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



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.

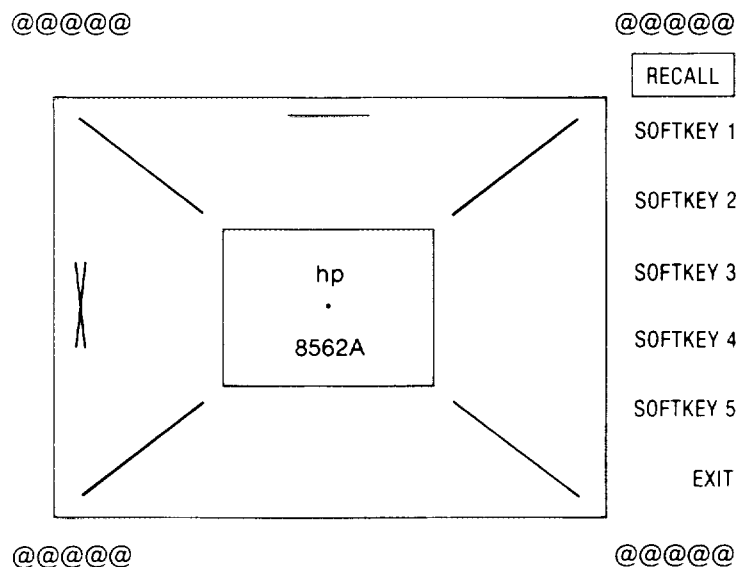
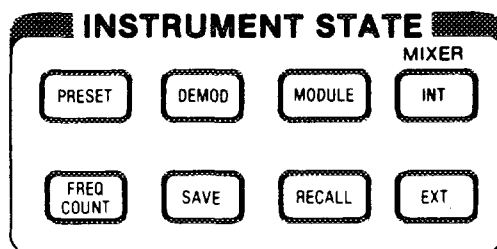


Fig. 4.1. CRT alignment pattern. X POSN moves the display left and right; Y POSN moves the display up and down. TRACE ALIGN rotates the display.

MANUAL OPERATION

- ELAPSED TIME** displays the cumulative operating time of the spectrum analyzer. The value, which is expressed in hours, appears in the active function block.
- FACTORY PRSEL PK** (HP 8562A only) restores the preselector-peaking data that is set at the factory and makes this data the current preselector data. This data is stored in the factory data table and cannot be changed.
- RECALL PRSEL PK** (HP 8562A only) recalls the preselector data that is stored by the user in the user data table. 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



INT accesses a menu of functions that employ the internal input mixer in the spectrum analyzer. These functions are described below.

PRESELECTION 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**.

MANUAL OPERATION

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 VS FREQ displays the stored conversion loss for a specific frequency in the current 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 AVERAGE 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 MENU displays the previous menu of softkeys.

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

SIG ID AT MKR activates a signal identification function for locating the correct mixer 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 number appear in the active function block. If the function cannot identify the signal, "NOT FOUND" is displayed in the active function block.

SIG ID → CF sets the center frequency to the frequency 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.

MANUAL OPERATION

- SIG ID ON OFF** switches the manual signal identification function ON and OFF. When ON, 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 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.
- 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.
- 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.
- BIAS** displays a menu of functions that allow you to select external-mixer bias. The bias is provided on the center conductor 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 OFF** turns off the external-mixer bias.
- POSITIVE BIAS** selects positive mixer bias for an external mixer. This value, which can 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 greater than 0 mA, a "+" appears on the left edge of the display.
- NEGATIVE BIAS** selects negative mixer bias for an external mixer. This value, which can 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 MENU** displays the previous menu of softkeys.

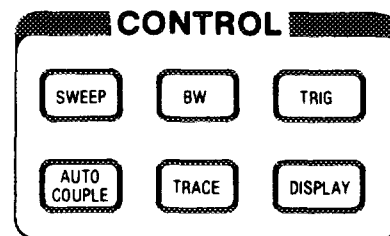
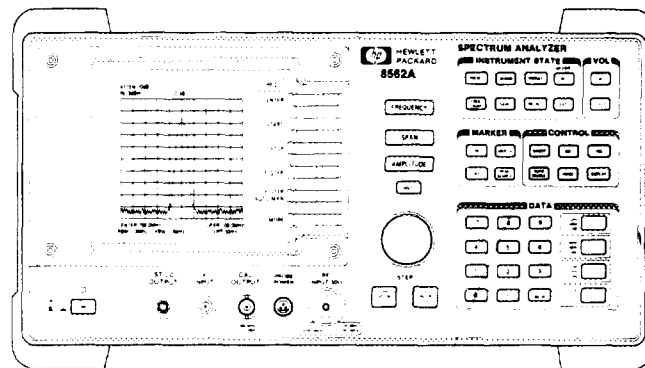




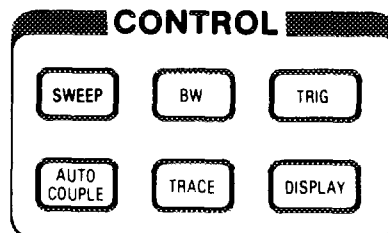
CHAPTER 5

CONTROL FUNCTIONS

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



SWEEP



MANUAL OPERATION

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

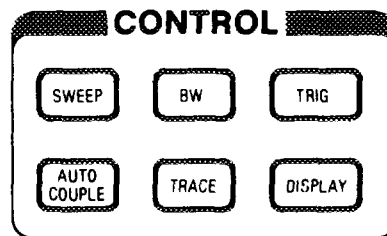
REAR PNL OUTPUT displays a menu of functions that provide access to certain signals via a rear-panel output. These functions are described below.

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

.5V/GHz (FAV) provides a DC ramp out of J8. The ramp is a frequency-analog voltage corresponding to the tuned frequency of the analyzer. The voltage is 0.5 V per GHz, from 0 Hz to 22 GHz.

PREV MENU displays the previous menu of softkeys.

AUTO COUPLE



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

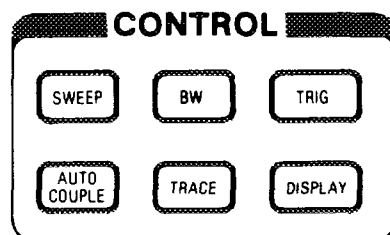
ALL sets the video bandwidth, the resolution bandwidth, the input attenuator, the sweep time, and the center frequency step-size to coupled mode. The spectrum analyzer chooses appropriate values for these functions depending on the selected frequency and span (or start and stop frequencies). These values are set according to the coupled ratios stored under the softkeys **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 bandwidth. The ratio is displayed in the active function block, and it is used when the two bandwidths 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 LEVEL** selects the maximum signal amplitude seen at the input mixer. This value is always in dBm, 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 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.

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, ranges from 100 Hz to 1 MHz in a 1, 3, 10 sequence. The value can be changed using the DATA keys, the STEP keys, or the knob. Press either key to activate the resolution bandwidth. 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.

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, ranges from 1 Hz to 3 MHz in a 1, 3, 10 sequence. The value can be changed using the DATA keys, the STEP keys, or the knob. Press either key to activate the video bandwidth. A line 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

MANUAL OPERATION

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.

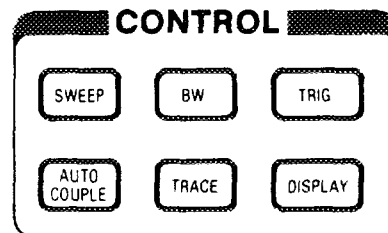
MAX NO. VID AVGS selects the number of sweeps used in video averaging (see below). This value ranges from 1 to 999 and appears in the active function block. After the desired value is entered, video averaging automatically begins. A number indicating the sweeps that have been averaged appears at the 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



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.

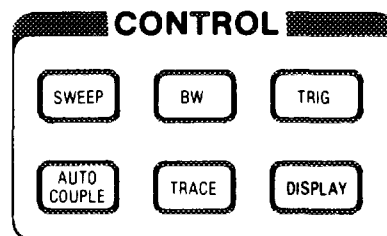
MAX HOLD A displays and holds in Trace A the maximum responses of the input signal. In this mode the trace accepts data from subsequent sweeps.

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.

- 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** 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.
- LINE**
and
DSP LINE
ON OFF
- THRESHLD** 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.
- and**
THRESHLD
ON OFF
- PLOTTER** 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.
- MENU**
- PLOT** 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.
- ALL**

MANUAL OPERATION

- 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).

MANUAL OPERATION

Use $A-B+DL\rightarrow A$ to Correct Data

The function $A-B+DL\rightarrow A$ provides the most versatile method for applying correction data to a trace. $A-B+DL\rightarrow A$ 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 $A-B+DL\rightarrow A$ 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 $A-B+DL\rightarrow A$. 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 $A-B+DL\rightarrow A$. 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 $A+B\rightarrow A$ moves Trace A data up the screen, while the function $A-B\rightarrow A$ 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).



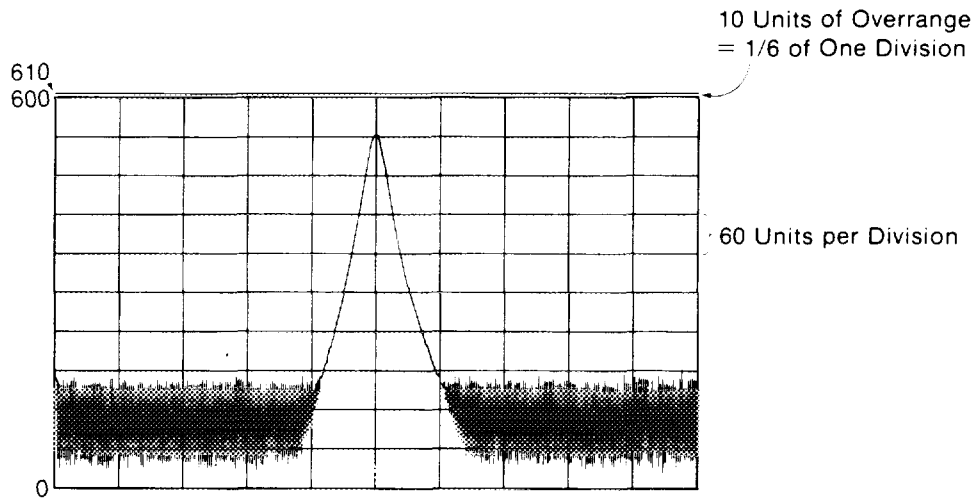


Fig. 5.1. HP 8562A/B display units.

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.

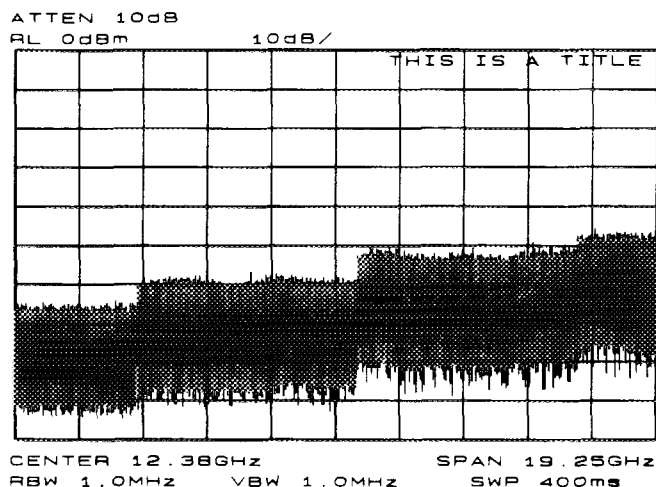


Fig. 6.1. Screen titles appear in the upper-right corner of the display.

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
```



REMOTE OPERATION

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

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.

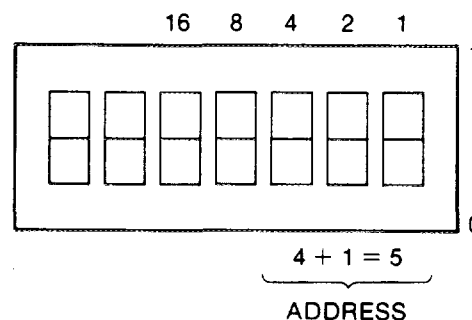


Fig. 7.1. Plotter address set to five.

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.

REMOTE OPERATION

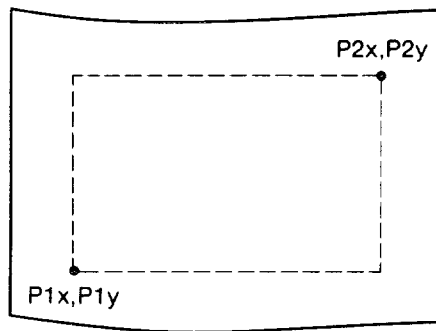


Fig. 7.2. P1 and P2 coordinates.

Plotter	TYPICAL SCALING POINTS		PLOTTING RANGE	
	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.

REMOTE OPERATION

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 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

```


REMOTE OPERATION

Example 2

```
10      SUB Enter_data(Fa,Fb,Rl,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, dB μ V, 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,Rl,Rb,Vb,St,Lg,Aunits$)
40      OUTPUT 718;"TDF P;TRA?;"
50      ENTER 718;A(*)
60      END
70      SUB Get_data(Fa,Fb,Rl,Rb,Vb,St,Lg,Aunits$)
80      OUTPUT 718;"FA?;FB?;RL?;RB?;VB?;ST?;LG?;AUNITS?;"
90      ENTER 718 USING "K";Fa,Fb,Rl,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,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

```


REMOTE OPERATION

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 dB μ V

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:

$$n = \text{RL}(x/600)$$

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.

REMOTE OPERATION

Example 7

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

```


REMOTE OPERATION

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
```

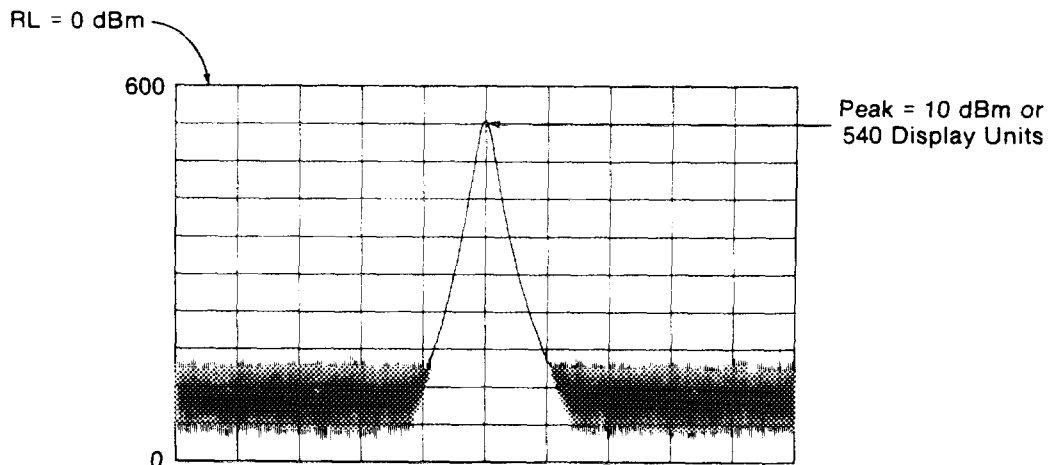


Fig. 8.1.

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/lsh length: character or numerical data. Defined for each command where used.

LANGUAGE REFERENCE

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.

Resolution Bandwidth

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.

Sweeping Control

AUTOCP	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.

LANGUAGE REFERENCE

Demodulation

DEMODO	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 (LO).
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.

LANGUAGE REFERENCE

Preselector Control

PP Peaks preselector.
PSDAC Preselector peak data.

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.

<u>BIT</u>	<u>DECIMAL</u>	<u>DEFINITION</u>
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.

Initialization

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

Processing

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.

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

Marker 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.



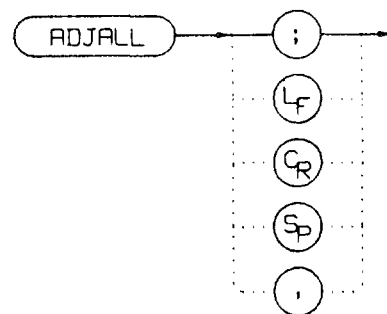
CHAPTER 14

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.

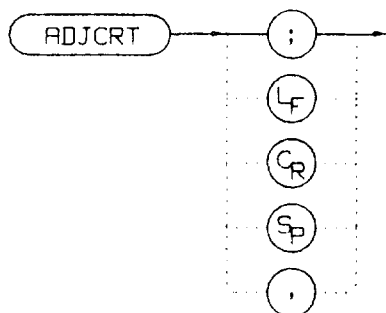
EXAMPLE

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


LANGUAGE REFERENCE

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.

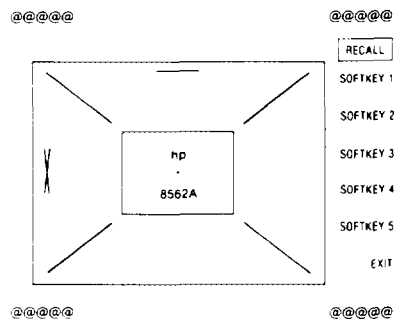


Fig. 14.1. CRT alignment pattern. X POSN moves the display left and right; Y POSN moves the display up and down. TRACE ALIGN rotates the display.

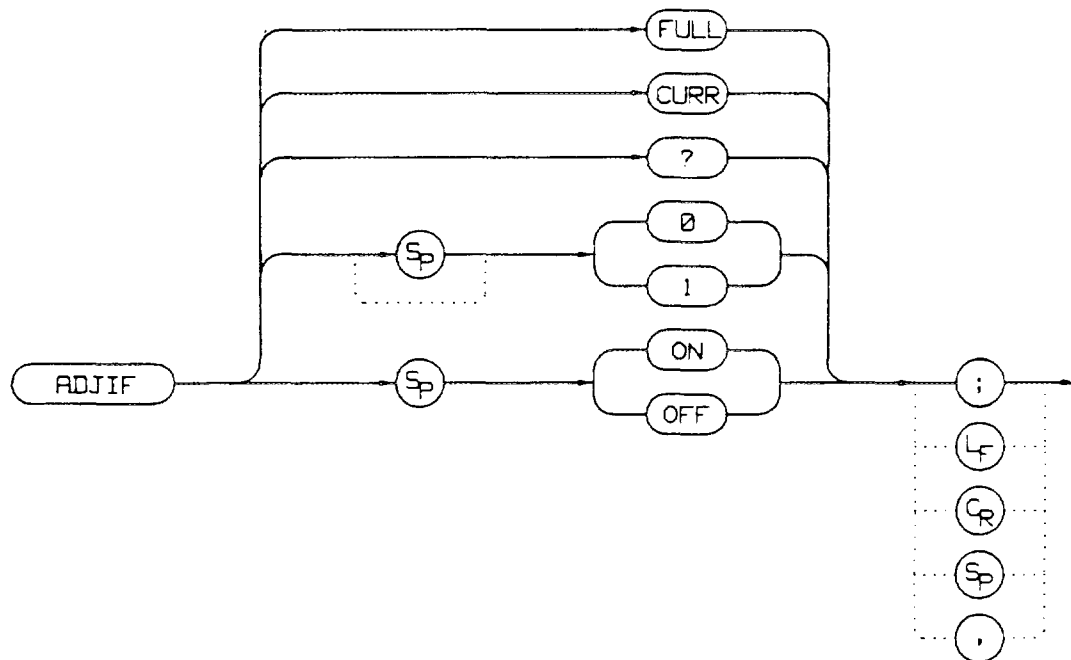
EXAMPLE

```
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



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

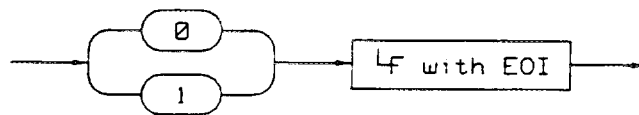
ON: Reactivates the IF adjustment

LANGUAGE REFERENCE

PRESET STATE

On

QUERY RESPONSE



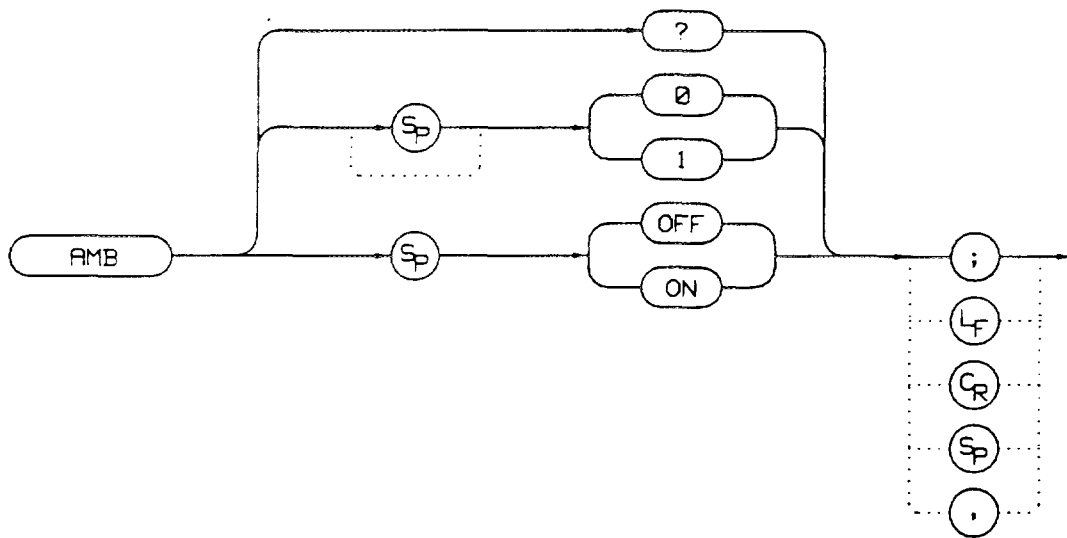
EXAMPLE

```
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

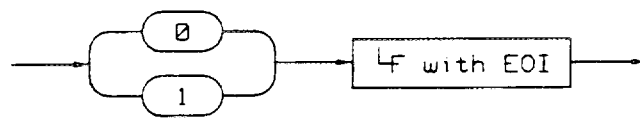
The displayed amplitude of each trace element falls in one of 600 data points. There are 10 points of overrange, which corresponds to 1/6 of a division of overrange. When adding or subtracting trace data, any results exceeding this limit are clipped at the limit.

LANGUAGE REFERENCE

TEST STATE

Off

QUERY RESPONSE

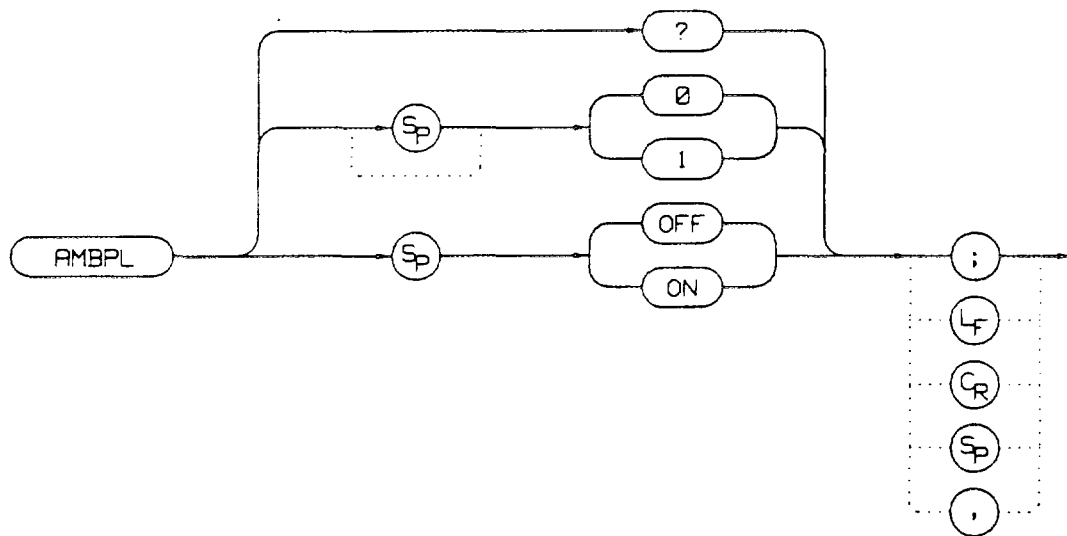


EXAMPLE

```
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

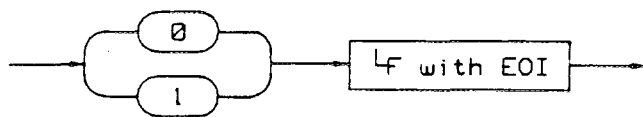
The displayed amplitude of each trace element falls in one of 600 data points. There are 10 points of overrange, which corresponds to 1/6 of a division of overrange. When adding or subtracting trace data, any results exceeding this limit are clipped at the limit.

LANGUAGE REFERENCE

PRESET STATE

Off

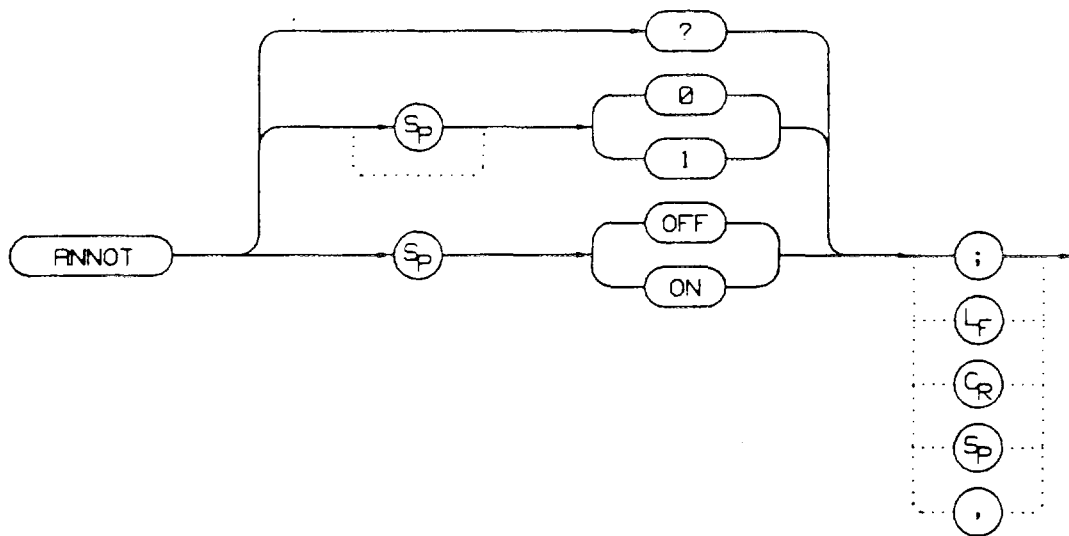
QUERY RESPONSE



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



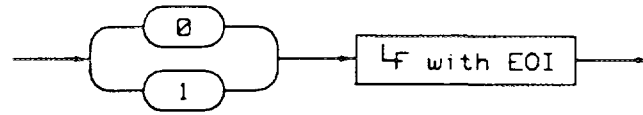
The ANNOT command turns the display annotation off or on.

ANNOT STATE

On

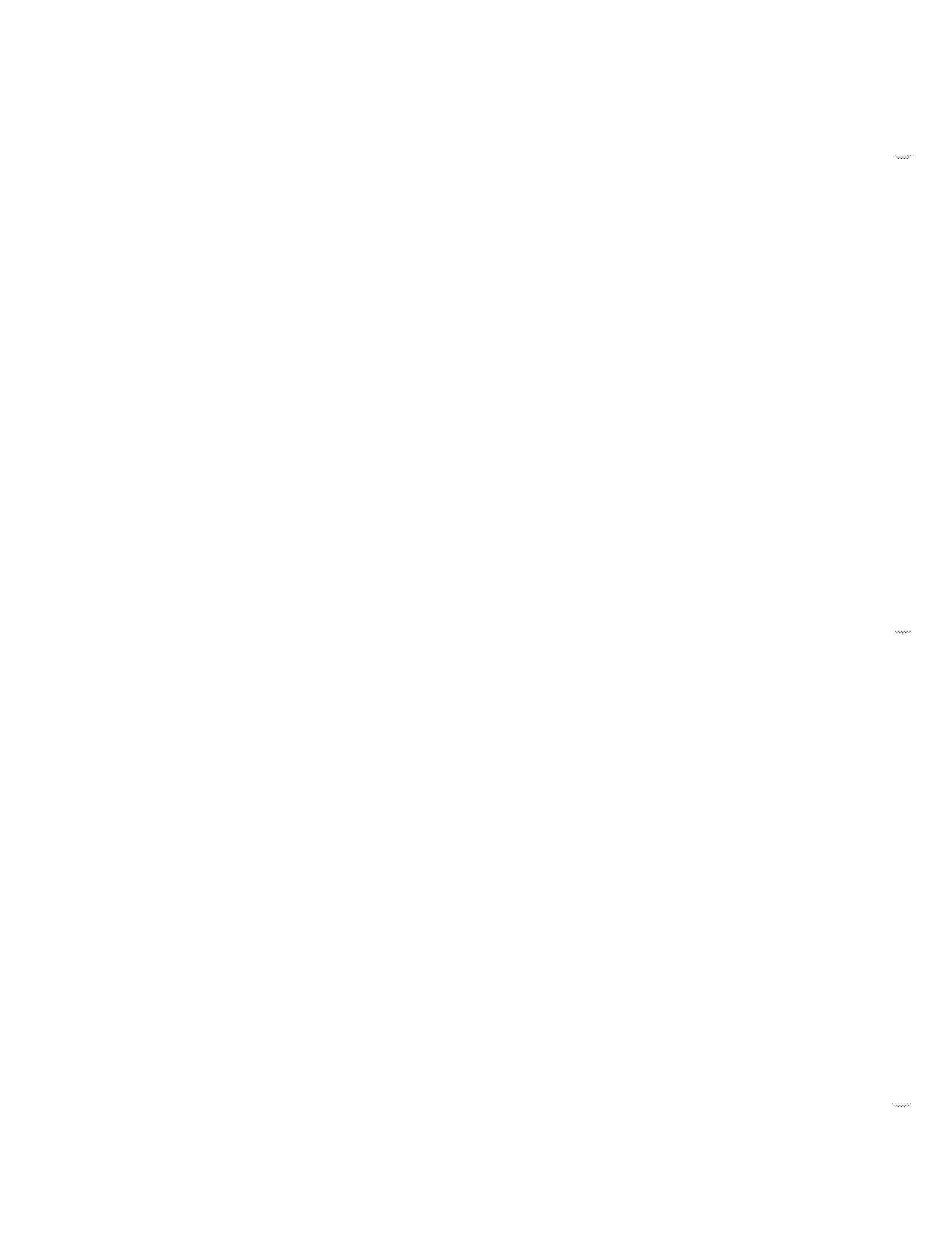
LANGUAGE REFERENCE

QUERY RESPONSE

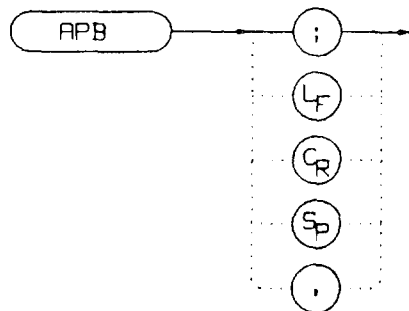


EXAMPLE

```
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



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

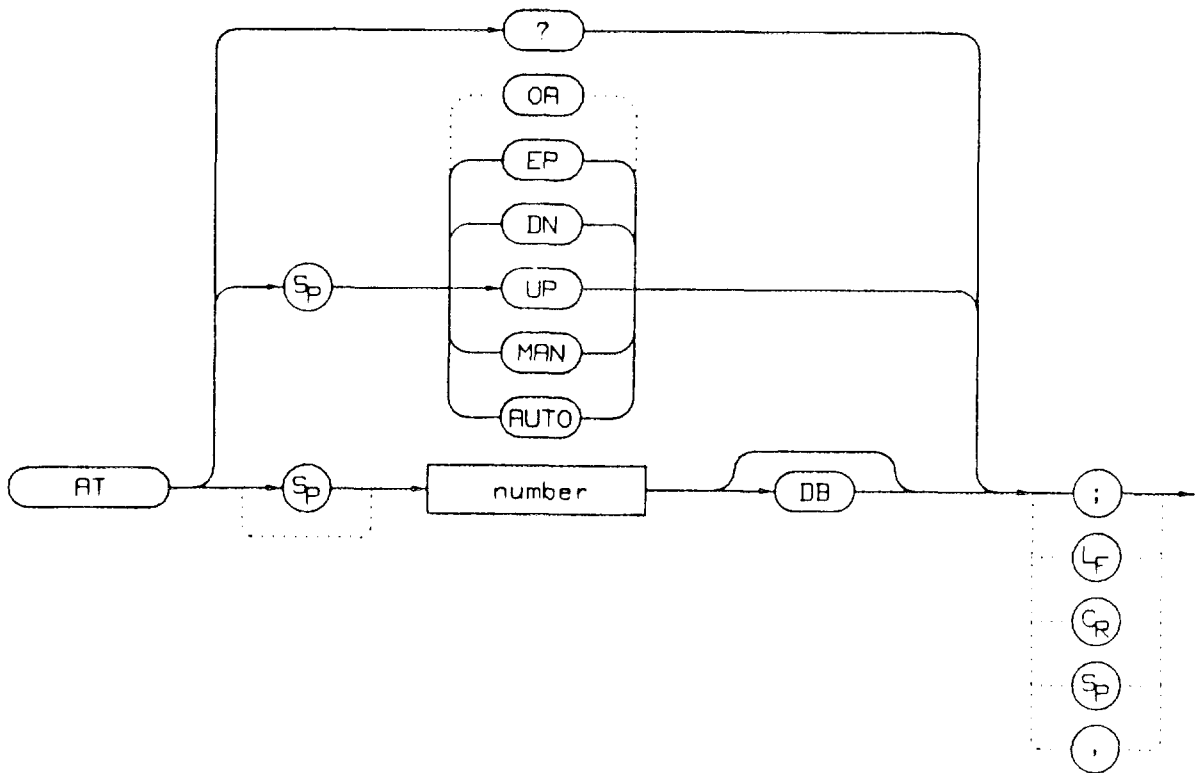
```



LANGUAGE REFERENCE

AT
INPUT CONTINUATION

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.

RESET STATE

Coupled mode, 10 dB

QUERY RESPONSE



EXAMPLE

```

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

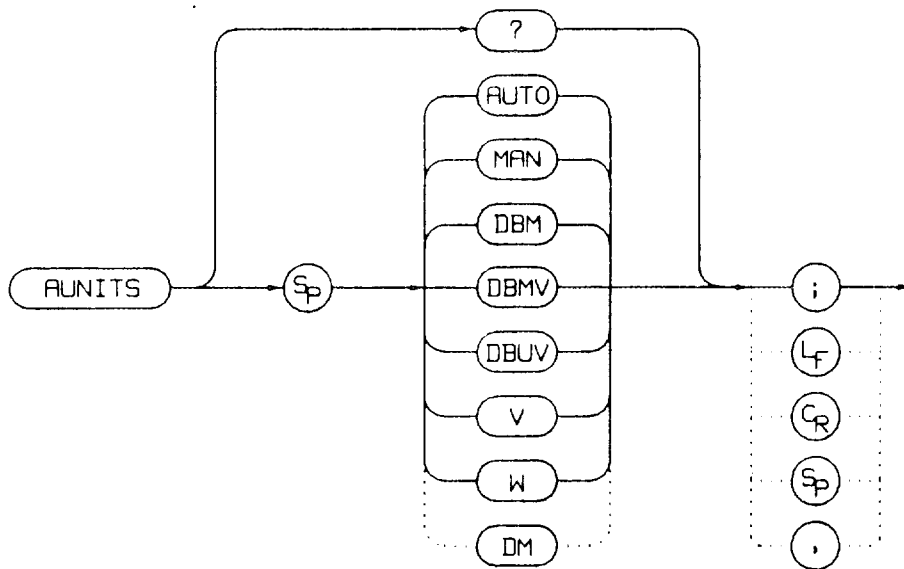


LANGUAGE REFERENCE

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.

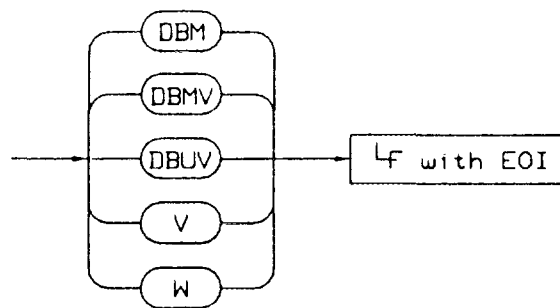
MAN: sets amplitude units to manual mode.



PRESET STATE

Coupled mode, dBm

QUERY RESPONSE



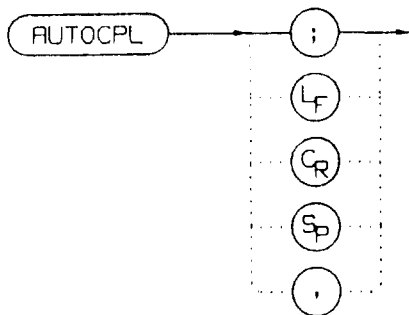
EXAMPLE

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


LANGUAGE REFERENCE

AUTOCP AUTO COUPLED

SYNTAX



DESCRIPTION

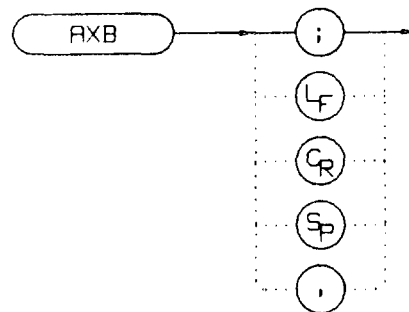
The AUTOCP command sets the video bandwidth, the resolution bandwidth, the input attenuator, the sweep time, and the center frequency step-size to coupled mode. These functions can be recoupled individually or all at once. The spectrum analyzer chooses appropriate values for these functions. The video 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;"AUTOCP;"  
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.

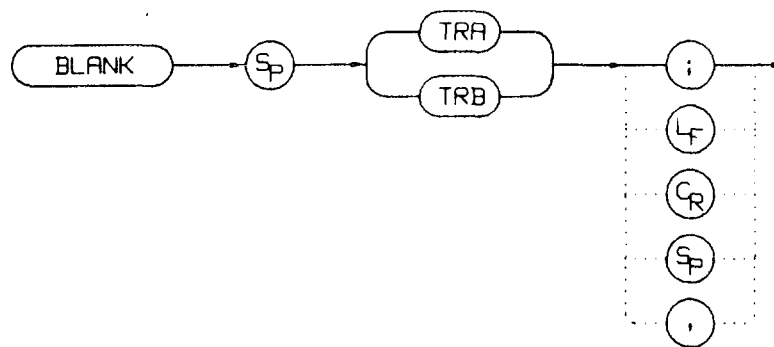
EXAMPLE

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


LANGUAGE REFERENCE

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.

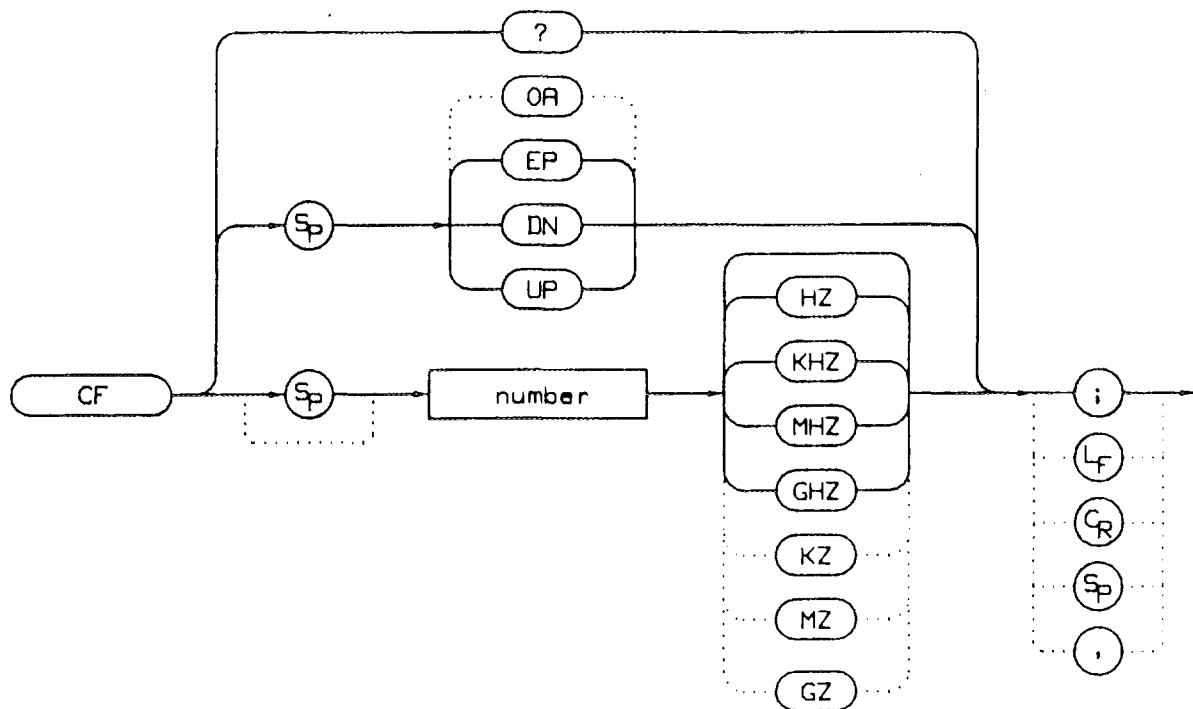
EXAMPLE

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


LANGUAGE REFERENCE

CF CENTER FREQUENCY

SYNTAX



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.

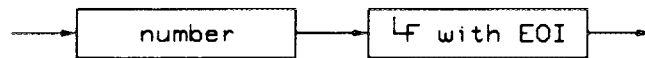
PARAMETERS

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.

MESSAGE RATE

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

MESSAGE RESPONSE



EXAMPLE

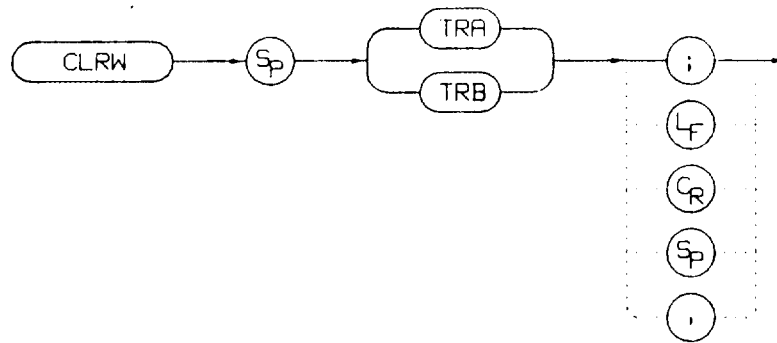
```
10      OUTPUT 718;"IP;"  
20      OUTPUT 718;"CF 300MHZ;SP 20MHZ;TS;"  
30      OUTPUT 718;"CF?;"  
40      ENTER 718;Cf  
50      PRINT Cf  
60      END
```



LANGUAGE REFERENCE

CLRW
CLEAR WRITE

SYNTAX



DESCRIPTION

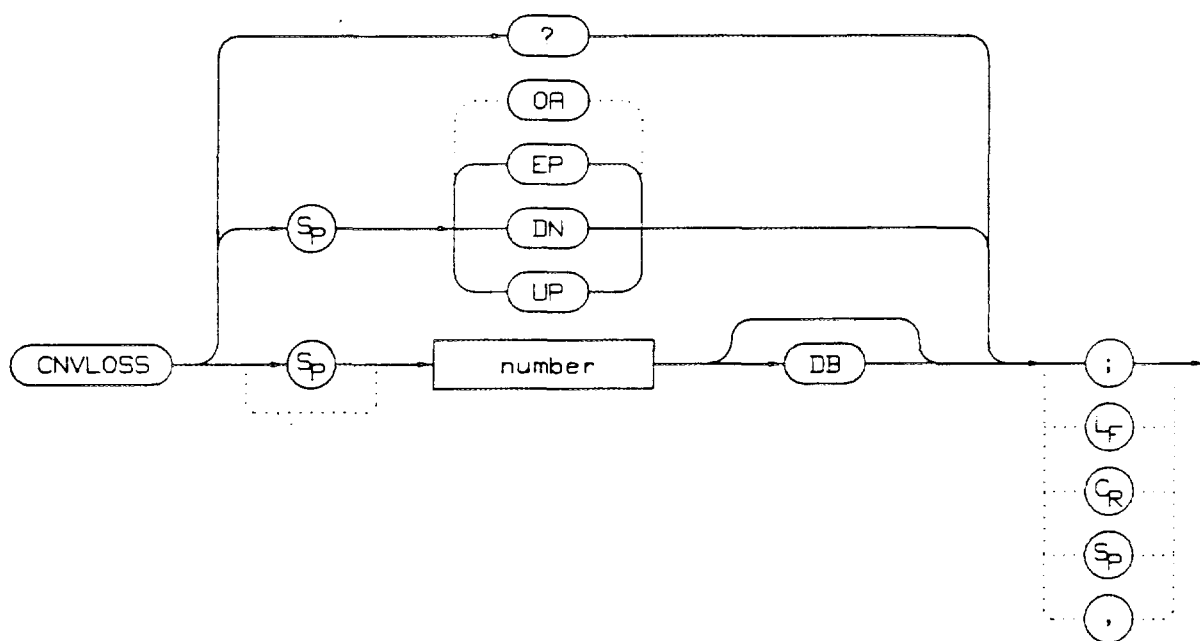
The CLRW command sets the chosen trace to clear-write mode. This mode sets each element of the chosen trace to the bottom-screen value; then new data from the detector is put in the trace with each sweep.

EXAMPLE

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



CONVERSION LOSS



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, querying CNVLOSS returns a zero.

PARAMETERS

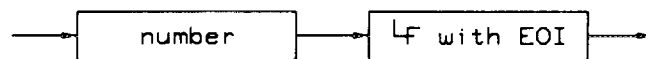
number: any real
 UP/DN: 0.1 dB

LANGUAGE REFERENCE

PRESET STATE

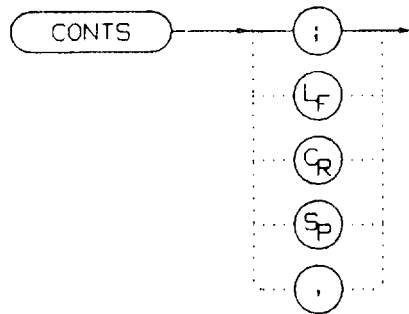
30 dB

QUERY RESPONSE



EXAMPLE

```
10      OUTPUT 718;"IP;MXRMODE EXT;"
20      INPUT "ENTER THE DESIRED FREQUENCY BAND (KAQVVEWFDGY 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
```

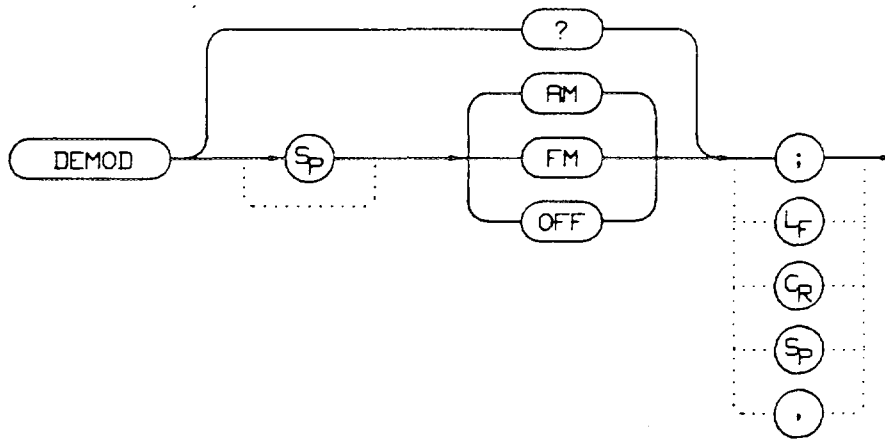
The CONTS command activates the continuous-sweep mode. This mode enables another sweep at the completion of the current sweep once the trigger conditions are met.

On

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


LANGUAGE REFERENCE

DEMOC DEMODULATION



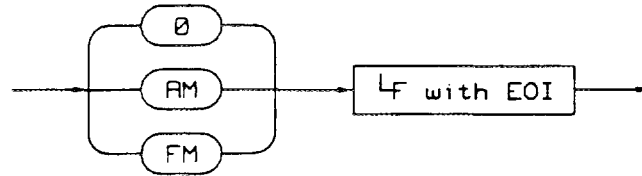
DESCRIPTION

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.

INIT STATE

Off

RESPONSE



```

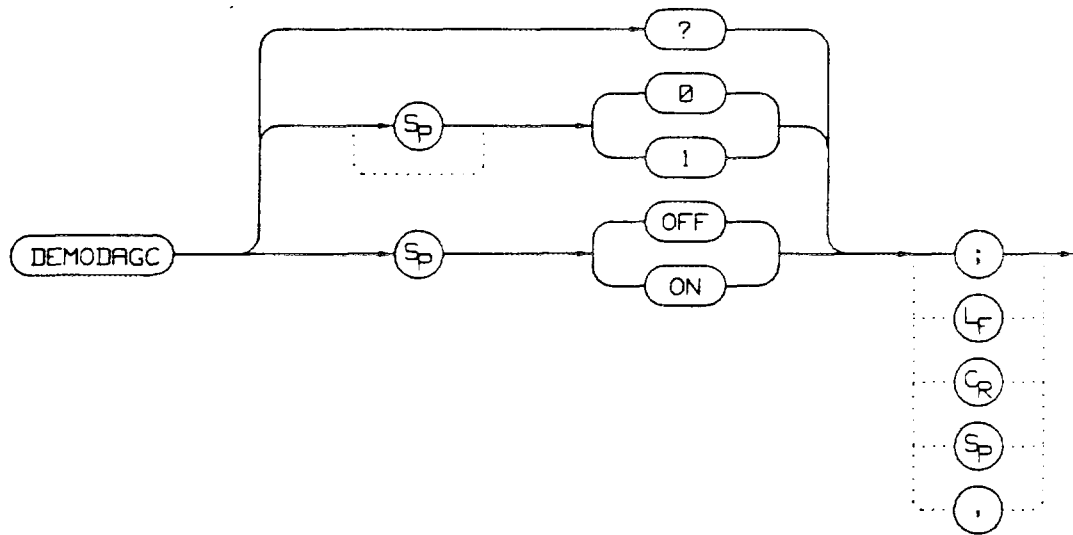
10      OUTPUT 718;"IP;"
20      OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
30      OUTPUT 718;"MKN EP;"
40      PRINT "MOVE MARKER TO SIGNAL TO BE DEMODULATED; PRESS HOLD"
50      PRINT "THEN PRESS CONTINUE"
60      PAUSE
70      INPUT "ENTER DEMODULATION TIME (.1 SEC - 60 SEC)",Dtime
80      OUTPUT 718;"DEMODT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

```


LANGUAGE REFERENCE

DEMOMDAGC
DEMODULATION AUTOMATIC GAIN CONTROL

SYNTAX



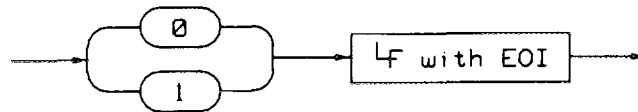
DESCRIPTION

The DEMOMDAGC 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.

RESET STATE

Off



L_F RESPONSEA₁ L_F

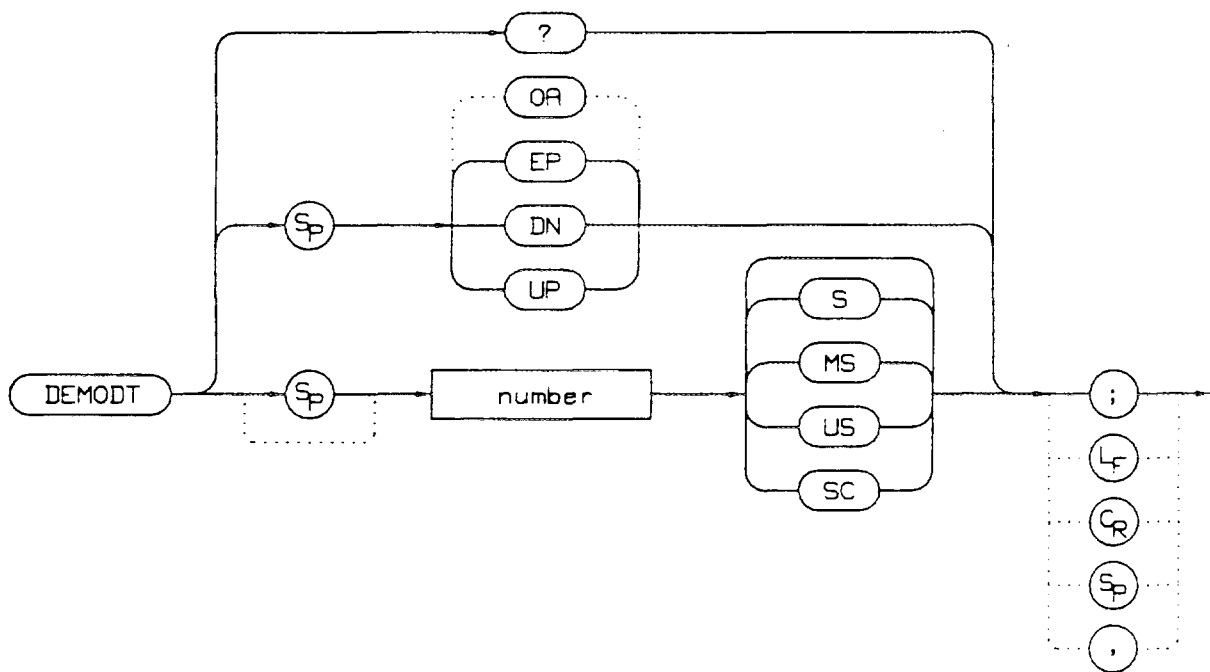
```

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
  
```


LANGUAGE REFERENCE

DEMOTD DEMODULATION TIME

SYNTAX



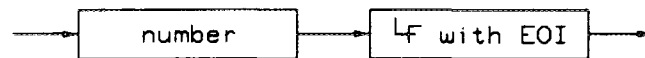
DESCRIPTION

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.

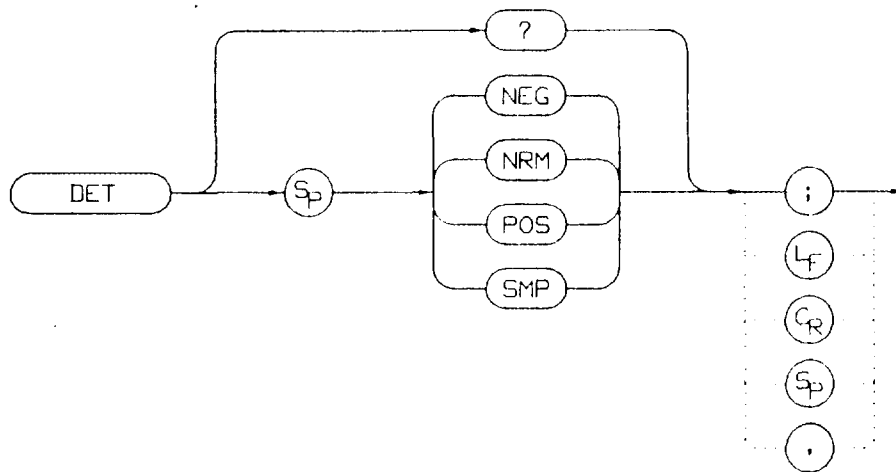
Off



```

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;"DEMOTD ";Dtime;"SEC;"
90      OUTPUT 718;"DEMOTD FM;"
100     LOCAL 718
110     PRINT "ADJUST VOLUME AND SQUELCH AS NECESSARY"
120     END
  
```


LANGUAGE REFERENCE



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.

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.

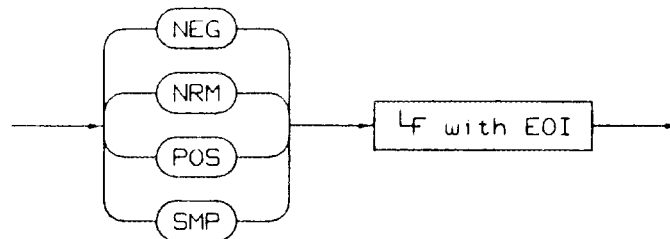
POS: selects the positive peak detector. The maximum signal values are displayed.

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.

Coupled mode, normal detector



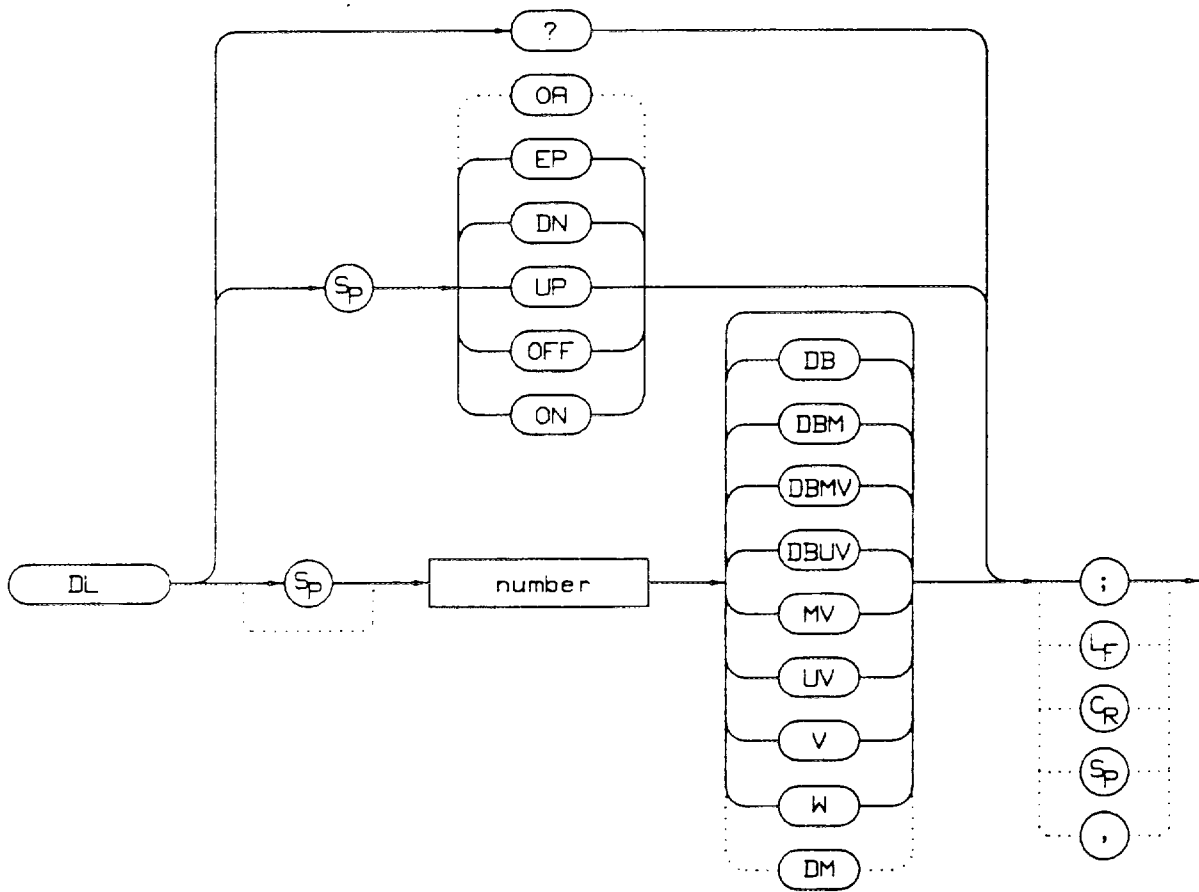
```

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
  
```


LANGUAGE REFERENCE

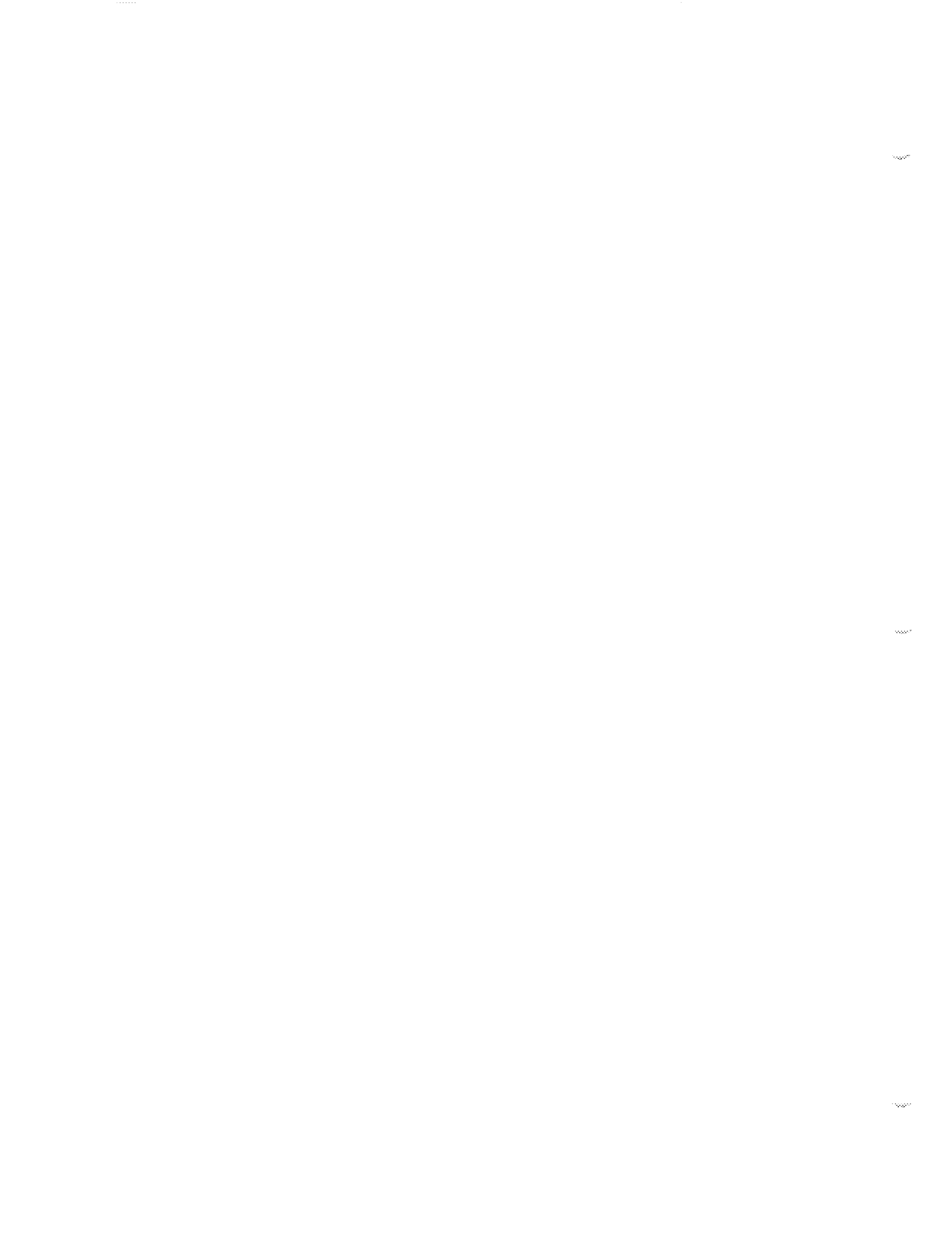
DL
DISPLAY LINE

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.



ENTER FREQUENCY

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

DATA

Off

LINK RESPONSE

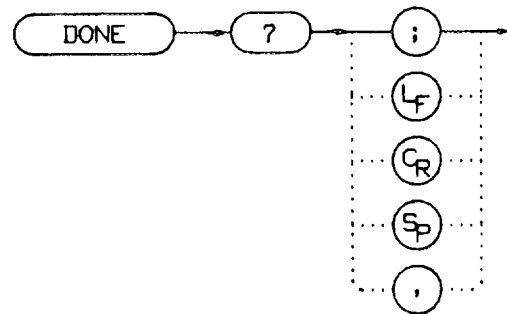


EXAMPLE

```

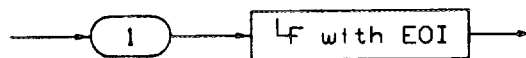
10      INPUT "ENTER START FREQUENCY, IN MHZ",Fa
20      INPUT "ENTER STOP FREQUENCY, IN MHZ",Fb
30      OUTPUT 718;"AUNITS DBUV;"
40      OUTPUT 718;"FA ";Fa;"MHZ;"
50      OUTPUT 718;"FB ";Fb;"MHZ;"
60      OUTPUT 718;"DL 48DBUV;"
70      END
  
```


LANGUAGE REFERENCE



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.

RESPONSE

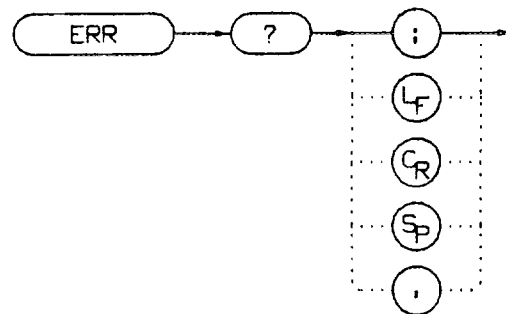


EXAMPLE

```
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



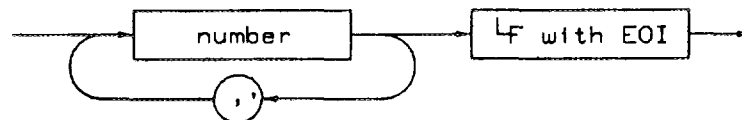
DESCRIPTION

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



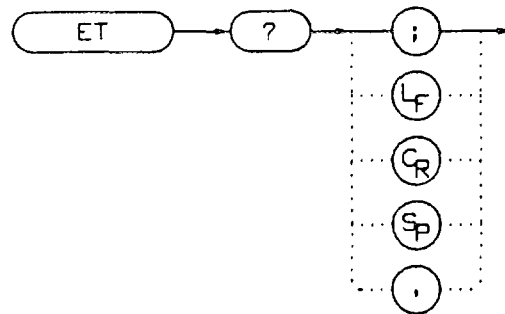
LANGUAGE REFERENCE

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

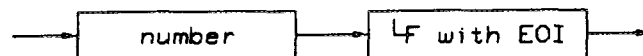
SYNTAX



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



EXAMPLE

```

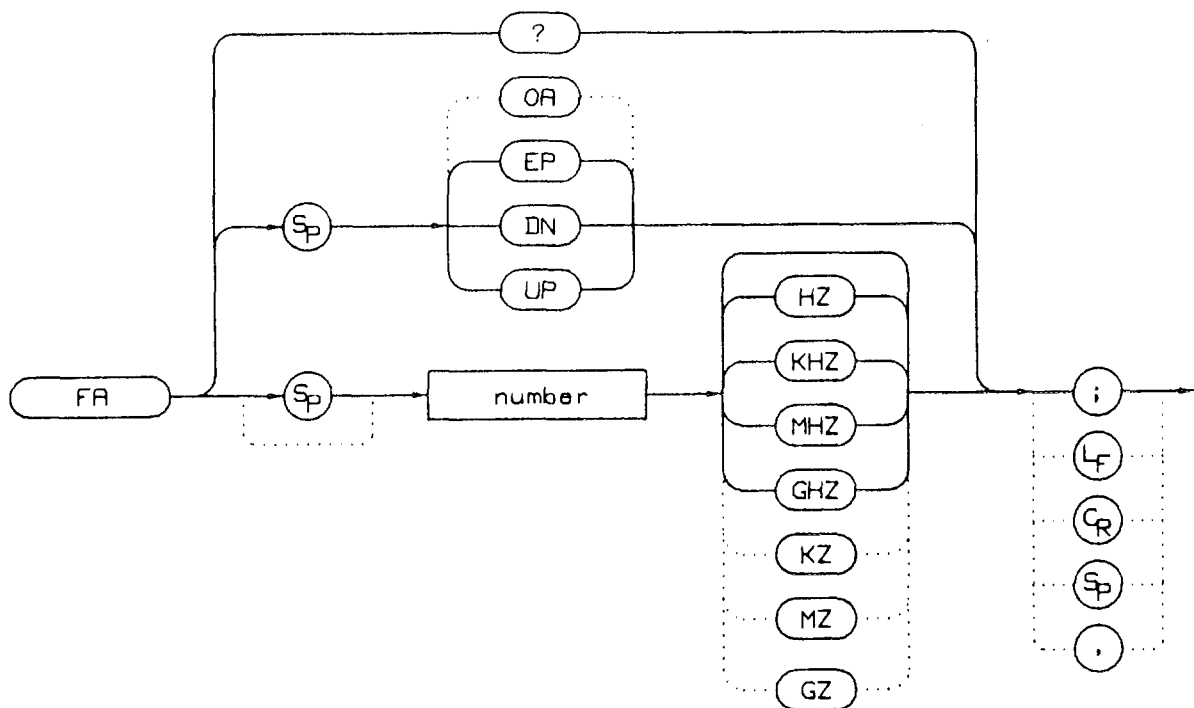
10      DIM Et$(5)
20      OUTPUT 718;"ET?;"
30      ENTER 718;Et$
40      PRINT Et
50      END

```


LANGUAGE REFERENCE

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.

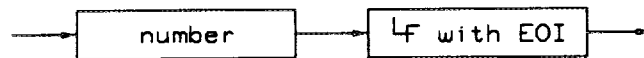
PARAMETERS

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



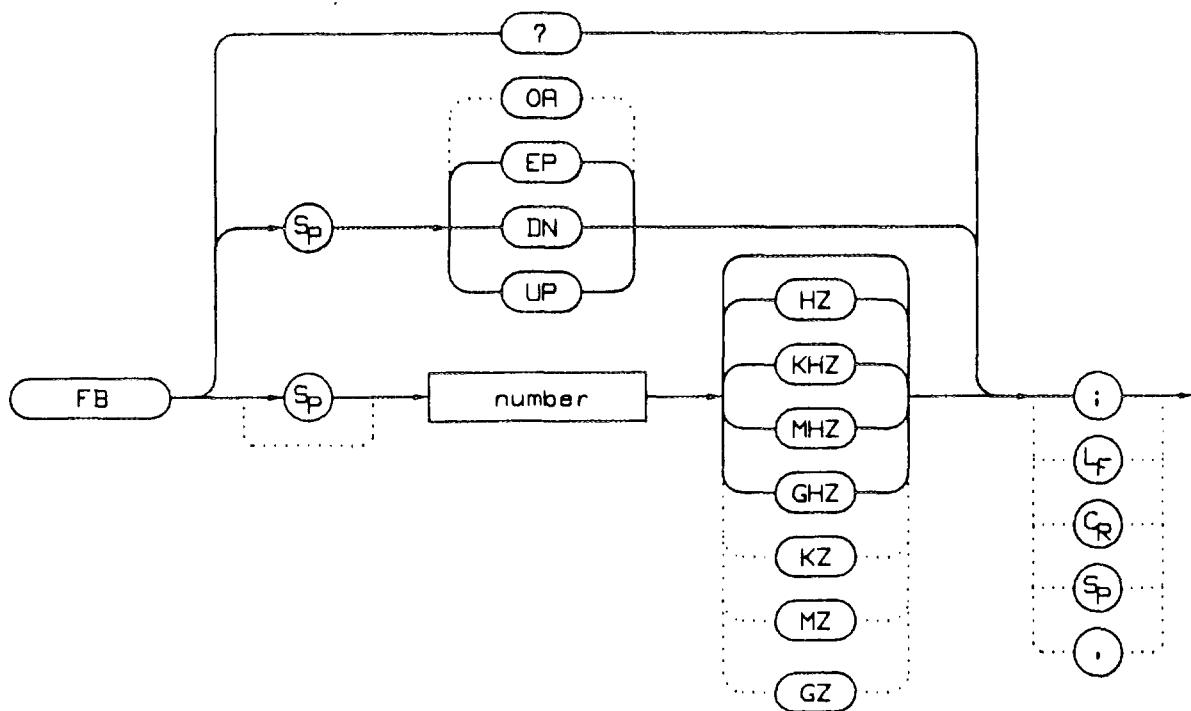
EXAMPLE

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


LANGUAGE REFERENCE

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

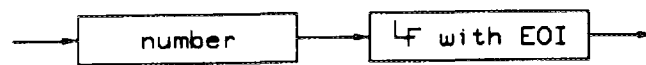
number: real from 0 to 22 E+9 (18 E+9 to 325 E+9 in external mixer mode).
UP/DN: increments in 10% of span.

PRESET STATE

22.0 GHz (HP 8562A)

2.9 GHz (HP 8562B)

QUERY RESPONSE



EXAMPLE

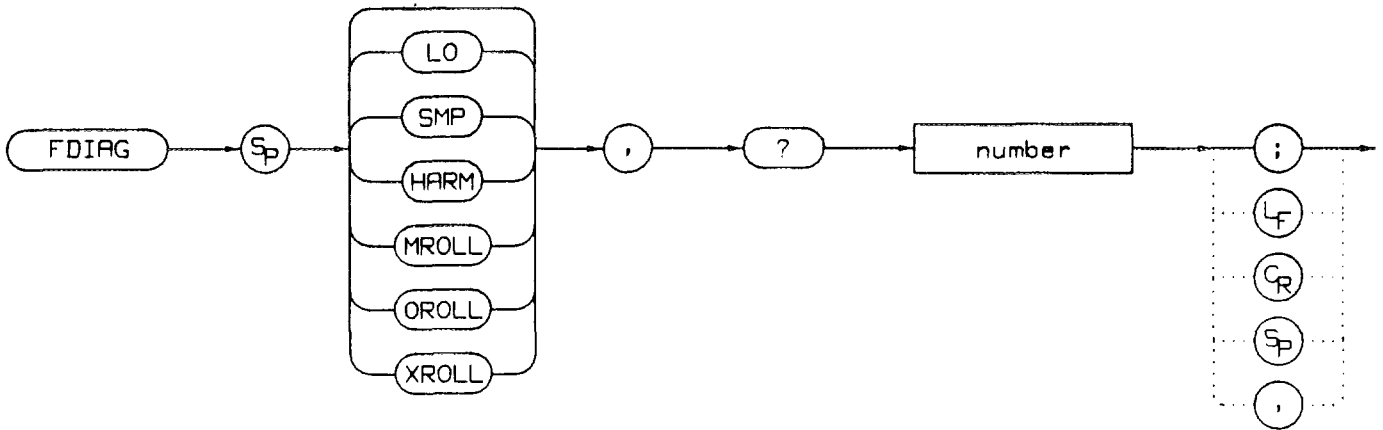
```
10      OUTPUT 718;"FA 88MHZ;FB 108MHZ;"
20      OUTPUT 718;"FB?;"
30      ENTER 718;Fb
40      PRINT Fb
50      END
```


LANGUAGE REFERENCE

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

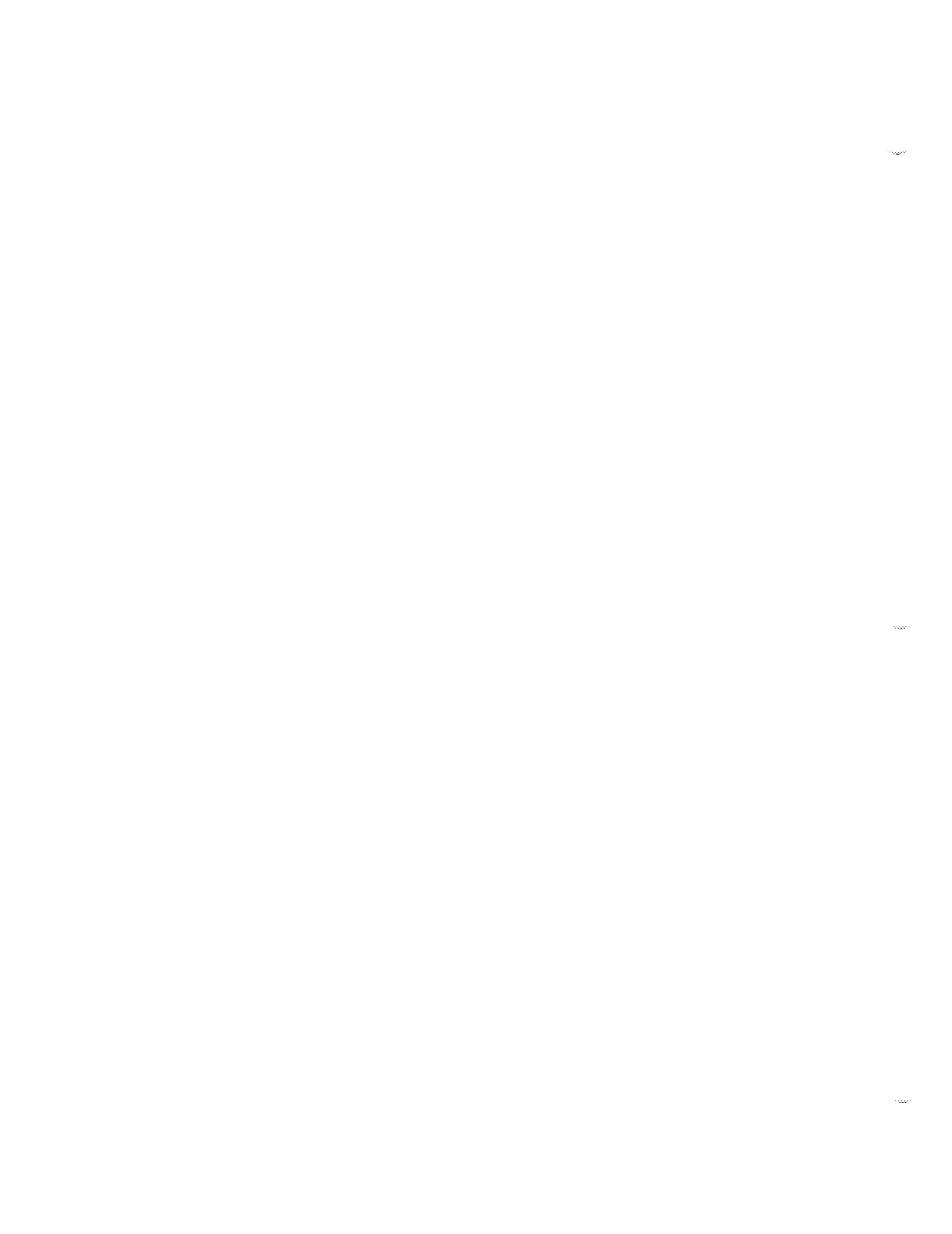
In multiband sweeps, the above frequencies correspond to the band being swept when the command is executed.

QUERY RESPONSE



EXAMPLE

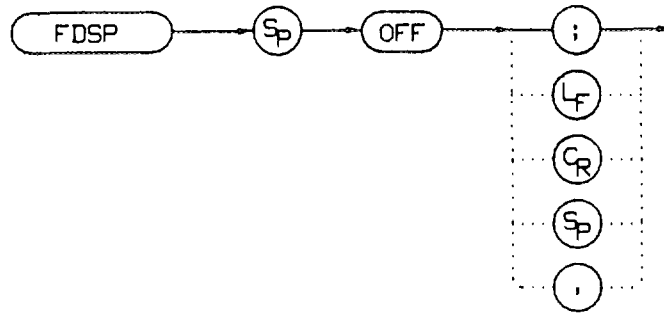
```
10      OUTPUT 718;"FDIAG SMP,?;"
20      ENTER 718;Fdiag
30      PRINT "DIAGNOSTIC FREQUENCY IS ",Fdiag
40      END
```



LANGUAGE REFERENCE

FDSP FREQUENCY DISPLAY OFF

SYNTAX



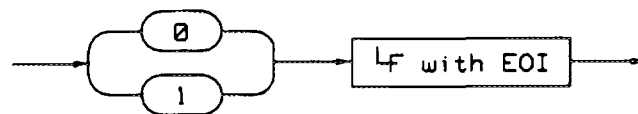
DESCRIPTION

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



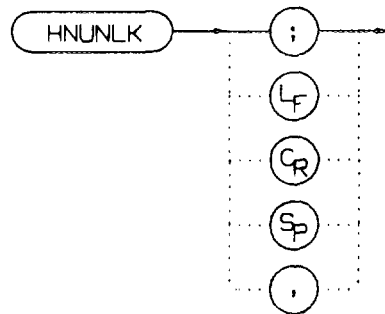
EXAMPLE

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


LANGUAGE REFERENCE

```
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
```

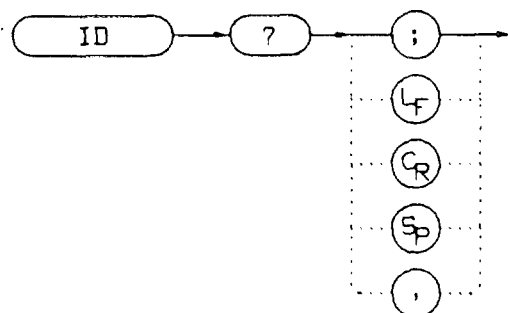

UNLOCK HARMONIC



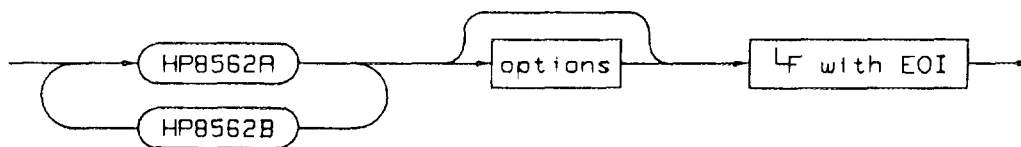
The HNUNLK command unlocks the harmonic number, allowing you to select frequencies and spans outside the range of the locked harmonic number. Also, when HNUNLK is executed, more than one harmonic can then be used to sweep across a desired span. For example, sweep a span from 18 GHz to 40 GHz. In this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

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


LANGUAGE REFERENCE



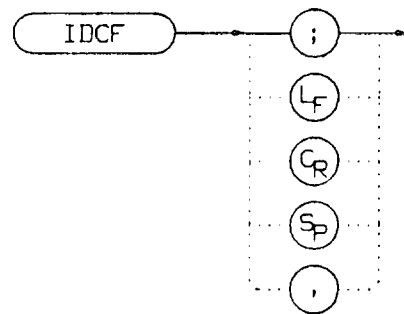
The ID command returns the model number of the spectrum analyzer (HP 8562A or HP 8562B) and any options installed.



```

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





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.

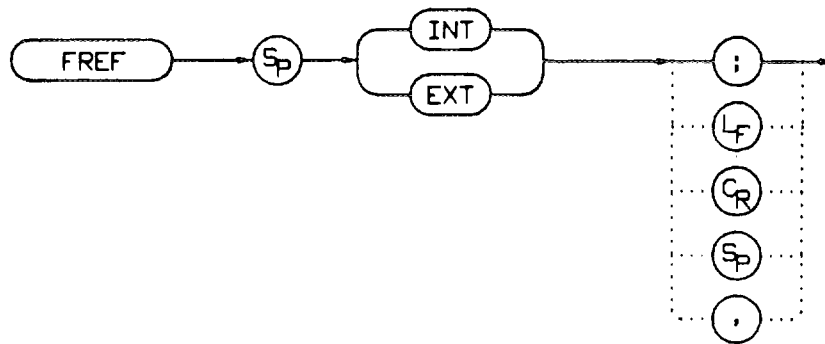
```
10      OUTPUT 718;"SIGID AUTO;"
20      OUTPUT 718;"IDCF;"
30      OUTPUT 718;"CF?;"
40      ENTER 718;Cf
50      PRINT Cf
60      END
```



LANGUAGE REFERENCE

FREF FREQUENCY REFERENCE

SYNTAX



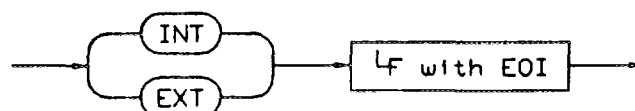
DESCRIPTION

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 (± 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



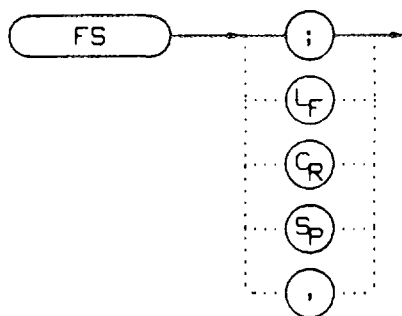
EXAMPLE

```
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
```


LANGUAGE REFERENCE

FS
FULL SPAN

SYNTAX



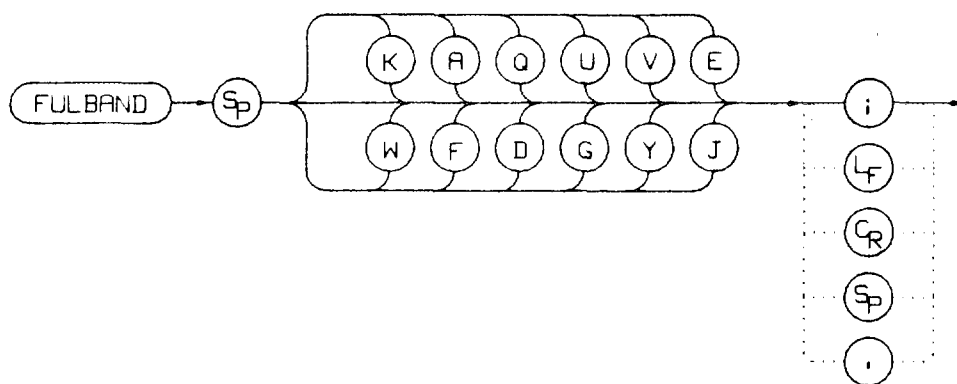
DESCRIPTION

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
```



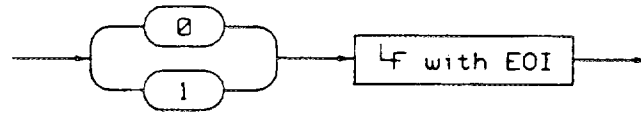


The FULBAND command selects a commonly-used, external-mixer frequency band, as shown in Table 14.1. The harmonic lock function (HNLOCK) is also set; this locks the harmonic of the chosen band.

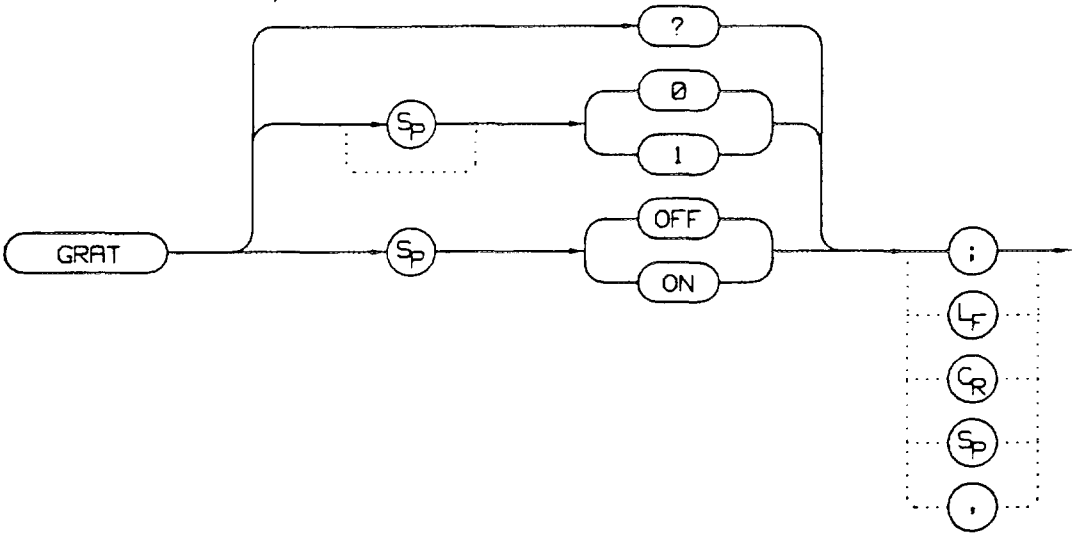
FREQUENCY BAND	FREQUENCY RANGE (GHz)	MIXING HARMONIC	CONVERSION LOSS
K	18.0 - 26.5	6 -	30 dB
A	26.5 - 40.0	8 -	30 dB
Q	33.0 - 50.0	10 -	30 dB
U	40.0 - 60.0	10 -	30 dB
V	50.0 - 75.0	14 -	30 dB
E	60.0 - 90.0	16 -	30 dB
W	75.0 - 110.0	18 -	30 dB
F	90.0 - 140.0	24 -	30 dB
D	110.0 - 170.0	30 -	30 dB
G	140.0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

LANGUAGE REFERENCE



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

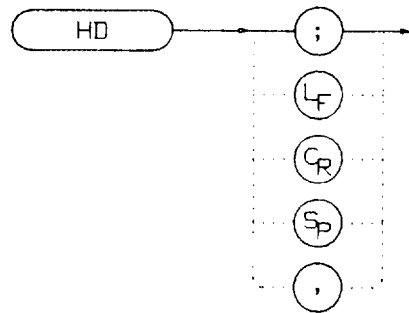
The GRAT command turns the display graticule on or off.

FE

On

LANGUAGE REFERENCE

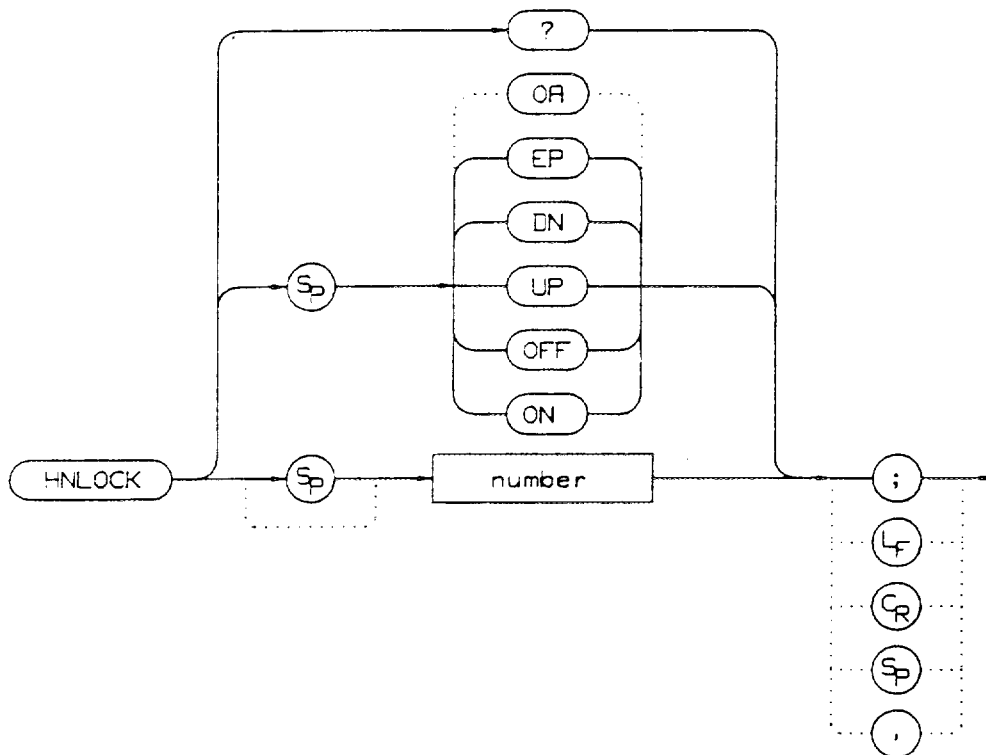
```
10      OUTPUT 718;"IP;MXRMODE EXT;"
20      INPUT "ENTER THE DESIRED FREQUENCY BAND (KAQVUEWFDGY OR J)",Fulband$
30      OUTPUT 718;"FULBAND ";Fulband$;";"
40      OUTPUT 718;"MKN EP;"
50      PRINT "POSITION THE MARKER ON THE DESIRED SIGNAL"
60      PRINT "PRESS HOLD, THEN PRESS CONTINUE"
70      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
```

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

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


LANGUAGE REFERENCE



N

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.

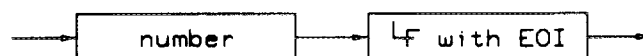
MIXER MODE	FREQUENCY RANGE (GHz)	MIXING HARMONIC
INTERNAL	2.75 - 6.46	1 -
	5.69 - 13.03	2 -
	12.36 - 19.70	3 -
	19.03 - 22.10	4 -
EXTERNAL	18.00 - 26.50	6 -
	26.50 - 40.00	8 -
	33.00 - 50.00	10 -
	40.00 - 60.00	10 -
	50.00 - 75.00	14 -
	60.00 - 90.00	16 -
	75.00 - 110.00	18 -
	90.00 - 140.00	24 -
	110.00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

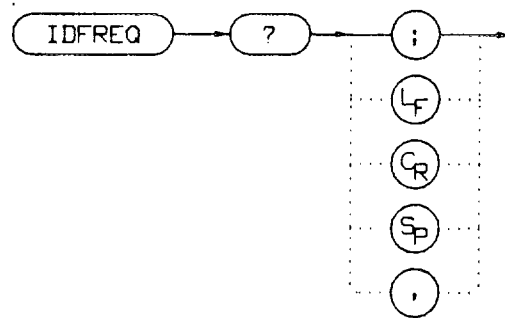
number: integer from 1 to 54 (for best results, choose from harmonic numbers shown in Table 14.2).
 UP/DN: increments of 1.

OFF

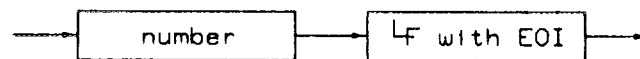
Off



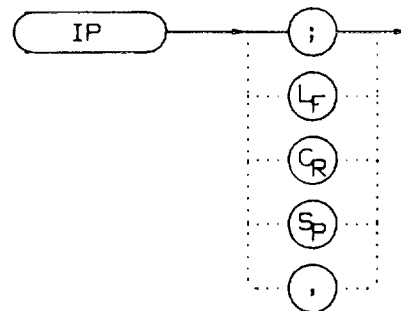
LANGUAGE REFERENCE



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



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

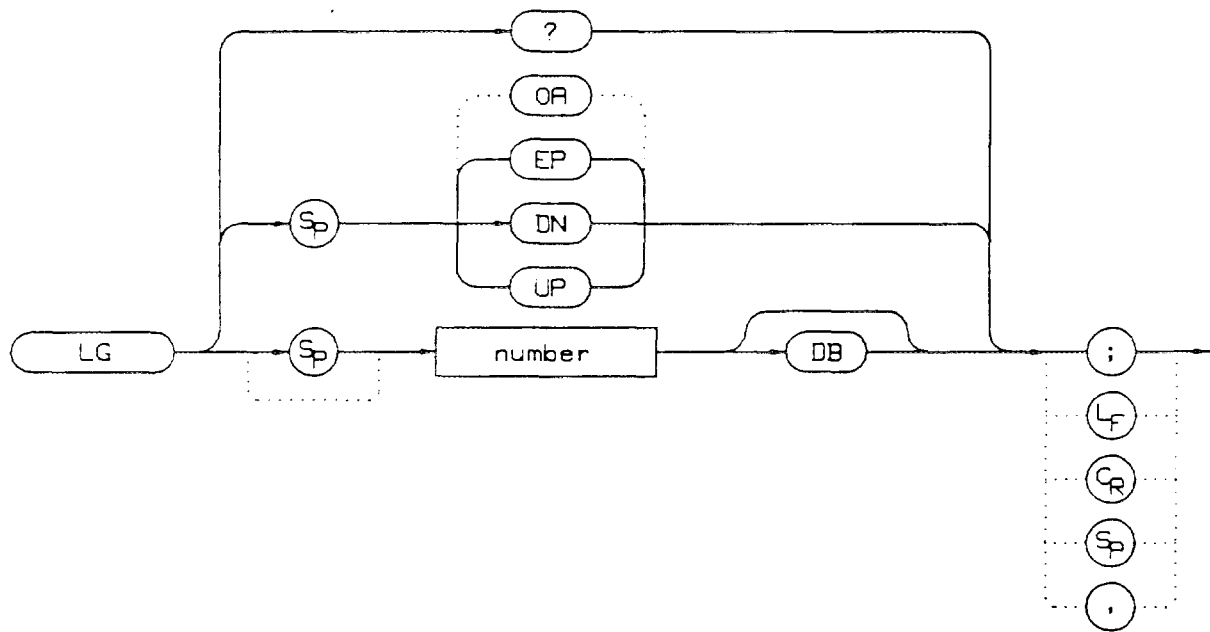
The IP command sets the spectrum analyzer to a known, predefined state, shown in Table 14.3. IP does not affect the contents of any data or trace registers or stored preselector data. IP does not clear the input or output data buffers; to clear these, execute the statement CLEAR 718. Include the TS command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

LANGUAGE REFERENCE

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.

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

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

number: 1, 2, 5, or 10.

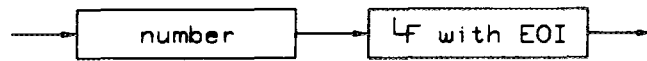
UP/DN: increments in a 1, 2, 5, 10 sequence.

LANGUAGE REFERENCE

STATE

10 dB/div

31.00 dB

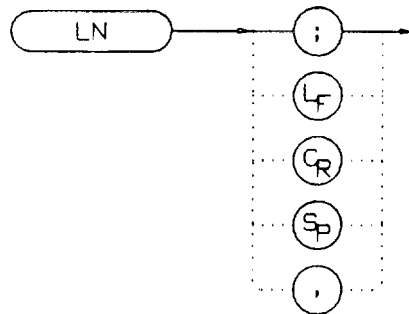


STATE

```
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

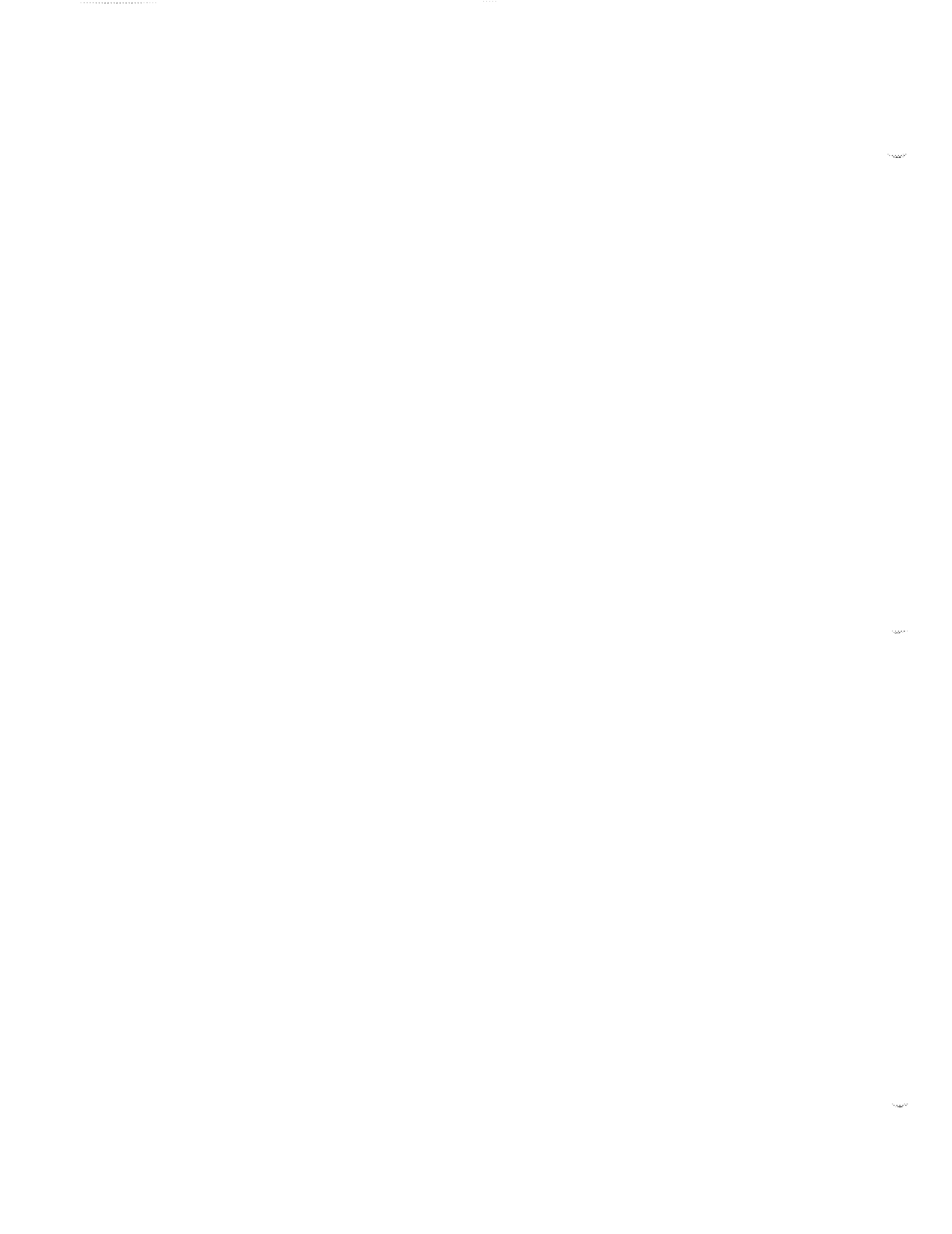


DESCRIPTION

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

EXAMPLE

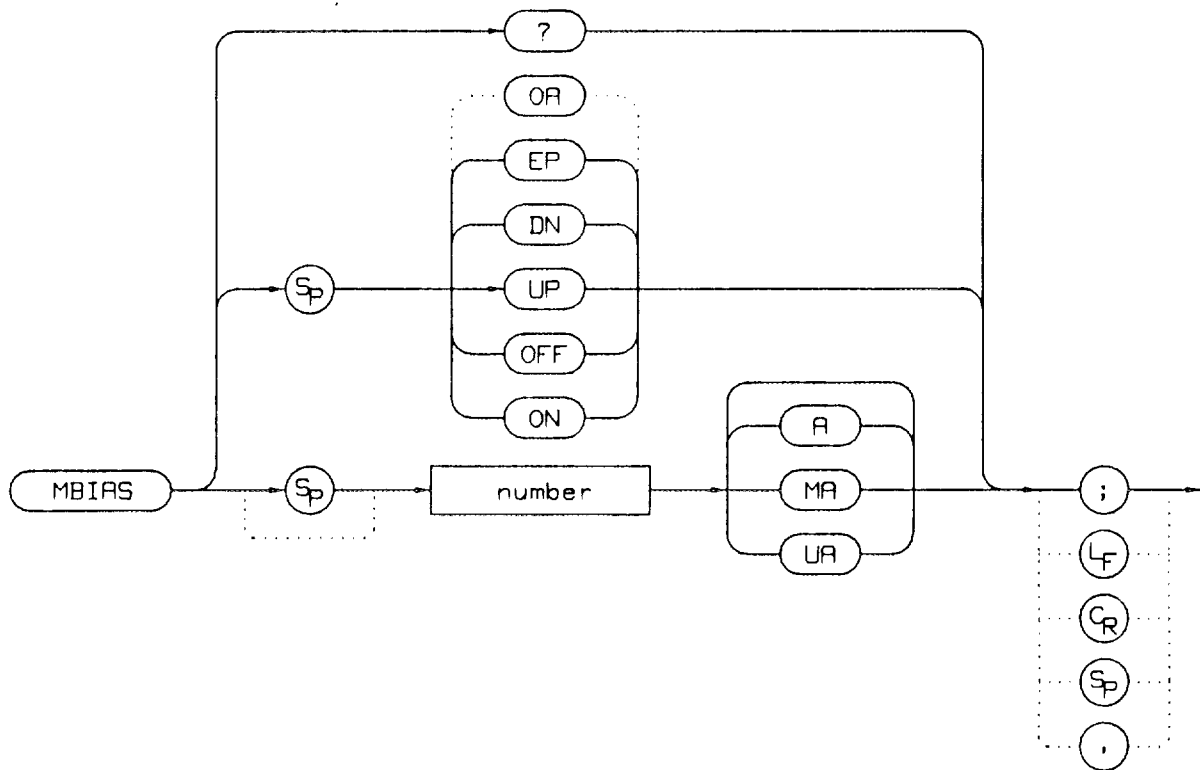
```
10      OUTPUT 718;"LN;"  
20      END
```



LANGUAGE REFERENCE

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 as 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.

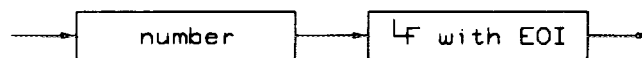
PARAMETERS

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

PRESET STATE

Off

QUERY RESPONSE



EXAMPLE

```

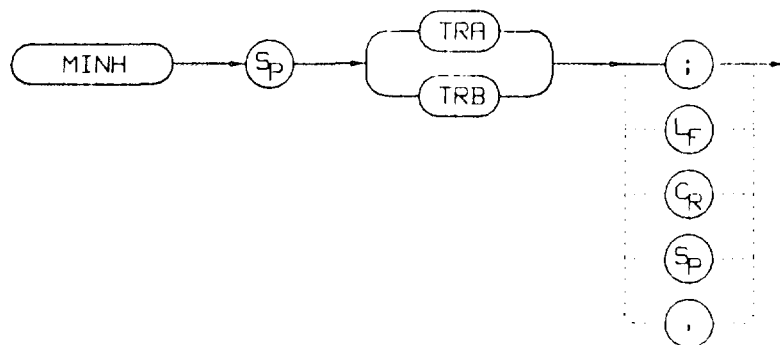
10     OUTPUT 718;"IP;MXRMODE EXT;FULBAND U;"
20     OUTPUT 718;"MKN EP;"
30     PRINT "MOVE THE MARKER TO THE DESIRED SIGNAL"
40     PRINT "PRESS HOLD THEN PRESS CONTINUE"
50     PAUSE
60     INPUT "ENTER THE BIAS VALUE, IN MA",Bias
70     OUTPUT 718;"MBIAS ";Bias;"MA;"
80     OUTPUT 718;"MBIAS EP;"
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
  
```



LANGUAGE REFERENCE

MINH MINIMUM HOLD

SYNTAX



DESCRIPTION

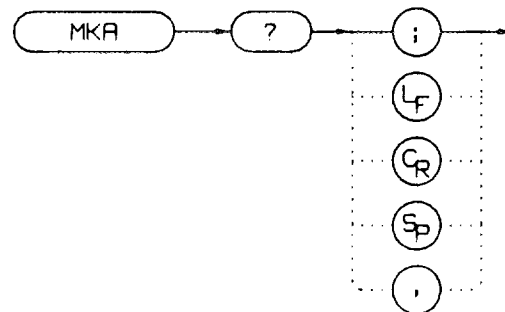
The MINH command updates the chosen trace with the minimum signal level detected at each trace-data point from subsequent sweeps. This function employs the negative peak detector (refer to the DET command).

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

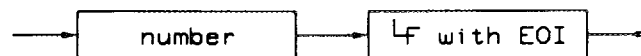
SYNTAX



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

```

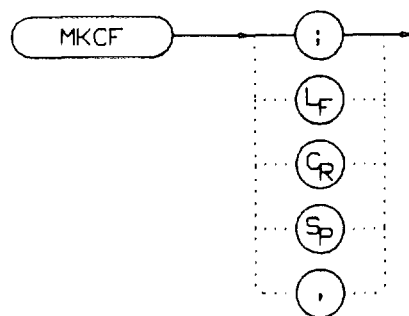
10      OUTPUT 718;"IP;SNGLS;"
20      INPUT "ENTER IN DESIRED CENTER FREQUENCY, IN MHZ",Cf
30      INPUT "ENTER IN DESIRED FREQUENCY SPAN, IN MHZ",Sp
40      OUTPUT 718;"CF ";Cf;"MHZ;"
50      OUTPUT 718;"SP ";Sp;"MHZ;"
60      OUTPUT 718;"TS;MKPK HI;"
70      OUTPUT 718;"MKA?;AUNITS?;"
80      ENTER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



LANGUAGE REFERENCE

MKCF MARKER TO CENTER FREQUENCY

SYNTAX



DESCRIPTION

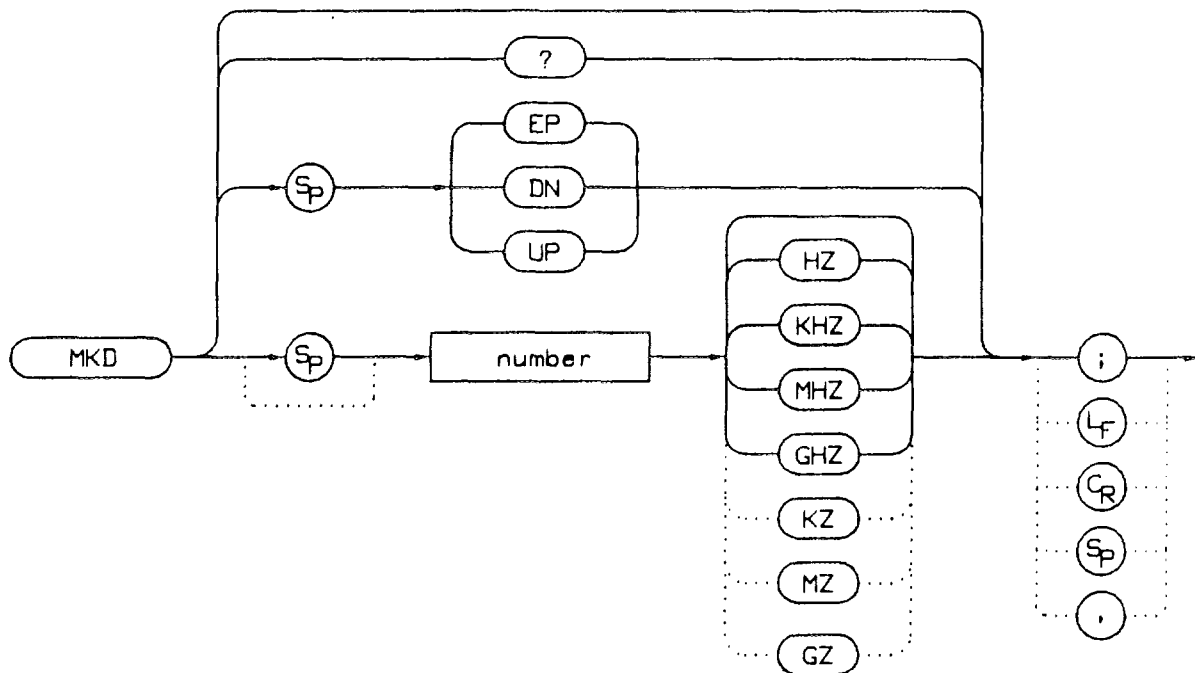
The MKCF command sets the center frequency to the frequency value of an active marker.

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.

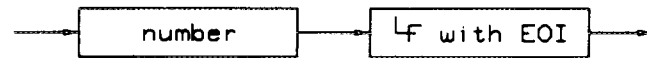
PARAMETERS

number: real from $12.9 \text{ E}+9$ to $2.9 \text{ E}+9$ in low band or from $-22.9 \text{ E}+9$ to $22 \text{ E}+9$ in high band ($-3.7 \text{ E}+9$ to $307 \text{ E}+9$ in external mixer mode).

UP/DN: increments in 10% of span.

LANGUAGE REFERENCE

QUERY RESPONSE



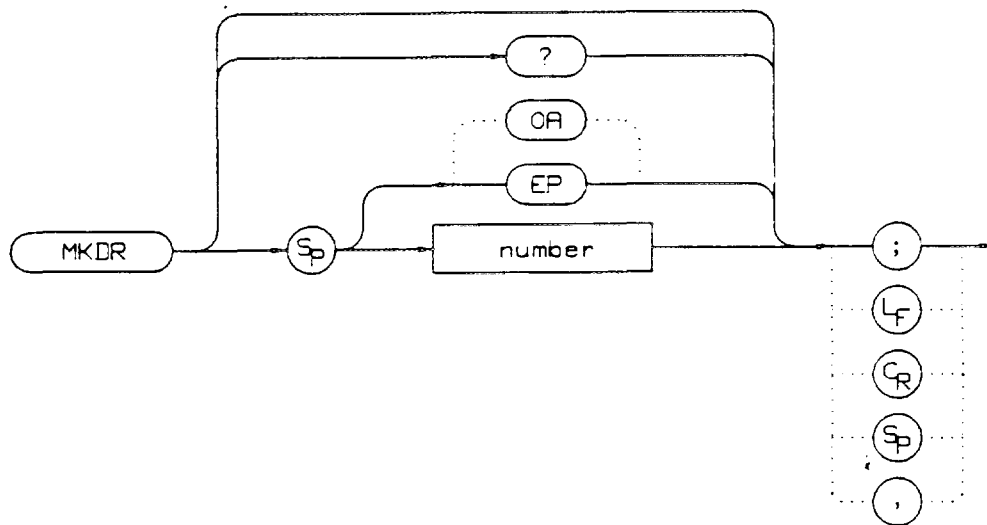
EXAMPLE

```
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

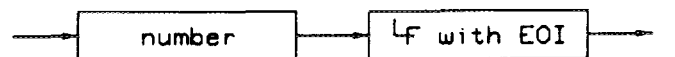
SYNTAX



DESCRIPTION

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

QUERY RESPONSE



EXAMPLE

```

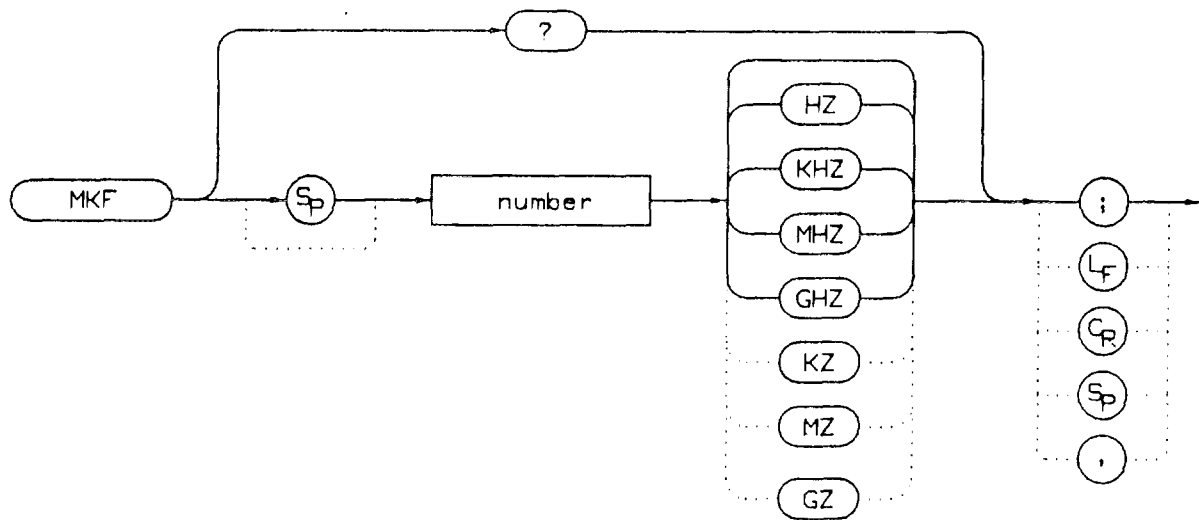
10      OUTPUT 718;"CF 300MHZ;SP 200MHZ;;"
20      OUTPUT 718;"TS;MKPK HI;MKD;MKPK NH;MKDR?;"
30      ENTER 718;Period
40      PRINT "THE TIME PERIOD IS ",Period
50      END

```


LANGUAGE REFERENCE

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.

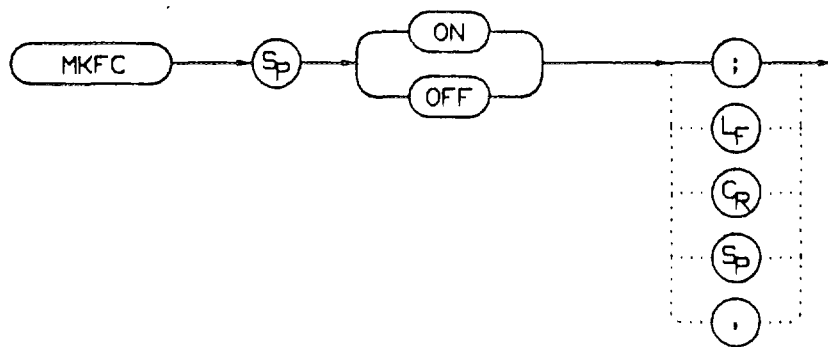
PARAMETERS

number: real from 0 to 22 E+9.

LANGUAGE REFERENCE

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

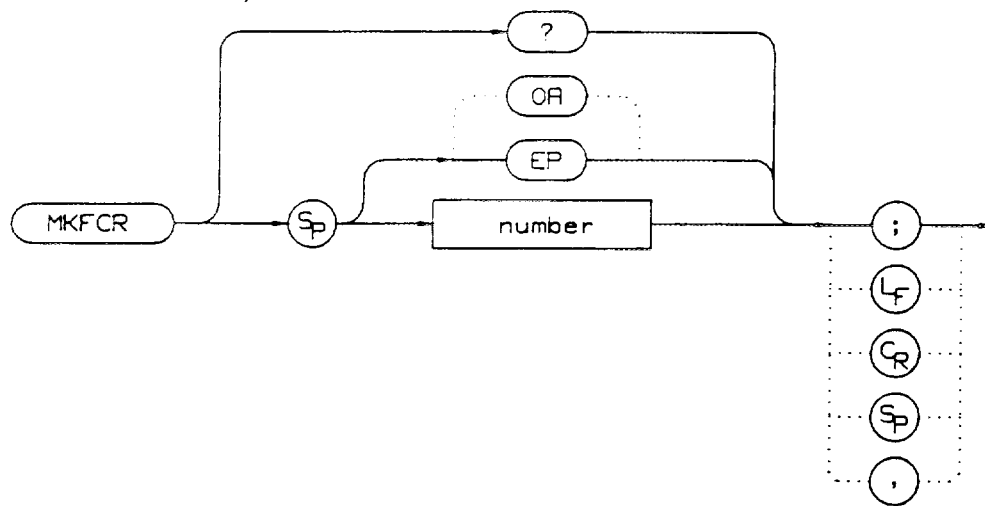
EXAMPLE

```
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
```


LANGUAGE REFERENCE

MKFCR
FREQUENCY COUNTER RESOLUTION

SYNTAX



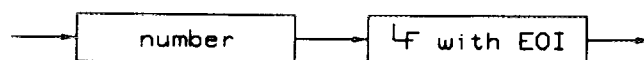
DESCRIPTION

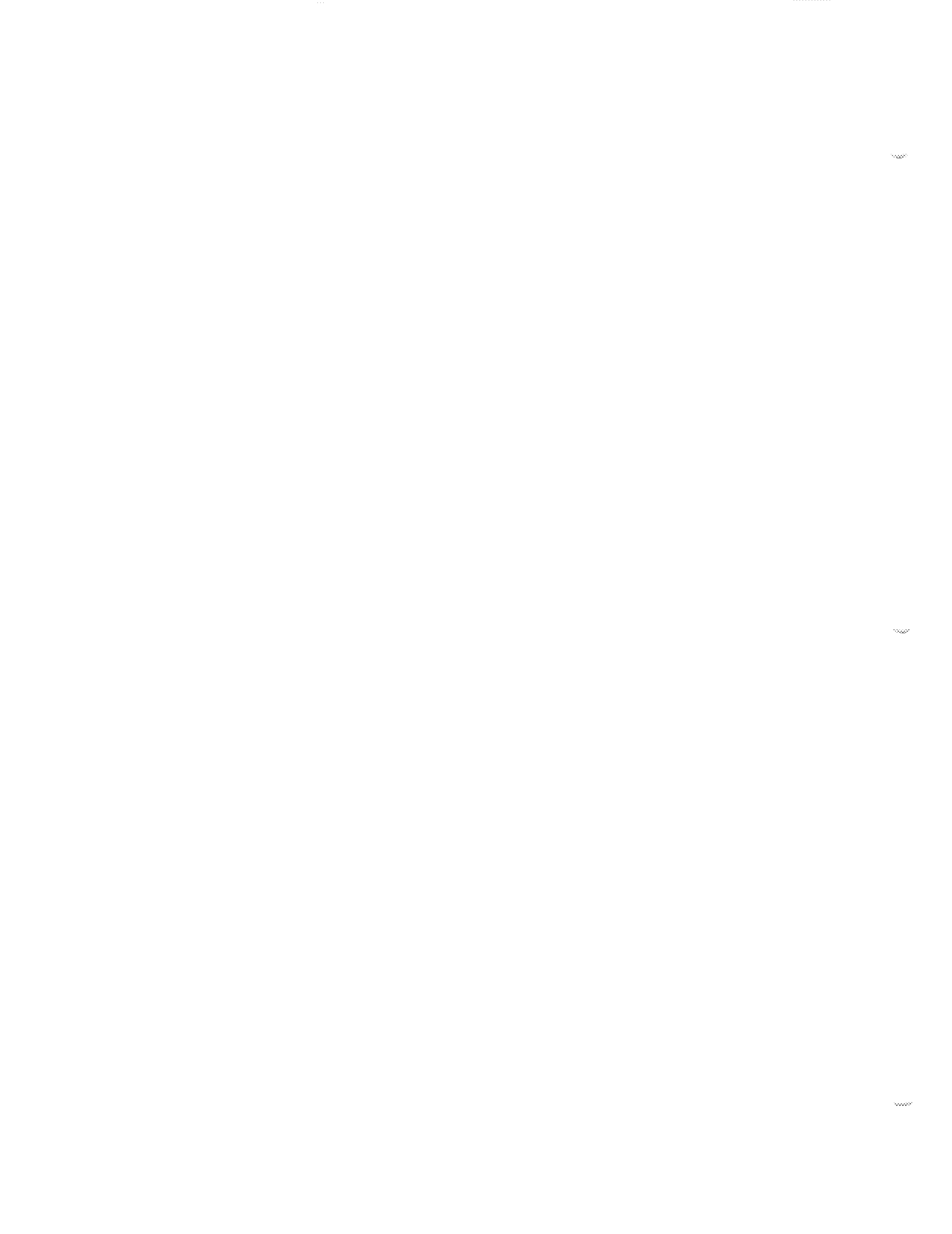
The MKFCR command specifies the resolution of the frequency counter. Refer to the MKFC command. The default value is 10 kHz.

PARAMETERS

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

QUERY RESPONSE





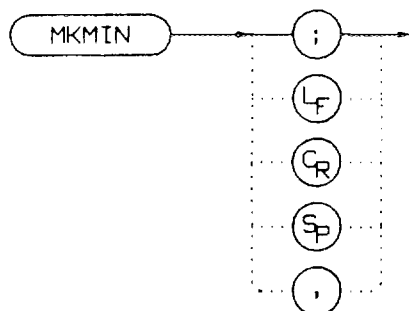
EXAMPLE

```
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
```


LANGUAGE REFERENCE

MKMIN MARKER TO MINIMUM

SYNTAX



DESCRIPTION

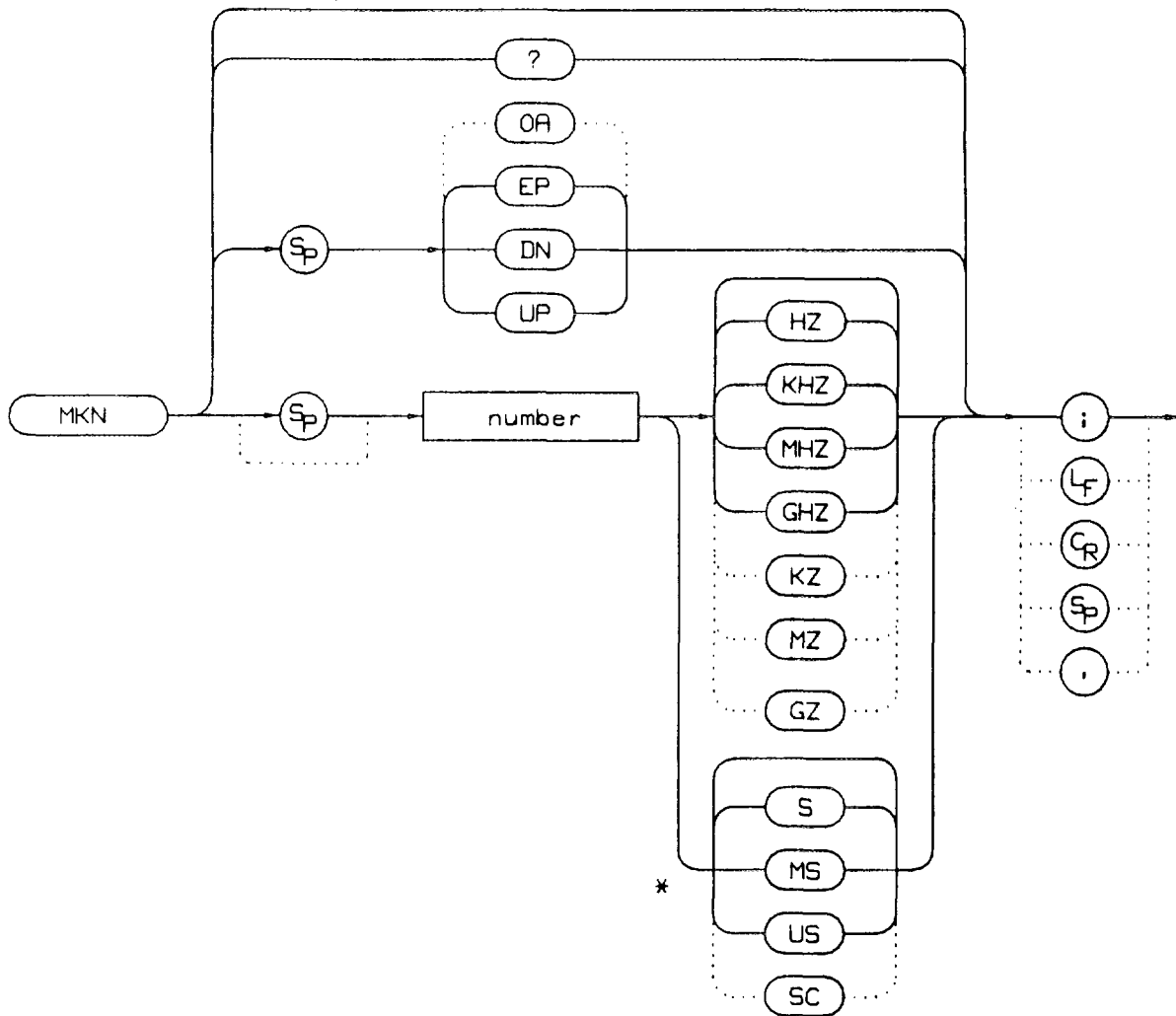
The MKMIN command places an active marker on the minimum signal detected on a trace.

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.

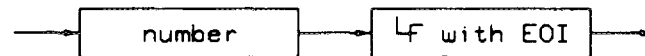


LANGUAGE REFERENCE

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 REFERENCE



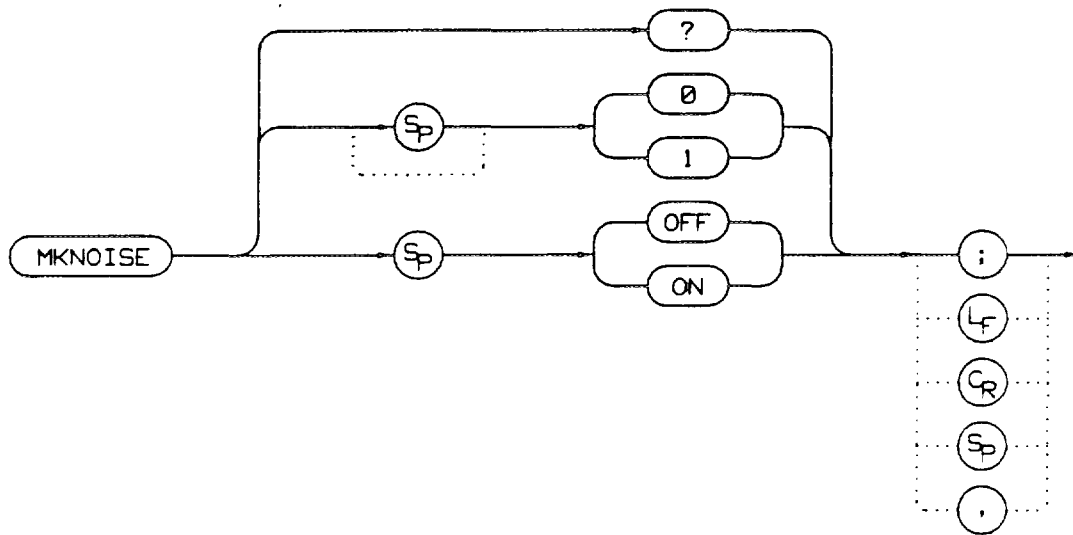
EXAMPLE

```
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

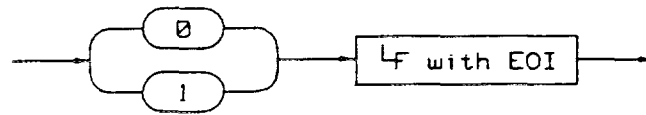
MKNOISE sets the detector mode to sample and computes the average of 32 data points (16 points on one side of the marker, the marker itself, and 15 points on the other side of the marker). This average is corrected for effects of the log amplifier, bandwidth shape factor, IF detector, and resolution 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

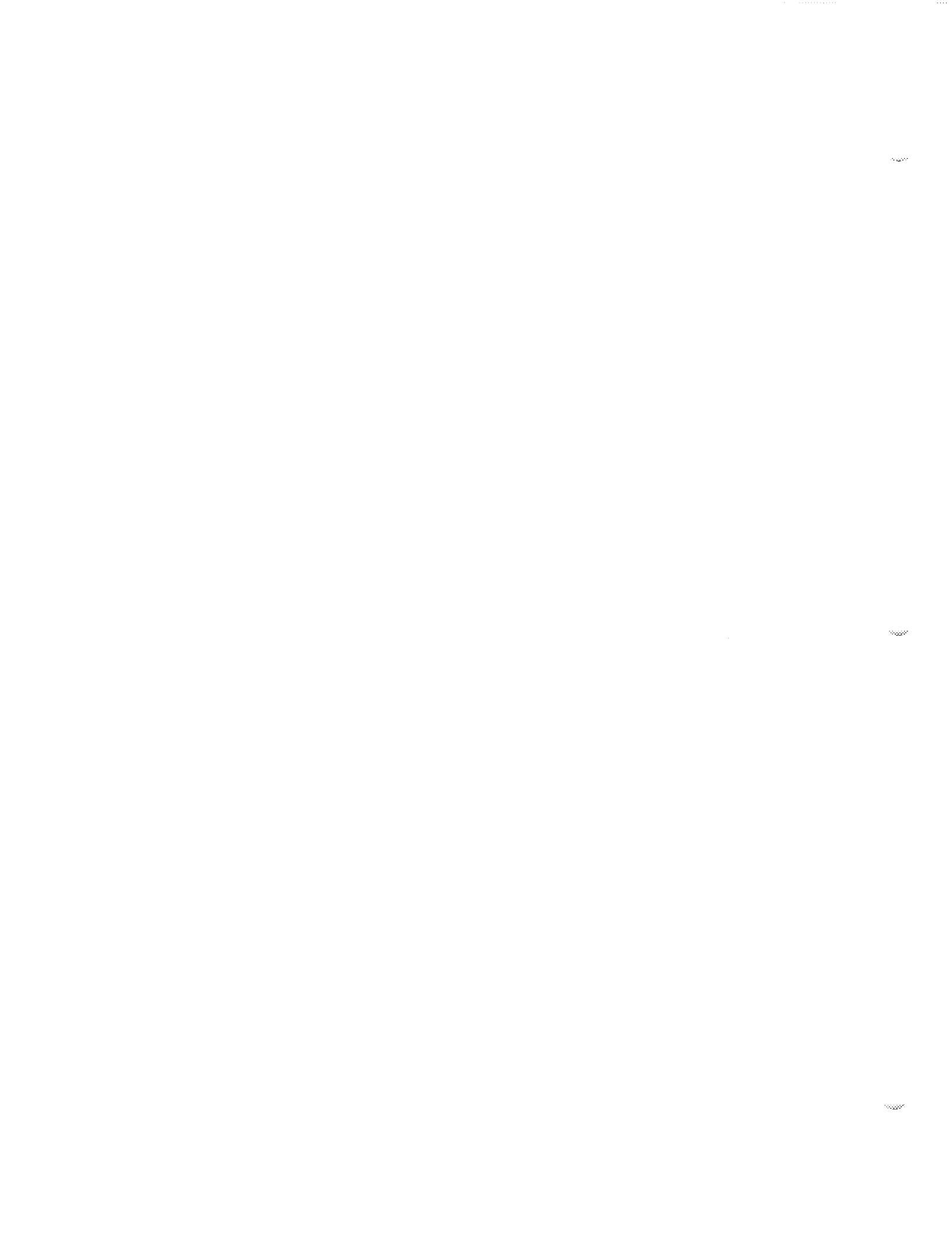
LANGUAGE REFERENCE

QUERY RESPONSE



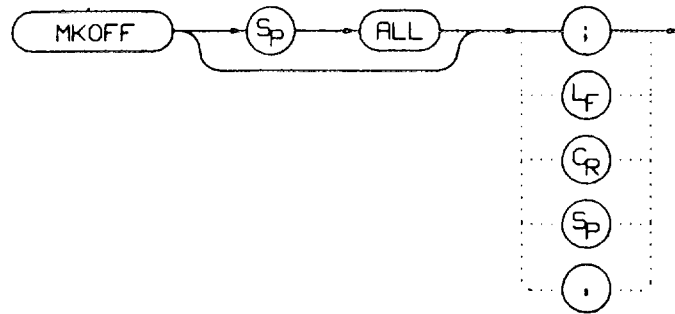
EXAMPLE

```
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



DESCRIPTION

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

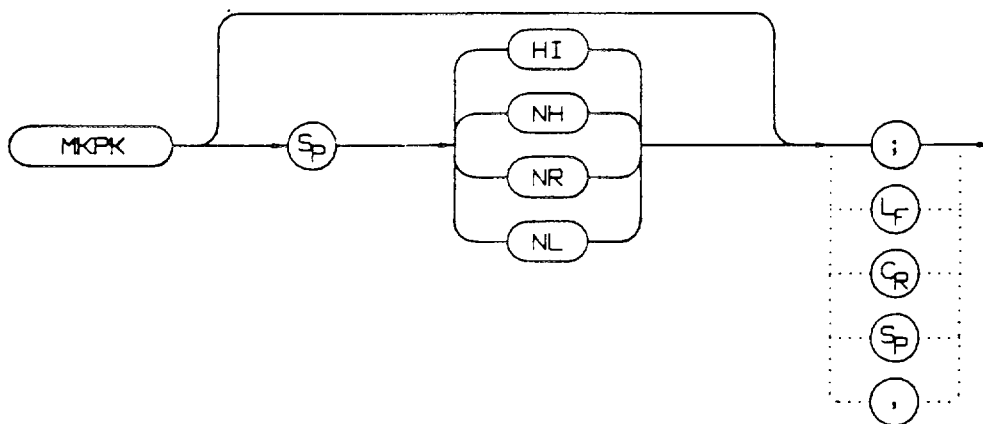
EXAMPLE

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


LANGUAGE REFERENCE

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.



LANGUAGE REFERENCE

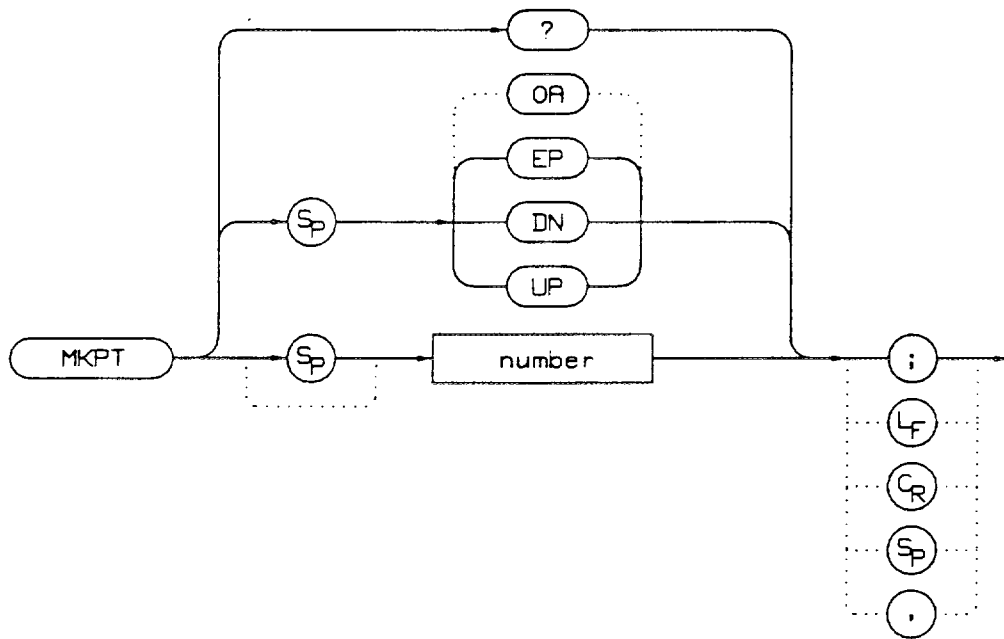
```
10      OUTPUT 718;"IP;SNGLS;"
20      INPUT "ENTER START FREQUENCY, IN MHZ",Start_freq
30      INPUT "ENTER STOP FREQUENCY, IN MHZ",Stop_freq
40      OUTPUT 718;"FA ";Start_freq;"MHZ;"
50      OUTPUT 718;"FB ";Stop_freq;"MHZ;"
60      OUTPUT 718;"TS;MKPK HI;MKD;TS;MKPK NH;"
70      OUTPUT 718;"MKA?;"
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
```



LANGUAGE REFERENCE

MKPT MARKER THRESHOLD

SYNTAX



DESCRIPTION

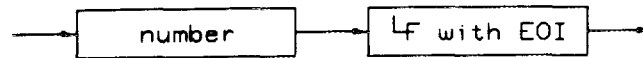
The MKPT command sets the minimum amplitude level from which a peak on the trace can be detected. The default value is -120 dBm. See also the MKPX command.

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

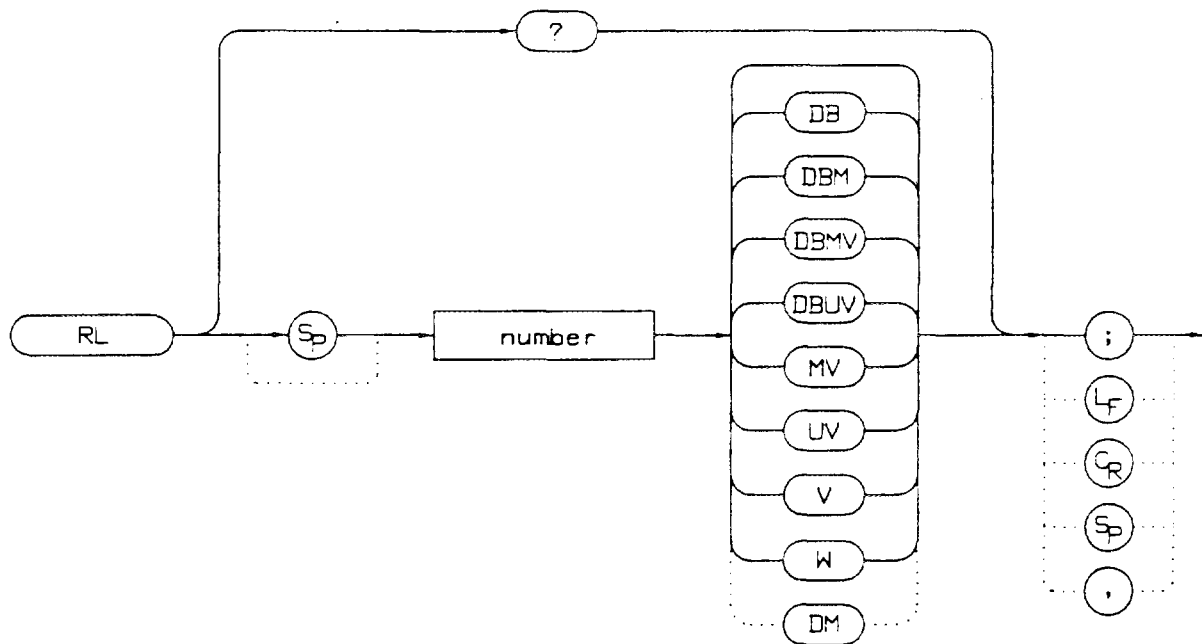
number: real from -120 to 30.
UP/DN: increments of 10 dB.

QUERY RESPONSE



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
```

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.

LANGUAGE REFERENCE

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

Table 14.4. Frequency ranges and minimum reference level.

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.

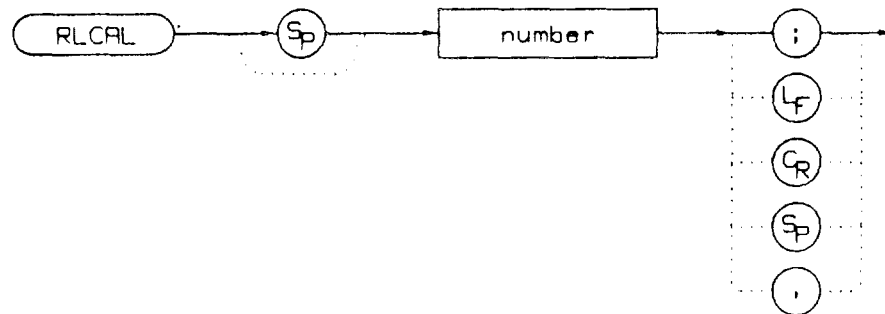


0 dBm

```

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
  
```





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 frequency 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.

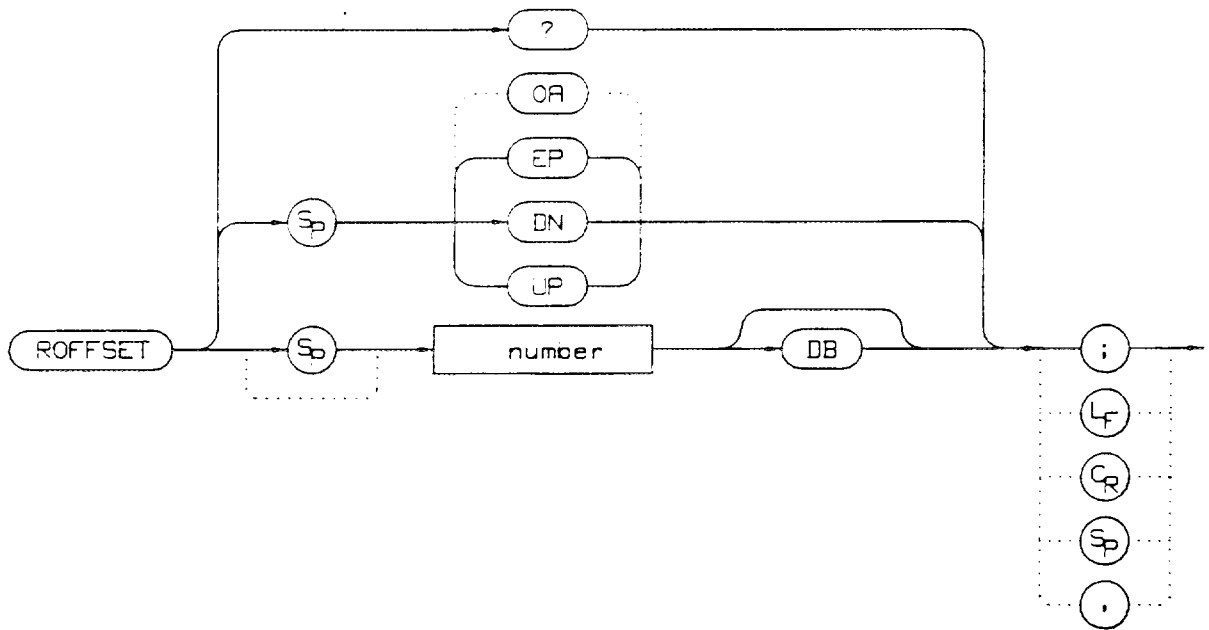
number: integer from -255 to 255 .

```

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

```


LANGUAGE REFERENCE



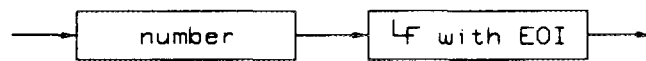
The ROFFSET command introduces an offset to all amplitude readouts (e.g., the reference level and marker amplitude). The offset is in dB, regardless of the selected scale and units. The offset can be useful to account for gains or losses in accessories connected to the input of the analyzer. When this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

SYNTAX

number: real from -100 to 100.

UP/DN: increments of one vertical division.

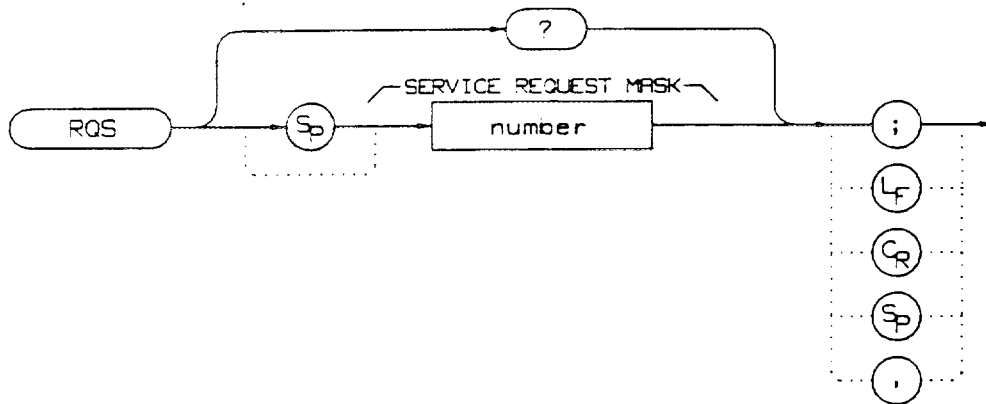
Off



```
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
```

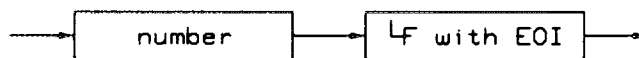


LANGUAGE REFERENCE



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.

15E

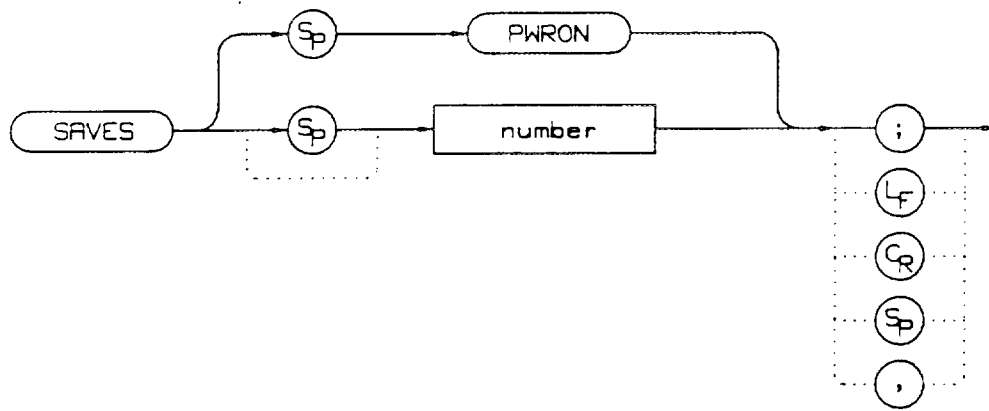


LANGUAGE REFERENCE

```
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
```



LANGUAGE REFERENCE



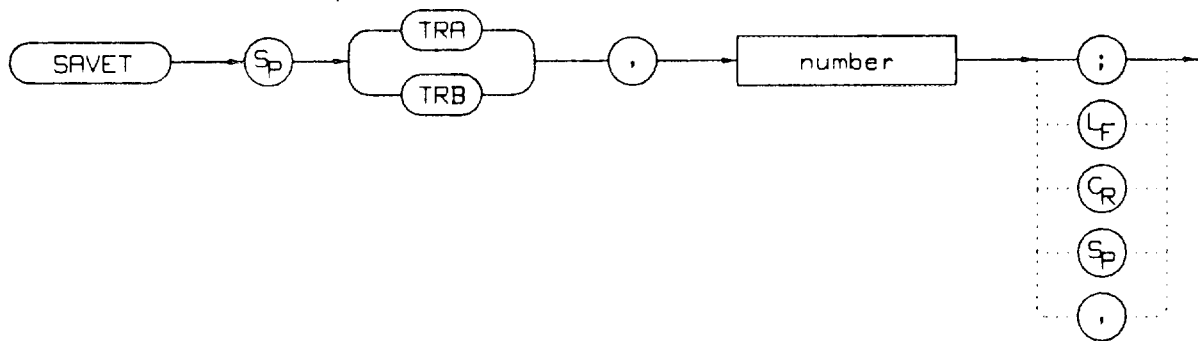
The SAVES command saves the currently-displayed instrument state in the specified state register.

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
```

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

TRA: stores the contents of Trace A.

TRB: stores the contents of Trace B.

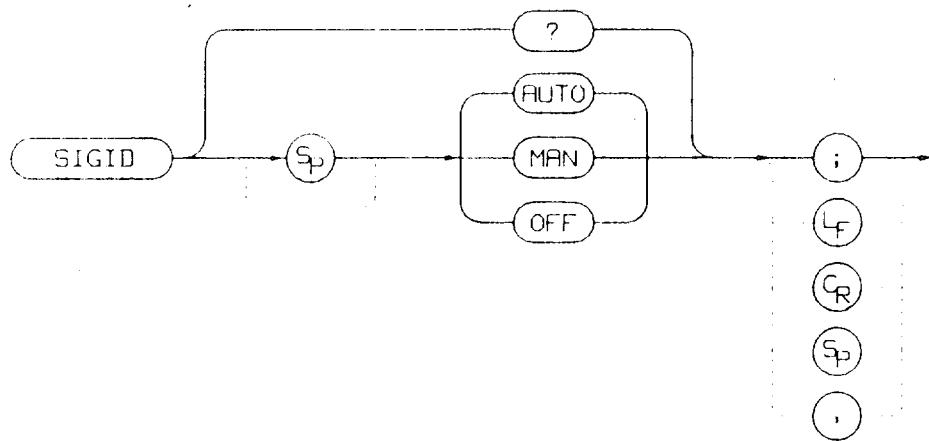
number: integer from 0 to 7. Numbers less than zero default to zero; numbers greater than seven are not allowed.

```

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

```


SIGID
SIGNAL IDENTIFICATION



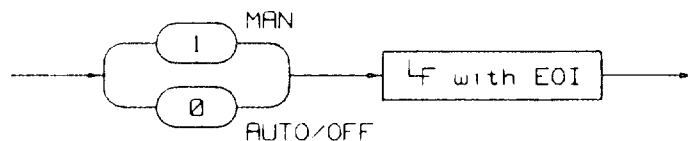
The SIGID command identifies signals for the external mixing frequency bands.

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.

MAN MODE RESPONSE

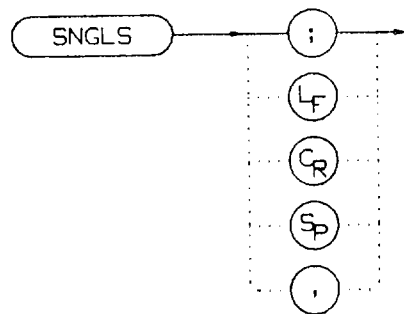


LANGUAGE REFERENCE

EXAMPLE

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





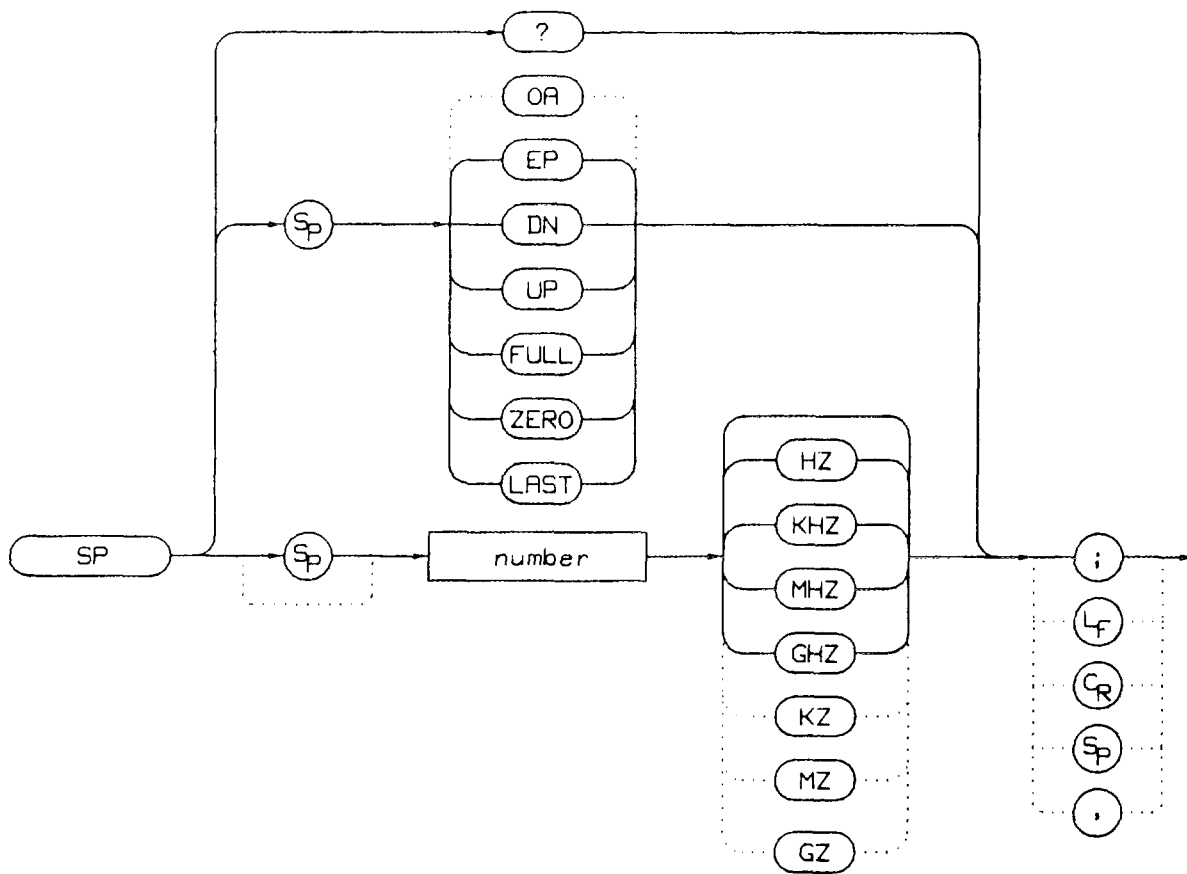
The SNGLS command selects the single-sweep mode. This mode allows only one sweep when trigger conditions are met. When this function is active, an "S" appears on the left edge of the display.

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


LANGUAGE REFERENCE

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

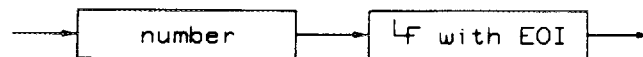
The low band of the spectrum analyzer ranges from 1 kHz to 2.9 GHz. The upper band ranges from 2.75 to 22 GHz. The frequency span cannot be set to overlap both bands at the same time. For example, to sweep a range from 2.0 to 3.5 GHz, use the low band to sweep from 2.0 to 2.9 GHz and use the upper band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

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.

Full span; 19.25 GHz (HP 8562A)

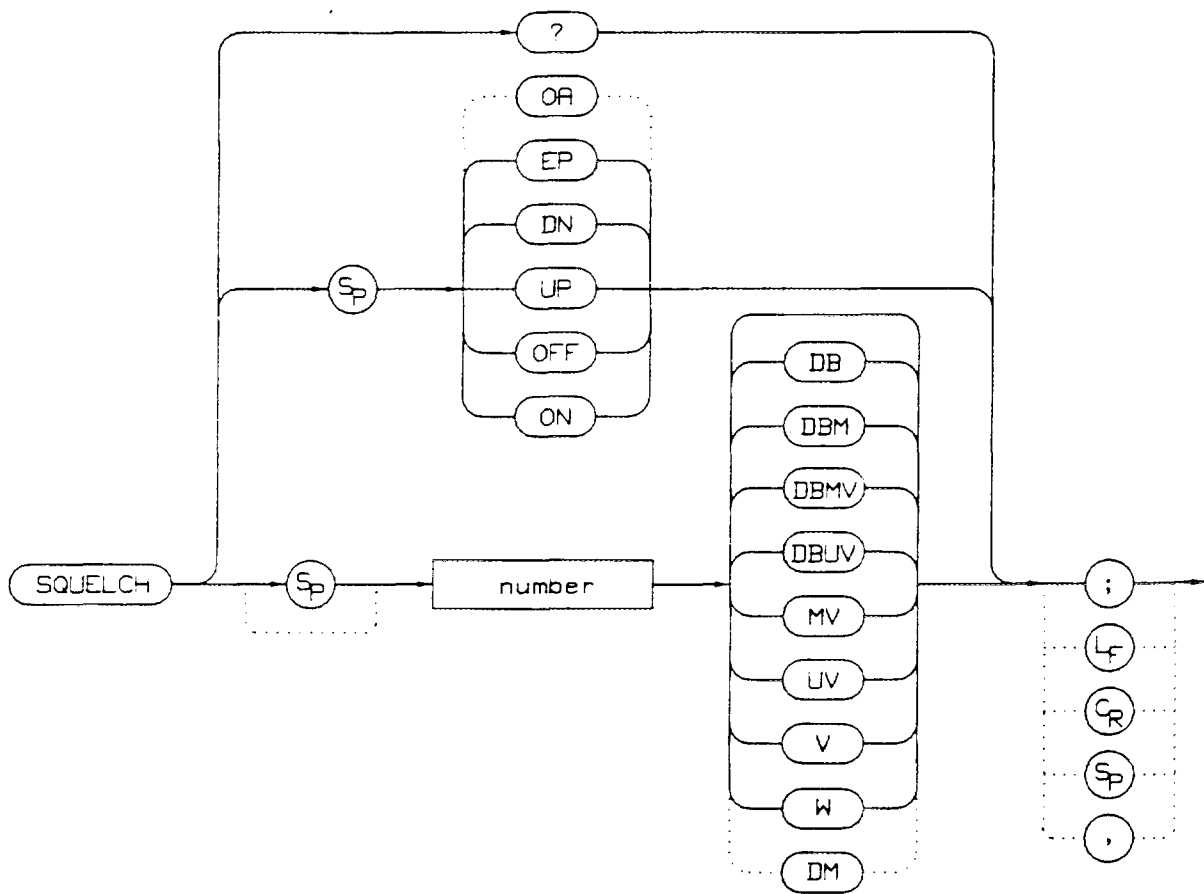
full span; 1.45 GHz (HP 8562B)



```

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


LANGUAGE REFERENCE



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.

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

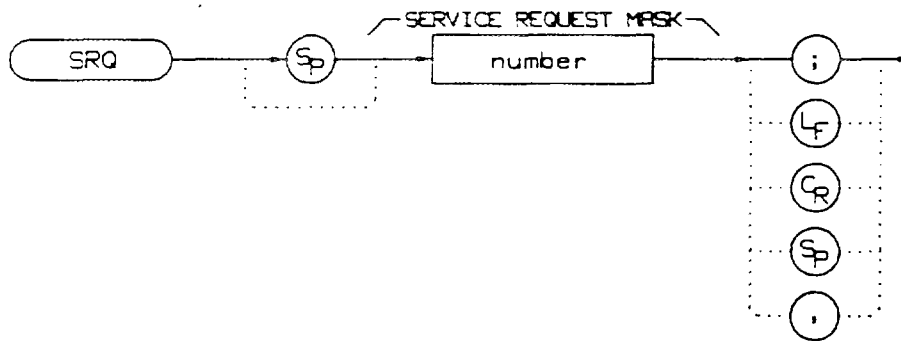
Off



```

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;"DEMOTD ";Dtime;"SEC;"
90      OUTPUT 718;"SQUELCH EP;"
100     INPUT "ADJUST SQUELCH AS NECESSARY; PRESS HOLD, THEN ENTER",A$
110     OUTPUT 718;"DEMOT FM;"
120     LOCAL 718
130     END
  
```


LANGUAGE REFERENCE

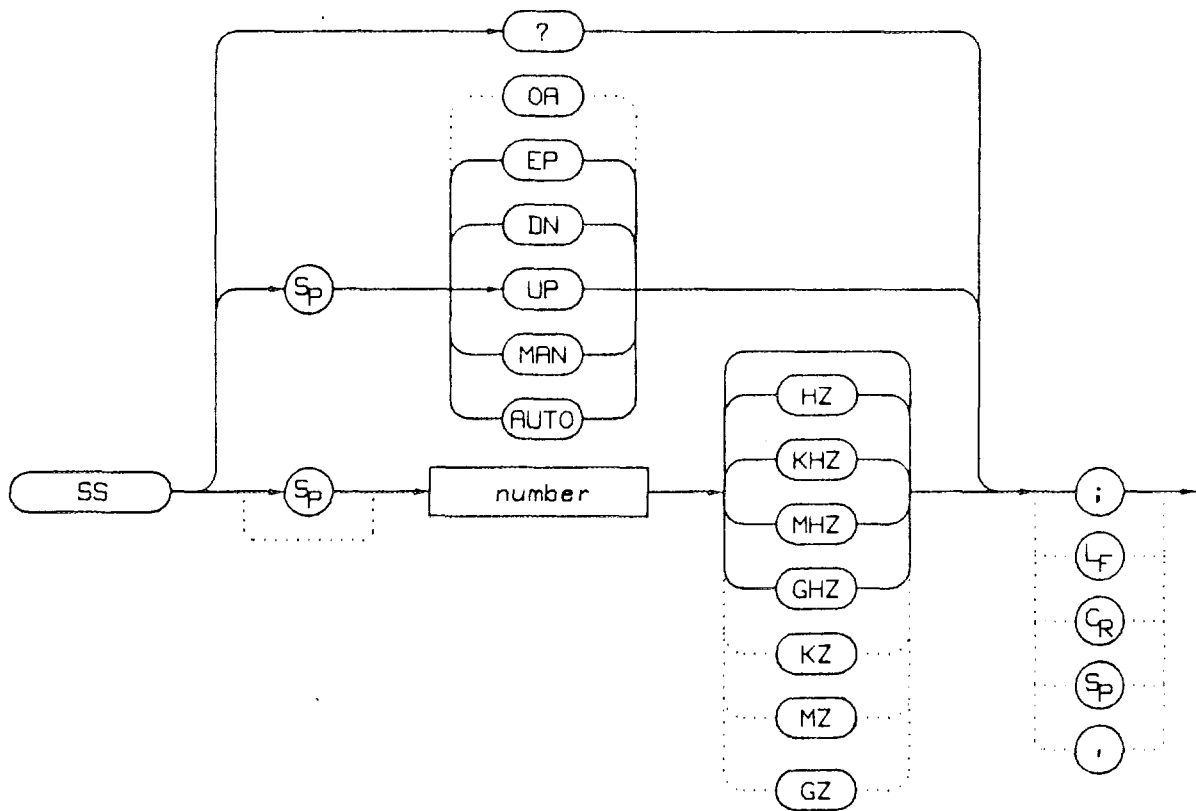


The SRQ command triggers a service request. This command allows you to force a service request and test a program designed to handle service requests. However, the service request can be triggered only if it is first masked using the RQS command. For more service request information, refer to Chapter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

```

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

```

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.



LANGUAGE REFERENCE

INPUT DEVICES

number: real from 100 to 22 E+9.

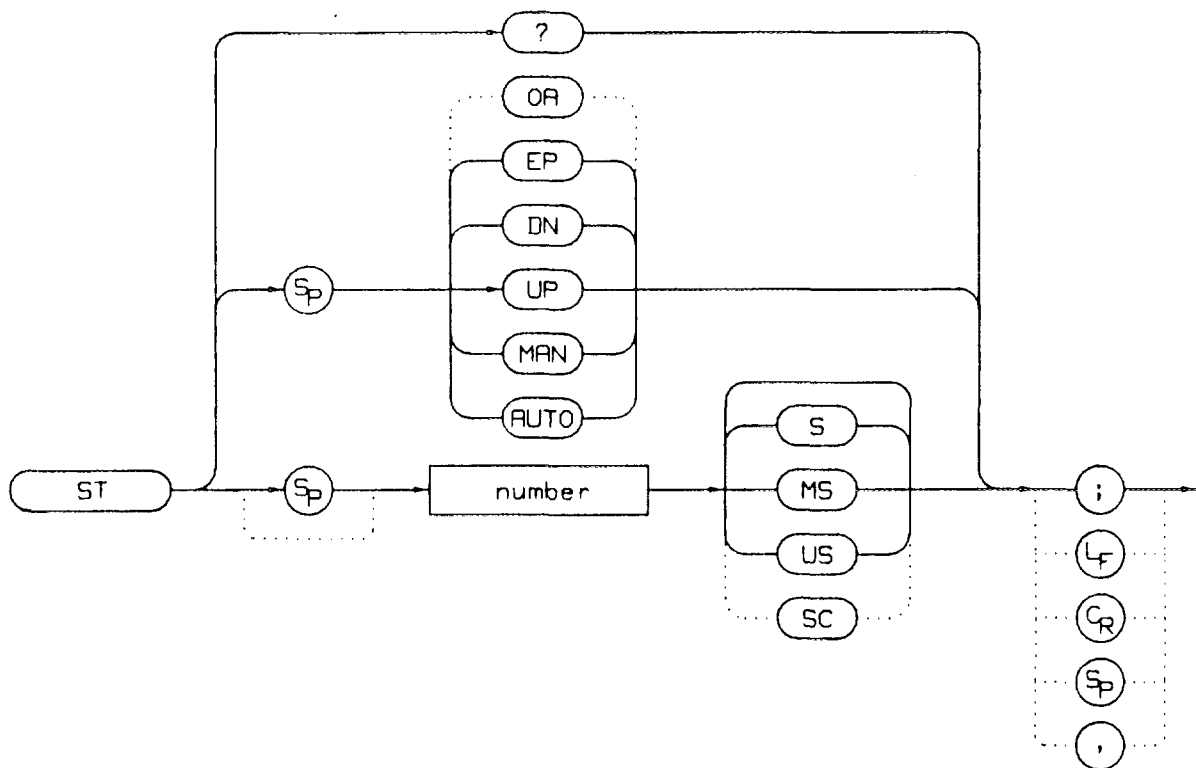
UP/DN: increments in a 1, 2, 5, 10 sequence.

OUTPUT DEVICES



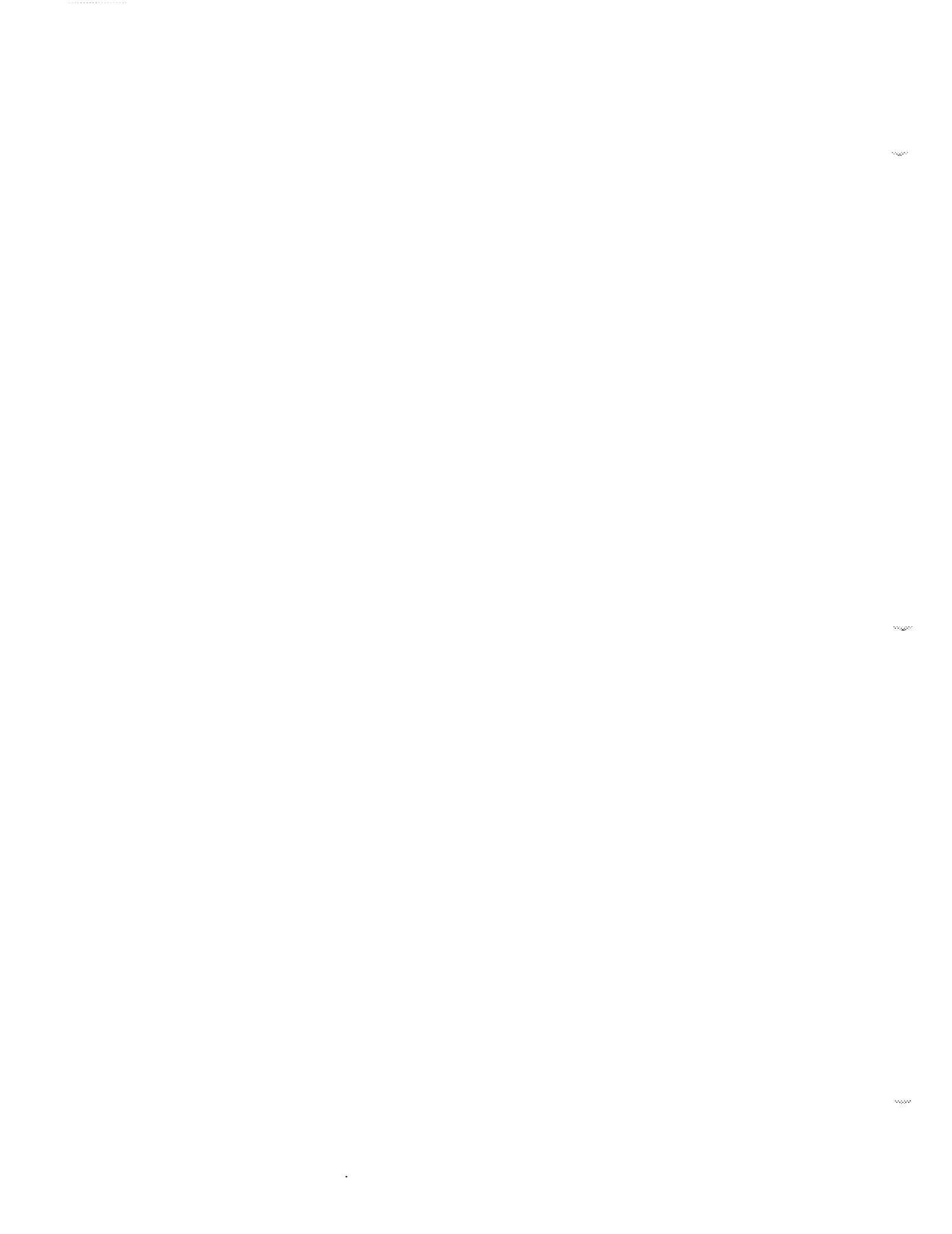
EXAMPLE

```
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_ampl
100 PRINT "The fundamental is ";Mk_amp-Mk_ampl;" db above the first harmonic"
110  END
```

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.



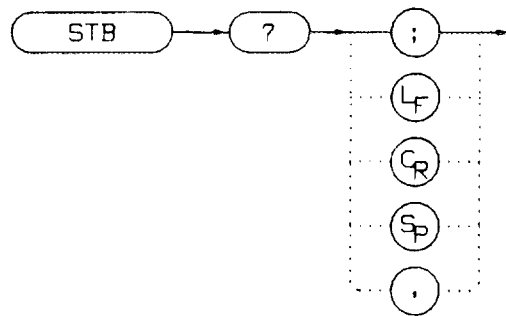
LANGUAGE REFERENCE

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.

Coupled mode; 50 msec

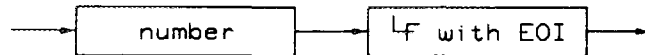


```
10      OUTPUT 718;"ST 500MSEC;"
20      OUTPUT 718;"ST DN;"
30      OUTPUT 718;"ST?";
40      ENTER 718;St
50      PRINT St
60      END
```

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.

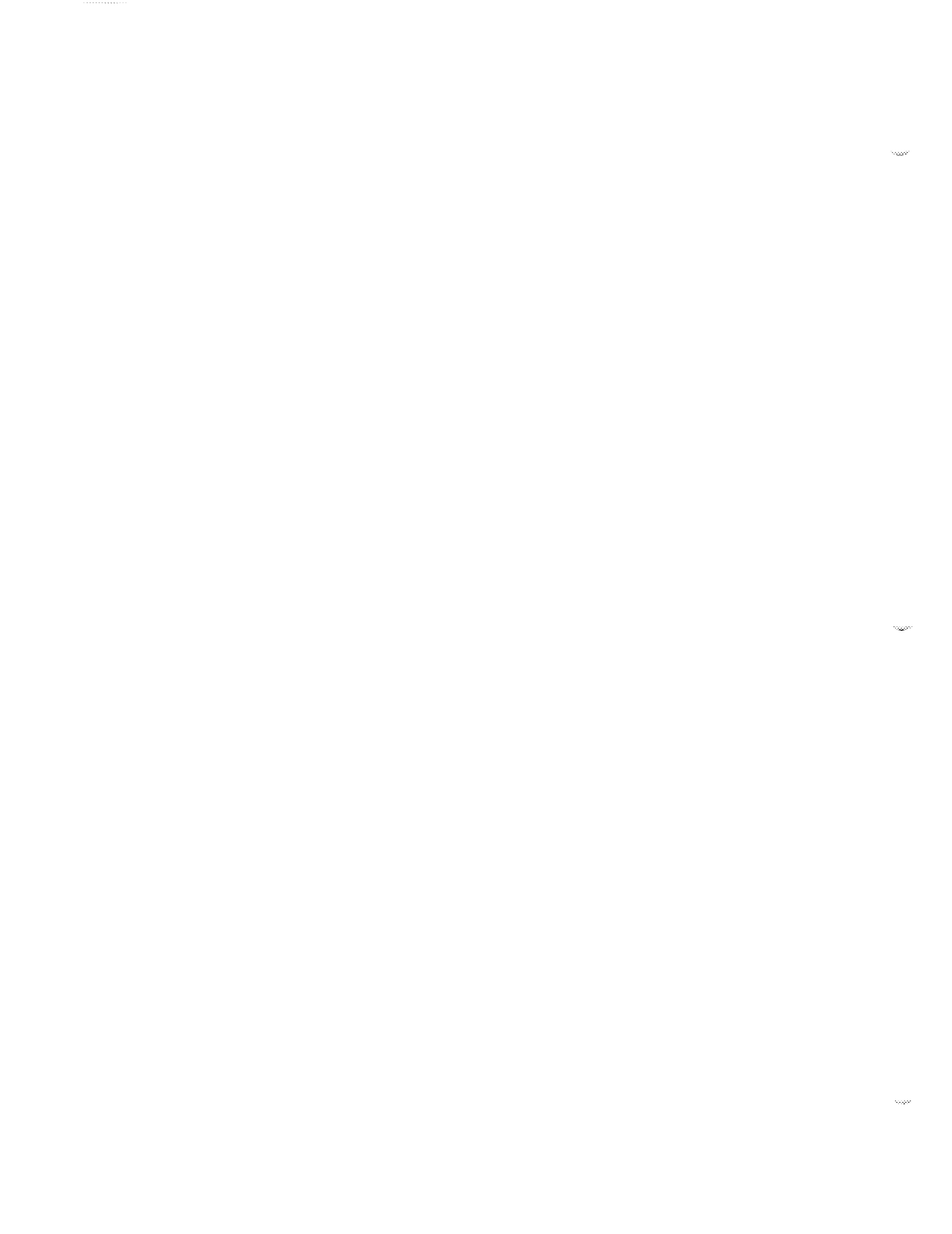
RESPONSE



LANGUAGE REFERENCE

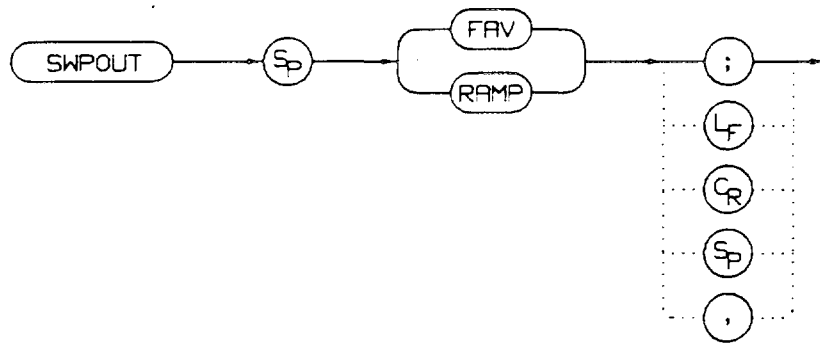
EXAMPLE

```
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



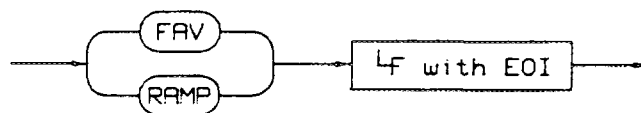
DESCRIPTION

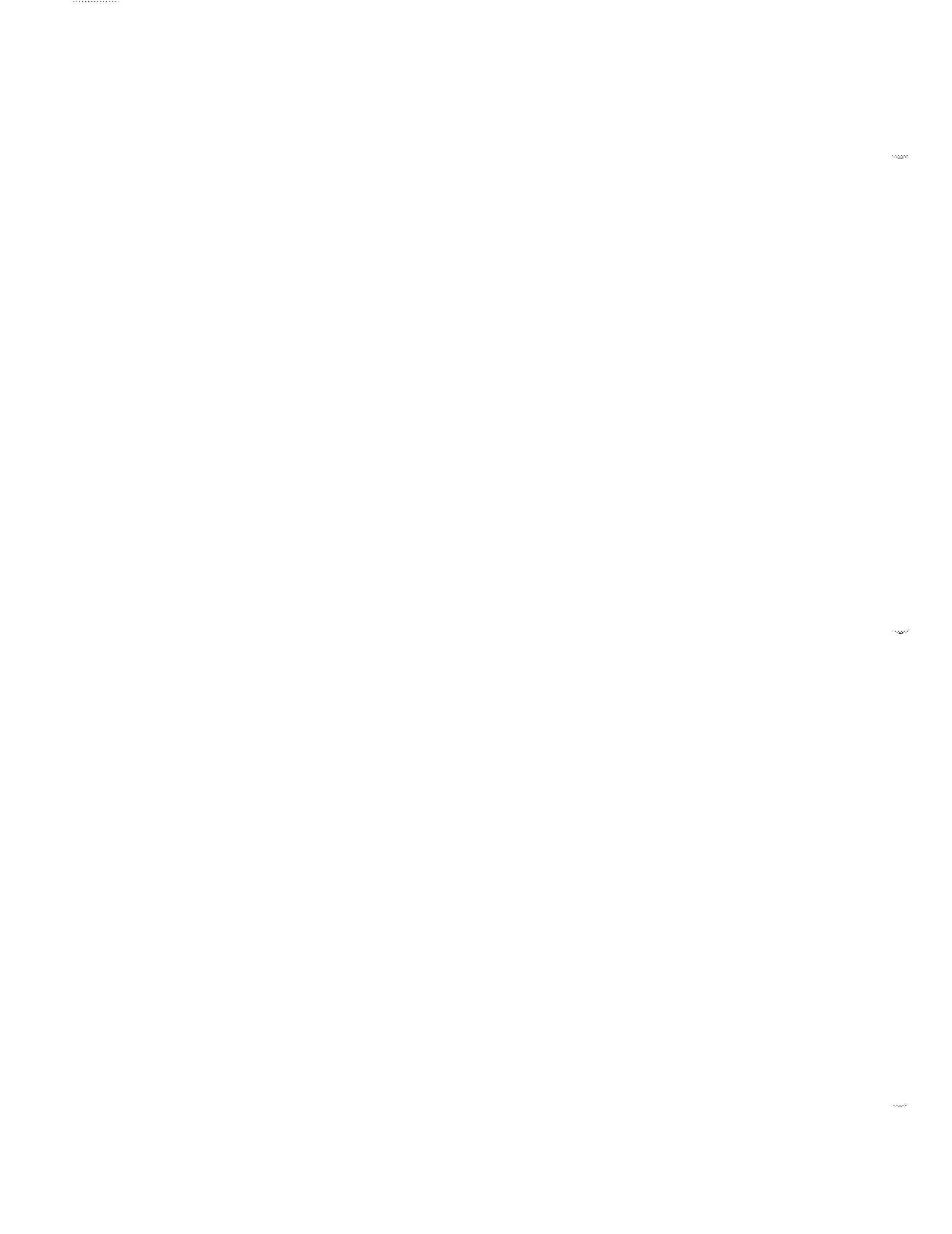
The SWPOUT command selects the sweep-related signal that is available from J8 on the rear panel. FAV provides a DC ramp of 0.5V/GHz from 0-22 GHz. RAMP provides a 0-10 V ramp corresponding to the sweep ramp that tunes the first local oscillator (LO). In multiband sweeps, one ramp is provided for each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

PRESET STATE

0.5 V/GHz (FAV)

QUERY RESPONSE





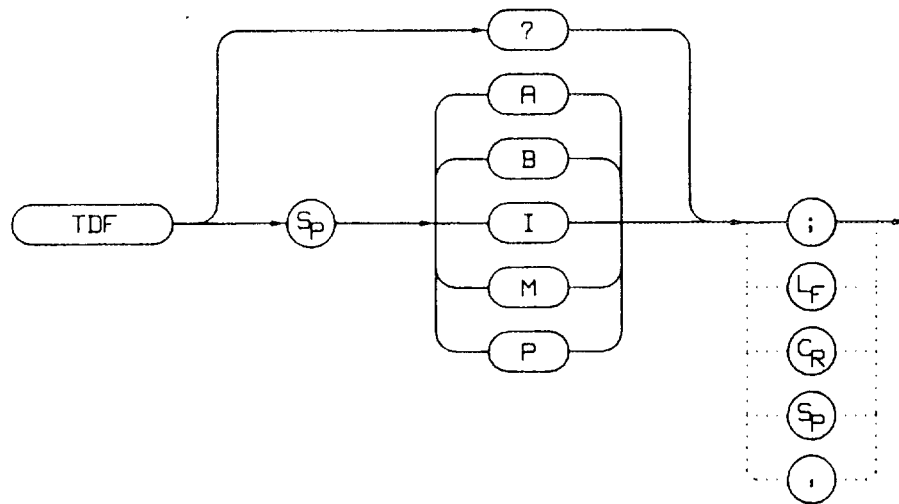
LANGUAGE REFERENCE

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.

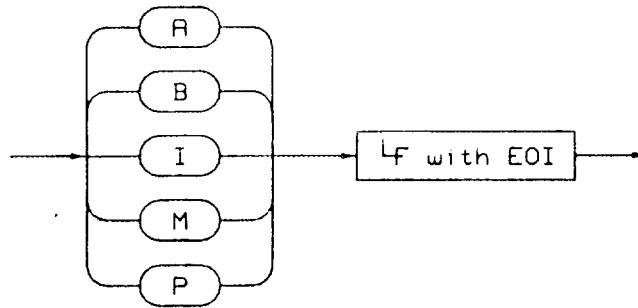
M: specifies ASCII data format.

P: specifies real number output format. Numbers are in Hz, Volts, Watts, dBm, dBmV, dB μ V, dBV, or seconds.



LANGUAGE REFERENCE

QUERY RESPONSE



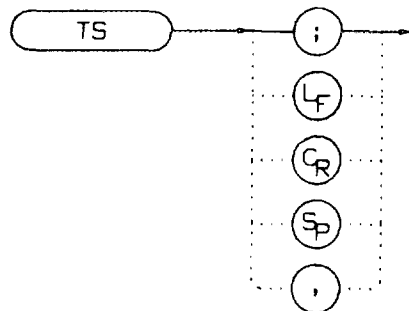
EXAMPLE

```
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
```


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

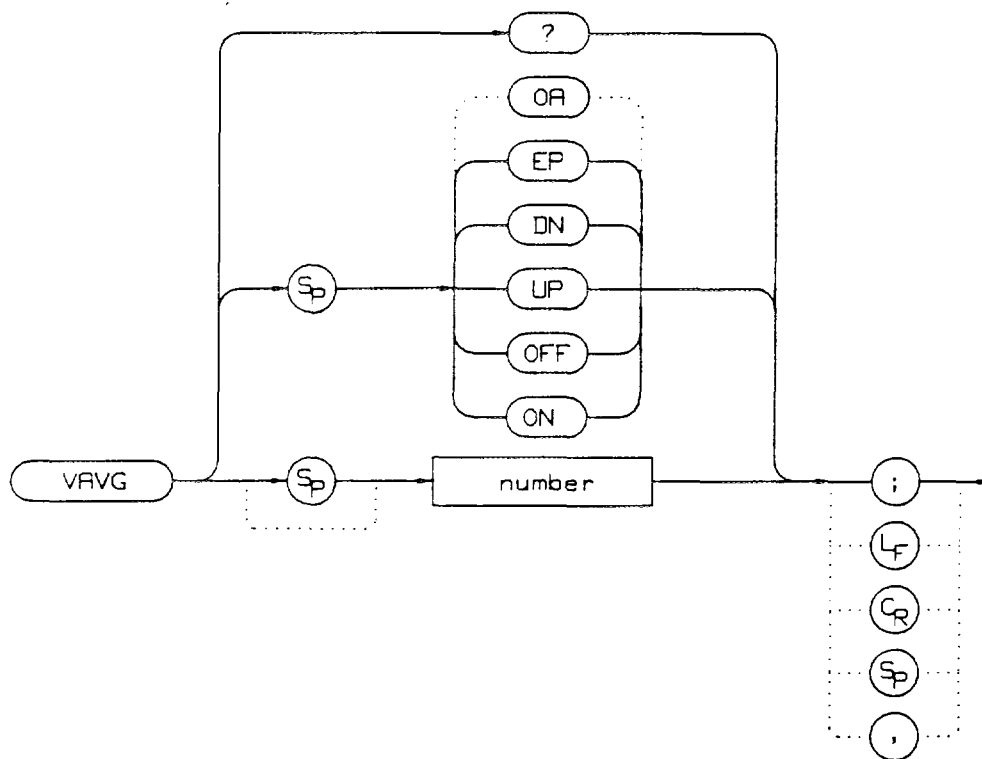
```



LANGUAGE REFERENCE

VAVG VIDEO AVERAGE

SYNTAX

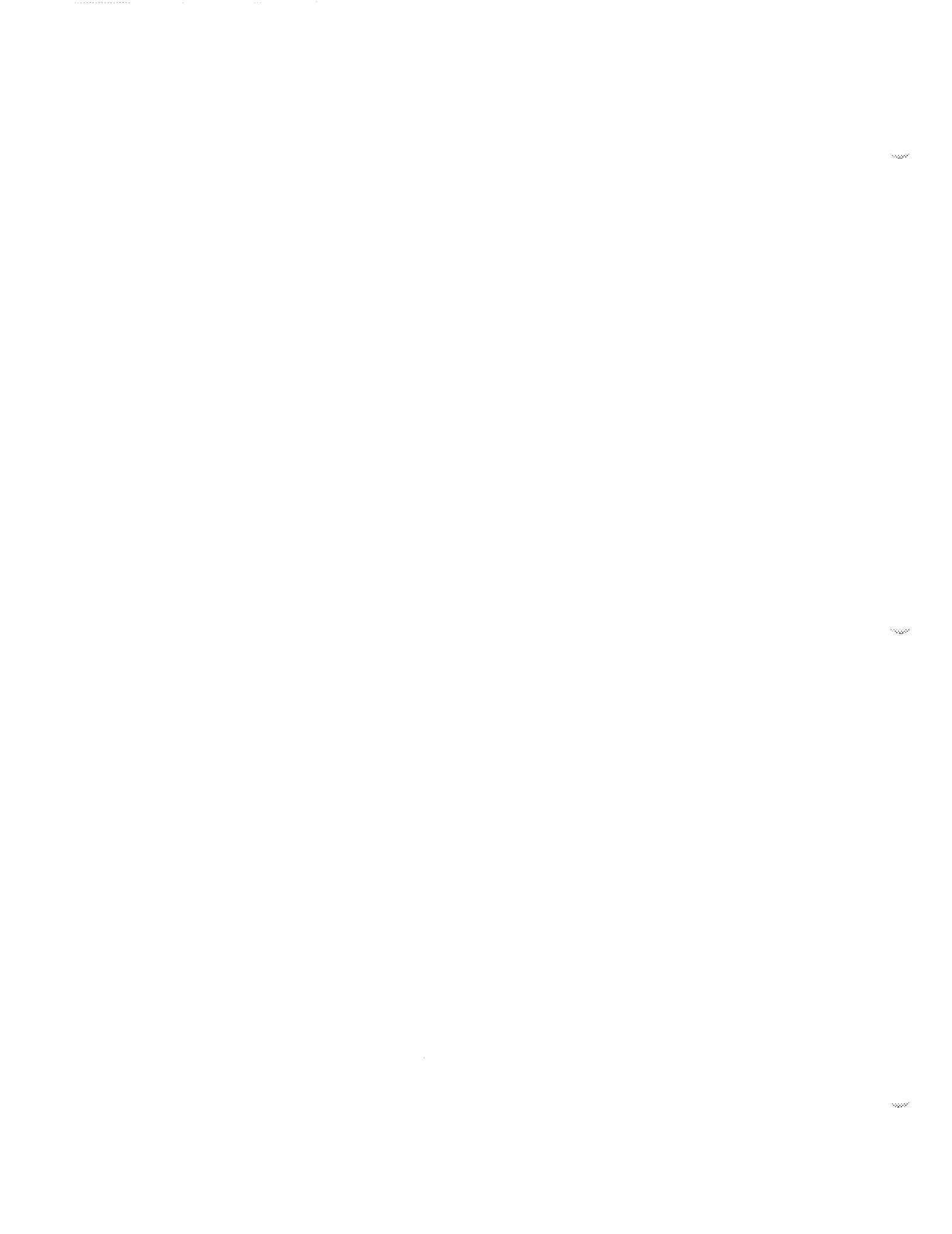


DESCRIPTION

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.



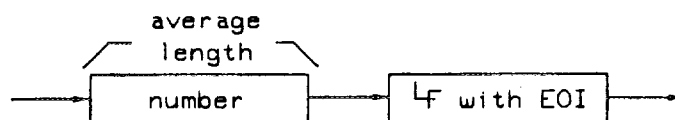
PARAMETERS

number: integer from 1 to 999.
UP/DN: increments by 1.

PRESET STATE

100

QUERY RESPONSE



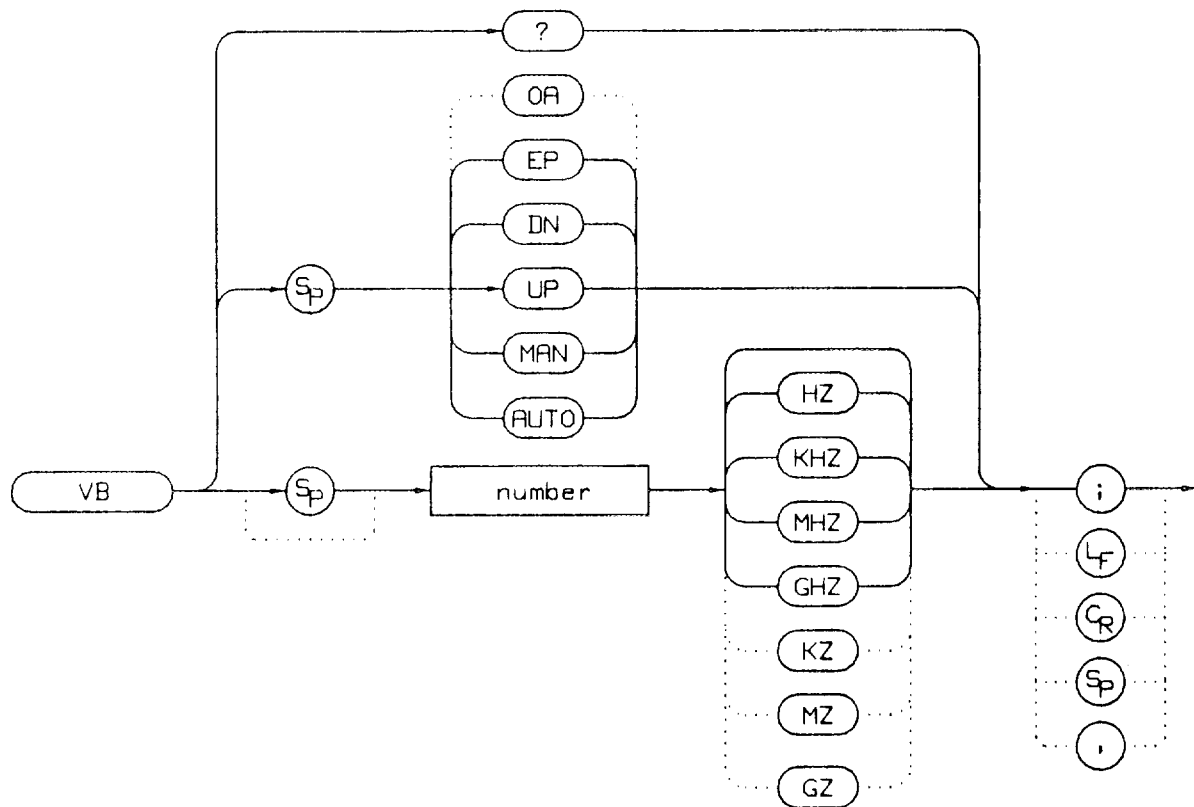
EXAMPLE

```
10      OUTPUT 718;"SNGLS;VAVG 20;TS;"  
20      END
```


LANGUAGE REFERENCE

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.

INITIAL STATE

Coupled mode, 1 MHz

QUERY RESPONSE



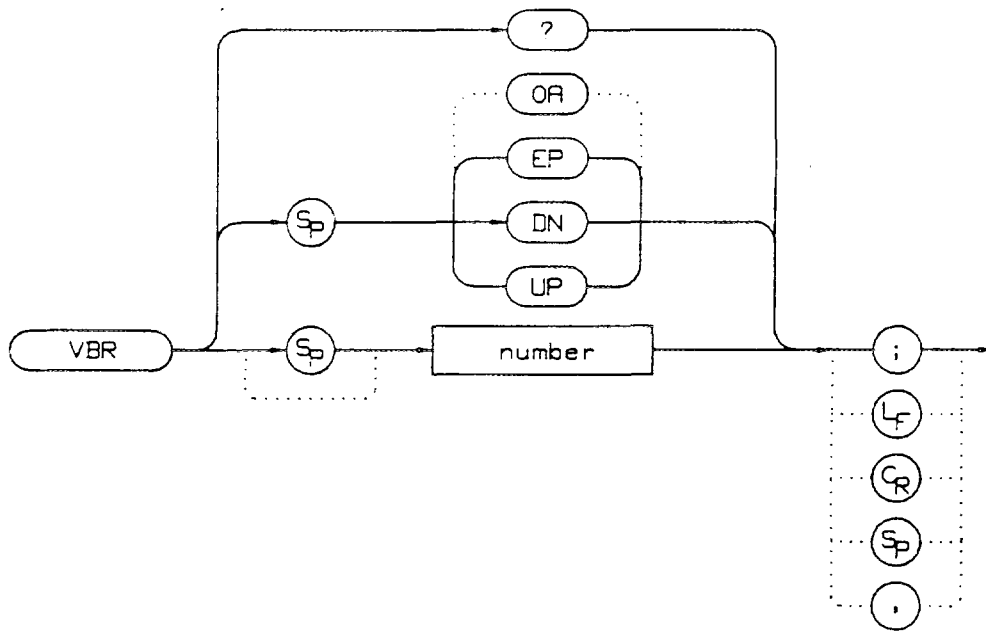
EXAMPLE

```

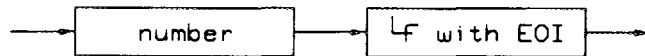
10      OUTPUT 718;"IP;"
20      OUTPUT 718;"CF 12GHZ;SP 2GHZ;"
30      INPUT "SELECT THE VIDEO BANDWIDTH, IN KHZ",B_width
40      OUTPUT 718;"VB ";B_width;"KHZ;"
50      OUTPUT 718;"VB?;";
60      ENTER 718;B_width
70      PRINT "SELECTED BANDWIDTH IS ",B_width,"HZ"
80      END
  
```



LANGUAGE REFERENCE



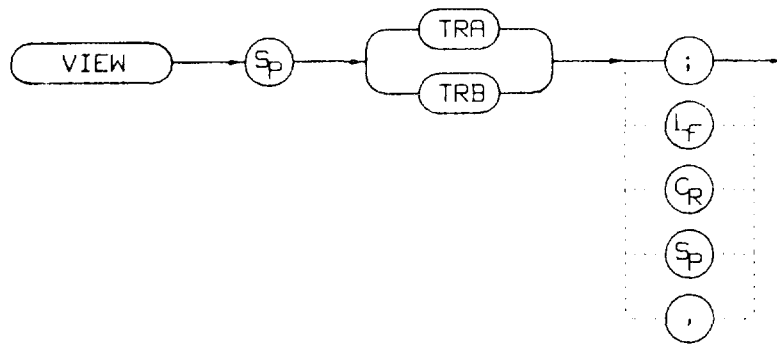
The VBR command specifies the coupling ratio between the video bandwidth and the resolution bandwidth. The ratio ranges from 0.003 to 3 in a 1, 3, 10 sequence. The default ratio is 1.



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
```

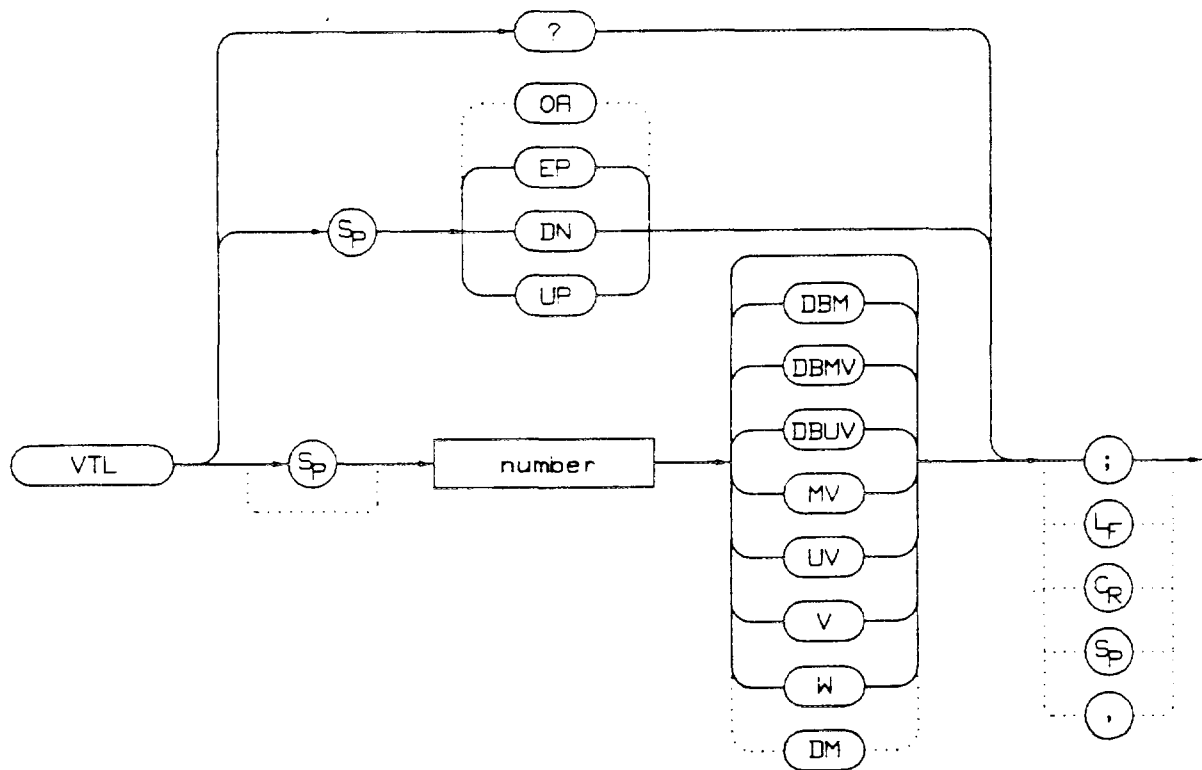

LANGUAGE REFERENCE



The VIEW command displays the current contents of the selected trace, but does not update the contents.

```
10      OUTPUT 718;"CLRW TRA;TS;VIEW TRA;"  
20      END
```


VTL
VIDEO TRIGGER LEVEL



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.

LANGUAGE REFERENCE

QUERY RESPONSE



EXAMPLE

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


APPENDIX A

COMMANDS VS. FRONT-PANEL KEYS

PROGRAMMING CONVENTIONS

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
AUTOCP	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
DEMODO	Demodulation	AM DEMOD ON OFF FM DEMOD ON OFF
DEMODOAGC	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






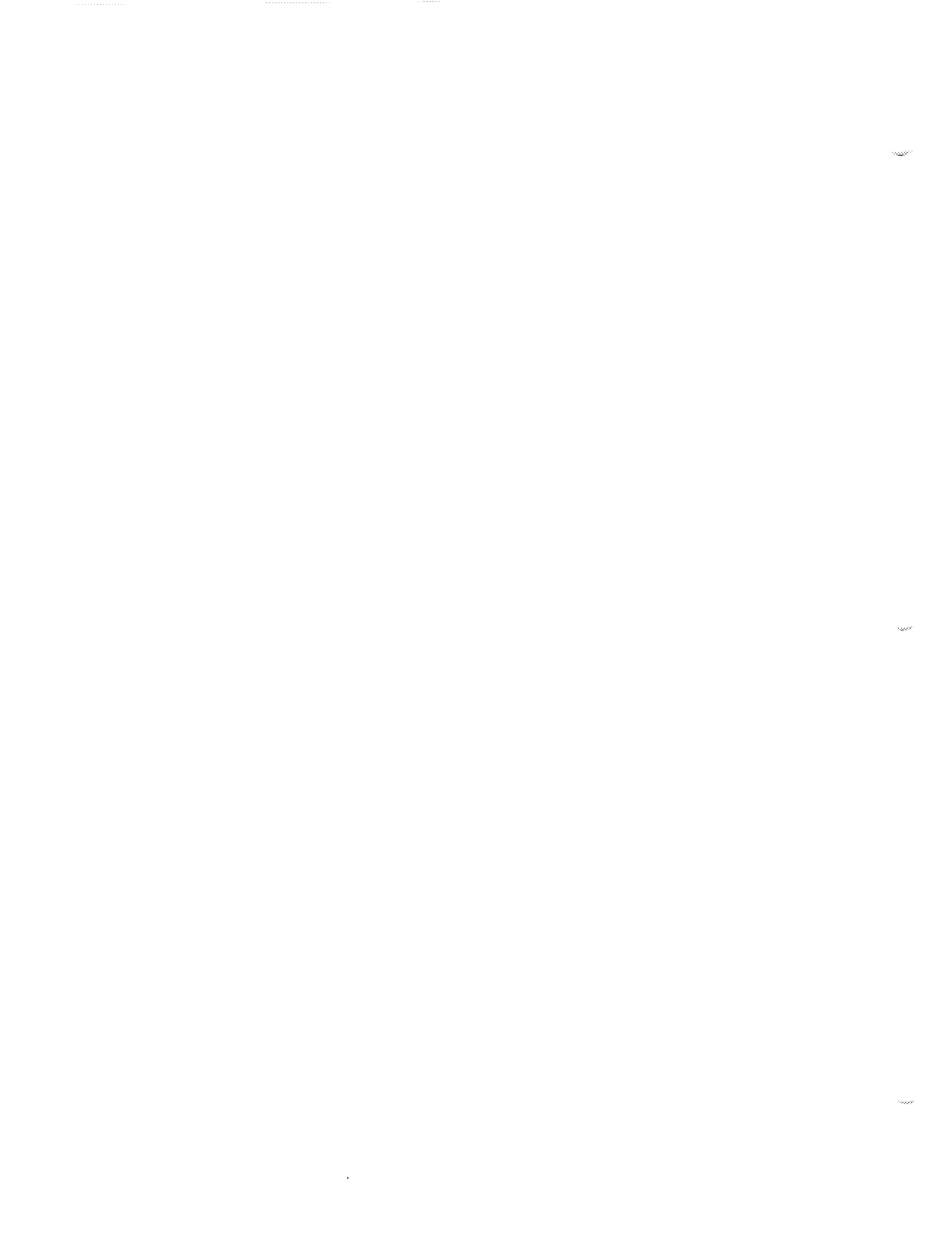
RL	Reference Level	REF LVL, 
RLCAL	Reference Level Calibration	REF LVL CAL
ROFFSET	Reference Level Offset	REF LVL OFFSET
RQS	Request Service Conditions	
SAVES	Save State	SAVE STATE
SAVET	Save Trace	SAVE TRACE
SER	Serial Number	
SIGDEL	Signal Amplitude Delta	
SIGID	Signal Identify	SIG ID ON OFF
SNGLS	Single Sweep	SINGLE
SP	Frequency Span	
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	
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



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 display block. After reviewing the errors, press CLR ALL & EXIT to return the previous spectrum analyzer display.

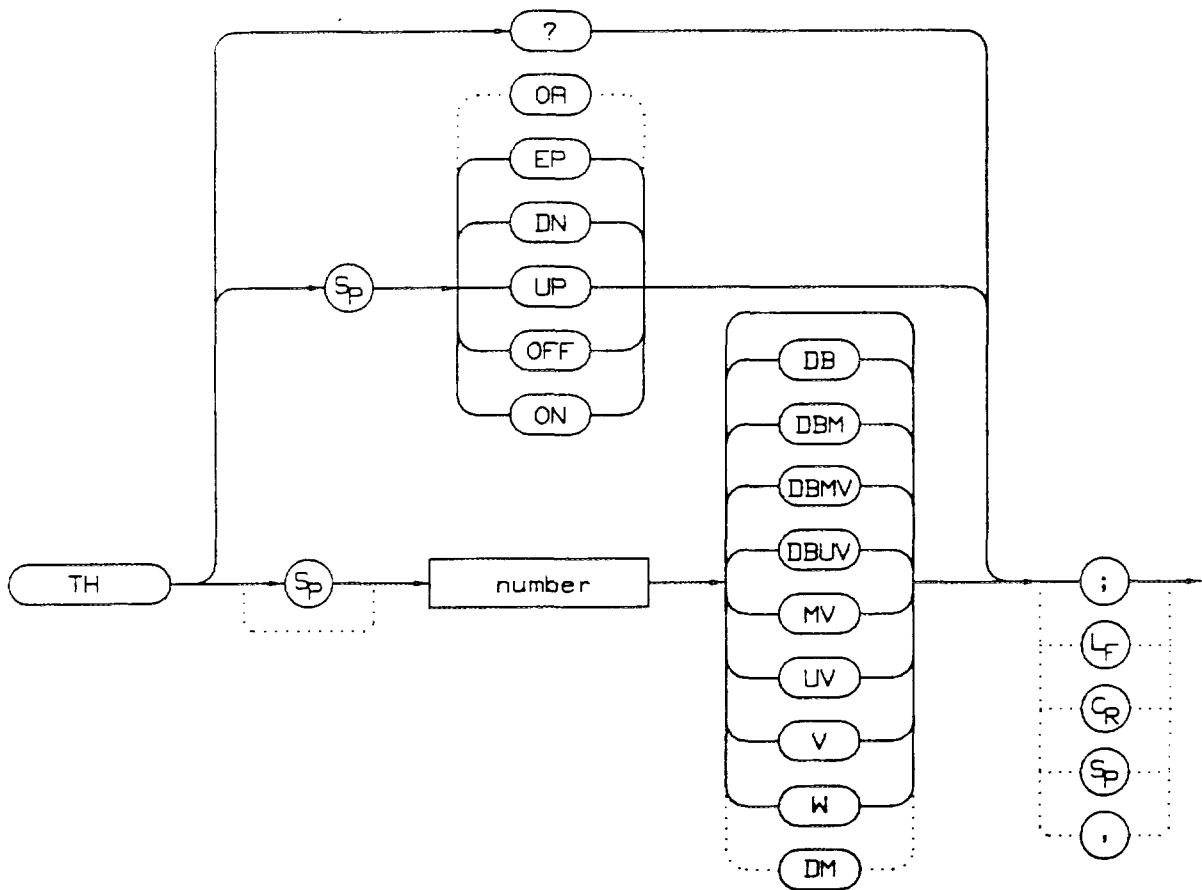
ERROR CODE	ERROR	PROBABLE CAUSE
100	NO PWRON	Power-on state not valid; a default state was loaded instead
101	NO STATE	Recalled state not valid or not saved
106	ABORTED!	Aborted operation
107	HELLO ??	No HP-IB listener on bus
108	TIME OUT	Controller time out
109	CTRLFAIL	Take control of HP-IB failed
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.



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.



LANGUAGE REFERENCE

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

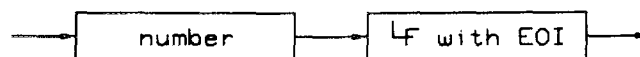
number: real from -220 to 30.

UP/DN: increments by one vertical division.

PRESET STATE

Off

QUERY RESPONSE

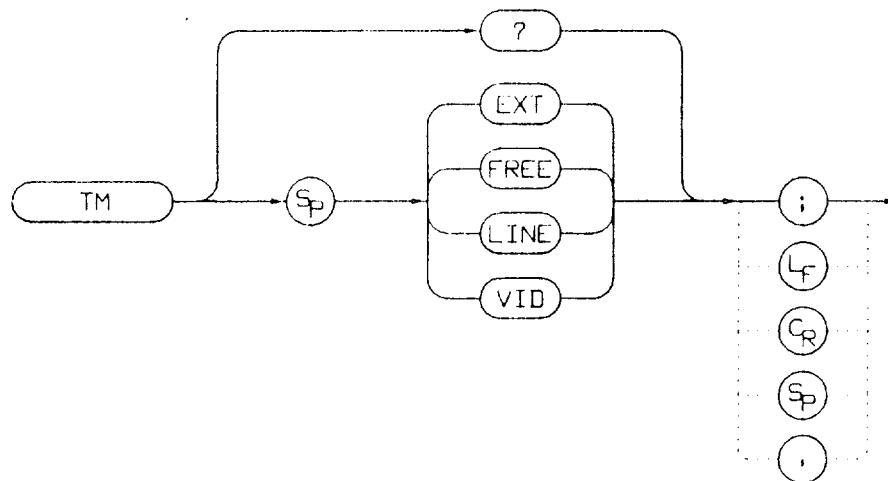


EXAMPLE

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


TM TRIGGER MODE

SYNTAX



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.

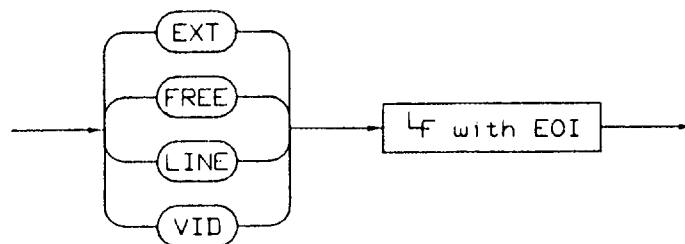
VID: selects the video mode. Sweep triggers occur whenever the positively-sloped part of the input signal passes through the video trigger level. This trigger level can be changed (refer to the VTL command), and a dashed line appears on the screen to denote the selected level.

LANGUAGE REFERENCE

PRESET STATE

Free-run mode

QUERY RESPONSE

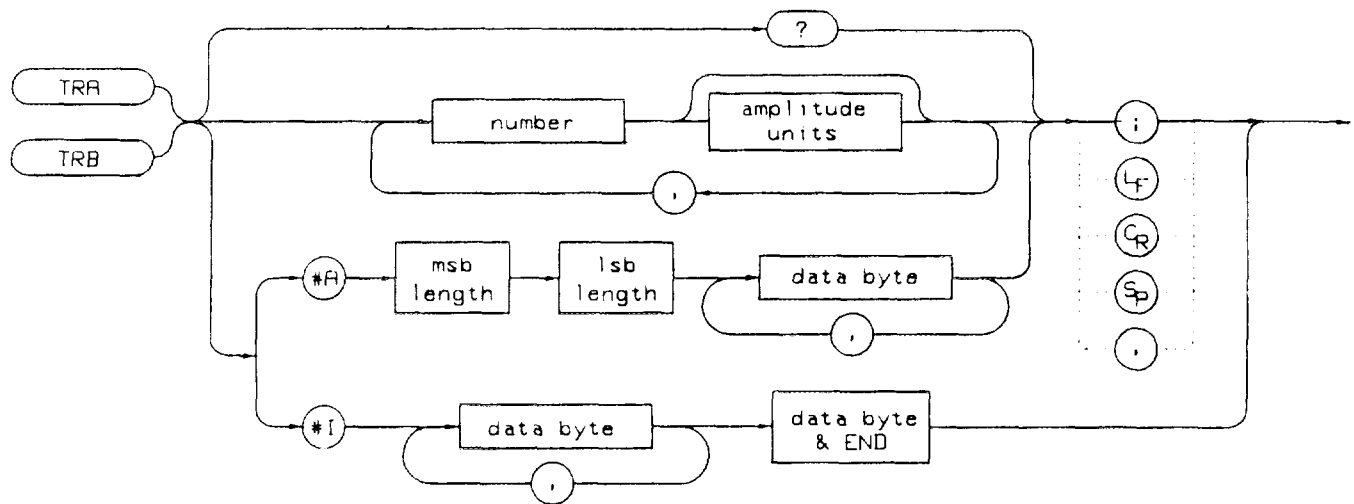


EXAMPLE

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


TRA/TRB TRACE DATA INPUT/OUTPUT

SYNTAX



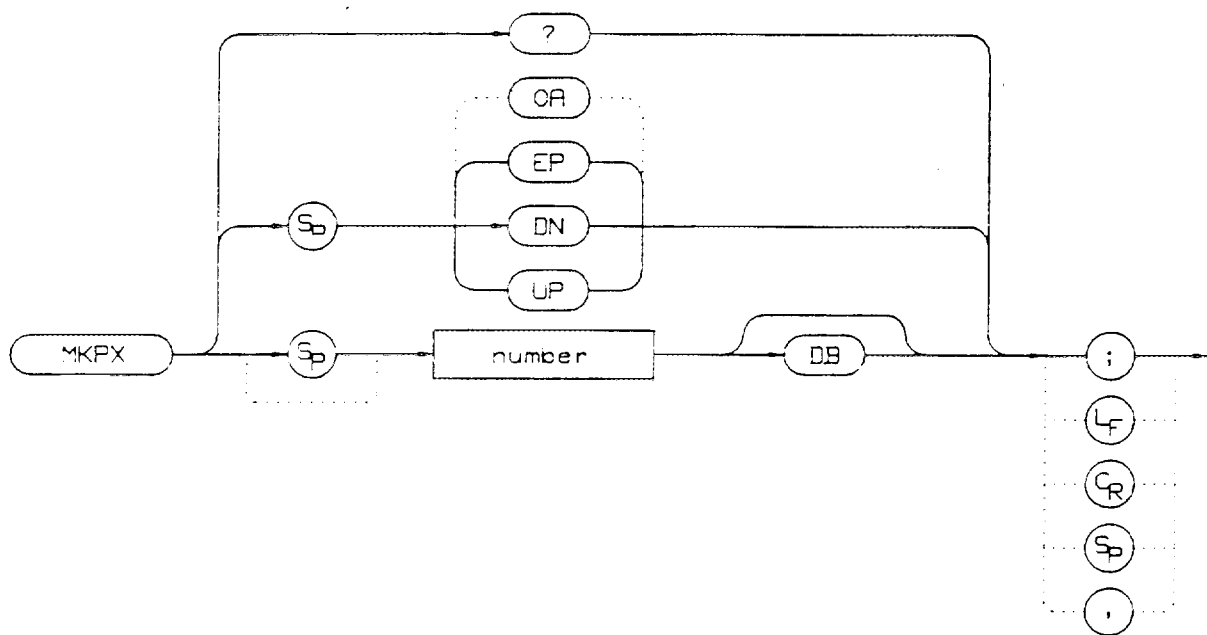
DESCRIPTION

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.

LANGUAGE REFERENCE



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.

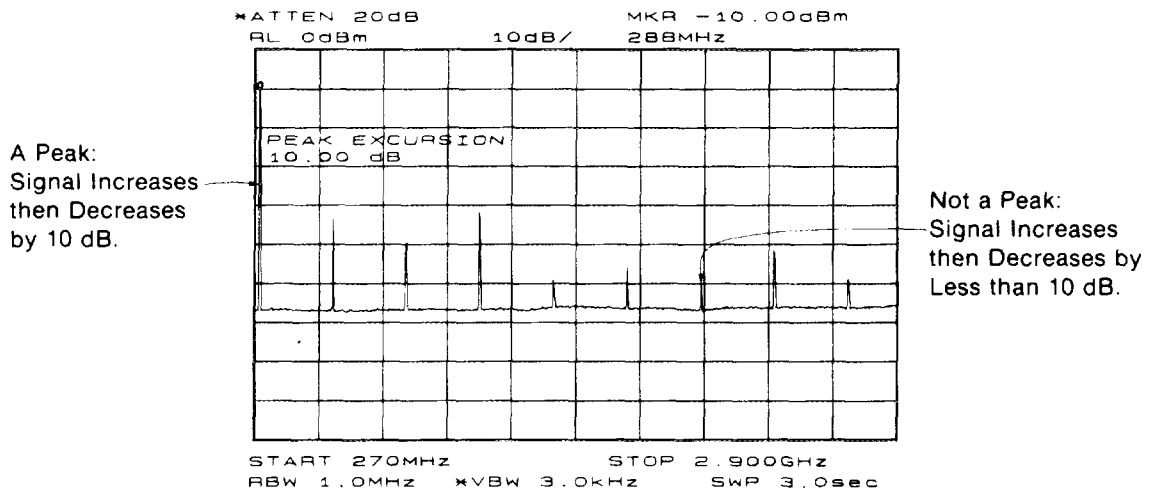


Figure 14.2. MKPX determines which signals are considered peaks.

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



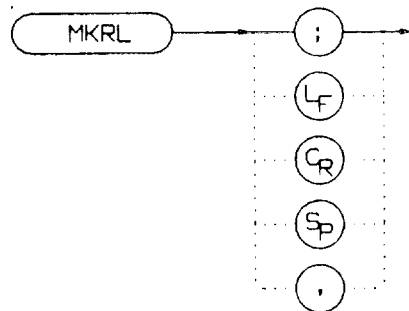
```

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
  
```


LANGUAGE REFERENCE

MKRL MARKER TO REFERENCE LEVEL

SYNTAX

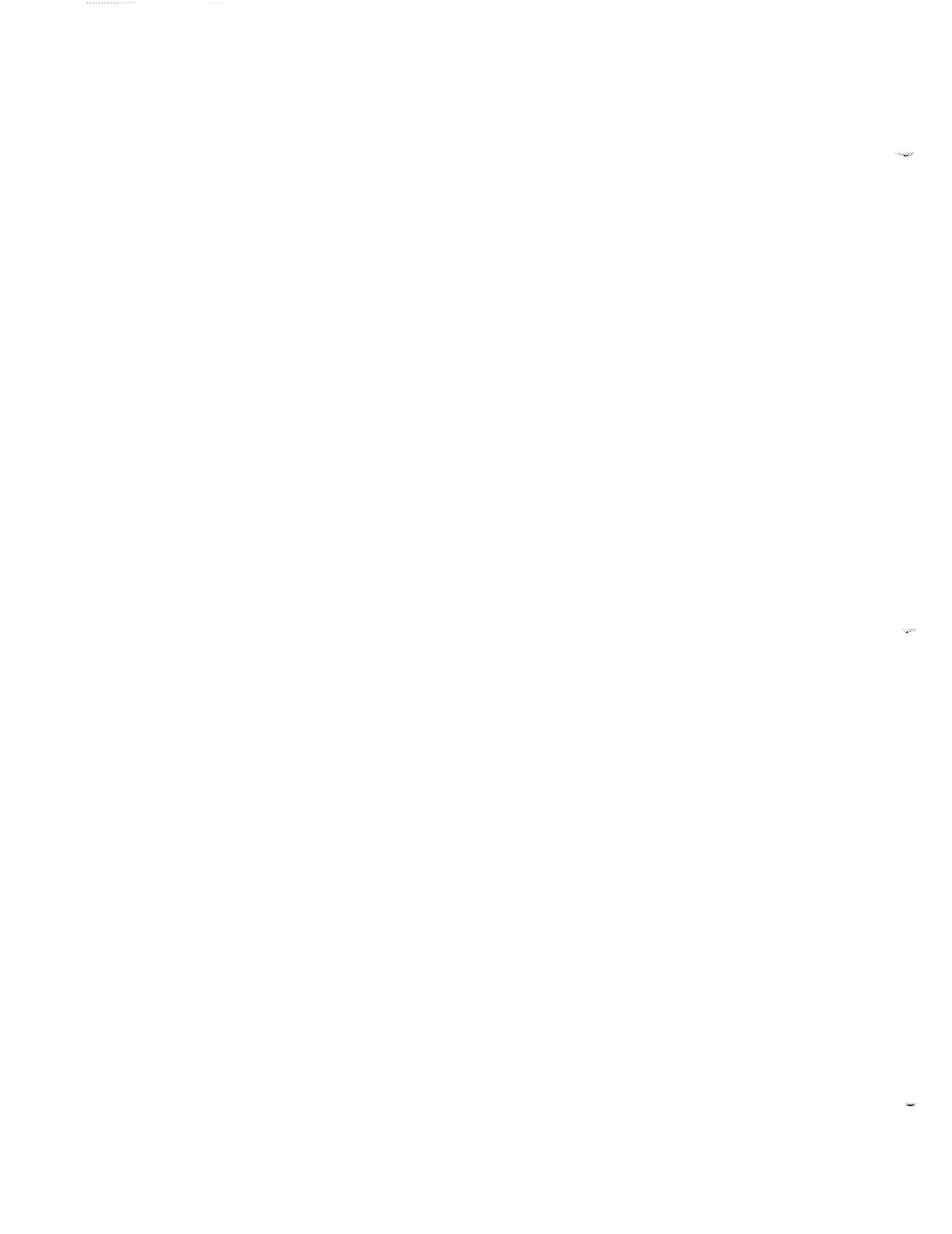


DESCRIPTION

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.

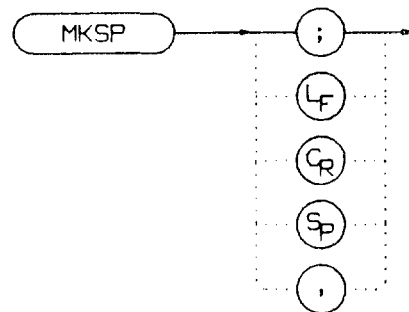
EXAMPLE

```
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



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.

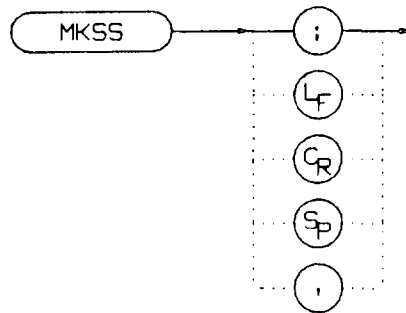
EXAMPLE

```

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

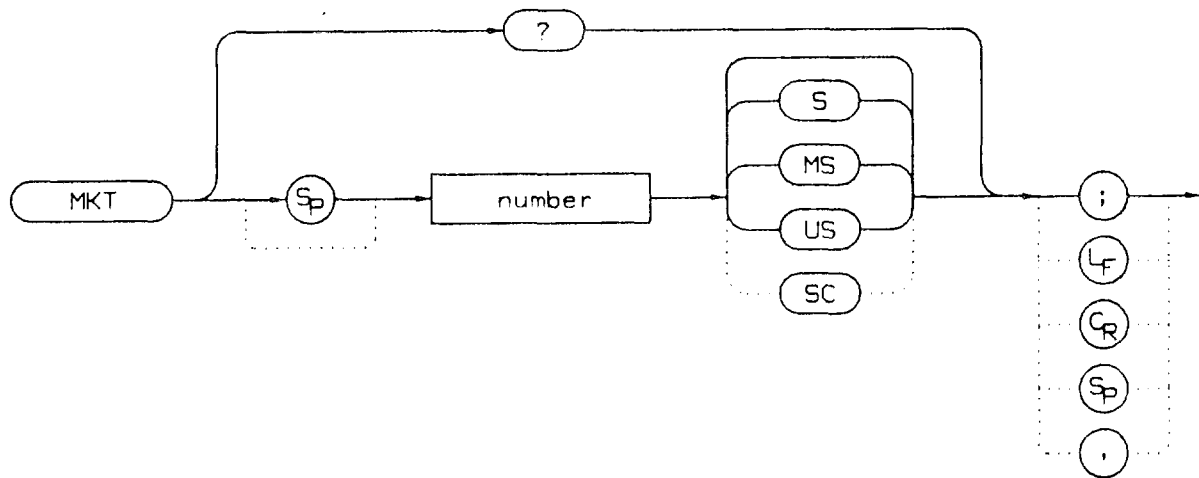
```


LANGUAGE REFERENCE



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

```
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
```

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

PARAMETERS

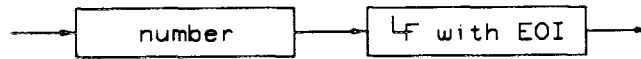
number: real from 0 to the current sweep time.

INITIAL STATE

Off

LANGUAGE REFERENCE

QUERY RESPONSE



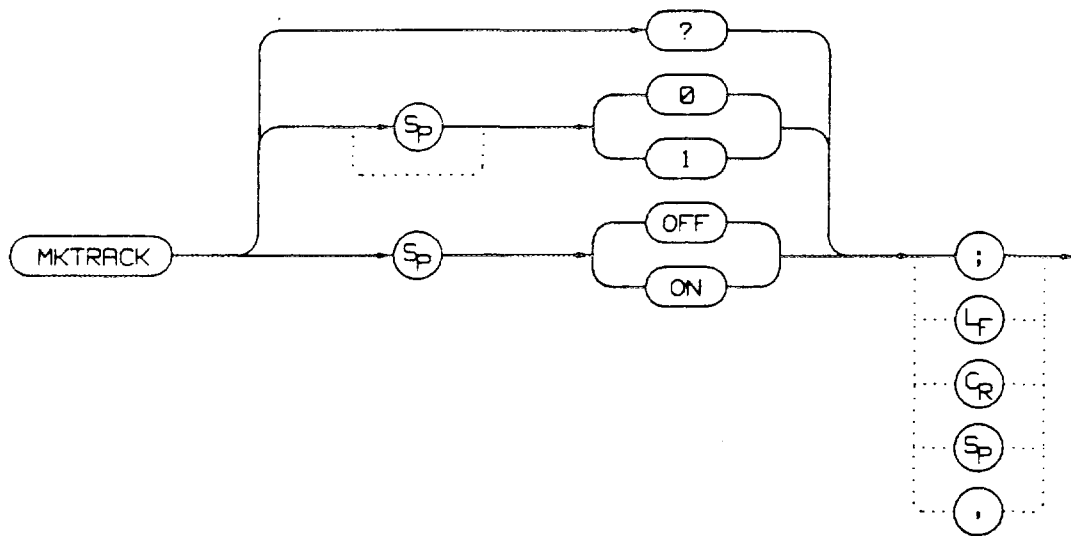
EXAMPLE

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



MKTRACK SIGNAL TRACK

SYNTAX



DESCRIPTION

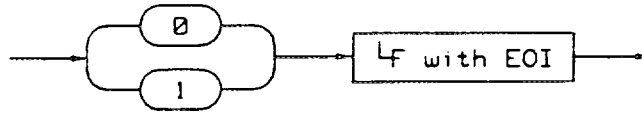
The MKTRACK command locates the active marker and sets the center frequency to the marker value. This is done after every sweep, thus maintaining the marker value at the center frequency. This allows you to quickly "zoom in" from a wide span to a narrow one, without losing the signal from the screen. 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

LANGUAGE REFERENCE

QUERY RESPONSE

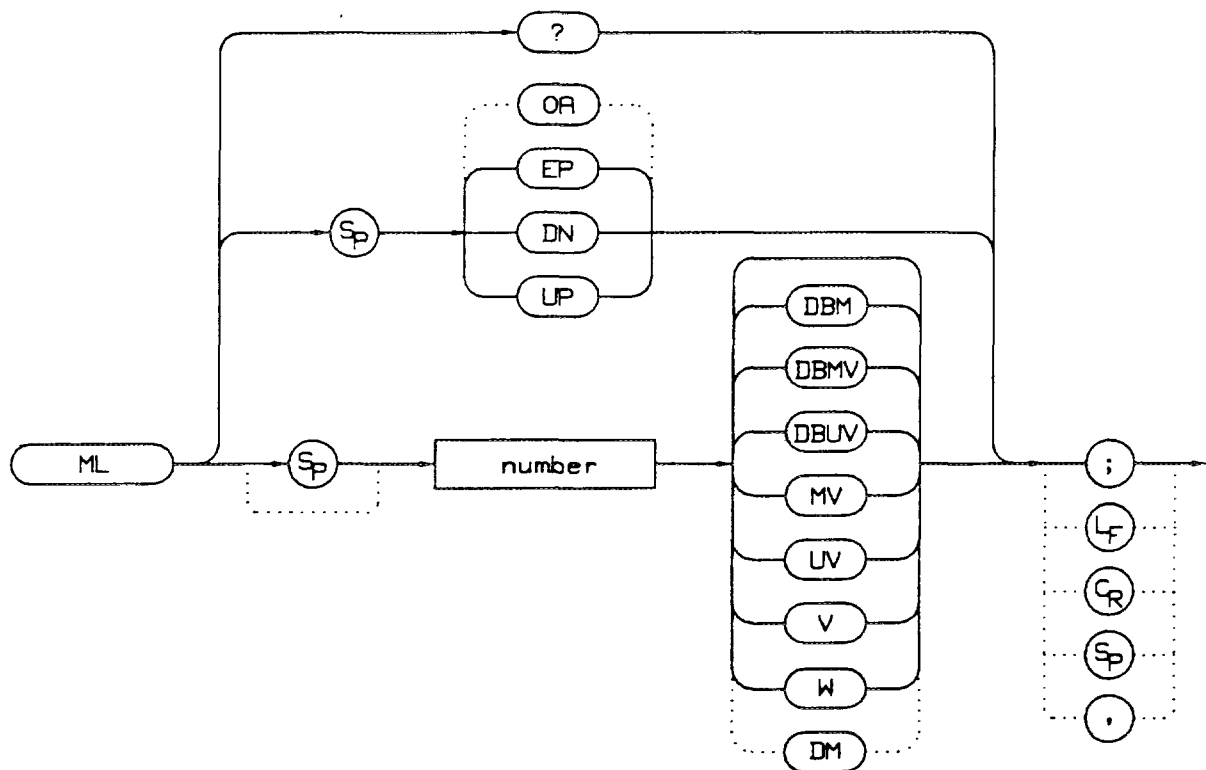


EXAMPLE

```
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.

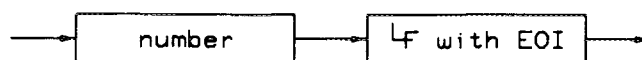


LANGUAGE REFERENCE

PRESET STATE

-10 dBm

QUERY RESPONSE



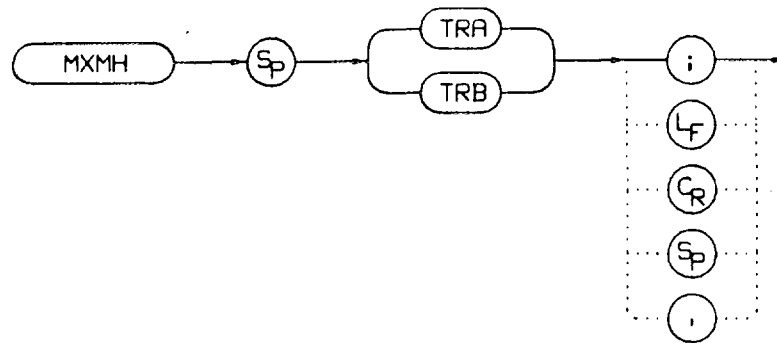
EXAMPLE

```
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

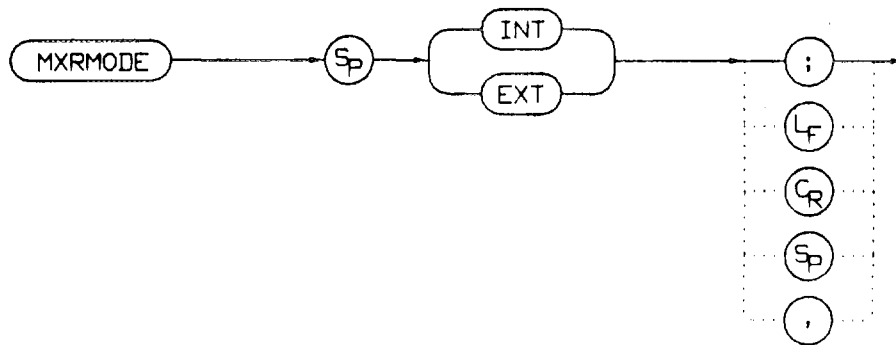
```

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


LANGUAGE REFERENCE

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

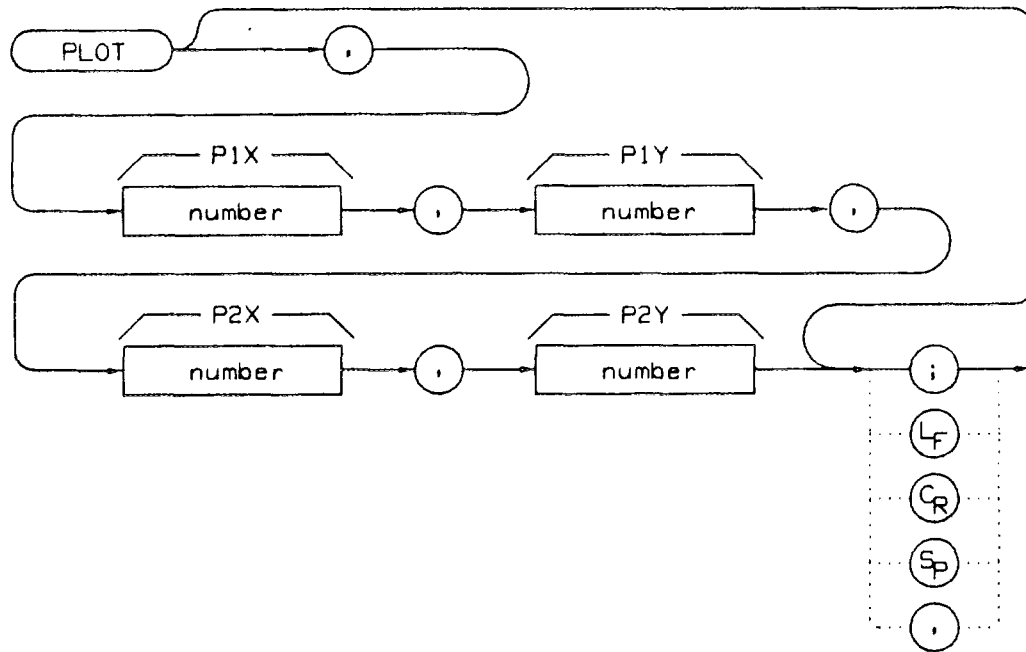
Internal

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.

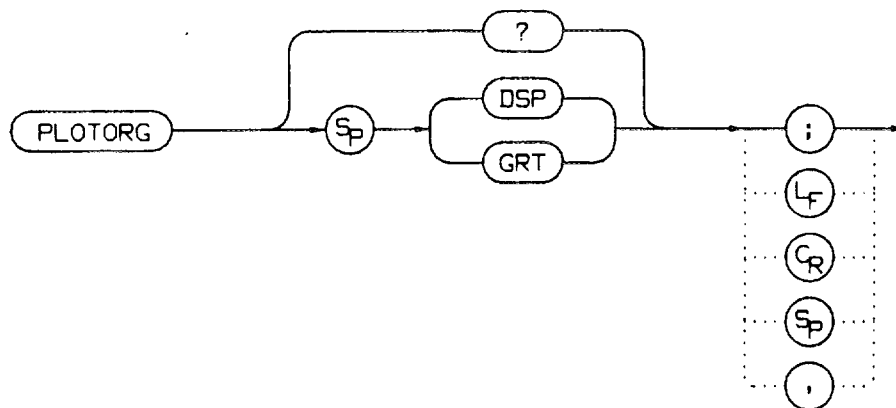
LANGUAGE REFERENCE

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
```


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.

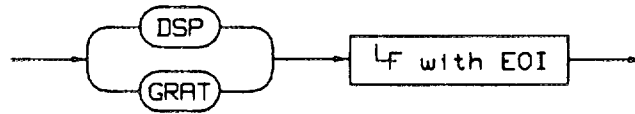
PARAMETERS

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

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

LANGUAGE REFERENCE

QUERY RESPONSE

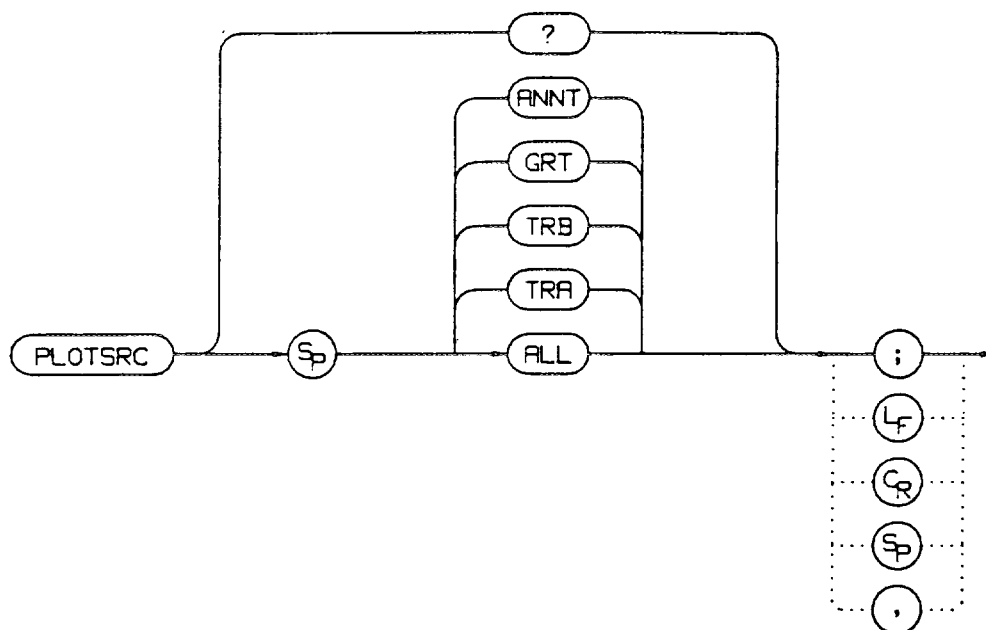


EXAMPLE

```
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

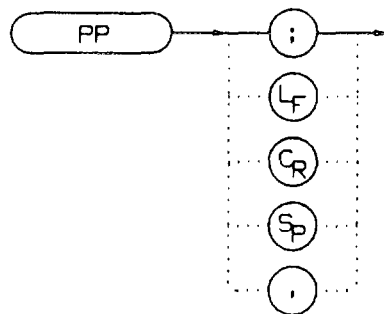
The PLOTSRC command specifies the source for the PLOT command.

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.

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

```

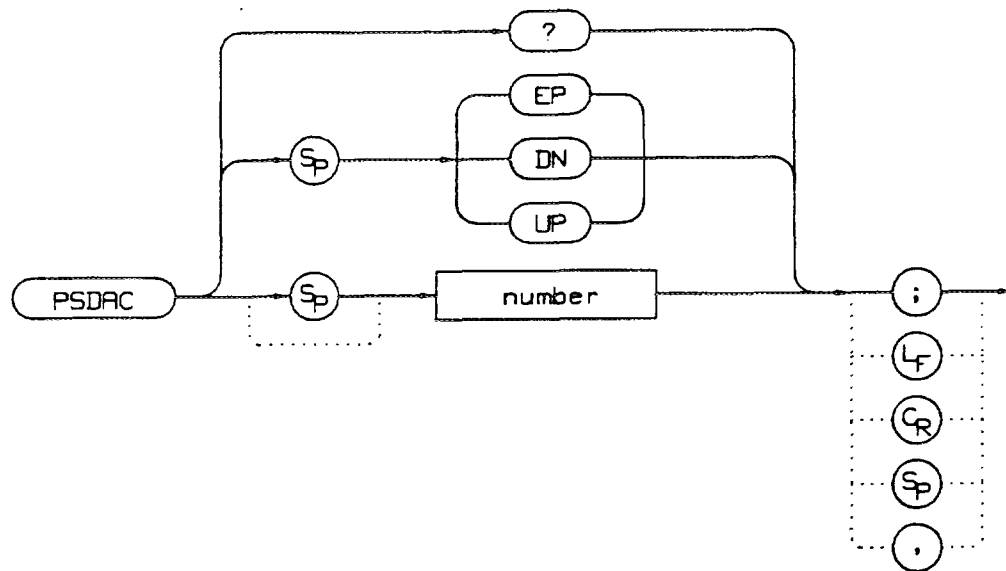
10      OUTPUT 718;"CF 3GHZ;SP 500KHZ;"
20      OUTPUT 718;"TS;MKPK HI;MKCF;TS;PP;"
30      END

```


LANGUAGE REFERENCE

PSDAC
PRESELECTOR DAC NUMBER

SYNTAX



DESCRIPTION

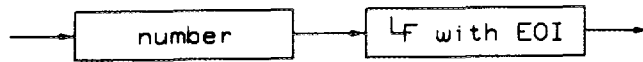
The PSDAC command returns the preselector peak DAC number.

PARAMETERS

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



QUERY RESPONSE



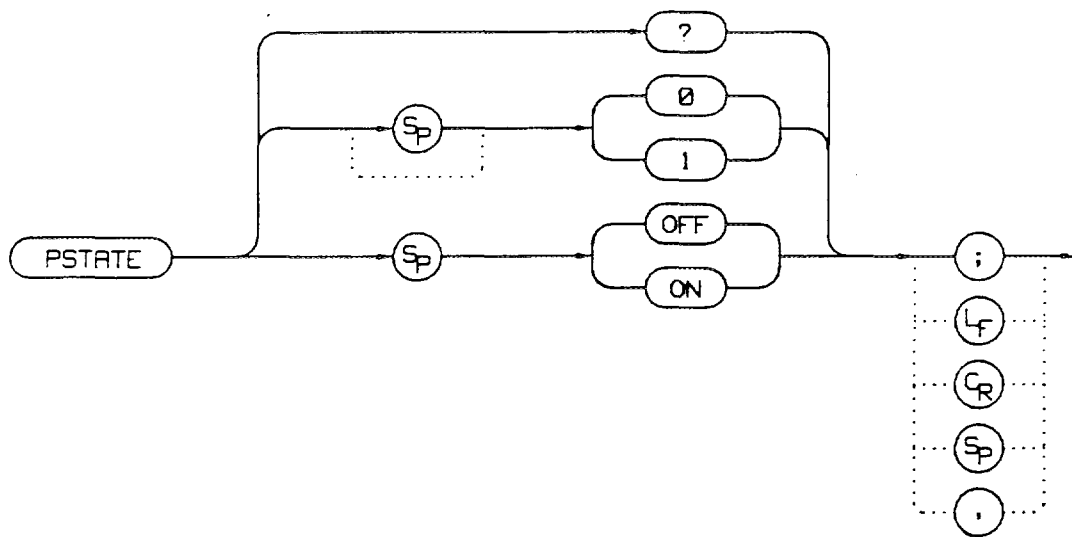
EXAMPLE

```
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
```


LANGUAGE REFERENCE

PSTATE PROTECT STATE

SYNTAX

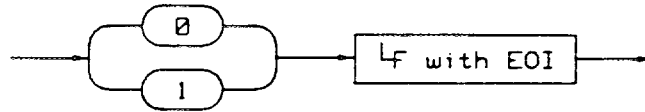


DESCRIPTION

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

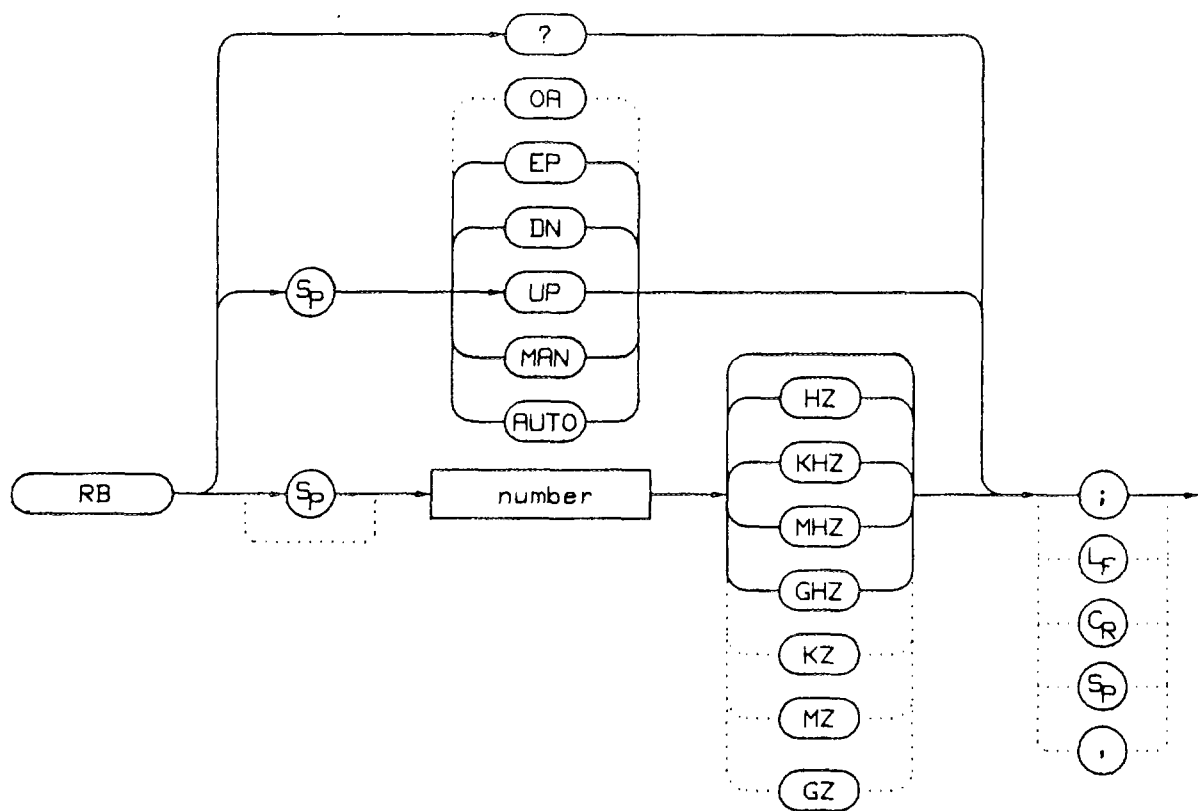


```
10      OUTPUT 718;"PSTATE ON;"
20      OUTPUT 718;"PSTATE?;"
30      ENTER 718;State
40      PRINT State
50      OUTPUT 718;"PSTATE OFF;"
60      END
```


LANGUAGE REFERENCE

RB RESOLUTION BANDWIDTH

Syntax



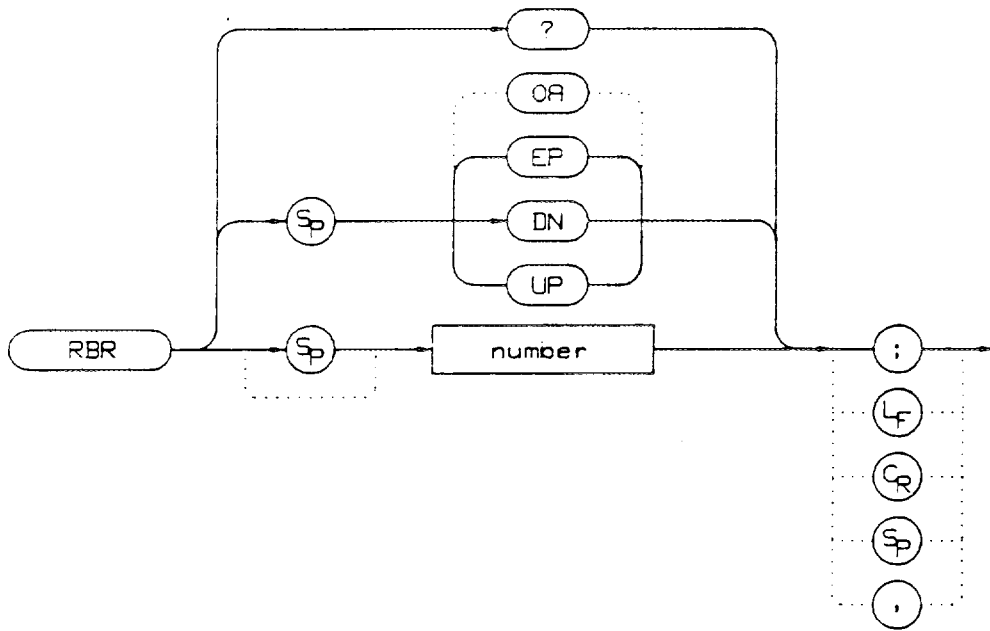
DESCRIPTION

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.

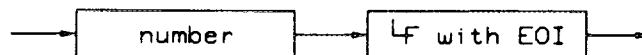
PARAMETERS

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

LANGUAGE REFERENCE



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



LANGUAGE REFERENCE

```
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
```

