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**HP 8591A/8593A Spectrum Analyzer  
Quick Reference Guide**



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## Introduction

This guide provides a quick reference for experienced spectrum analyzer users.

Chapter 1 summarizes how to make a basic measurement use the front-panel features, and how to perform the self-calibration routines. Chapter 2 contains brief descriptions of the analyzer functions. Chapter 3 contains the remote programming codes. Appendix A lists the analyzer error messages, Appendix B contains helpful charts and graphs for amplitude modulation, frequency modulation, and pulsed R measurements.

## Guide Terms and Conventions

The six keys along the right side of the display are called softkeys. Their labels are displayed on the screen. The softkeys appear in boldface type in this guide, for example, **REF LVL**. Pressing the labeled keys on the front panel changes the softkey labels or initiates functions. The front-panel keys appear in boxes in this guide, for example, **FREQUENCY**.

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**Caution** The input of the analyzer can be damaged easily. When using a line impedance stabilization network (LISN) device with the analyzer, disconnect the analyzer from the LISN device before changing switch position on, or voltage to, the LISN device.

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## Making a Basic Measurement

This chapter introduces the basic functions of the spectrum analyzer. Basic measurements simply involve tuning the instrument to place a signal on the screen, then measuring the frequency and amplitude of the signal.

**Caution** Do not exceed the maximum input power. The maximum input power is +30 dBm (1 watt) continuous, 25 V dc for the HP 8591A. The maximum input power is +30 dBm (1 watt) continuous, 0 V dc for the HP 8593A.

Let's begin using the spectrum analyzer by measuring an input signal. Since the 300 MHz calibration signal (CAL OUT) is readily available, we will use it as our input signal.

First, turn the instrument on (if it is already on, press the green **PRESET** key).

**Note** If the display is garbled, or you want to reset the analyzer configuration to the state it was in when it was originally shipped from the factory, use the **DEFAULT CONFIG** function. To access **DEFAULT CONFIG** softkey, press **CONFIG**, **MORE 1 of 2** (the bottom softkey), **DEFAULT CONFIG**, **DEFAULT CONFIG** (the fourth softkey from the top of the analyzer). (**DEFAULT CONFIG** requires a double press.)

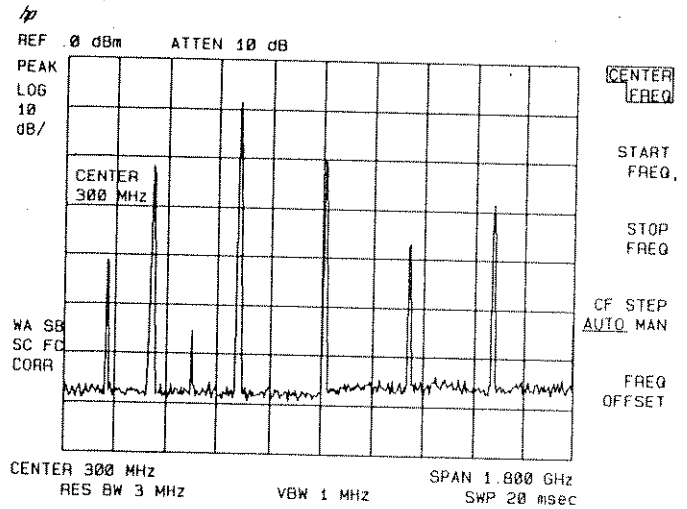
Connect the CAL OUT to the analyzer INPUT connector on the front panel using an appropriate BNC-to-Type-N adapter.

*Option 001 only:* Use a 75Ω cable to connect the INPUT 75Ω connector.

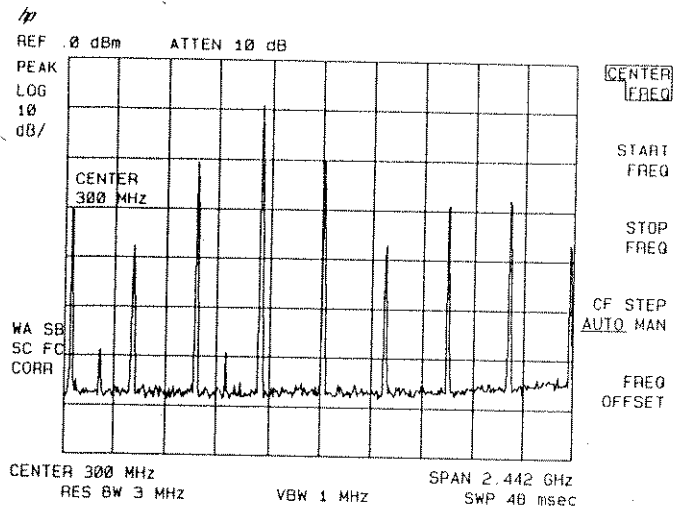
*Option 026 only:* Use an appropriate APC 3.5 adapter. Then follow these steps:

1. Set the center frequency.

Press the **FREQUENCY** key. CENTER appears on the left side of the screen, indicating that the center frequency function is active. The center frequency softkey label appears in inverse video to indicate that center frequency is the active function. The space on the screen where CENTER 900 MHz appears if you have an HP 8591A (or CENTER 12.38 GHz appears if you have an HP 8593A) is called the active function block. Functions appearing in this block are active: their values can be changed with the knob, step keys, or number/units keypad. Set the center frequency to 300 MHz with the DATA keys by pressing 300 **MHz**. The knob and step keys can also be used to set the center frequency.



**Figure 1-1. Center Frequency Set to 300 MHz on HP 8591A**



**Figure 1-2. Center Frequency Set to 300 MHz on HP 8593A**

2. Set the span.

Press **SPAN**. SPAN is now displayed in the active function block, and the span softkey label appears in inverse video to indicate it is the active function. Reduce the span to 1 MHz by pressing the down key (**↓**), or **1** **MHz**.

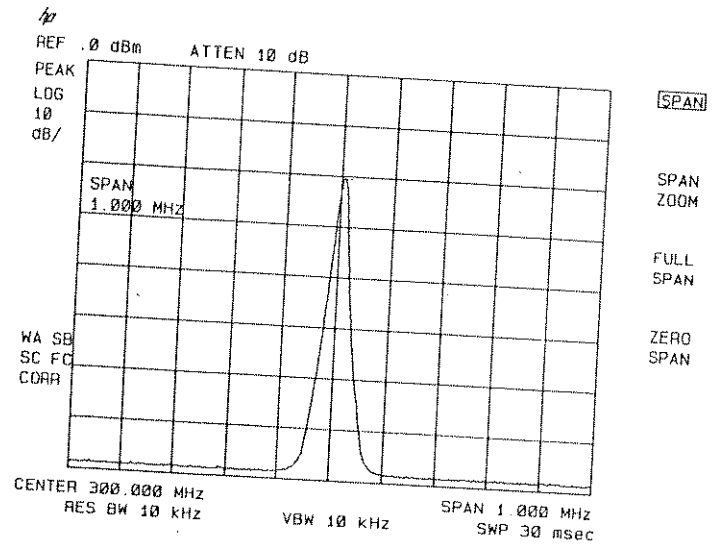


Figure 1-3. Frequency Span Reduced to 1 MHz



### 3. Set the amplitude.

When the peak of a signal does not appear on the screen, it may be necessary to adjust the amplitude level on the screen. Press **AMPLITUDE**. The message REF LEVEL .0 dBm appears in the active function block, and the reference level softkey label appears in inverse video to indicate it is the active function. The reference level is the top graticule line on the display and is set to 0.0 dBm. Changing the value of the reference level changes the amplitude level of the top graticule line.

If desired, use the reference level function to place the signal peak on the screen using the knob, step keys, or number/units keypad.

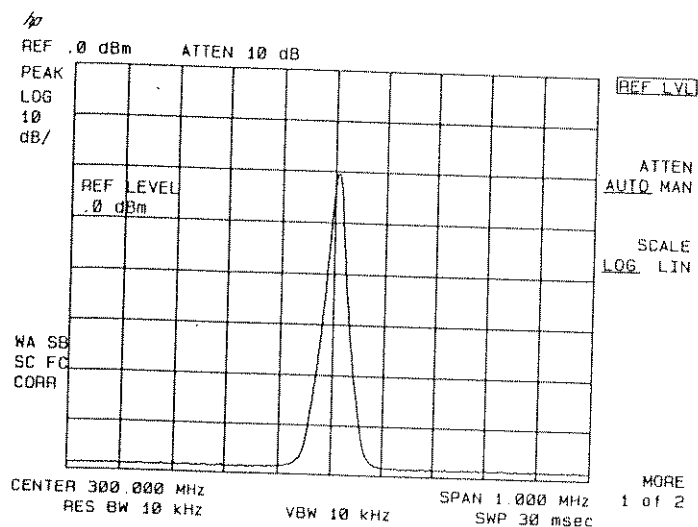


Figure 1-4. Setting the Amplitude

#### 4. Activate the marker.

You can place a diamond-shaped marker on the signal peak to find the signal's frequency and amplitude.

To activate a marker, press the **MKR** key (located in the MARKER section of the front panel). The marker normal softkey label appears in inverse video to show it is the active function. Turn the knob to place the marker at the signal peak.

You can also use the **PEAK SEARCH** key, which automatically places a marker at the highest point on the trace.

Readouts of marker amplitude and frequency appear in the active function block and in the upper right corner of the display. Look at the marker readout to determine the amplitude of the signal.

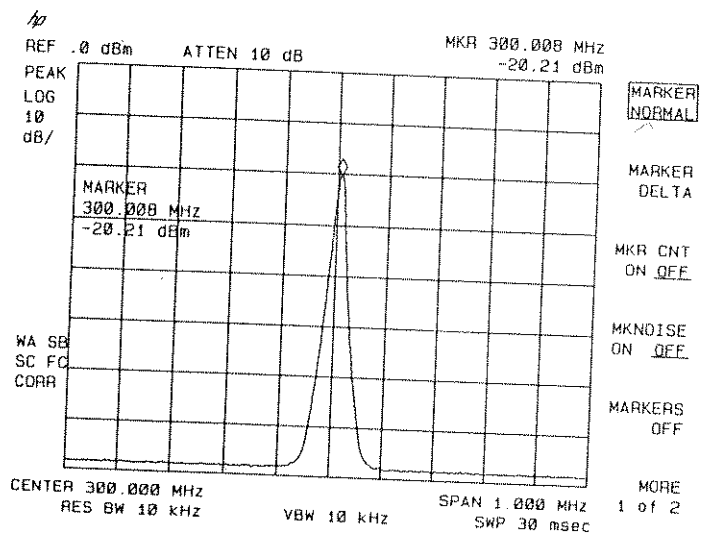


Figure 1-5. Marker Reads Out Frequency and Amplitude

## 1-6 Making a Basic Measurement

Many measurements require only these four steps. To return the instrument to its initial power-on state, press **PRESET**.

## Self-Calibration Routines

The self-calibration routines add offsets, called correction factors, to internal circuitry. The addition of the correction factors is required to meet frequency and amplitude specifications.

### Warm-Up Time

To meet spectrum analyzer specifications, allow two hours at a constant temperature within the operating temperature range and 30 minute warm-up before attempting to make any calibrated measurements. Be sure to calibrate the analyzer only *after* the analyzer is stable.

The spectrum analyzer frequency and amplitude self-calibration routines are accessed by the **CAL FREQ & AMPTD** softkey in the **CAL** menu.

To self-calibrate the instrument, connect CAL OUT to the INPUT 50 $\Omega$  connector, using an appropriate cable. *Option 001 only:* Use a 75 $\Omega$  cable to connect CAL OUT to the INPUT 75 $\Omega$  connector.

Press the following analyzer keys: **CAL**, **CAL FREQ & AMPTD**. The frequency and amplitude self-calibration routines take approximately 9 minutes to finish, at which time the correction factors will be stored in working RAM. To store

this data in the area of analyzer memory that is saved when the analyzer is turned off, press the **CAL STORE** softkey.

The frequency and amplitude self-calibration functions can be done separately by using the **CAL FREQ** or **CAL AMPTD** softkeys instead of **CAL FREQ & AMPTD**.

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**Notes** If **CAL FREQ** and **CAL AMPTD** self-calibration routines are used, the **CAL FREQ** routine should always be performed before the **CAL AMPTD** routine

Interrupting the **CAL AMPTD**, **CAL FREQ**, or **CAL FREQ & AMPTD** self-calibration routines may result in corrupt data being stored in RAM. (If this occurs, rerun the **CAL FREQ & AMPTD** routine.)

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When the correction factors are added to internal circuitry, **CORR (corrected)** appears on the left side of the screen.

## Self-Calibration Routine Problems

If the correction data has been corrupted or is obviously inaccurate, use the **CAL FETCH** softkey to retrieve the correction data that has previously been saved. If the fetched correction data is corrupt, the following procedure can be used to set the correction data back to predetermined values:

1. Press **FREQUENCY**, **-37 Hz**, **CAL**, **MORE 1 of 3**, **MORE 2 of 3**, **DEFAULT CAL DATA**.
2. Perform the **CAL FREQ** and **CAL AMPTD** routines, or the **CAL FREQ & AMPTD** routine. Be sure **CAL OUT** is connected to the analyzer input.

**Note** Using **DEFAULT CAL DATA** may cause the self-calibration routine to fail (the frequency span error may interfere with the analyzer routine to locate the 300 MHz calibration signal). If this occurs, press **FREQUENCY**, **-37** **Hz**, before performing the **CAL FREQ** routine, or the **CAL FREQ & AMPTD** routine.

If the self-calibration routines cannot be performed, see Chapter 8 in the *HP 8591A/8593A Spectrum Analyzer Installation, Verification, and Operation Manual*.

## Getting Acquainted with the Front Panel and Display

This section describes the front-panel features and screen annotation.

### Front-Panel Feature Overview

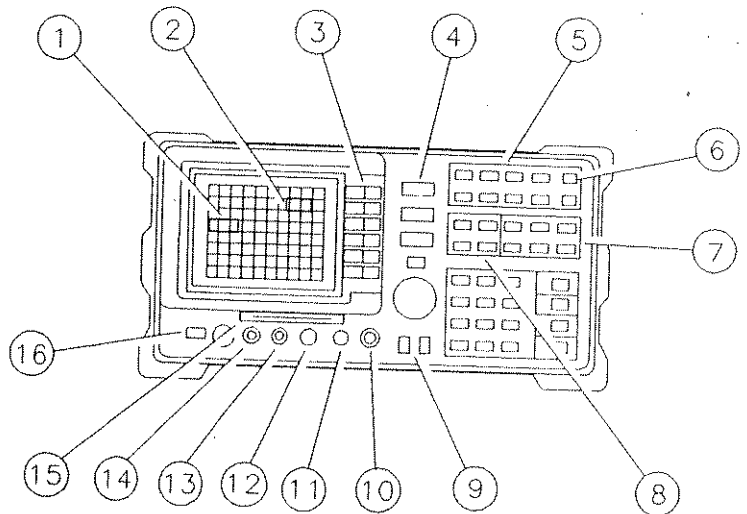


Figure 1-6. Front-Panel Overview

The following section provides a brief description of features.

1. **ACTIVE FUNCTION BLOCK** is the space on the screen that indicates the active function. The values of functions appearing in this block can be changed with the knob, step keys, or number/units keypad.
2. **MESSAGE BLOCK** is the space on the screen where MEAS UNCAL and the asterisk (\*) appear. If one or more functions are manually set and the amplitude or frequency becomes uncalibrated, MEAS UNCAL appears. (Use **AUTO COUPLE**, **AUTO ALL** to recouple functions.) The asterisk indicates that a function is in progress. See Appendix A for analyzer error messages.
3. **SOFTKEYS** are unlabeled keys next to the screen that are annotated on the screen. The labeled keys on the analyzer's front panel access menus of related softkeys.
4. **FREQUENCY**, **SPAN**, and **AMPLITUDE** are the three large dark-brown keys that activate the primary analyzer functions and access menus of related functions.
5. **INSTRUMENT STATE** functions affect the state of the entire spectrum analyzer. Self-calibration routines and special-function menus are accessed with these keys. The green **PRESET** key resets the entire analyzer state and can be used as a "panic" button when you wish to return to a known state. The **MODE** key accesses the current operating mode of the analyzer and allows you to change to any operating mode available for your analyzer. See the

*HP 8591A/8593A Spectrum Analyzer Installation, Verification, and Operation Manual* for more information. **SAVE** and **RECALL** allow you to save and recall traces and states to or from analyzer memory. **SAVE** and **RECALL** allow you to save and recall traces, states, and programs to or from a memory card.

6. **COPY** key allows you to print or plot screen data. (This requires Option 021 or 023.) Use **CONFIG**, **PLOT CONFIG** or **PRINT CONFIG**, and **COPY DEV PRNT PLT** before using the **COPY** function.
7. **CONTROL** functions access menus that allow you to adjust the resolution bandwidth, store and manipulate trace data, and control the instrument display.
8. **MARKER** functions control the markers, read out frequencies and amplitudes along the spectrum-analyzer trace, automatically locate the signals of highest amplitude, and keep a marker signal in the center of the screen.
9. **DATA** keys, **STEP** keys and the **KNOB** allow you to change the numeric value of an active function. **HOLD** deactivates an active function.
10. **INPUT 50Ω** is the signal input for the spectrum analyzer. (**INPUT 75Ω** is the signal input for an Option 001 analyzer.)

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**Caution** Excessive signal input damages the analyzer input attenuator and the input mixer. The maximum power that the spectrum analyzer can tolerate appears on the front panel.

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11. **PROBE POWER** provides the power for an active probe and other accessories.

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## 1-12 Making a Basic Measurement

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12. CAL OUT provides a calibration signal of 300 MHz at -20 dBm on the front panel.
13. VOL-INTEN allows you to change the brightness of the screen display and the volume from the speaker (the speaker is available with Option 102).
14. 100 MHz COMB OUT supplies a 100 MHz signal with harmonics up to 22 GHz for use as a reference signal (for the HP 8593A only).
15. MEMORY CARD READER reads from or writes to a memory card.
16. **LINE** turns on the instrument and performs an instrument check.

## Screen Annotation

Figure 1-7 shows annotation as it appears on the screen of the analyzer when it is set to clear-write A, store-blank B, free run trigger, and single sweep. Correction factors are applied. Table 1-1 lists the features of the front panel numerically and refers to the features in Figure 1-7. Table 1-2 shows the different screen annotation codes for trace, trigger, and sweep modes.

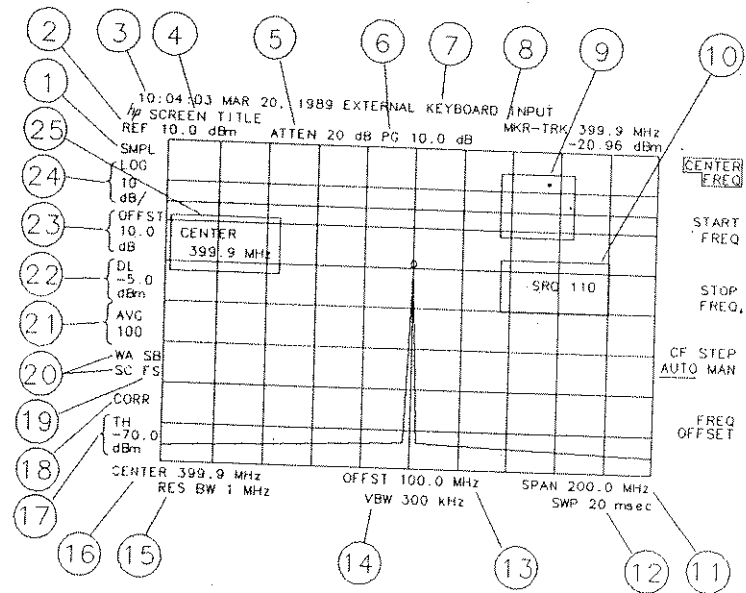


Figure 1-7. Screen Annotation

**Table 1-1. Screen Annotation**

| Index | Feature   | Index | Feature                             |
|-------|---|-------|-------------------------------------|
| 1     | detector mode   | 13    | frequency offset                    |
| 2     | reference level   | 14    | video bandwidth                     |
| 3     | time/date display   | 15    | resolution bandwidth                |
| 4     | screen title  | 16    | center frequency or start frequency |
| 5     | RF attenuation  | 17    | threshold                           |
| 6     | preamplifier gain   | 18    | correction factors on               |
| 7     | external keyboard entry                                       | 19    | trigger*                            |
| 8     | marker/signal track readout                                   | 20    | trace mode†                         |
| 9     | measurement-uncalibrated/<br>function-in-progress<br>messages | 21    | video average                       |
| 10    | service request   | 22    | display line                        |
| 11    | frequency span or stop<br>frequency                           | 23    | amplitude offset                    |
| 12    | sweep time  | 24    | amplitude scale                     |
|       |   | 25    | active function block               |

\*Index number 19 refers to analyzer trigger and sweep modes. In Figure 1-7, the first letter ("F") indicates the analyzer is in free-run trigger mode. The second letter ("S") indicates the analyzer is in single-sweep mode.

†Index number 20 refers to analyzer trace modes. In Figure 1-7, the first letter ("W") indicates the analyzer is in clear-write mode. The second letter, "A", represents trace A. The next two letters ("SB") indicate store-blank mode ("S") for trace B ("B"). Trace mode annotation for trace C is displayed under the trace mode annotation of trace A. In Figure 1-7, the trace C trace mode is "SC", indicating trace C ("C") is in store-blank mode ("S").

**Table 1-2. Screen Annotation for Trace, Trigger, and Sweep Modes**

| Trace Mode                     | Trigger Mode                | Sweep Mode       |
|--------------------------------|-----------------------------|------------------|
| W = clear-write (traces A/B/C) | F = free run                | C = continuous   |
| M = maximum hold (traces A/B)  | L = line                    | S = single sweep |
| V = view (traces A/B/C)        | V = video                   |                  |
| S = store-blank (traces A/B/C) | E = external                |                  |
| M = minimum hold (trace C)     | T = TV<br>(Option 102 only) |                  |

## Analyzer Functions

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This is a listing of the spectrum analyzer functions. The functions are grouped within the main function blocks of the analyzer: AMPLITUDE, CONTROL, FREQUENCY, INSTRUMENT STATE, MARKER, and SPAN. The functions are listed alphabetically within the group. All softkeys are shown in the menu diagram inside the rear cover of this guide. The functions accessed by **SERVICE DIAG** and **SERVICE CAL** are not included in this listing. Refer to the *HP 8591A/8593A Spectrum Analyzer Installation, Verification, and Operation Manual* for more information.

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### Amplitude Functions

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**Caution** To prevent damage to the input mixer, the power level at the input mixer must not exceed +30 dBm. To prevent signal compression, power at the input mixer must be kept below -10 dBm.

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**AMPLITUDE** accesses the amplitude menu and makes the reference level the active function.

**AMPTD UNITS** accesses the softkeys to change amplitude units.

## Amplitude Functions

**ATTEN AUTO MAN** sets the input attenuation in 10 dB increments.

**dBm** changes the amplitude units to dBm for the current amplitude scale.

**dBmV** changes the amplitude units to dBmV for the current amplitude scale.

**dBuV** changes the amplitude units to dB $\mu$ V for the current amplitude scale.

**EXT PREAMP** adds a positive or negative preamplifier gain value, which is subtracted from the displayed signal.

**INPUT Z 50 75** sets the input impedance for power-to-voltage conversions. The impedance selected is for computational purposes only, since the actual impedance is set by internal hardware.

**MAX MXR LEVEL** lets you change the maximum input mixer level in 10 dB steps.

**PRESEL DEFAULT** uses the correction factors from the CAL YTF self-calibration routine to provide a swept flatness response without preselector peaking. (*HP 8593A only*)

**PRESEL PEAK** adjusts the preselector to maximize the amplitude at the position of the marker. (*HP 8593A only*)

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**Note** Preselector peak operates in the preselected bands (bands 1 to 4) only.

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**REF LVL** changes the value of the reference level.

**REF LVL OFFSET** adds an offset value to the displayed reference level.

## 2-2 Analyzer Functions

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**SCALE LOG LIN** sets the vertical scale to log or linear and activates log scale per division.

**Volts** changes the amplitude units to volts for the current amplitude scale.

**Watts** changes the amplitude units to watts for the current amplitude scale.

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## Control Functions

**9 kHz EMI BW** selects the 9 kHz resolution bandwidth at the 6 dB power level for EMI measurements.

**120 kHz EMI BW** selects the 120 kHz resolution bandwidth at the 6 dB power level for EMI measurements.

**A-B -> A ON OFF** subtracts trace B from trace A and places the result in trace A.

**A < - - > B** exchanges the contents of the trace A register with the trace B register and puts traces A and B in view mode.

**ABCDEF** accesses the softkey menu for selecting screen title characters A through F.

**A -> C** moves trace A into trace C.

**ANNOTATN ON OFF** turns the screen annotation on and off. However, softkey annotation remains on-screen.

**ATTEN AUTO MAN** sets the input attenuation in 10 dB increments.

**AUTO COUPLE** accesses the auto couple menu.

#### Control Functions

**AUTO ALL** automatically couples all functions that can be auto-coupled: resolution bandwidth, video bandwidth, attenuation, sweep time, center frequency step, video bandwidth, and video-bandwidth/resolution-bandwidth ratio.

**B -> C** moves trace B into trace C.

**B-DL -> B** subtracts the display line from trace B and places the result into trace B.

**B <- -> C** exchanges trace B and trace C.

**BLANK A** stops taking amplitude data for trace A and makes trace A invisible.

**BLANK B** stops taking amplitude data for trace B and makes trace B invisible.

**BLANK C** stops taking amplitude data for trace C and makes trace C invisible.

**BW** accesses the bandwidth control menu and activates the resolution bandwidth function.

**CF STEP AUTO MAN** activates the step size for the center frequency function.

**CLEAR** allows you to clear the title or the prefix.

**CLEAR WRITE A** erases any data previously stored in trace A and continuously displays any signals detected during sweeps of the frequency range of the analyzer.

**CLEAR WRITE B** erases any data previously stored in trace B and continuously displays any signals detected during sweeps of the frequency range of the analyzer.

## 2-4 Analyzer Functions

**CLEAR WRITE C** erases any data previously stored in trace C and continuously displays any signals detected during sweeps of the frequency range of the analyzer.

**CHANGE PREFIX** accesses the softkeys that change the prefix for storage and retrieval of states, traces, or programs.

**CHANGE TITLE** accesses the softkeys that change the screen title.

**DETECTOR SAMPL PK** selects sample or peak detection.

**DISPLAY** accesses softkeys that activate the display line and threshold, allow title entry, and control the graticule and screen annotation.

**DSP LINE ON OFF** activates an adjustable horizontal line that is used as a visual reference line.

**EXTERNAL** activates the trigger condition that allows the next sweep to start when an external voltage (connected to the EXT TRIG INPUT on the rear panel) passes through approximately 1.5 V, becoming positive. The external trigger signal must be a 0 V to +5 V TTL signal.

**FREE RUN** activates the trigger condition that allows the next sweep to start as soon as possible after the last sweep.

**GHIJKL** accesses the softkey menu for selecting screen title characters G through L.

**GRAT ON OFF** turns the screen graticule on and off.

**LINE** activates the trigger condition that allows the next sweep to start when the line voltage passes through zero, becoming positive.



**MAX HOLD A** updates each trace point of trace A with the maximum level detected at each point during successive sweeps.

**MAX HOLD B** updates each trace point of trace B with the maximum level detected at each point during successive sweeps.

**MIN HOLD C** updates each trace point of trace C with the minimum level detected at each point during successive sweeps.

**MNOPQR** accesses the softkey menu for selecting screen title characters M through R.

**NORMLIZE ON OFF** normalizes trace A with the contents of trace B.

**NORMLIZE POSITION** turns on the display line.

**RES BW AUTO MAN** allows you to select the analyzer's 3 dB power level IF bandwidth manually or automatically recouple it.

**RPG TITLE** allows you to add lowercase letters and special characters to a screen title. When all characters have been entered, press **[HOLD]** to exit.

**STUVWX** accesses the softkey menu for selecting screen title characters S through X.

**[SWEEP]** accesses the sweep time menu and activates the sweep time function.

**SWEEP CONT SGL** allows you to select between continuous-sweep mode or single-sweep mode. Use **[SGL SWP]** to trigger a sweep in single-sweep mode.

## 2-6 Analyzer Functions

**SWP TIME AUTO MAN** allows you to change the sweep time manually or automatically recouple it.

**THRESHLD ON OFF** sets the lower boundary of the active trace. The threshold line “clips” signals that would otherwise appear below the line.

**TRACE** accesses the trace menus that allow you to store and manipulate trace information.

**TRACE A B C** allows you to select functions for trace A, trace B, or trace C.

**TRIG** accesses the softkey menu that allows you to select the sweep mode and trigger mode.

**TV LINE #** allows you to select the line number of the TV frame on which to trigger the sweep. *(Option 102 only)*

**TV SYNC NEG POS** allows you to trigger on the negative or positive video format. Most formats use the negative position, SECAM uses the positive format. *(Option 102 only)*

**TV TRIG** activates the TV trigger mode and accesses the TV trigger menu. *(Option 102 only)*

**TV TRIG EVEN FLD** allows you to trigger on an even field of an interlaced video picture format. *(Option 102 only)*

**TV TRIG ODD FLD** allows you to trigger on an odd field of an interlaced video picture format. *(Option 102 only)*

**TV TRIG VERT INT** allows you to trigger on a vertical interval (only for noninterlaced video picture formats). *(Option 102 only)*

**VBW/RBW RATIO** allows the selection of the ratio between the video and resolution bandwidths.

## Control Functions

**VID AVG ON OFF** initiates a digital averaging routine that averages displayed signals and noise. It does not affect the sweep time, bandwidth, or other analog characteristics of the analyzer.

**VID BW AUTO MAN** allows you to change the analyzer's post-detection filter manually or automatically recouple it. **VID BW AUTO MAN** auto couples **VBW/RBW RATIO** also.

**VIDEO** activates the trigger condition that allows the next sweep to start if the detected RF envelope voltage rises to a level set by the display line.

**VIEW A** holds the amplitude data in the trace A register. It disconnects the trace register from the signal-detection circuitry so that the trace A register will not be updated as the analyzer sweeps. If trace A is deactivated with **BLANK A**, the stored data can be retrieved with **VIEW A**. **CLEAR WRITE A** and **MAX HOLD A** overwrite the stored data.

**VIEW B** is the same as **VIEW A** except trace B is used. **CLEAR WRITE B** and **MAX HOLD B** overwrite the stored data.

**VIEW C** is the same as **VIEW A** except trace C is used. **CLEAR WRITE C** and **MIN HOLD C** overwrite the stored data.

**YZ\_# SPC CLEAR** accesses the softkey menu for selecting the characters Y, Z, underscore ( \_ ), #, space, or for clearing the screen title or prefix.

## Frequency Functions

**CENTER FREQ** activates the center frequency function to allow the selection of frequency at the center of the screen.

**CF STEP AUTO MAN** activates the step size for the center frequency function.

**FREQUENCY** accesses the frequency functions menu and activates the center frequency function.

**FREQ OFFSET** adds an offset value to the frequency readout to account for pre-analyzer frequency conversions. Offset entries are added to all frequency readouts including marker, start frequency, and stop frequency.

**START FREQ** sets the frequency at the left side of the graticule.

**STOP FREQ** sets the frequency at the right side of the graticule.

## Instrument State

**% AM** determines the percentage of amplitude modulation. The function finds the amplitude difference between the two highest peaks on the screen and computes the percent modulation for the calculated dB difference. (See FigureB-1 for the AM percentage chart.)

**3 dB POINTS** finds the bandwidth of the signal at the 3 dB power level.

**3rd ORD MEAS** finds the third-order product and measures the frequency and amplitude differences relative to the fundamental signal.

**6 dB POINTS** finds the bandwidth of the signal at the 6 dB power level.

**99% PWR BW** computes the power of all signal responses and returns the bandwidth under which 99% of total power is found.

**ALL DLP -> CARD** saves all the programs in analyzer memory on a memory card using the specified prefix.

**ANALYZER ADDRESS** allows you to change the analyzer's HP-IB address. (*Option 021 only*)

**AUX CONN CONTROL** accesses the menu to control the input and outputs of the auxiliary interface connector.

**AUX CTRL** accesses the menu for control of the FM Demodulator (if Option 102 is installed), the auxiliary interface connector, and, for the HP 8593A, the comb generator.

**BAUD RATE** allows you to change the baud rate. (*Option 023 only*)

**BLANK CARD** removes all the files from the memory card.

**B & W PRINTER** allows you to specify a black and white print using **COPY DEV PRNT PLT**, **COPY**. (*Option 021 or 023 only*)

**CAL** activates the self-calibration menu.

## 2-10 Analyzer Functions

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**Note** Ensure that CAL OUT is connected to the analyzer input before performing CAL FREQ, CAL AMPTD, or CAL FREQ & AMPTD.

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**CAL AMPTD** initiates an amplitude self-calibration routine.

**CAL FETCH** retrieves stored correction factors.

**CAL FREQ** initiates a frequency self-calibration routine.

**CAL FREQ & AMPTD** performs both the frequency and amplitude self-calibration routines.

**CAL STORE** allows you to save correction factors in the area of analyzer memory that is accessed when the analyzer is powered up. Correction factors are only stored in the "working" area of memory (not the area of memory that is accessed at power-up) until **CAL STORE** is pressed. Use **CAL FETCH** to retrieve stored correction factors.

**CAL YTF** generates the best slope and offset adjustment for the YIG-tuned preselector filter for each harmonic band.  
(HP 8593A only)

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**Note** Connect the COMB OUT to the analyzer input before running CAL YTF.

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**CARD CONFIG** accesses the menu that catalogs, formats, or erases a memory card.

**CARD -> DLP** allows you to retrieve a previously saved program from the memory card.

**CARD -> STATE** allows you to retrieve a previously saved state from the memory card.

## Instrument State

**CARD -> TRACE** allows you to retrieve a previously saved trace from the memory card.

**CATALOG ALL** catalogs all programs and variables loaded into analyzer memory if internal memory is selected.

**CATALOG ALL** catalogs all the programs, traces, and states saved on the memory card if the memory card is selected.

**CATALOG CARD** accesses the menu for the memory card catalog options.

**CATALOG DLP** catalogs all of the DLP (downloadable programs) in analyzer memory or memory card.

**CATALOG PREFIX** catalogs all of the saved data with the specified prefix.

**CATALOG STATES** catalogs all of the saved states from the memory card.

**CATALOG TRACES** catalogs all of the saved traces from the memory card.

**CATALOG VARIABLES** catalogs all of the variables in analyzer memory.

**CHANGE PREFIX** accesses the softkeys to change the prefix for storage and retrieval of states, traces, or programs on the memory card or the variables and programs stored in the analyzer memory.

**CNTL A 0 1** sets the auxiliary interface control line A output high or low.

**CNTL B 0 1** sets the auxiliary interface control line B output high or low.

**CNTL C 0 1** sets the auxiliary interface control line C output high or low.

**CNTL D 0 1** sets the auxiliary interface control line D output high or low.

**COMB GEN ON OFF** turns the comb generator on and off.  
(*HP 8593A only*)

**CONFIG** places the analyzer in local mode (see "LOCAL"), accesses the softkey menus for configuring the printer and plotter, sets the time and date, and displays the options that are installed.

**CONF TEST** performs a self-test by cycling through the analyzer's major functions.

**COPY** initiates a print or plot of the screen data to the graphics printer or plotter addressed with **CONFIG**, and **PLOT CONFIG** (for a plot), or **PRINT CONFIG** (for a print). Use **COPY DEV PRNT PLT** to choose between a printer or a plotter output. (*Option 021 or 023 only*)

**COPY DEV PRNT PLT** allows you to choose between copying to a printer or a plotter. (*Option 021 or 023 only*)

**CORRECT ON OFF** controls the use of the correction factors.

**CRT HORZ POSITION** changes the horizontal position of the analyzer's display. (The position is saved in memory when **CAL STORE** is pressed.)

**CRT VERT POSITION** changes the vertical position of the analyzer's display. (The position is saved in memory when **CAL STORE** is pressed.)

**DATEMODE MDY DMY** allows you to display the real-time clock's date in month-day-year or day-month-year format.



## Instrument State

**DEFAULT CAL DATA** allows you to use predetermined correction data. See "Self-Calibration Routine Problems" in Chapter 1 for more information.

**DEFAULT CONFIG** resets all user configuration settings to their default values.

**DELETE FILE** deletes the selected file from the memory or analyzer memory.

**DELTA MEAS** finds and displays the frequency and amplitude differences between the two highest amplitude signals.

**DEMOD** accesses the menu for Option 102, the AM/FM Speaker and TV Synch Trigger option. (*Option 102 only*)

**DEMOD ON OFF** allows you to turn the amplitude or frequency demodulation on or off. (*Option 102 only*)

**DEMOD AM FM** allows you to choose between amplitude or frequency demodulation. (*Option 102 only*)

**DISPLAY CNTL I** displays the status of auxiliary interface control line I on the analyzer screen.

**DISPOSE USER MEM** allows you to purge all programs, states, and traces from the analyzer memory.

**DWELL TIME** sets the dwell time for the marker pause, during which demodulation takes place in nonzero span sweeps. (*Option 102 only*)

**EXIT** blanks the catalog information from the screen and returns the analyzer to the state it was in before the catalog operation.

**EXIT CATALOG** returns the analyzer to the state it was in before the catalog operation.

**FFT MEAS** transforms zero span data into the frequency domain using a fast Fourier transform.

**FM GAIN** sets the FM gain. FM gain limits the frequency deviation of the signal from the top of the analyzer screen to the bottom of the analyzer screen. *(Option 102 only)*

**FORMAT CARD** formats a memory card in logical interchange format (LIF).

**INTRNL CRD** allows you to catalog, save, or retrieve data or programs from internal memory or memory card.

**LOAD FILE** loads the selected item from the memory card.

(LOCAL) control of the front panel is obtained by pressing **CONFIG** if the analyzer has been placed in remote mode by a controller.

**MEAS/USER** accesses the menus for special functions and the user menu.

**MODE** accesses the spectrum analyzer mode and other modes of operation.

**PAINTJET PRINTER** allows you to select a color print (with an HP PaintJet printer) using **COPY DEV PRNT PLT**, **COPY**. *(Option 021 or 023 only)*

**PK-PK MEAS** finds and displays the frequency and amplitude differences between the highest and lowest signals.

**PLOT CONFIG** accesses the menu to address the plotter and select from plotter options. *(Option 021 or 023 only)*

**PLOTTER ADDRESS** allows you to select the HP-IB address of the plotter. *(Option 021 or 023 only)*

## Instrument State

**PLT LOC** allows you to select the location of a plotter output. (This key appears only if two or four plots per page are selected using **PLTS/PG 1 2 4**.) (*Option 021 or 023 only*)

**PLTS/PG 1 2 4** allows you to choose a full-page, half-page, or quarter-page plot. (*Option 021 or 023 only*)

**PRESET** returns the analyzer to a known state. **PRESET** accesses the softkey menu of available analyzer modes. The **PRESET** key performs a processor test, but does not affect the correction factors. **PRESET** clears both the input and output buffers.

**PRESET SPECTRUM** allows only the spectrum analyzer mode to be preset; it will not affect the other operating modes. It provides a convenient starting point for most measurements.

**PRESET SPECTRUM** performs a subset of the functions that **PRESET** performs.

**PRINT CONFIG** accesses the menu to address the printer and select from a black and white print or a color print. (A color print requires an HP PaintJet printer.) (*Option 021 or 023 only*)

**PRINTER ADDRESS** allows you to select the HP-IB address of the printer. (*Option 021 or 023 only*)

**PRINTER SETUP** resets the printer, sets the lines per page to 60, and skips the page perforations.

**PRT MENU ON OFF** allows the softkey labels to be printed when doing a print with the **COPY** key. (*Option 021 or 023 only*)

**RECALL** accesses the menu to recall data from the analyzer memory or memory card.

**SAV LOCK ON OFF** protects the contents of the current state and trace registers from being overwritten.

## 2-16 Analyzer Functions

**SAVE** accesses the menu that stores data into the analyzer's memory or memory card.

**SET DATE** allows you to set the date of the analyzer's real-time clock.

**SET TIME** allows you to set the time of the analyzer's real-time clock.

**SGL SWP** activates the single-sweep mode and sets up a sweep for the next trigger.

**SHOW OPTIONS** displays the installed options.

**SPEAKER ON OFF** allows you to turn the internal speaker on or off. (*Option 102 only*)

**SQUELCH** allows you to set the squelch threshold by setting the squelch level. Setting the squelch threshold allows strong signals to pass while muting weak signals. (*Option 102 only*)

**STATE -> CARD** saves the analyzer state on the memory card using the specified prefix.

**TIMEDATE** accesses the menu to set and display the real-time clock.

**TIMEDATE ON OFF** allows you to turn the display of the real-time clock on or off.

**TRACE A** allows you to recall previously saved trace data into trace A or save trace data from trace A.

**TRACE B** allows you to recall previously saved trace data into trace B or save trace data from trace B.

**TRACE C** allows you to recall previously saved trace data into trace C or save trace data from trace C.

## Marker Functions

**TRACE -> CARD** saves the analyzer trace on the memory card using the specified prefix.

**USER MENU(S)** accesses menu 1 which is available for user-defined functions.

**VERIFY TIMEBASE** allows the time base for the real-time clock to be changed to verify that the time base is operational.

**PRESET** resets the time base to its original value. A pass code is required to access this function.

---

## Marker Functions

**CNT RES AUTO MAN** allows the counter resolution to be changed manually or auto-coupled.

**MARKER AMPTD** keeps the active marker at a desired amplitude on the screen once the marker has been positioned. Once activated, the marker remains at the same amplitude even as the signal frequency is changed. If no signal is detected at that amplitude, the marker searches for the signal closest to the amplitude value.

**MARKER DELTA** activates a second marker at the position of the active marker. The amplitude and frequency of the first marker are fixed, and the second marker can be manipulated.

**MARKER NORMAL** activates a single marker at the center frequency on the active trace.

**MARKERS OFF** turns off all markers, including signal track. Marker annotation is removed.

**MARKER -> CF** changes the analyzer settings so that the frequency at the marker becomes the center frequency.

**MARKER -> CF STEP** assigns the value of the active marker to the center-frequency step-size. If marker delta is active, the step size will be set to the difference in frequencies between the markers.

**MARKER -> REF LVL** changes the analyzer settings so that the amplitude at the active marker becomes the reference level.

**MINIMUM -> MARKER** moves the marker to the minimum value detected.

**MKNOISE ON OFF** reads out the average noise level in reference to a 1 Hz noise power bandwidth at the marker position.

**MKPAUSE ON OFF** stops the analyzer sweep at the marker position for 0.002 to 100 seconds.

**MKR ->** calls up the softkey menus for the transfer of marker information directly into other functions.

**MKR** accesses the basic marker functions menu and activates the marker.

**MKR CNT ON OFF** turns the marker counter on and off.

**MKR  $\Delta$  -> SPAN** sets the start and stop frequencies to the values of the delta markers. The start and stop frequencies will not be set if the delta marker is off.

**NEXT PEAK** places the marker on the next highest peak above the threshold.

**NEXT PK LEFT** moves the marker to the next peak to the left of the current marker above the threshold.

## Span Functions

**NEXT PK RIGHT** moves the marker to the next peak to the right of the current marker above the threshold.

**PEAK EXCURSN** sets the minimum amplitude variation of signals that the marker can identify as a peak.

**PEAK MENU** accesses the **PEAK SEARCH** menu.

**PEAK SEARCH** places a marker on the highest amplitude of a trace, displays the marker's amplitude and frequency, and calls up the peak search softkey menu.

**PK-PK MEAS** finds and displays the frequency and amplitude differences between the highest and lowest signals.

**SIGNAL TRACK** moves the signal with an active marker to the center of the screen and fixes the signal peak there.

---

## Span Functions

**0-2.9 Gz BAND 0** locks onto harmonic band 0. Harmonic band 0 is unpreselected and restricts the frequency range from 0 Hz to 2.9 GHz. *(HP 8593A only)*

**2.75-6.4 BAND 1** locks onto harmonic band 1. Harmonic band 1 is preselected and restricts the frequency range from 2.75 GHz to 6.4 GHz. *(HP 8593A only)*

**6.0-12.8 BAND 2** locks onto harmonic band 2. Harmonic band 2 is preselected and restricts the frequency range from 6.0 GHz to 12.8 GHz. *(HP 8593A only)*

**12.4-19. BAND 3** locks onto harmonic band 3. Harmonic band 3 is preselected and restricts the frequency range from 12.4 GHz to 19.4 GHz. *(HP 8593A only)*

## 2-20 Analyzer Functions

**19.1-22 BAND 4** locks onto harmonic band 4. Harmonic band 4 is preselected and restricts the frequency range from 19.1 GHz to 22.0 GHz. *(HP 8593A only)*

**BAND LOCK** accesses the harmonic band menu. *(HP 8593A only)*

**BND LOCK ON OFF** locks the analyzer on a selected frequency band (local oscillator harmonic number). *(HP 8593A only)*

**FULL SPAN** changes the analyzer's frequency span to full span if possible. The HP 8593A harmonic band lock keeps the span within the current harmonic band.

**SPAN** accesses the span menu and activates the span function.

**SPAN** activates the span function.

**SPAN ZOOM** activates the signal tracking function if there is an on-screen marker present. If a marker is not present, **SPAN ZOOM** places a marker on the highest signal peak and then activates signal tracking. Any subsequent changes to the span occur with the signal tracked to center screen.

**ZERO SPAN** sets the analyzer's frequency span to zero.



## Programming

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### Introduction

The following pages are a compilation of all current programming commands for the HP 8591A and the HP 8593A Spectrum Analyzers. More information on each command can be found in the *HP 8590 Series Spectrum Analyzer Programming Manual*.

### How to Use This Reference

This reference is intended for use by the experienced spectrum analyzer programmer.

To find a programming code that performs a particular function, refer to the "Functional Index," which groups the commands according to similar function. Once the desired command is found, refer to the alphabetical listing of the programming codes for further keyword definition and syntax information.

For further information on syntax, refer to "Notation Conventions," "Syntax Conventions," and "Characters and Secondary Keywords (Reserved Words) Summary."

## Notation Conventions

The following symbols and type styles found in this guide denote the following:

**BOLD TYPE** All characters appearing in bold type are key words and must appear exactly as shown.

**CAPITAL LETTERS** All characters that are capital letters are secondary keywords and appear within the keyword syntax. They must appear exactly as shown, and their meanings can be found in “Characters and Secondary Keywords (Reserved Words) Summary.”

**< >** Characters appearing in angular brackets are considered to be elements of the language being defined. Their meanings can be found in the section “Syntax Conventions” unless otherwise specified with the keyword definition.

**[ ]** Square brackets indicate that whatever occurs within the brackets is optional.

**|** “or”: Indicates a choice of exactly one element from a list (for example, `< a > | < b >` indicates `< a >` or `< b >` but not both).

**( )** Parentheses are used to clarify which elements are to be chosen from.

- Indicates that a space must be placed at the indicated location (for example, A\_ <a> indicates there must be a space between the keyword A and the element <a>.

::= "Is defined as" (for example, <a>::= <b> <c> indicates that <a> can be replaced by the series of elements <b> <c> in any statement where <a> occurs).

## Syntax Conventions

<A-block data field>::=  
#A <length> <command list> (use when the length of the command list is known).

<A-block data format>::=  
#A <length> <command list>.

<character>::=  
Sp!"#%&'()+,-/0123456789:;ABCDEFGHIJKLMNO  
PQRSTUVWXYZ[\]?~'abcdefghijklmnopqrstuvwxyz

<character string>::=  
list of characters.

<command list>::=  
any spectrum analyzer command or list of commands separated by semicolons.

<CR>::=  
carriage return.

## Introduction

<data byte> ::=

8-bit byte containing numeric or character data.

<delimiter> ::=

!|"|\$|%|&|'|/|:|=|@

<destination> ::=

TRA|TRB|TRC|<user-defined trace>|<user-defined variable>|<predefined variable>|<trace range>.

<display units> ::=

within screen or graticule coordinates. Screen coordinates are (Xmin,Ymin) = (-40,-22), (Xmax,Ymax) = (471,233).

Graticule coordinates are (Xmin,Ymin) = (0,0), (Xmax,Ymax) = (400,200).

<EOI> ::=

end or identify.

<I-block data field> ::=

#I<command list>END; (use when the length of the command list is not known).

<integer> ::=

integer number.

<key label> ::=

1 to 8 characters per label line, use the (|) symbol to separate into two softkey label lines.

## 3-4 Programming

**<key number> ::=**

**<integer>** from 1 to 6, 601 to 1200 | **<trace element>** | **<predefined function>** | **<predefined variable>** | **<user-defined variable>**.

**<label> ::=**

2 to 11 characters long that is defined by the FUNCDEF command. Choice of characters is A through Z and the underscore ( \_ ). The underscore should be used as the second character of the label. Omitting the underscore, or using the underscore in other than the second character in a label, is not recommended.

**<length> ::=**

two 8-bit bytes specifying the length of the command list.

**<LF> ::=**

line feed.

**<number> ::=**

**<integer>** | **<real>**.

**<numeric data format> ::=**

**<real>** **<CR>** **<LF>** **<EOI>**.

**<real> ::=**

real number.

**<source> ::=**

**TRA** | **TRB** | **TRC** | **<user-defined trace>** | **<user defined variable>** | **<predefined variable>** | **<predefined function>** | **<trace range>** | **<number>**.

## Introduction

**<source1> ::=**

TRA|TRB|TRC| <user-defined trace> | <user-defined variable> | <predefined variable> | <predefined function> | <trace range> | <number>.

**<source2> ::=**

TRA|TRB|TRC| <user-defined trace> | <user-defined variable> | <predefined variable> | <predefined function> | <trace range> | <number>.

**<string data field> ::=**

<delimiter> <command list> <delimiter>.

**<trace destination> ::=**

TRA|TRB|TRC| <user-defined trace> | <trace range>

**<trace element> ::=**

Any element (point) of trace A, trace B, trace C, or user-defined trace. Trace A, trace B, trace C can have 1 to 401 elements; a user-defined trace can have 1 to 2047 elements.

**<trace range> ::=**

Any segment of trace A, trace B, trace C, or user-defined trace.

**<trace source> ::=**

TRA|TRB|TRC| <user-defined trace> | <trace range>

**<user-defined function> ::=**

2 to 11 characters defined in the FUNCDEF or ACTDEF declaration.

**<user-defined trace>::=**

2 to 11 characters defined in the TRDEF statement. A user-defined trace can have 1 to 2047 elements.

**<user-defined variable>::=**

2 to 11 characters defined in the VARDEF or ACTDEF declaration.

## Functional Index

### AMPLITUDE

|         |  |
|---------|--|
| AT      | Specifies input attenuation.   |
| AUNITS  | Specifies amplitude units for input, output, and display.                  |
| INZ     | Specifies input impedance value that is used in conversion to power units. |
| LG      | Selects log scale.   |
| LN      | Selects linear scale.  |
| MDU     | Returns the analyzer's baseline and reference level.                       |
| MKRL    | Sets reference level to marker amplitude.                                  |
| ML      | Specifies mixer level.   |
| RL      | Specifies reference level.   |
| ROFFSET | Specifies reference level offset.  |

### AUX INTERFACE CONTROL

|       |                                 |
|-------|---------------------------------|
| CNTLA | Turns control line A on or off. |
| CNTLB | Turns control line B on or off. |
| CNTLC | Turns control line C on or off. |

## Functional Index

CNTLD Turns control line D on or off.  
CNTLI Returns the status of control line I.

## BANDWIDTH

RB Specifies resolution bandwidth.  
VB Specifies video bandwidth.  
VBR Specifies coupling ratio of video bandwidth to resolution bandwidth.

## CALIBRATION

CAL Initiates calibration routines.

## COMMAND TRIGGER

ONCYCLE Performs command list periodically.  
ONDELAY Performs command list once after a time period.  
ONEOS Performs command list on end of every sweep.  
ONMKR Performs command list at the marker.  
ONSRQ Performs command list on every service request.  
ONSWP Performs command list at beginning of every sweep.  
ONTIME Performs command list at a specific time.

## COMB GENERATOR *(HP 8593A only)*

COMB Turns comb generator on or off.



**COUNTER-LOCK**

MKFC Turns marker frequency count on or off.  
MKFCR Sets the marker counter resolution.

**COUPLING**

AUTO Recouples active function or recouples all functions.

**DIAGNOSTIC**

CNF Performs the confidence test.

**DISPLAY**

ANNOT Turns annotation on or off.  
AUNITS Specifies amplitude units for input, output, and display.  
CRTHPOS Specifies the CRT horizontal position.  
CRTVPOS Specifies the CRT vertical position.  
DL Specifies display line level.  
DSPLY Writes the value of a variable on the analyzer screen.  
GRAT Turns graticule on or off.  
HD Holds or disables front-panel data entry and blanks active function.  
LG Selects log scale.  
LN Selects linear scale.  
MENU Displays specified menu on the CRT.  
TH Specifies displayed threshold level.

## Functional Index

- TITLE** Writes text string to the top line of the analyzer screen.
- TRGRPH** Graphs compressed trace.

## FREQUENCY

- CF** Specifies center frequency.
- FA** Specifies start frequency.
- FB** Specifies stop frequency.
- FOFFSET** Specifies frequency offset.
- FS** Specifies full frequency span.
- SP** Specifies frequency span.
- SS** Specifies center-frequency step-size.

## FM DEMODULATOR *(Option 102 only)*

- DEMODO** Turns the demodulator on or off and selects between AM and FM demodulation.
- FMGAIN** Specifies frequency for FM GAIN.
- TVSYNC** Selects between negative and positive triggering for video frame formats.

## GRAPHICS

- CLRDSO** Erases user-generated graphics.
- DT** Defines label terminator.
- GR** Graphs specified y values on the analyzer screen.
- LB** Writes label to display.
- PA** Moves pen to current position.
- PD** Places pen down.
- PR** Draws vector from last position (plot relative).
- PRINT** Prints screen data.

|       |   |
|-------|---|
| PU    | Lifts pen up.   |
| TEXT  | Writes text string to screen at current pen position. |
| TITLE | Writes text string to top line of analyzer screen.    |

## HARMONIC BANDS

|        |                                       |
|--------|---------------------------------------|
| HN     | Specifies the harmonic number (band). |
| HNLOCK | Locks the tuning band.                |
| HNUNLK | Unlocks the tuning band.              |
| PP     | Performs a preselector peak.          |

## INFORMATION

|         |  |
|---------|--|
| ACTVF   | Returns a "0" if the function is not active.                               |
| BIT     | Returns the state of a bit.  |
| CLS     | Clears status byte.  |
| HAVE    | Returns status of device or function option if installed.                  |
| ID      | Returns the HP model number of the analyzer used.                          |
| MODE    | Specifies the operating mode of the analyzer.                              |
| REV     | Returns the analyzer's firmware date.                                      |
| RQS     | Provides service request mask bits which are enabled for service requests. |
| SAVRCLF | Indicates that a save or recall operation is in progress.                  |
| SAVRCLN | Appends number to prefix for save and recall operations.                   |
| SAVRCLW | Used to specify what is to be saved or recalled.                           |
| SER     | Returns the serial number of the analyzer.                                 |

## Functional Index

SRQ            Sets service request.  
STB            Queries status byte.

## INPUT/OUTPUT

CAT            Catalogs card or memory.  
EE            Enables front-panel number entry.  
EK            Enables front-panel knob control.  
ENTER        Controls the HP-IB in order to receive data.  
EP            Enables parameter entry from front panel.  
HD            Holds or disables data entry and blanks active function readout.  
OA            Returns active function.  
OL            Returns learn string.  
OUTPUT       Controls the HP-IB in order to send data.  
PREFIX       Specifies the prefix.  
RELHPIB     Releases HP-IB control.  
RCLT         Recalls state and trace from an internal trace register.  
SAVET        Saves state and trace in an internal trace register.  
TA            Controls trace A output.  
TB            Controls trace B output.  
TDF          Selects trace data output format.  
TRA/TRB/TRC Controls trace data input/output.

## INSTRUMENT STATE

IP            Performs an instrument preset.  
PSTATE      Protects state.  
RCLS        Recalls an internal state register.  
SAVES       Saves an internal state register.

**MARKER**

|         |  |
|---------|--|
| MKFC    | Turns marker frequency count on or off.                              |
| MKFCR   | Sets the marker counter resolution.                                  |
| MDS     | Specifies measurement data size as byte or word.                     |
| MF      | Returns marker frequency.  |
| MKA     | Specifies amplitude of the active marker.                            |
| MKACT   | Specifies active marker: 1, 2, 3, or 4.                              |
| MKBW    | Specifies marker bandwidth.  |
| MKCF    | Moves marker frequency into center frequency.                        |
| MKCONT  | Continues sweep after MKSTOP.  |
| MKD     | Moves delta marker to specified position.                            |
| MKF     | Specifies frequency of active marker.                                |
| MKMIN   | Moves active marker to minimum signal detected.                      |
| MKN     | Moves active marker to specified frequency as frequency type marker. |
| MKNOISE | Returns average value at marker, normalized to 1 Hz bandwidth.       |
| MKOFF   | Turns off all markers.   |
| MKP     | Places the marker at the given x-axis position.                      |
| MKPAUSE | Pauses sweep at marker.  |
| MKPK    | Moves active marker to maximum signal detected.                      |
| MKPX    | Specifies minimum excursion for peak identification.                 |
| MKREAD  | Selects type of marker readout to be displayed.                      |
| MKRL    | Sets reference level to marker amplitude.                            |
| MKSP    | Sets span to marker frequency value.                                 |

## Functional Index

|         |   |
|---------|---|
| MKSS    | Sets the center-frequency step-size to the marker frequency.  |
| MKSTOP  | Stops the sweep at the active marker.   |
| MKTRACE | Assigns marker to trace.  |
| MKTRACK | Turns signal track on or off.   |
| MKTYPE  | Specifies the marker type.  |
| M4      | Turns on marker zoom.   |
| SPZOOM  | Places a marker on the highest on-screen signal peak, and turns on the signal track function (if an on-screen marker is not present). |

## MATH (see also Trace Math)

|        |   |
|--------|---|
| ABS    | Calculates the absolute value of the operand.                 |
| ADD    | Calculates the sum of the operands.                           |
| AVG    | Averages two trace operands.                                  |
| BIT    | Returns the state of a bit.                                   |
| CTA    | Converts to absolute units.                                   |
| CTM    | Converts to measurement units.                                |
| DIV    | Returns the result of the division of two operands.           |
| EXP    | Calculates the base 10 exponential of an operand.             |
| INT    | Calculates integer value of an operand.                       |
| LOG    | Calculates log of operand.                                    |
| MEAN   | Returns the mean value of a trace.                            |
| MIN    | Finds the minimum of two operands.                            |
| MINPOS | Finds the <i>x</i> -axis position of the minimum trace value. |
| MOD    | Finds the remainder from division.                            |
| MPY    | Multiplies two operands.                                      |
| MXM    | Finds the maximum of two operands.                            |

|          |  |
|----------|--|
| PDA      | Finds the probability distribution of the amplitude. |
| PDF      | Finds the probability distribution of frequency.     |
| RMS      | Finds the root mean square.                          |
| SQR      | Finds the square root.                               |
| STDEV    | Finds the standard deviation.                        |
| SUB      | Subtracts one operand from another.                  |
| SUM      | Finds the sum of two operands.                       |
| SUMSQR   | Finds the sum of operands squared.                   |
| VARIANCE | Finds amplitude variance of operand.                 |

### MEMORY OPERATION

|        |   |
|--------|---|
| CAT    | Displays directory information from the specified or current mass storage device. |
| FORMAT | Formats the memory card.  |
| LOAD   | Loads data from the memory card into the analyzer memory.                         |
| MSI    | Defines the mass storage device.  |
| PURGE  | Deletes the file.   |
| STOR   | Stores item from instrument to memory card.                                       |

### OPERATOR ENTRY

|    |   |
|----|---|
| EE | Enables front-panel data number entry.                      |
| EK | Enables front-panel knob control.                           |
| EP | Enter parameter from front panel.                           |
| HD | Holds or disables entry and blanks active function readout. |

### PLOTTER

|      |  |
|------|--|
| PLOT | Returns HP-GL compatible screen plot data. |
|------|--|

## Functional Index

### PRINTER

**PRINT** Returns HP raster graphics compatible screen data.

### PROGRAM FLOW

**ABORT** Aborts all user-defined functions.  
**IF** **IF/THEN/ELSE/ENDIF** forms a conditional construct.

**REPEAT** **REPEAT/UNTIL** forms a looping construct.  
**RETURN** Returns from user-defined function.

### REAL-TIME CLOCK

**DATEMODE** Sets the format of the display of the date.

**SETDATE** Sets the date of the real-time clock.

**SETTIME** Sets the time of the real-time clock.

**TIMEDATE** Displays the time and date of the real-time clock.

**TIMEDSP** Turns the display of the real-time clock on or off.

### SWEEP TRIGGER

**CONTS** Selects continuous-sweep mode.

**ONEOS** Performs the command list on end of sweep.

**ONSWP** Performs the command list at beginning of sweep.

**SNGLS** Selects single-sweep mode.

**ST** Specifies sweep time.

**TM** Specifies trigger mode.

**TS** Begins a new sweep.



**SYNCHRONIZATION**

TS Begins a new sweep.  
DONE Returns a "1" after preceding commands are begun.

**TRACE**

DET Specifies detection mode.  
IB Inputs trace B in binary units  
PKPOS Returns maximum value of trace.  
PWRBW Returns power bandwidth of signal.  
RCLT Recalls state and trace from the trace register.  
SAVET Saves state and trace in the trace register.  
TA Returns trace A data.  
TB Returns trace B data.  
TRA/TRB/TRC Controls trace A/B/C data input/output.  
TRCMEM Returns the maximum trace register number.  
TRDEF Declares a user-defined trace.  
TRGRPH Graphs a compressed trace.  
TRPRST Returns traces to preset state.  
TRSTAT Returns status of traces.  
TWINDOW Specifies trace window for FFT.

**TRACE MATH (also see MATH)**

APB Adds trace A and trace B and places the result in trace A.  
AXB Exchanges trace A and trace B.  
BML Subtracts display line from trace B, and places the result in trace B.

## Functional Index

|          |   |
|----------|---|
| BTC      | Transfers trace B into trace C.               |
| BXC      | Exchanges trace B and trace C.                |
| CLRAVG   | Restarts video averaging.                     |
| COMPRESS | Compresses a trace to the desired length.     |
| CONCAT   | Concatenates two traces.                      |
| FFT      | Calculates fast Fourier transform.            |
| MIRROR   | Displays the mirror image of a trace.         |
| PEAKS    | Specifies trace peaks.                        |
| SMOOTH   | Smooths a trace.                              |
| TRMATH   | Performs trace math at the end of each sweep. |
| VAVG     | Turns video averaging on or off.              |
| XCH      | Exchanges traces.                             |

## TRACE PROCESSING

|       |  |
|-------|--|
| AMB   | Subtracts trace B from trace A and places the result in trace A.                         |
| AMBPL | Subtracts trace B from trace A, adds the display line, and places the result in trace A. |
| BLANK | Blanks trace.  |
| CLRW  | Clear-writes trace.  |
| MOV   | Moves trace from source to destination.  |
| MINH  | Updates trace C elements with minimum level detected.                                    |
| MXMH  | Updates trace elements with maximum level detected.                                      |
| TA    | Transfers trace A.   |
| TB    | Transfers trace B.   |
| TRDSP | Turns trace display on or off.   |
| VIEW  | Views trace.   |

**TV SYNC (Option 102 only)**

TVLINE Specifies horizontal line of video to trigger on  
 TVSFRM Specifies type of video frame to trigger on.

**USER-DEFINED**

ABORT Aborts all user-defined functions.  
 ACTDEF Defines an active function.  
 DISPOSE Deletes user-defined functions.  
 ERASE Disposes of all user-defined functions.  
 FUNCDEF Defines a function.  
 KEYCLR Clears softkeys 1 through 6.  
 KEYCMD Defines the function and label of a softkey based on a condition and updates the label whenever a key is pressed.  
 KEYDEF Defines a softkey.  
 KEYENH Activates inverse video and underlining of a softkey.  
 KEYEXC Executes a softkey.  
 KEYLBL Relabels a softkey.  
 MEM Returns the amount of memory available.  
 MENU Displays the specified softkey menu.  
 RETURN Returns from user-defined function.  
 SAVEMENU Saves softkeys 1 – 6 in the menu specified.  
 TRDEF Declares a user-defined trace.  
 USTATE Returns/sends user state.  
 VARDEF Declares a user-defined variable.

## Programming Codes

### ABORT;

Stops the execution of all user-defined functions and readies the instrument for the next command received.

### ABS\_ < destination >, < source >;

Places the absolute value of the source value(s) in the destination.

### ACTDEF\_ < function name > (< active function area label >, < preset value >, (STEP|NONE|HZ|SEC|DB|DBM|V|ABSHZ|INTEGER), (< delimiter > < command list > < delimiter > | user-defined function))|?;

Creates a user-defined active function.

< function name > ::= 2 to 11 ASCII characters representing the function name.

< active function area label > ::= ASCII characters representing the label for the active function area.

< preset value > ::= < number > | < user-defined variable >.

Query response using < name >: < numeric data format >.

Query response using ACTDEF < function name >:

ACTDEF < function name >, ! < active function area label >!, < preset value >, (STEP|NONE|HZ|SEC|DB|DBM|V|ABSHZ|INTEGER), < A-block data format > < CR > < LF > < EOI >.

**ACTVF\_ < active function >;**

Returns a "0" if the given function is not active.

< active function > ::= AT|CF|DL|FA|FB|FMGAIN  
|FOFFSET|INZ|LG|MKA|MKD|MF|MKF|MKFCR  
|MKN|MKPAUSE|MKPX|ML|MODE|RB  
|ROFFSET|RL|SAVRCLN|SETDATE|SETTIME  
|SP|SQLCH|SS|ST|TH|TIMEDATE|TITLE  
|TVLINE|VB|VBR| and user-defined active function  
specified by the ACTDEF command.

**ADD\_ < destination >, < source 1 >, < source 2 >;**

Adds the sources and sends the sum to the destination.

**AMB\_(ON|OFF|1|0)|?;**

Subtracts trace B from trace A and sends the result to trace A during every sweep of the analyzer.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**AMBPL\_(ON|OFF|1|0)|?;**

Subtracts trace B from trace A, adds the display line value to the difference, and sends the result to trace A during every sweep of the analyzer.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**ANNOT\_(ON|OFF|1|0)|?;**

Turns the display annotation on or off.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**APB;**

Adds trace A to trace B and sends the result to trace A.

## Programming Codes

**AT\_**((<real>[DB])|AUTO|UP|DN|EP)|?);

Specifies the RF input attenuation. Default units are dB.

Query response: <numeric data format>.

**AUNITS\_**(DBM|DBMV|DBUV|V|W)|?);

Specifies the amplitude units for input, output and display for the current amplitude setting (log or linear).

Query response: (DBM|DBMV|DBUV|V|W)<CR>  
<LF> <EOI>.

**AUTO**;

Automatically couples the active functions.

**AVG\_**<destination>, <source>, <ratio>;

Computes the average value of the source and the destination according to the following algorithm:

Average =  $[(\text{ratio} - 1) \times \text{destination} + \text{source}] / \text{ratio}$

<ratio> ::= <real> | <user-defined variable>

| <predefined variable> | <predefined function>

| <trace element>.

**AXB**;

Exchanges trace A and trace B.

**BIT\_**<destination>, <source>, <bit number>;

Places the state of the bit ("0" or "1") in the destination.

<destination> ::= <user-defined variable> |

<predefined variable> | <trace element>.

<source> ::= <user-defined variable> | <predefined variable> | <predefined function> | <trace element> |

<number>.

<bit number> ::= <user-defined variable> | <predefined variable> | <predefined function> | <trace element> | <integer>.

**BLANK\_(TRA|TRB|TRC);**

Blanks trace A, trace B, or trace C, and stops taking new data into the specified trace.

**BML;**

Subtracts the display line from trace B and sends the result to trace B.

**BTC;**

Transfers trace B to trace C.

**BXC;**

Exchanges trace B and trace C.

**CAL\_(ON|OFF|STORE|FETCH|FREQ|AMP|ALL|YTF|DISP|DUMP|INIT);**

Controls the calibration routine.

**CAT\_[a|c|d|s|t]\*[,INT|CARD];**

Returns directory information from the specified or current mass storage device. The directory information is returned as ASCII string data. The a, c, d, s, and t parameters represent the data types as follows:

a = antenna

c = correction

d = downloadable program

s = state

t = trace

If the data type is not specified, CAT returns all the directory information. If INT or CARD is not specified, CAT returns directory information from the current mass storage device.

## Programming Codes

**CF**(\_( <real> [HZ|KHZ|MHZ|GHZ]) |UP|DN|EP) |?);  
Specifies the center frequency. Default units are Hz.  
Query response: <numeric data format>.

**CLRAVG**;  
Restarts video averaging.

**CLRDSP**;  
Erases menu or user-generated graphics.

**CLRW**\_(TRA|TRB|TRC);  
Clears the specified trace and enables trace data acquisition.

**CLS**;  
Clears all status bits.

**CNF**;  
Performs the confidence test.

**CNTLA**\_(ON|OFF|1|0) |?);  
Makes the control line A of the auxiliary interface high or low.  
Query response: (ON|OFF) <CR> <LF> <EOI>.

**CNTLB**\_(ON|OFF|1|0) |?);  
Makes the control line B of the auxiliary interface high or low.  
Query response: (ON|OFF) <CR> <LF> <EOI>.



**CNTLC**(\_(ON|OFF|1|0))|?;

Makes the control line C of the auxiliary interface high or low.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**CNTLD**(\_(ON|OFF|1|0))|?;

Makes the control line D of the auxiliary interface high or low.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**CNTLI**;

Returns a "1" if pin 5 of the auxiliary interface is high, a "0" if the line is low.

**COMB**\_(ON|OFF|1|0);

Turns the comb generator on or off. (*HP 8593A only*)

**COMPRESS**\_ <trace destination >, <trace source >,  
(AVG|NRM|NEG|POS|SMP|PKAVG|PKPIT);

Compresses the trace source to fill the trace destination according to the specified compression algorithm.

**CONCAT**\_ <trace destination >, <source1 >, <source2 >;

Concatenates source 1 and source 2 and sends the new trace array to the destination.

**CONTS**;

Selects continuous-sweep mode.

**CRTHPOS**(\_ <position > |UP|DN)|?;

Specifies the horizontal position of the analyzer display.

<position >:: = <integer > from 1 to 34.

Query response: <numeric data format >.

## Programming Codes

**CRTVPOS**(\_ <position> |UP|DN)|?;

Specifies the vertical position of the analyzer display.

<position> ::= <integer> from 10 to 58.

Query response: <numeric data format>.

**CTA**\_ <destination>, <source>;

Converts the source values from measurement units to the current absolute amplitude units and stores this result in the destination.

<destination> ::= <user-defined variable>.

<source> ::= <user-defined variable> | <integer>

| <predefined variable> | <predefined function>.

**CTM**\_ <destination>, <source>;

Converts the source values to vertical measurement units and places the result in the destination.

<destination> ::= <user-defined variable>.

<source> ::= <user-defined variable> | <real>.

**DATEMODE**(\_ (MDY|DMY))|?;

Allows the display of the real-time clock to be set in month-day-year format or day-month-year format.

Query response: (MDY|DMY)<CR><LF><EOI>.

**DEMODO**\_(AM|FM|ON|OFF);

Turns the demodulator on or off, and selects between AM or FM demodulation.

**DET**(\_ (POS|SMP))|?;

Selects the specified analyzer input detection mode.

Query response: (POS|SMP)<CR><LF><EOI>.

**DISPOSE**\_ <operand>;

Allows the user to free user memory which has been allocated previously for user-defined functions. **DISPOSE ALL** clears all operands.

## Programming Codes

**DT** < character >;

Defines any character as the label terminator. The label terminator is used for the LB command.

**EE**;

Sends values entered by the operator on the analyzer numeric keypad to the controller.

**EK**;

Allows data entry with the front-panel knob when the analyzer is under remote control.

**ENTER** < HP-IB address >, (K|B|W), < destination >;

Establishes the analyzer as a controller on the HP-IB.  
< HP-IB address > ::= < number > | < user-defined variable > | < predefined variable > | < predefined function > | < trace element >.

K = Free field, ASCII real number format.

B = One byte binary.

W = One word binary (2 bytes).

< destination > ::= < trace element > | < user-defined variable > | < predefined variable >.

**EP**;

Sends values entered by the operator on the analyzer number keyboard to the current function.

**ERASE**;

Clears trace A and trace B, disposes of the contents of the user memory, and resets the internal state registers to the instrument preset state and presets the analyzer.

**EXP** *<destination>*, *<source>*, *<scaling factor>*;  
 The exponential of the source is placed in the destination.  
 The EXP command is useful for converting log values to linear values.  
*<scaling factor>* ::= *<real>* | *<user-defined variable>* | *<predefined function>* | *<predefined variable>* | *<trace element>*.

**FA**(*<real>* [*HZ|KHZ|MHZ|GHZ*]) | *UP|DN|EP*) | ?;  
 Specifies the start frequency. Default units are Hz.  
 Query response: *<numeric data format>*.

**FB**(*<real>* [*HZ|KHZ|MHZ|GHZ*]) | *UP|DN|EP*) | ?;  
 Specifies the stop frequency. Default units are Hz.  
 Query response: *<numeric data format>*.

**FFT** *<trace destination>*, *<trace source>*, *<window>*;  
 Performs a forward fast Fourier transform on the source trace and sends the results to the destination trace. Before executing FFT, a trace window must be defined with the TWINDOW command, for proper formatting.

*<trace destination>* ::= *TRA|TRB|TRC* | *<user-defined trace>*.  
*<trace source>* ::= *TRA|TRB|TRC* | *<user-defined trace>*.  
*<window>* ::= *TRA|TRB|TRC* | *<user-defined trace>*.

**FMGAIN**(*<integer>* [*HZ|KHZ|MHZ|GHZ*]) | ?;  
 Allows you to specify the full screen range for FM gain.  
 Query response: *<numeric data format>*.

## Programming Codes

**FOFFSET**( (< real > [HZ|KHZ|MHZ|GHZ]) )|?;  
Specifies the frequency offset for all absolute frequency readouts such as center frequency. Default units are Hz.  
Query response: < numeric data format >.

**FORMAT** < delimiter > < volume label > < delimiter >;  
Formats a memory card in the logical interchange format (LIF).  
< volume label > ::= 0 to 6 characters.

**FS**;  
Selects the full frequency span mode of the analyzer.

**FUNCDEF** < label > ,( < string data field > | < A-block data field > | < I-block data field > );  
Defines a routine consisting of analyzer commands, assigns it a label, and stores the routine and its label in the user memory.

**GR** < integer > [, < integer > ];  
Graphs the given y coordinate by incrementing the x coordinate by 1. The integer parameter may be repeated.

**GRAT**( (ON|OFF|1|0) )|?;  
Turns the graticule on or off.  
Query response: (ON|OFF) < CR > < LF > < EOI >.

**HAVE**\_( HPIB|RS232|FMD|CNT|TV|FADC|CARD );  
Returns a "0" if the specified device is not installed.

HPIB = Option 021.

RS232 = Option 023.

FMD = Option 102.

CNT = Counter-lock.

TV = Option 102.

FADC = Option 101.

CARD = Memory card reader.

**HD;**

Disables data entry via the analyzer numeric keypad, knobs, or step keys. The active function readout is blanked, and any active function is deactivated.

**HN[?];**

Returns the harmonic number of the analyzer's current tuning. (*HP 8593A only*)

Query response: < numeric data format >.

**HNLOCK(\_(<integer> | ON | OFF | EP))|?;**

Forces the analyzer to use only the selected harmonic. (*HP 8593A only*)

Query response: (ON | OFF) < CR > < LF > < EOI >.

**HNUNLK;**

Unlocks the harmonic number. (*HP 8593A only*)

**IB < entry >;**

Provides a method for reading or storing values into trace B.

< entry > :: = exactly 802, 8-bit binary bytes.

**ID[?];**

Returns the HP model number of the analyzer.

Query response: < character string >  
< CR > < LF > < EOI >.

## Programming Codes

**IF\_** < condition1 >, (GT|LT|EQ|NE|GE|LE),  
< condition2 >, THEN < command list > [ELSE  
< command list > ]ENDIF;

Compares condition 1 to condition 2. If the condition is true, the command list is executed. Otherwise, commands following the next ELSE or ENDIF statements are executed.

< condition1 > ::= < number > | < user-defined variable >  
| < predefined variable > | < predefined function >  
| < trace element > .

< condition2 > ::= < number > | < user-defined variable >  
| < predefined variable > | < trace element > .

**INT\_** < destination >, < source >;

Places the greatest integer which is less than or equal to the source value into the destination.

**INZ**( (75|50|EP|OA) )|?;

Specifies the value of input impedance expected at the active input port.

Query response: (50|75) < CR > < LF > < EOI > .

**IP**;

Performs an instrument preset.

**KEYCLR**;

Clears softkeys 1 through 6 of menu 1.

**KEYCMD\_** < key number >, < delimiter > < key press  
command string > < delimiter >, < delimiter > < menu label  
command string > < delimiter >;

Allows you define the function and label of a softkey based on a condition. The softkey label is updated whenever a key

is pressed.

< key press command string > ::= < command list > .

< menu label command string > ::= < command list > .

**KEYDEF\_** < key number > (, (< string data field > | < user-defined function >), < delimiter > < key label > < delimiter > ) | ?;

Assigns a label and user-defined function to a softkey.

Query response: < A-block data format > " < character string > " < CR > < LF > < EOI > .

**KEYENH\_** < key number > , < delimiter > < key label > < delimiter > , < delimiter > < inverse video condition > < delimiter > , < delimiter > < move enhancement condition > < delimiter > ;

Activates part or all of the key label in the inverse video mode, or moves the underline from one section of the label to another.

< inverse video condition > ::= an analyzer command.

< move enhancement condition > ::= an analyzer command.

**KEYEXC\_** < key number > ;

Executes the specified defined key.

< key number > ::= < integer > value from 1 to 6, or 601 to 1200.

**KEYLBL\_** < key number > , < delimiter > < key label > < delimiter > ;

Renames a key without changing its function.



## Programming Codes

**LB**< character string > < terminator >;

Writes text (label) at the current pen position with alphanumeric characters specified in the character field.  
< terminator > ::= < character > specified in DT command

**LG**( (< real > [DB|DM]) | UP|DN|EP) | ?;

Specifies the vertical graticule divisions as logarithmic units without changing the reference level. Default units are dB.  
Query response: < numeric data format >. A query response of zero indicates a linear scale.

**LN**;

Specifies the vertical graticule divisions as linear units without changing the reference level.

**LOAD**\_ < delimiter > < character string > < delimiter >  
[, < destination > ];

Loads the data from the memory card. Omit the destination if the data is not trace data.

< destination > ::= TRA|TRB|TRC| < user-defined trace >.

**LOG**\_ < destination > , < source > , < scaling factor > ;

Takes the logarithm (base 10) of the source, multiplies the result by the scaling factor, then stores it in the destination.  
< scaling factor > ::= < real > | < trace element >  
| < predefined function > | < predefined variable > | < user-defined variable >.

**MDS**( (B|W) ) | ?;

Formats binary measurements by selecting the measurement data size as an 8-bit byte or a two-byte word.

Query response: (B|W) < CR > < LF > < EOI >.

**MDU[?];**

Returns values for the analyzer's baseline and reference level.

Query response: < number >, < number >, < number >, < number >, (DBM|DBMV|DBUV|V|W) < CR > < LF > < EOI >.

**MEAN\_(TRA|TRB|TRC| < trace range > | < user-defined trace >)?;**

Returns the mean value of a trace in measurement units.

Query response: < numeric data format >.

**MEM?;**

Returns the amount of unused analyzer memory available for user programs and variables.

Query response: < numeric data format >.

**MENU(< menu number >)?;**

Displays the selected softkey menu on the analyzer screen.

Menu 0 is blank.

< menu number > :: = integer value of 1, or 101 to 200.

Query response: < numeric data format >.

**MF;**

Returns the frequency (or time) of the on-screen active marker.

**MIN\_ < destination >, < source 1 >, < source 2 >;**

Compares the two sources, point by point, and sends the lesser value of each comparison to the destination.

## Programming Codes

### **MINH\_TRC;**

Updates each trace C element with the minimum level detected.

### **MINPOS\_(TRA|TRB|TRC| <user-defined trace> | <trace range >);**

Returns a value which is the x-axis position (in < display units >) of the minimum amplitude value in trace A, trace B, trace C, or user-defined trace.

### **MIRROR\_ <trace destination >, <trace source >;**

Moves the mirror image of the source trace into the destination trace.

### **MKA\_( <real > |UP|DN|EP|AUTO))|?;**

Specifies the amplitude of the active marker in the current amplitude units when marker type is of fixed or amplitude type. When queried, MKA returns the marker amplitude independent of marker type.

Query response: < numeric data format > .

### **MKACT[(1|2|3|4))|?];**

Establishes the active marker. The active marker becomes marker number 1 after the MKACT command.

Query response: (1|2|3|4) < CR > < LF > < EOI > .

### **MKBW\_ <integer >;**

Returns the bandwidth at the specified power level relative to an on-screen marker (if present) or the signal peak (if no on-screen marker is present).

### **MKCF;**

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

**MKCONT;**

Continues sweeping from the marker after the marker has been stopped. (See MKSTOP.)

**MKD**( (<real> [HZ|KHZ|MHZ|GHZ]) | UP | DN | EP) | ?;

Places a second marker the specified frequency from the active marker. Frequency may be positive or negative. Default units are Hz.

Query response: < numeric data format > .

**MKF**( (<real> [HZ|KHZ|MHZ|GHZ]) | EP | UP | DN) | ?;

Specifies the frequency of the active marker. Default units are Hz.

Query response: < numeric data format > .

**MKFC**( (ON | OFF | 1 | 0) ) | ?;

Turns the marker frequency counter on or off.

Query response: (0|1) < CR > < LR > < EOI >

**MKFCR**( <real> [HZ|KHZ|MHZ|GHZ]) UP | DN) | ?;

Sets the resolution of the marker counter.

Query response: < numeric data format > .

**MKMIN;**

Moves the active marker to the minimum value detected.

**MKN**( (<real> [HZ|KHZ|MHZ|GHZ]) | UP | DN | EP) | ?;

Activates and moves the marker to the specified frequency.

Query response: < numeric data format > .

### Programming Codes

**MKNOISE**(\_(ON|OFF)|1|0)|?;

Returns the average value at the marker, normalized to a 1 Hz bandwidth.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**MKOFF**[\_ALL];

Turns off the active marker, or all markers (if the ALL parameter is specified).

**MKP**( (<integer> | <trace element> | <predefined function> | <predefined variable> | <user-defined variable> ))|?;

Places the active marker to the given x-coordinate.

Query response: <numeric data format>.

**MKPAUSE**[( (<real> ]SC|MS|US)|UP|DN|EP|OA|AUTO)|?];

Pauses the sweep at the active marker for the duration of the delay period.

Query response: <numeric data format>.

**MKPK**[\_ (HI|NH|NR|NL)];

Positions the active marker on signal peaks.

**MKPX**( (<real> [DB])|UP|DN|EP)|?;

Specifies the minimum signal excursion for peak identification. Default units are dB.

Query response: <numeric data format>.

**MKREAD**(**\_**(**FRQ**|**PER**|**SWT**|**IST**|**FFT**))|?;

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

Query response: (**FRQ**|**PER**|**SWT**|**IST**|**FFT**)  
<CR> <LF> <EOI>.

**MKRL**;

Sets reference level to the active marker amplitude.

**MKSP**;

Sets the start and stop frequencies to the values of the delta markers.

**MKSS**;

Sets the center-frequency step-size to the marker frequency (or frequency difference, if delta markers are used).

**MKSTOP**;

Stops the sweep at the active marker.

**MKTRACE**(**\_**(**TRA**|**TRB**|**TRC**))|?;

Moves the active marker to the corresponding position on another trace.

Query response: (**TRA**|**TRB**|**TRC**)<CR>  
<LF> <EOI>.

**MKTRACK**(**\_**(**ON**|**OFF**|**1**|**0**)|?;

Turns the marker signal track on or off.

Query response: (**ON**|**OFF**)<CR> <LF> <EOI>.

## Programming Codes

**MKTYPE**(**\_**(PSN|FIXED|AMP|DELTA))|?;

Specifies the type of active marker to be used.

Query response: (PSN|FIXED|AMP|DELTA)  
<CR> <LF> <EOI>.

**ML**(**\_**(**<real>**[DB|DM])|EP|UP|DN)|?;

Specifies the maximum signal level that is applied to the input mixer for a signal that is equal to or below the reference level.

Query response: < numeric data format >.

**MOD****\_****<destination>**,**<source 1>**,**<source 2>**;

Places the modulo (remainder) of the division of source 1 by source 2 in the destination.

**MODE**(**\_****<integer>**)|?;

Selects the operating mode of the analyzer if the mode is available. The parameter is assigned to the mode as follows:

0 = Spectrum analyzer mode.

1 = Not assigned.

2 = Not assigned.

3 = CATV operation (available as HP 85711A memory card).

4 = EMI operation (available as HP 85712A memory card).

5 = Digital radio (available as HP 85713A memory card).

Query response: < numeric data format >.

**MOV****\_****<destination>**,**<source>**;

Copies the source into the destination.

**MPY****\_****<destination>**,**<source 1>**,**<source 2>**;

Multiplies the sources, point by point, and sends the result to the destination.

**MSI**(\_(CARD|INT))|?;

Specifies the current mass storage device.

Query response: (CARD|INT) <CR> <LF> <EOI>.

**MXM**\_ <destination>, <source1>, <source2>;

Compares source 1 and source 2, point by point, and sends the greater value of each comparison to the destination.

**MXMH**\_(TRA|TRB);

Updates the selected trace with the maximum level detected at each frequency (maximum hold).

**M4**\_( <real> [HZ|KHZ|MHZ|GHZ])|UP|DN|EP|AUTO)|?;

Moves the active marker to the specified frequency. Stepping up or down changes the frequency span. Default units are Hz.

Query response: <numeric data format>.

**OA**;

Returns the active function value.

**OL**;

Returns the coded instrument state information to the controller in 202 8-bit bytes.

**ONCYCLE**\_( <time value>, <string data field>)|?;

ONCYCLE periodically executes the command string.

<time value> ::= <number> | <user-defined variable> in seconds.

Query response: <time value>, <A-block data format> <CR> <LF> <EOI>.



## Programming Codes

**ONDELAY**( *< time value >* , *< string data field >* )|?;

Executes the command string after the time value has elapsed.

*< time value >* ::= *< number >* | *< user-defined variable >*  
in seconds.

Query response: *< time value >* , *< A-block data format >*  
*< CR >* *< LF >* *< EOI >* the time value representing the  
time left until event occurs.

**ONEOS**( *< string data field >* | *< A-block data field >*  
| *< I-block data field >* )|?;

Executes the contents of the data field after the end of  
sweep.

Query response: *< A-block data format >* *< CR >*  
*< LF >* *< EOI >*.

**ONMKR**( *< string data field >* )|?;

ONMKR performs the command list when the sweep  
reaches the marker position.

Query response: *< A-block data format >* *< CR >*  
*< LF >* *< EOI >*.

**ONSRQ**( *< string data field >* )|?;

Executes the command list whenever a service request oc-  
curs.

Query response: *< A-block data format >* *< CR >*  
*< LF >* *< EOI >*.

**ONSWP**( *< string data field >* | *< A-block data field >*  
| *< I-block data field >* )|?;

Executes the command list at the beginning of the sweep.

Query response: *< A-block data format >*  
*< CR >* *< LF >* *< EOI >*.

**ONTIME**(\_ <time value>, <string data field>)|?;

Executes the command list at the specified time.  
 <time value> ::= <number> | <user-defined variable>  
 in YYMMDDHHMMSS format.

Query response: digits representing YYMMDDHHMMSS,  
 <A-block data format> <CR> <LF> <EOI>.

**OP**[?];

Returns parameter values P1 and P2, which represent the dimensions of the lower-left and upper-right analyzer display, when the display is to be used as a graphics plotter.

Query response: -40,-22,471,233 <CR> <LF> <EOI>.

**OUTPUT**[\_ <address>, (K|KC|KL), <output data>;

Establishes the analyzer as a controller on the HP-IB. The data is output according to the specified format options.

<address> ::= <number> | <predefined function>  
 | <predefined variable> | <user-defined variable>  
 | <trace element>.

K = Free field, ASCII real number format.

KC = One byte binary.

KL = One word (2 bytes) binary.

<output data> ::= <predefined function> | <predefined variable> | <user-defined variable> | <trace element>  
 | <delimiter> <data byte> <delimiter> | <A-block data field> | <I-block data field>.

**PA**[\_ PU|PD]\_ <X coordinate>, <Y coordinate>;

Draws vectors to the specified *x* and *y* coordinates. PU and PD determine whether the vector(s) are displayed. The *x,y* coordinate pairs may be repeated.

<x coordinate> ::= positive integer in <display units>.

<y coordinate> ::= positive integer in <display units>.

## Programming Codes

### **PD;**

Instructs the analyzer to plot vectors on the analyzer screen until a PU command is received.

**PDA\_** < trace destination >, < trace source >, < resolution >;  
Replaces the destination trace with the amplitude distribution function of the source trace.

< trace destination > ::= TRA | TRB | TRC | < user-defined trace >.

< trace source > ::= TRA | TRB | TRC | < user-defined trace >.

< resolution > ::= < real > | < user-defined variable > | < predefined function > | < trace element >.

**PDF\_** < trace destination >, < trace source >;

Increments an element of the destination trace whenever the corresponding element of the source trace exceeds a threshold. This is useful for constructing a frequency probability density function.

< trace destination > ::= TRA | TRB | TRC | < user-defined trace >.

< trace source > ::= TRA | TRB | TRC | < user-defined trace >.

**PEAKS\_** < trace destination >, < trace source >,  
(AMP | FRQ)?;

Sorts the signal peaks in the source trace by amplitude or frequency and returns the number of peaks found to the controller. It also sends the sorted results to the destination trace.

Query response: < numeric data format >.

**PKPOS\_**(TRA|TRB|TRC| <user-defined trace> | <trace range>);

Returns the *x*-axis position of the maximum value of the trace.

**PLOT**[ <P1x value>, <P1y value>, <P2x value>, <P2y value>];

Initiates a plotter output of the screen data to the remote interface. With the appropriate HP-IB commands, the HP-IB can be configured to route the data to an external plotter.

<P1x value> ::= <P1y value> ::= <number> that represents plotter dependent values that specify the lower-left plotter dimension.

<P2x value> ::= <P2y value> ::= <number> that represents plotter dependent values that specify the upper-right plotter dimension.

**PP;**

Peaks the preselector. (*HP 8593A only*)

**PR\_**[(PU|PD)] <X coordinate>, <Y coordinate>;

Specifies a new plot location on the analyzer screen relative to its current coordinates. The *x, y* coordinate pair may be repeated.

<x coordinate> ::= positive integer in <display units>.

<y coordinate> ::= positive integer in <display units>.

**PREFX\_** <delimiter> <prefix> <delimiter>;

Specifies or changes the prefix used in save and recall operations.

<prefix> ::= 0 to 6 characters, A through Z and the underscore (the underscore cannot be the first character of the prefix)

## Programming Codes

**PRINT[\_(BW|COLOR|0|1)];**

Initiates a output of the screen data to the remote interface. With appropriate HP-IB commands, the HP-IB can be configured to route the data to an external printer. PRINT, PRINT0, or PRINT BW outputs the screen data in monochrome format. PRINT1 or PRINT COLOR outputs the screen data in color format (with an HP PaintJet printer only).

**PSTATE\_(ON|OFF|1|0))|?;**

This command protects the state registers from being changed.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**PU;**

Instructs the analyzer not to plot vectors on the analyzer screen until a PD is received.

**PURGE\_ <delimiter> <filename> <delimiter>;**

Deletes the file name from the current mass storage device.  
<filename> ::= a valid file name.

**PWRBW\_ <trace source> , <percentage> ?;**

Computes the combined power of all signal responses in the source and returns the bandwidth which contains the specified percentage of the total power. Positions marker at beginning and end of the interval.

<percentage> ::= <number> | <user-defined variable>  
| <predefined variable> | <predefined function> | <trace element>.

Query response: <numeric data format>.

**RB**( (<real> [HZ|KHZ|MHZ|GHZ]) |UP|DN|EP  
|AUTO) |?;

Specifies the resolution bandwidth. Default units are Hz.  
Query response: < numeric data format >.

**RCLS** <number>;

Recalls the previously saved state stored in registers 1  
through 9.

<number> ::= 1|2|3|4|5|6|7|8|9.

**RCLT** <trace source>, <trace register>;

Recalls previously saved trace data and the corresponding  
instrument state from the trace registers.

<trace register> ::= <integer> from 0 to TRCMEM - 1.

**RELHPIB**;

Discontinues analyzer control of HP-IB. (*Option 023 only*)

**REPEAT** <command list> **UNTIL** <flow operand1>,  
(GT|LT|EQ|NE|GE|LE), <flow operand2>;

REPEAT and UNTIL commands form a looping construct.

<flow operand1> ::= <number> | <user-defined  
variable> | <predefined variable> | <trace element>.

<flow operand2> ::= <number> | <user-defined  
variable> | <predefined variable> | <trace element>.

**RETURN**;

Stops the operation of a current user-defined command and  
returns program operation to the point where the user-  
defined function was called.

## Programming Codes

**REV[?];**

Returns the firmware revision number of the analyzer being used.

Query response: < number > < CR > < LF > < EOI > in YYMMDD format.

**RL(< real > [DB|DM])|UP|DN|EP)?;**

Specifies the amplitude value of the reference level.

Query response: < numeric data format > .

**RMS\_(TRA|TRB|TRC| < user-defined trace > | < trace range >)?;**

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

Query response: < numeric data format > .

**ROFFSET(< real > [DB|DM])|EP)?;**

Offsets all amplitude readouts without affecting the trace.

Query response: < numeric data format > .

**RQS(< integer >)?;**

Sets a bit mask for service requests.

< integer > ::= ASCII decimal number 0–62.

Query response: < numeric data format > . (Returns the decimal weighing of the status byte bits which are enabled during a service request.)

**SAVEMENU\_ < menu number >;**

Saves menu 1 under the menu number given.

< menu number > ::= < integer > value of 1, or 101 to 200.

**SAVES\_ <state register >;**

Saves the current state of the analyzer in the specified state register.

<state register > ::= 1|2|3|4|5|6|7|8.

**SAVET\_ <trace source >, <trace register >;**

Saves trace in the selected register.

<trace register > ::= integer from 0 to TRCMEM - 1.

**SAVRCLF\_SAVE|RECALL;**

Indicates that a save or recall operation is to be executed.

**SAVRCLN\_ <integer > |EP);**

Appends number to prefix for save and recall operations.

**SAVRCLW\_(TRA|TRB|TRC|DLP|STATE);**

Specifies the data to be transferred – trace A, trace B, trace C, a program, or a state.

**SER[?];**

Returns the serial number of the analyzer.

Query response: <numeric data format >.

**SETDATE(\_ <date >)|?;**

Sets the date of the real-time clock of the analyzer.

<date > ::= <number > in the YYMMDD format.

Query response: <numeric data format > representing YYMMDD.



## Programming Codes

**SETTIME**(\_ <time >)|?;

Sets the time of the real-time clock of the analyzer.  
<time > ::= <number > in the HHMMSS format.  
Query response: <numeric data format > representing HHMMSS.

**SMOOTH**\_ <trace source > , <number of points > ;

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

<number of points > ::= <number > | <trace element >  
| <predefined function > | <predefined variable >  
| <user-defined variable > .

**SNGLS**;

Selects the single-sweep mode.

**SP**[( \_ (<real > [HZ|KHZ|MHZ|GHZ]) | UP | DN | EP | ?)];

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

Query response: <numeric data format > .

**SPZOOM**;

Places a marker on the highest on-screen signal (if an on-screen marker is not present), turns on the signal track function, and activates the span function.

**SQLCH**(\_ <integer >)|?;

Sets the squelch threshold by setting the squelch level.

Query response: <numeric data format > .

**SQR**\_ <destination > , <source > ;

Computes the square root of the source and sends the result to the destination.

**SRQ\_ <integer >;**

Used by an external controller to simulate service requests to the analyzer.

<integer > ::= integer from 2 to 126.

**SS\_( <real > [HZ|KHZ|MHZ|GHZ]) | UP | DN | EP | AUTO) | ?;**

Sets the center frequency step size. Default units are Hz.

Query response: < numeric data format > .

**ST([ <real > ] [SC | MS | US]) | UP | DN | EP | AUTO) | ?;**

Specifies the time in which the analyzer sweeps the displayed frequency range.

Query response: < numeric data format > .

**STB?;**

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

**STDEV\_(TRA | TRB | TRC | <user-defined trace > | <trace range >) ?;**

Returns the standard deviation of the specified trace amplitude.

Query response: < numeric data format > .

## Programming Codes

**STOR\_** < file type > , [ < delimiter > < file name > < delimiter > ] , < source > ;

Stores an individual function on the memory card. Use trace A, trace B, trace C, or user-defined trace when storing trace data. Use an asterisk as the source when storing downloadable programs. If the source parameter is omitted, an executable copy of the user's memory is stored on the memory card. If the file name is omitted, a file name is created.

< file type > :: = a | c | d | s | t. The a, c, d, s, and t parameters represent the data types as follows:

a = antenna

c = correction

d = downloadable program

s = state

t = trace

< file name > :: = 1 to 6 characters.

< source > :: = TRA | TRB | TRC | < user-defined trace > | < user-defined variable > | < user-defined function > | \*.

**SUB\_** < destination > , < source1 > , < source2 > ;

Subtracts source 2 from source 1, point by point, and sends the difference to the destination.

**SUM\_** (TRA | TRB | TRC | < user-defined trace > | < trace range > ) ? ;

Returns the sum of the amplitudes of each trace element in measurement units.

Query response: < numeric data format > .

**SUMSQR**\_(TRA|TRB|TRC| <user-defined trace>  
|<trace range>)?;

Returns the sum of the squares of the amplitude of each trace element in measurement units.

Query response: < numeric data format > .

**TA**;

Transfers the 401 amplitude values of trace A to the controller.

**TB**;

Transfers the 401 amplitude values of trace B to the controller.

**TDF**\_(A|B|I|M|P)|?;

Formats trace information for return to the controller.

TDF A = returns data as an A-block data field.

TDF B = enables binary format.

TDF I = returns I-block data field.

TDF M = returns values in < display units > .

TDF P = returns absolute measurement units.

Query response: (A|B|I|M|P)<CR><LF><EOI> .

**TEXT**\_<delimiter><character string><delimiter>;

Writes text on the spectrum analyzer screen at the current pen location.

**TH**(((<real>[DB|DM])|UP|DN|EP|AUTO))|?;

Clips signal responses below the specified threshold level.

Default units are dBm. Default level is nine major divisions below the reference level.

Query response: < numeric data format > .

## Programming Codes

**TIMEDATE**(< time date value >)|?;

Sets the time and date for the analyzer's real-time clock in the YYMMDDHHMMSS format.

< time date value > ::= < number > in the YYMMDDHHMMSS format.

Query response: < number > <CR> <LF> <EOI> in the YYMMDDHHMMSS format.

**TIMEDSP**((ON|OFF|1|0))|?;

Enables the display of the time and date on the analyzer screen.

Query response: (ON|OFF) <CR> <LF> <EOI>.

**TITLE**< delimiter > < character string > < delimiter >;  
Allows entry of a screen title.

**TM**((FREE|VID|LINE|EXT|TV))|?;

Implements the selected trigger mode. TV trigger is available for Option 102 only.

Query response: (FREE|VID|LINE|EXT|TV) <CR> <LF> <EOI>.

**TRA**((< number > [< number >]) | < A-block data field > | < I-block data field >)|?;

Provides a method for returning or storing trace values.

Query response: ((< number > [< number >]) | < A-block data format > | < I-block data format > | < data byte > < data byte > END) <CR> <LF> <EOI>.

## TRB

Same format and query response as TRA.

**TRC**

Same format and query response as TRA.

**TRCMEM[?];**

Returns the total number of registers available for SAVET and RCLT.

Query response: < numeric data format > .

**TRDEF\_ <label> (? | (, <trace length> );**

Creates a user-defined trace.

< trace length > ::= < user-defined variable >  
| < predefined variable > | < predefined function >  
| < trace element > | < number >

Query response: < numeric data format > .

**TRDSP\_ (TRA | TRB | TRC), (ON | OFF | 1 | 0);**

Controls the display of trace A, B, or C without clearing the trace (measurements can still be taken).

**TRGRAPH\_ <address>, <x position>, <y position>, <expanding factor>, <trace source>;**

Displays a compressed (see "COMPRESS") trace anywhere on the spectrum analyzer display. The x and y positions orient the trace positions.

< address > ::= integer.

< x position > ::= integer in < display units > .

< y position > ::= integer in < display units > .

< expanding factor > ::= integer from 0 to 100.

< trace source > ::= TRA | TRB | TRC | < user-defined trace > .

## Programming Codes

**TRMATH**( <string data field> | <A-block data field>  
<I-block data field> )|?;

Executes the specified trace math or user-operator commands at the end of a sweep. All analyzer commands except TS are allowed.

Query response: <A-block data format> <CR>  
<LF> <EOI>.

**TRPRST**;

Sets trace operations to their preset values.

**TRSTAT**?;

Returns the status of traces A, B, and C to the controller.

Query response: (CLEAR-WRITE|BLANK|VIEW  
|MXMH|MINH)(A|B|C)  
<CR> <LF> <EOI>.

**TS**;

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

**TVLINE**( ( <line number> |UP|DN|EP) )|?;

Sets the line number of the horizontal line of video on which to trigger.

<line number> ::= <integer> from 10 to 1021.

Query response: <numeric data format>.

**TVSFRM**\_(BOTH|EVEN|ODD|VERTICAL);

Selects the type of video frame to trigger on.

**TVSYNC**\_(NEG|POS);

Selects the polarity of video modulation to trigger on.

**TWINDOW\_** < trace destination >, UNIFORM | HANNING | FLATTOP;

Formats trace information for fast Fourier analysis (FFT). This user-defined trace should be used as the < window > parameter in the FFT command. UNIFORM: for FFT of transient signals and random noise. This window has the least frequency uncertainty. HANNING: offers a compromise between the UNIFORM window and the FLATTOP window. FLATTOP: for FFT of periodic signals. This window has the least amplitude uncertainty.

**UP;**

Increases the value of the active function by the applicable step size.

**USTATE**(\_ #A < length > < character string >)|?;

Transmits information that has been stored in the analyzer by the user.

Query response: < A-block data format > < CR > < LF > < EOI >.

**VARDEF\_** < label >, < preset value >;

Defines a variable name and assigns an initial value to it. IP reassigns the initial value to the variable name.

< preset value > ::= < trace element > | < predefined function > | < predefined variable > | user-defined variable > | < number >.

**VARIANCE\_** < trace source > ?;

Returns the amplitude variable of the selected trace, in measurement units.



### Programming Codes

**VAVG**( *<integer>* | ON | OFF ) | ? ;

Turns the video averaging on or off.

*<integer>* ::= represents the maximum number of sweeps executed for averaging. Default length is 100.

Query response: *<numeric data format>*.

**VB**( ( *<real>* [ HZ | KHZ | MHZ | GHZ ] ) | UP | DN | EP | AUTO ) | ? ;

Specifies the video bandwidth of the post-detection filter.

Query response: *<numeric data format>*.

**VBR**( *<real>* | UP | DN | EP | OA ) | ? ;

Specifies the value which is multiplied by the resolution bandwidth to determine the automatic setting of video bandwidth.

Query response: *<numeric data format>*.

**VIEW**( TRA | TRB | TRC ) ;

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

**XCH** *<destination>* , *<source>* ;

Exchanges the contents of the source with the destination.

*<source>* ::= TRA | TRB | TRC | *<user-defined*

*trace>* | *<user-defined variable>* | *<trace range>*.

## Characters and Secondary Keywords (Reserved Words) Summary

| Element | Description  |
|---------|--|
| a       | Antenna factors.   |
| A       | Amp (unit).  |
| A       | A-block data field.  |
| ABSHZ   | Absolute Hz (unit).  |
| ALL     | All.   |
| AM      | Amplitude modulation. ( <i>Option 102 only</i> )             |
| AMP     | Amplitude.   |
| AUTO    | Auto couple.   |
| AVG     | Average.   |
| B       | 8-bit byte.  |
| B       | Binary format.   |
| BOTH    | Both odd and even frames trigger. ( <i>Option 102 only</i> ) |
| BW      | Black and white.   |
| c       | Correction factors.  |
| CARD    | Memory card.   |
| COLOR   | Color print.   |
| CNT     | Counter-lock.  |
| d       | Downloadable programs.                                       |
| DB      | Decibel (unit).  |
| DBM     | Absolute decibel milliwatt (unit).                           |
| DBMV    | Decibel millivolt (unit).                                    |
| DBUV    | Decibel microvolt (unit).                                    |
| DELTA   | Delta.   |
| DISP    | Display.   |
| DLP     | Downloadable program.  |
| DM      | Absolute decibel milliwatt (unit).                           |

Characters and Secondary Keywords (Reserved Words) Summary

|         |   |
|---------|---|
| DMY     | Day, month, year format.                        |
| DN      | Decreases parameter one step size               |
| DUMP    | Dump.   |
| EP      | Pauses program for data entry from front panel. |
| EQ      | Equal to.                                       |
| EVEN    | Even video frame. <i>(Option 102 only)</i>      |
| EXT     | External trigger.                               |
| FADC    | Fast ADC. <i>(Option 101 only)</i>              |
| FETCH   | Fetch.  |
| FIXED   | Fixed.  |
| FFT     | Fast Fourier transform.                         |
| FLATTOP | Flat top filter window.                         |
| FMD     | FM demodulator. <i>(Option 102 only)</i>        |
| FM      | Frequency modulation. <i>(Option 102 only)</i>  |
| FREE    | Free run.                                       |
| FRQ     | Frequency.                                      |
| FREQ    | Frequency.                                      |
| GE      | Greater than or equal to.                       |
| GHZ     | Gigahertz (unit).                               |
| GT      | Greater than.                                   |
| GZ      | Gigahertz (unit).                               |
| HANNING | Hanning filter window.                          |
| HI      | Highest.  |
| HPIB    | HP-IB. <i>(Option 021 only)</i>                 |
| HZ      | Hertz (unit).                                   |
| I       | I-block data field.                             |
| INIT    | Initialize.                                     |
| INT     | Internal analyzer memory.                       |
| INTEGER | Integer.  |
| IST     | Inverse sweep time.                             |
| K       | Free field ASCII format with no terminator.     |

Characters and Secondary Keywords (Reserved Words) Summary

|       |  |
|-------|--|
| KC    | Free field ASCII format with "CR" an "LF" terminator.  |
| KL    | Free field ASCII format with "CR" an "END" terminator. |
| KHZ   | Kilohertz (unit).                                      |
| KZ    | Kilohertz (unit).                                      |
| LE    | Less than or equal to.                                 |
| LINE  | Line trigger.  |
| LT    | Less than.   |
| M     | Measurement units.                                     |
| MA    | Milliamp (unit).                                       |
| MDY   | Month, day, year format.                               |
| MHZ   | Megahertz (unit).                                      |
| MS    | Millisecond (unit).                                    |
| MV    | Millivolts (unit).                                     |
| MW    | Milliwatt (unit).                                      |
| MZ    | Megahertz (unit).                                      |
| NE    | Not equal to.  |
| NEG   | Negative.  |
| NH    | Next highest peak.                                     |
| NL    | Next peak left.  |
| NONE  | No units.  |
| NRM   | Normal.  |
| NR    | Next peak right.                                       |
| OA    | Output amplitude.                                      |
| ODD   | Odd video frame trigger. ( <i>Option 102 only</i> )    |
| OFF   | Turn function off.                                     |
| ON    | Turn function on.                                      |
| P     | Parameter units.                                       |
| PER   | Period.  |
| PKAVG | Peak average.  |
| PKPIT | Peak pit.  |
| POS   | Positive.  |

### Characters and Secondary Keywords (Reserved Words) Summary

|          |   |
|----------|---|
| PSN      | Position.                                       |
| RECALL   | Recall operation.                               |
| RS232    | RS-232 interface. ( <i>Option 023 only</i> )    |
| SAVE     | Save operation.                                 |
| s        | State.  |
| SC       | Seconds (unit).                                 |
| SMP      | Sample detection mode.                          |
| SP       | Space.  |
| STATE    | State register.                                 |
| STEP     | Step key ability.                               |
| STORE    | Store.  |
| SWT      | Sweep time.                                     |
| t        | Trace.  |
| TRA      | Trace A.  |
| TRB      | Trace B.  |
| TRC      | Trace C.  |
| TV       | TV trigger. ( <i>Option 102 only</i> )          |
| UA       | Microamp (unit).                                |
| UNIFORM  | Uniform filter window.                          |
| UP       | Increases the parameter one step size.          |
| US       | Microseconds (unit).                            |
| UV       | Microvolts (unit).                              |
| UW       | Microwatt (unit).                               |
| V        | Volts (unit).                                   |
| VERTICAL | Vertical triggering. ( <i>Option 102 only</i> ) |
| VID      | Video trigger.                                  |
| W        | Watts.  |
| W        | Word (for MDS command).                         |
| YTF      | YIG-tuned filter.                               |
| *        | Asterisk (wildcard).                            |
| ;        | Semicolon (ASCII code 59).                      |
| ,        | Comma (ASCII code 44).                          |
| 0        | Off. Command argument.                          |

**Characters and Secondary Keywords (Reserved Words) Summary**

**1**  
**50.**  
**75**  
**?**

**On. Command argument.**

**50Ω.**

**75Ω.**

**Returns a query response containing the value or state of the associated parameter. The query response is followed by a carriage-return/line-feed.**

## Analyzer Error Messages

The analyzer can generate various messages that appear on its screen during operation to indicate a problem.

There are three types of messages: hardware error messages (H), user-created error messages (U), and informational messages (M).

- Hardware error messages indicate the analyzer hardware is probably broken. Refer to Chapter 8 in the *HP 8591A/8593A Installation, Verification, and Operation Manual* for more information.
- User-created error messages appear when the analyzer is used incorrectly. They are usually generated during remote operation.
- Informational messages indicate the analyzer's progress within a specific procedure.

The messages are listed in alphabetical order on the following pages; each message is defined, and its type is indicated by an (H), (U), or (M).

### ADC-GND FAIL

Indicates a failure in the processor. (H)

### ADC-TIME FAIL

Indicates a failure in the processor. (H)

**ADC-2V FAIL**

Indicates a failure in the processor. (H)

**CAL: \_ \_ \_**

During the self-calibration routine, messages may appear on the display indicating the routine is progressing: SWEEP, FREQ, SPAN, AMPTD, FM GAIN + OFFSET, 3dB BW, ATTEN, LOG AMP, PEAKING, YTF. FREQ UNCAL appears briefly during CAL FREQ. (M)

**CAL: DATA NOT STORED**

**CAL AMP NEEDED**

The correction factors are corrupt and cannot be stored. Perform the **CAL AMPTD** routine. (U)(H)

**CAL: cannot execute CALAMP**

**enter: 0 dB PREAMP GAIN**

The preamp gain should be set to 0 dB for the **CAL AMPTD** routine to be performed. The preamp gain is set by using **EXT PREAMP**. (U)(H)

**CAL: FM SPAN SENS FAIL**

The analyzer could not set up span sensitivity of the FM coil. (H)

**CAL: GAIN FAIL**

Indicates the signal amplitude is too low during the **CAL AMPTD** routine. (H)

**CAL: LINEAR DET FAIL**

The linear self-calibration routine failed. (H)



**CAL: LOST COMB SIGNAL**  
Indicates the amplitude of the comb generator signal is insufficient to complete the CAL YTF. (U)(H)

**CAL: NO YTF IN 8590/1**  
The CAL YTF programming command is available only for the HP 8592B and the HP 8593A. (U)

**CAL: NO YTO AVAILABLE**  
The CAL DLY programming command is no longer available. (U)

**CAL: PASSCODE NEEDED**  
Indicates that the service function cannot be accessed without the pass code. (M)

**CAL: RES BW AMPL FAIL**  
The relative insertion loss of the resolution bandwidth is incorrect. (H)

**CAL SIGNAL NOT FOUND**  
Indicates the CAL OUT signal cannot be found. Check that the CAL OUT is connected to the INPUT connector using an appropriate cable. (U)(H)

**CAL: SPAN SENS FAIL**  
The self-calibration span sensitivity routine failed. (H)

**CAL: USING DEFAULT DATA**  
Indicates the CAL AMPTD routine has not finished correctly and default correction factors are being used. Interruption of the CAL AMPTD routine or an error can cause the routine to finish incorrectly. (M)

COMB SIGNAL NOT FOUND

The comb signal cannot be found. Check that 100 MHz COMB OUT is connected to the analyzer input. (U)(H)

COMMAND ERROR: \_ \_ \_

The specified programming command is not recognized by the analyzer. (U)

CONF TEST FAIL

Indicates that the confidence test failed. (H)

CONFLICT TABLE OVERFLOW

Indicates that too many two-letter compatible commands have been used. See *HP 8590 Series Programming Manual* for information about substituting alternate commands for two-letter compatible commands. (U)

COUNT UNCAL

Indicates the resolution bandwidth to span ratio is too small to use the marker count. Check the span and bandwidth settings. (U)

FAIL: \_ \_ \_

An error was discovered during the power-up check. The 4-digit by 10-digit code indicates the type of error. Error codes are described in the analyzer Service Manual. (H)

FREQ UNCAL

Indicates a YTO-tuning failure. This may occur when using default correction factors. Performing the CAL FREQ routine may eliminate the failure. The FREQ UNCAL message appears during the CAL FREQ routine briefly (it does not indicate a problem). (U)(H)

INVALID ACTDEF: \_ \_ \_

The specified ACTDEF name is not valid. See the ACTDEF programming command. (U)

INVALID AUNITS: \_ \_ \_

The amplitude units are not valid. See the AUNITS programming command. (U)

INVALID BLOCK FORMAT: IF STATEMENT

An invalid block format appeared within the IF statement. (U)

INVALID CARD: DIRECTORY

Indicates the memory card has not been formatted. (U)

INVALID CARD: NO CARD

Indicates a memory card has not been inserted. (U)

INVALID CARD

Indicates a card reader is not installed or the memory card is write-protected or a read-only memory card. This message can occur if remote programming commands for the memory card capability are executed with an HP 8590B or HP 8592B without Option 003. (U)

INVALID CARD: TYPE

Indicates a card reader is not installed or the memory card is write-protected or a read-only memory card. This message can occur if remote programming commands for the memory card capability are executed with an HP 8590B or HP 8592B without Option 003. (U)

**INVALID CHECKSUM: USTATE**

The user-defined state does not follow the expected format. (U)

**INVALID COMPARE OPERATOR**

An IF/THEN or REPEAT/UNTIL routine is improperly constructed. Specifically, the IF or UNTIL operands are incorrect. (U)

**INVALID DETECTOR: \_ \_ \_**

The specified detector is not valid. See the DET programming command. (U)

**INVALID ENTER FORMAT**

The enter format is not valid. See the appropriate programming command description to determine the correct format. (U)

**INVALID FILE: NO ROOM**

Indicates that there is not enough available space on the memory card to store the data. (U)

**INVALID HP-IB ADDRESS/OPERATION**

An HP-IB operation was aborted due to an incorrect address or invalid operation. (U)

**INVALID HP-IB OPERATION REN TRUE**

The HP-IB operation is not allowed. (Usually caused by print/plot when a calculator is on the interface bus.) (U)

**INVALID ITEM:**

Indicates an invalid parameter has been used in a programming command. (U)

INVALID KEYNAME: \_ \_ \_

The specified key name is not allowed. (The key name may have conflicted with an analyzer programming command.) Use an underscore as the second character in the key name or avoid beginning the key name with the following letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

INVALID OUTPUT FORMAT

The output format is not valid. See the appropriate programming command description to determine the correct format. (U)

INVALID REGISTER NUMBER

The specified trace register number is invalid. (U)

INVALID REPEAT MEM OVFL

Memory overflow occurred due to a REPEAT routine. This occurs if the repeat statements are too long. (U)

INVALID REPEAT NEST LEVEL

The nesting level in the REPEAT routine is improperly constructed. This can occur if too many REPEAT routines are nested. (U)

INVALID RS-232 ADDRESS/OPERATION

An RS-232 operation was aborted due to an incorrect address or invalid operation. (U)

INVALID SAVE REG

Data has not been saved in the specified state or trace register or the data is erroneous. (U)

INVALID STORE DEST: \_ \_ \_  
The specified destination field is invalid. (U)

INVALID SYMTAB ENTRY: SYMTAB OVERFLOW  
There is a symbol table overflow. This can occur if there are too many user-defined items (functions, variables, key definitions). (U)

INVALID TRACE: \_ \_ \_  
The specified trace is invalid. (U)

INVALID TRACE NAME: \_ \_ \_  
The specified trace name is not allowed. Use an underscore as the second character in the trace name or avoid beginning the trace name with the following pairs of letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

INVALID TRIGGER MODE: \_ \_ \_  
The specified trigger mode is invalid. See the TM programming command. (U)

INVALID VALUE PARAMETER: \_ \_ \_  
The specified value parameter is invalid. (U)

INVALID VARDEF: \_ \_ \_  
The specified variable name is not allowed. Use an underscore as the second character in the variable label or avoid beginning the variable label with the following letters: LB, OA, OL, TA, TB, TR, MA, MF, TS, OT, and DR. (U)

INVALID WINDOW TYPE: \_ \_ \_  
The specified window is invalid. See the TWINDOW programming command. (U)

MEAS UNCAL

The measurement is uncalibrated. Check the sweep time, span, and bandwidth settings. (U)

NO CARD FOUND

Indicates that the memory card is not installed. (U)

NO COUNTERLOCK AVAILABLE

The programming command is available for the HP 8591A or the HP 8593A only. (U)

OVEN COLD

Indicates that the analyzer has been powered up for less than five minutes. (M)

PARAMETER ERROR: \_ \_ \_

The specified parameter is not recognized by the analyzer. See the appropriate programming command description to determine the correct parameters. (U)

POS - PK FAIL

Indicates the positive-peak detector has failed. (H)

RES - BW SHAPE FAIL

Indicates the bandwidth shape factor is not within specifications. (H)

RES - BW NOISE FAIL

Indicates the noise floor level is too high at the indicated bandwidth. (H)

**REF UNLOCK**

Indicates that the frequency reference is not locked to the external reference input. Check that the 10 MHz REF OUT is connected to the EXT REF IN, or that an external 10 MHz reference source is connect to the EXT REF IN (when using an external reference). (M)(H)

**SAMPLE FAIL**

Indicates the sample detector has failed. (H)

**SOFTKEY OVFL**

Softkey nesting exceeds the maximum number of levels. (U)

**STEP GAIN ATTEN FAIL**

Indicates the step gain attenuation has failed. (H)

**UNDEF KEY**

A softkey referred to is not recognized by the analyzer. (U)

**SRQ \_ \_ \_**

The specified service request is active. Service requests are a form of informational message and are explained in Appendix B of the *HP 8591A/8593A Installation, Verification, and Operation Manual*. (M)

**VID-BW FAIL**

Indicates the video bandwidth(s) have failed. (H)



## **AM, FM, and Pulsed RF Reference Charts**

---

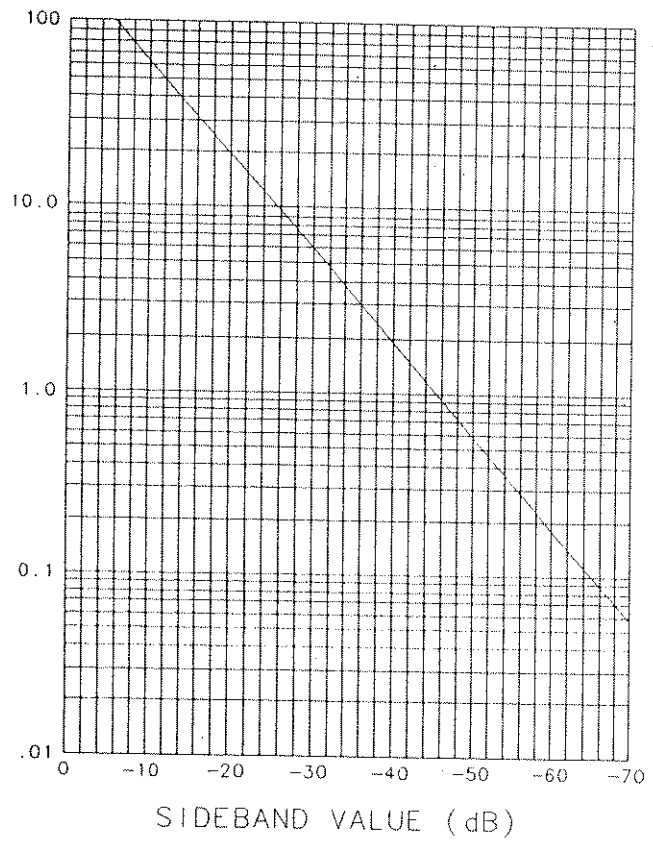
This appendix contains charts and graphs that are helpful for amplitude modulation, frequency modulation, and pulsed RF measurements.

### **Amplitude Modulation**

Modulation information can easily be determined from the carrier signal and a sideband.

The difference in amplitude between the two signals can be used to determine percent of modulation. Markers read the frequency difference between two signals, which is equal to the modulating frequency. The following table and graph help you to determine amplitude modulation information.

| % Modulation | Sideband level<br>below carrier (dB) | Sideband level<br>below carrier (dB) | % Modulation |
|--------------|--------------------------------------|--------------------------------------|--------------|
| 1            | 46                                   | 10                                   | 63           |
| 2            | 40                                   | 20                                   | 20           |
| 10           | 26                                   | 30                                   | 6.3          |
| 20           | 20                                   | 40                                   | 2.0          |
| 30           | 16.5                                 | 50                                   | 0.63         |
| 40           | 14                                   | 60                                   | 0.2          |
| 12           | 60                                   | 70                                   | 0.063        |
| 70           | 9.1                                  | 80                                   | 0.02         |
| 80           | 7.9                                  |                                      |              |
| 90           | 6.9                                  |                                      |              |
| 100          | 6.0                                  |                                      |              |

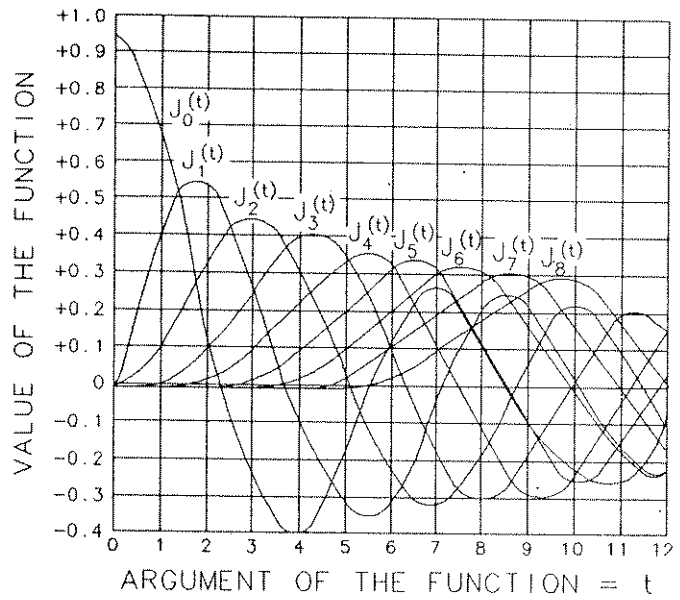


**Figure B-1. Percent Modulation**

### Carrier and First Sideband Charts for Calibrating Deviation

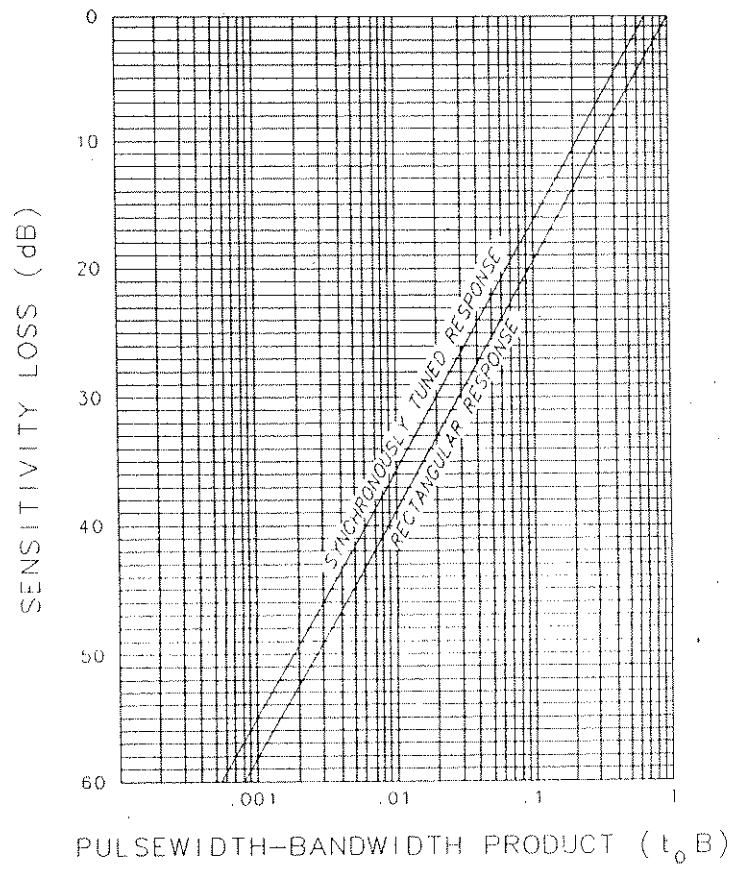
| Carrier<br>Bessel NULL<br>Order | $t^* = \Delta F/f$ | First Sideband | $t^* = \Delta F/f$ |
|---------------------------------|--------------------|----------------|--------------------|
| 1st                             | 2.4048             | 1st            | 3.83               |
| 2nd                             | 5.5201             | 2nd            | 7.02               |
| 3rd                             | 8.6531             | 3rd            | 10.17              |
| 4th                             | 11.7915            | 4th            | 13.32              |
| 5th                             | 14.9309            | 5th            | 16.47              |
| 6th                             | 18.0711            | 6th            | 19.62              |
| 7th                             | 21.2116            | 7th            | 22.76              |
| 8th                             | 24.3525            | 8th            | 25.90              |
| 9th                             | 27.4935            | 9th            | 29.05              |
| 10th                            | 30.6346            |                |                    |

\*t = modulation index

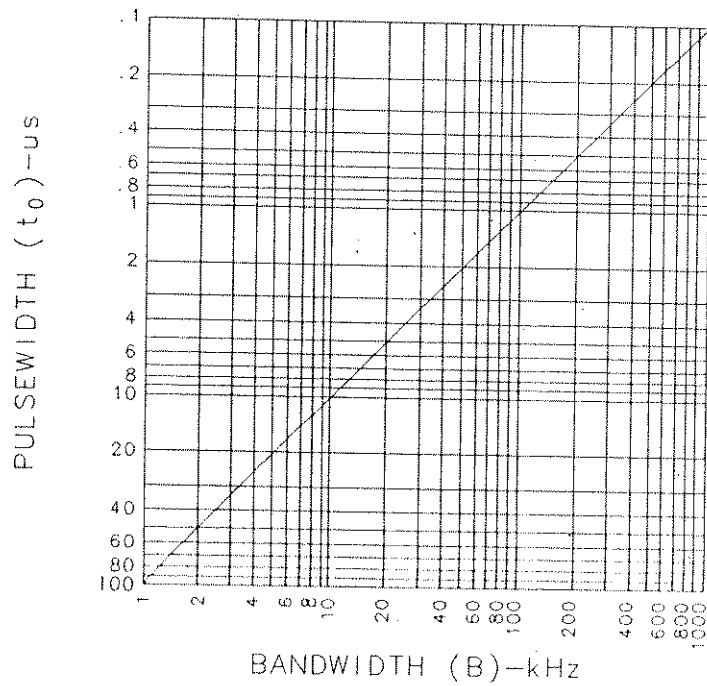


Bessel functions for the first eight orders

**Figure B-2. Bessel Null Graph**



**Figure B-3. Loss in Sensitivity (Pulsed RF versus CW)**



**Figure B-4. RES BW Setting for Pulsed RF  
Computed from  $t_0 B = 0.1$**

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# SPECTRUM ANALYZER MODE MENU

## FREQUENCY

CENTER, FREQ  
START, FREQ  
STOP, FREQ  
CF STEP, AUTO MAN  
FREQ, OFFSET

## SPAN

SPAN  
SPAN, ZOOM  
FULL, SPAN  
ZERO, SPAN  
BAND, LOCK\*

0-2.9 Gz, BAND 0\*  
2.75 - 6.4 BAND 1\*  
6.0 - 12.8, BAND 2\*  
12.4 - 19., BAND 3\*  
19.1-22, BAND 4\*  
BND LOCK, ON OFF\*

\* For HP 8593A only.

## AMPLITUDE

REF LVL  
ATTEN, AUTO MAN  
SCALE, LOG LIN  
PRESEL, PEAK\*  
PRESEL, DEFAULT\*  
MORE, 1 of 2

MAX MXR, LEVEL  
AMPTD, UNITS  
EXT, PREAMP  
INPUT Z, 50 75  
REF LVL, OFFSET  
MORE, 2 of 2

dBm  
dBmV  
Volts  
Watts

\* For HP 8593A only.

## MARKER

### MKR

MARKER, NORMAL  
MARKER, DELTA  
MKR CNT, ON OFF  
MKNOISE, ON OFF  
MARKERS, OFF  
MORE, 1 of 2

MKPAUSE, ON OFF  
MARKER, AMPTD  
CNT RES, AUTO MAN  
PK-PK, MEAS  
---  
MORE 2 of 2

### MKR -->

MARKER, ---> CF  
MARKER, ---> REF LVL  
MARKER, ---> CF STEP  
MKR Δ, ---> SPAN  
MINIMUM, ---> MARKER  
PEAK MENU

### PEAK SEARCH

MARKER, ---> CF.  
MARKER, DELTA  
NEXT PK, RIGHT  
NEXT PK, LEFT  
PEAK, EXCURSN

# INSTRUMENT STATE

## PRESET

SPECTRUM, ANALYZER → PRESET SPECTRUM  
 CATV, ANALYZER\*  
 EMI, ANALYZER\*  
 DIG RAD, ANALYZER\*

\* Memory Card Personality.

## MODE

PRESET, SPECTRUM

\* Toggles to the PRESET menu.

## CAL

CAL FREQ. & AMPTD  
 CAL, FREQ  
 CAL, AMPTD  
 CAL, YTF\*  
 CAL, STORE  
 MORE, 1 of 3 →

\* HP 8593A only.

CONF, TEST  
 CAL, FETCH  
 CORRECT, ON OFF  
 CRT VERT, POSITION  
 CRT HORZ, POSITION  
 MORE, 2 of 3 →

SERVICE, CAL →  
 SEVICE, DIAG →  
 DEFAULT, CAL DATA  
 ---  
 VERIFY, TIMEBASE  
 MORE, 3 of 3

EXECUTE, TITLE,  
 FLATNESS, DATA →  
 CAL, TIMEBASE  
 CAL MXR\*  
 SET ATTN, ERROR

EDIT, FLATNESS  
 ---  
 ---  
 ---  
 EXIT

DISPLAY, CAL DATA  
 DACS  
 STP GAIN, ZERO  
 AUX A  
 AUX B †  
 MORE 1 →

2v REF, DETECTOR  
 GND REF, DETECTOR  
 MAIN, COIL DR  
 FM COIL, DRIVE  
 FM SPAN  
 MORE 2 →

† HP 8591A only.

MAIN, SPAN  
 SWEEP, RAMP  
 SWEEP, TIME DAC  
 COARSE, TUNE DAC  
 BINARY, SPAN ‡  
 MORE 3 →

FINE, TUNE DAC  
 X FINE, TUNE DAC  
 + 10V REF, DETECTOR  
 -10V REF, DETECTOR  
 DROOP  
 MORE 4 →

FREQ, DIAG  
 SETPLL, OUTDAC  
 FRQ DISC, NORM OFF  
 FM, GAINS §  
 FM, OFFST§  
 MORE 5 →

YTF TUNE, COARS  
 YTF TUNE, FINE\*  
 YTF, DRIVER\*  
 MIXER, BIAS DAC\*  
 PRESEL, DAC\*  
 MORE 6\*

‡ Changes to YTF SPAN for HP 8593A.

§ For Option 102 only.

## MEAS/USER

NO USER, MENU

USER, MENU(S) →  
 FFT, MEAS  
 3 dB, POINTS  
 6 dB, POINTS  
 ---  
 MORE, 1 of 2 →

99%, PWR BW  
 %, AM  
 3rd ORD, MEAS  
 DELTA, MEAS  
 PK-PK, MEAS  
 MORE, 2 of 2

## AUX CTRL

DEMOD\* →

DEMOD, ON OFF\*  
 DEMOD, AM FM\*  
 SPEAKER, ON OFF  
 SQUELCH\*  
 FM, GAIN\*  
 DWELL, TIME\*

AUX CONN, CONTROL →  
 COMB GEN, ON OFF †

\* Option 102 only.  
 † For HP 8593A only.

CNTL A, 0 1  
 CNTL B, 0 1  
 CNTL C, 0 1  
 CNTL D, 0 1  
 ---

DISPLAY, CNTL I

# INSTRUMENT STATE (continued)

## CONFIG (LOCAL)

COPY DEV, PRNT PLT  
PLOT, CONFIG  
PRINT, CONFIG  
TIMEDATE  
CHANGE, PREFIX  
MORE, 1 of 2

PLTS/PG, 1 2 4  
PLT [ ], LOC [ ]  
PLT [ ] [ ], LOC [ ] [ ]  
PLOTTER, ADDRESS  
---

PREV, MENU

B&W, PRINTER  
PAINTJET, PRINTER  
PRINTER, ADDRESS  
PRT MENU, ON OFF  
PRINTER, SETUP  
PREV, MENU

TIMEDATE, ON OFF  
DATEMODE, MDY DMY  
SET, TIME  
SET, DATE  
---

PREV, MENU

CARD, CONFIG  
DISPOSE, USER MEM  
ANALYZER, ADDRESS\*  
DEFAULT, CONFIG  
SHOW, OPTIONS  
MORE, 2 OF 2

ABCDEF  
GHIJKL  
MNOPQR  
STUVWX  
YZ # SPC, CLEAR  
MORE 1 of 2

()',::;  
+ - < > =  
/? \ [ ]  
@ # \$ % & \*  
---  
MORE 2 of 2

CATALOG, CARD  
---  
FORMAT, CARD  
BLANK, CARD  
PREV, MENU

\* Changes to BAUD, RATE for Option 023.

## SAVE

STATE, ---> CARD\* ‡  
TRACE, ---> CARD\* ‡

ALL DLP, ---> CARD †  
CATALOG, CARD\*  
INTRNL, CBD

\* Becomes INTRNL when INTRNL is selected.

† When INTRNL is selected, this key becomes; "SAV LOCK ON OFF."

‡ Becomes MEM, LOCKED when SAV LOCK is on.

## RECALL

CARD, ---> STATE\*  
CARD, ---> TRACE\*

CARD --->, DLP ‡  
CATALOG, CARD\*  
INTRNL, CBD

TRACE A  
TRACE B  
TRACE C  
---  
PREV, MENU

CATALOG, ALL  
CATALOG, STATES ‡  
CATALOG, TRACES §  
---  
CATALOG, PREFIX  
MORE, 1 of 2

LOAD, FILE ‡  
---  
DELETE FILE  
---  
EXIT  
PREV, MENU

‡ This is blanked when INTRNL is selected.  
§ This becomes CATALOG, VARIABLES when INTRNL is selected.

CATLOG, DLP  
---  
CHANGE, PREFIX  
EXIT, CATALOG  
MORE 2 of 2

ABCDEF  
GHIJKL  
MNOPQR  
STUVWX  
YZ \*SPC, CLEAR  
MORE 1 of 2

()',::;  
+ - < > =  
/? \ [ ]  
@ # \$ % & \*  
---  
MORE 2 of 2



