HP 8591A/8593A Spectrum Analyzer
Quick Reference Guide

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Introduction

This guide provides a quick reference for experience
`spectrum analyzer users.

Chapter 1 summarizes how to make a basic measureme
use the front-panel features, and how to perform the sel
calibration routines. Chapter 2 contains brief description
the analyzer functions. Chapter 3 contains the remote
programming codes. Appendix A lists the analyzer error
messages, Appendix B contains helpful charts and graphs f
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.

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 INPU
nector on the front panel using an appropriate BN
a BNC-to-Type-N adapter.

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

Option 026 only: Use an appropriate APC 3.5 ada

Then follow these steps:

1. Set the center frequency.

   Press the [FREQUENCY] key. `CENTER` appears on
left side of the screen, indicating that the center freque
function is active. The center frequency softkey label ap
pears in inverse video to indicate that center frequency i
the active function. The space on the screen where `CEN-
TER 900 MHz` appears for the 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.

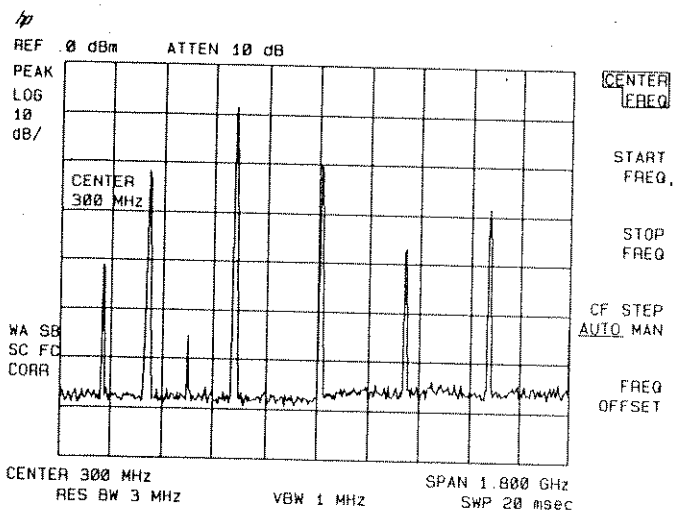

Figure 1-1. Center Frequency Set to 300 MHz on HP 8591A

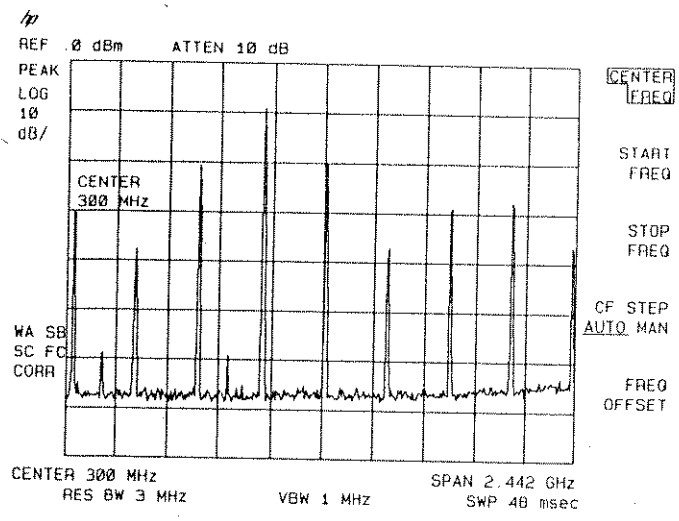

Figure 1-2. Center Frequency Set to 300 MHz on HP 8593A

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].

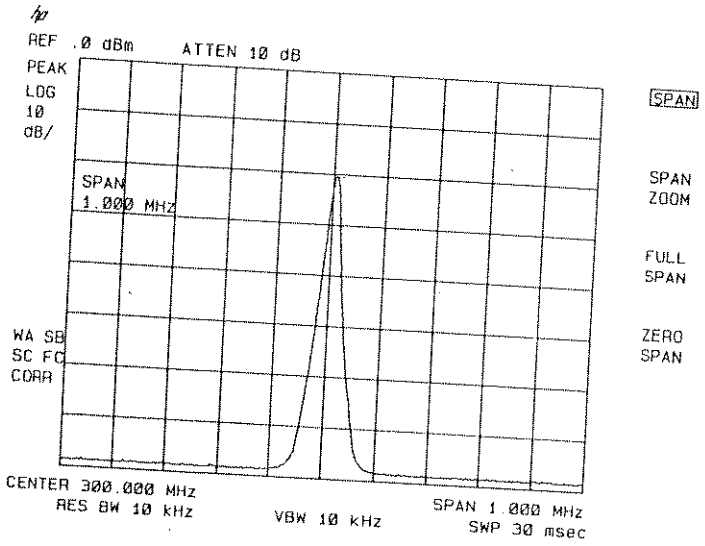

Figure 1-3. Frequency Span Reduced to 1 MHz

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.

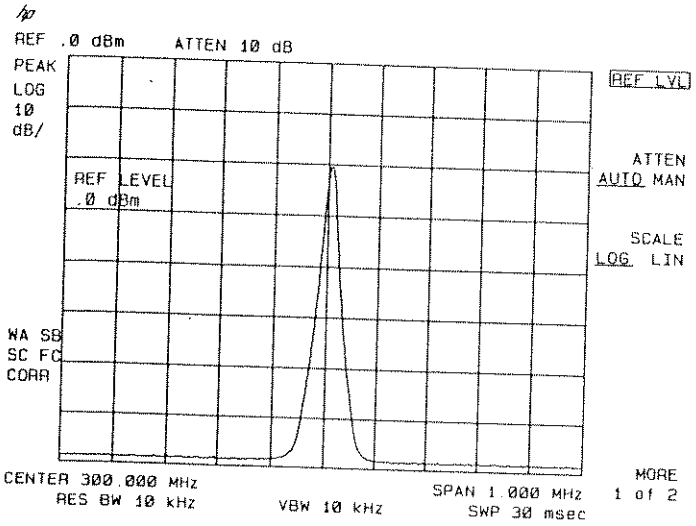

Figure 1-4. Setting the Amplitude

4. Activate the marker.

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

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

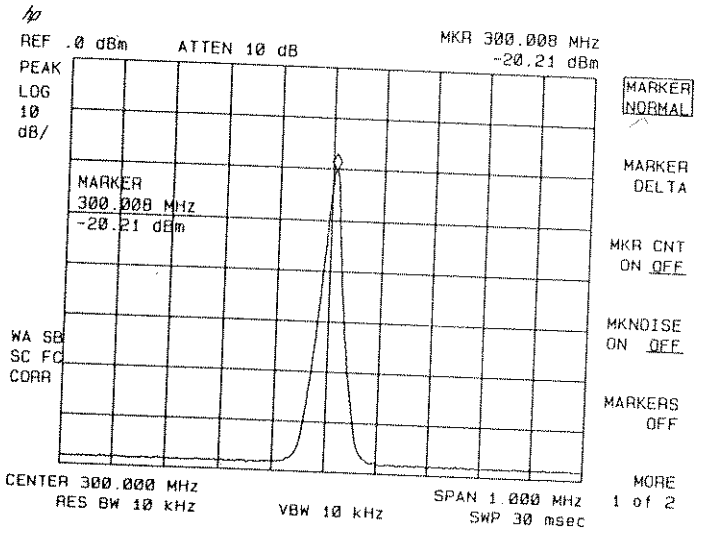

Figure 1-5. Marker Reads Out Frequency and Amplitude

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 50Ω connector, using an appropriate cable. *Option 001 only:* Use a 75Ω cable to connect CAL OUT to the INPUT 75Ω 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 th 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**.

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.)

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

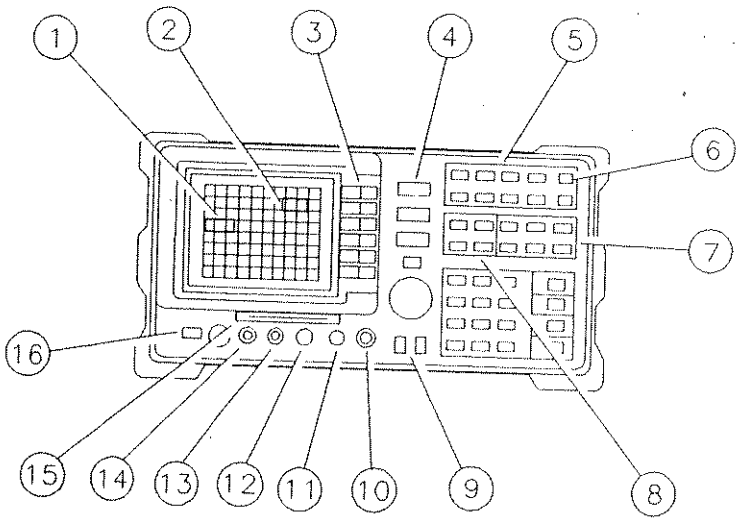

Figure 1-6. Front-Panel Overview

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 t 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 chang 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.)

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.

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, store-blank C, 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.

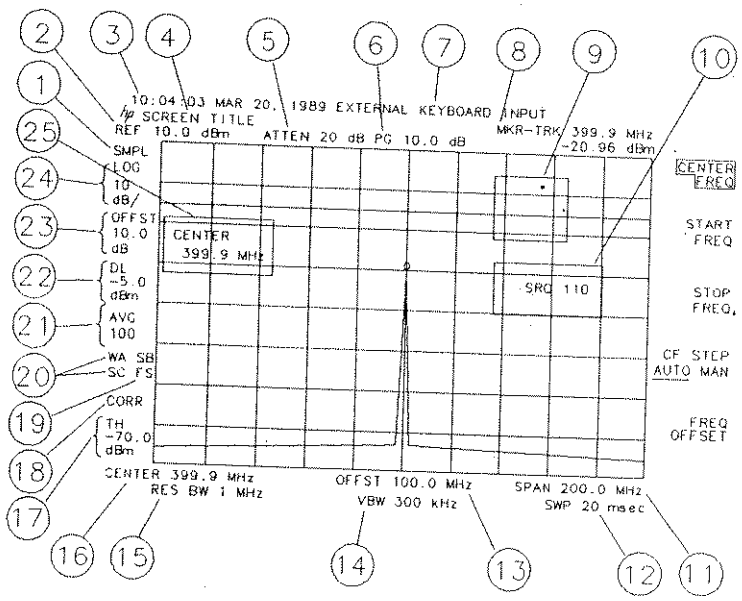

Figure 1-7. Screen Annotation

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		
6	preamplifier gain	17	threshold
7	external keyboard entry	18	correction factors on
8	marker/signal track readout	19	trigger*
9	measurement-uncalibrated/ function-in-progress messages	20	trace mode†
		21	video average
		22	display line
10	service request	23	amplitude offset
11	frequency span or stop frequency	24	amplitude scale
		25	active function block
12	sweep time		

*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 (Option 102 only)	

2 Analyzer Functions

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.

Amplitude Functions

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.

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

AMPTD UNITS accesses the softkeys to change amplitude units.

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 dBμV 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)*

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

REF LVL changes the value of the reference level.

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

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.

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.

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 the 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.

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 o 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 specia characters to a screen title. When all characters have beer 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.

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.

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 pos 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 dis connects 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.

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

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)*

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

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.

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 VARIABLS 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.

DEFAULT CAL DATA allows you to use predetermined c rection data. See "Self-Calibration Routine Problems" in C ter 1 for more information.

DEFAULT CONFIG resets all user configuration settings t their default values.

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

DELTA MEAS finds and displays the frequency and amplit 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 frequ cy demodulation on or off. *(Option 102 only)*

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

DISPLAY CNTL I displays the status of auxiliary interface cc trol 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)*

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.

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.

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 cloc 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 Δ -> 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.

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)*

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.

3

Programming

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:;ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]?-'abcdefghijklmnopqrstuvwxyz

<character string>::=
list of characters.

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

<CR>::=
carriage return.

<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.

<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>.

<source1>::=
TRA|TRB|TRC|<user-defined trace>|<user-define variable>|<predefined variable>|<predefined function>|<trace range>|<number>.

<source2>::=
TRA|TRB|TRC|<user-defined trace>|<user-define 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 element

<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.

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.

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)*

DEMOD	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

CLRDSP	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.

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.
PREFX	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.

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 *x*-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.

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.
TWNDOW	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.

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| VABSHZ|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.

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 = [((ratio – 1) X destination + source)]/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.

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>.

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 th 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>.

DEMOD_(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.

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 destir
The EXP command is useful is for converting log val
linear values.
<scaling factor>::=<real>|<user-defined variabl
|<predefined variable>|<predefined function>|
<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
TWNDOW 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>.

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>.

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.

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.

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>.

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>.

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>.

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 occurs.
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>.

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)

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.

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.

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>.

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>.

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>.

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.

TWNDOW_<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 FLAT-TOP 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.

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. *(Option 102 only)*
AMP	Amplitude.
AUTO	Auto couple.
AVG	Average.
B	8-bit byte.
B	Binary format.
BOTH	Both odd and even frames trigger. *(Option 102 only)*
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).

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. *(Option 102 only)*
EXT	External trigger.
FADC	Fast ADC. *(Option 101 only)*
FETCH	Fetch.
FIXED	Fixed.
FFT	Fast Fourier transform.
FLATTOP	Flat top filter window.
FMD	FM demodulator. *(Option 102 only)*
FM	Frequency modulation. *(Option 102 only)*
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. *(Option 021 only)*
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.

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. *(Option 102 only)*
OFF	Turn function off.
ON	Turn function on.
P	Parameter units.
PER	Period.
PKAVG	Peak average.
PKPIT	Peak pit.
POS	Positive.

PSN	Position.
RECALL	Recall operation.
RS232	RS-232 interface. *(Option 023 only)*
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. *(Option 102 only)*
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. *(Option 102 only)*
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.

1	On. Command argument.
50	50Ω.
75	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.

A

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 not sufficient 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 TWNDOW 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)

B

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 below carrier (dB)	Sideband level 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		

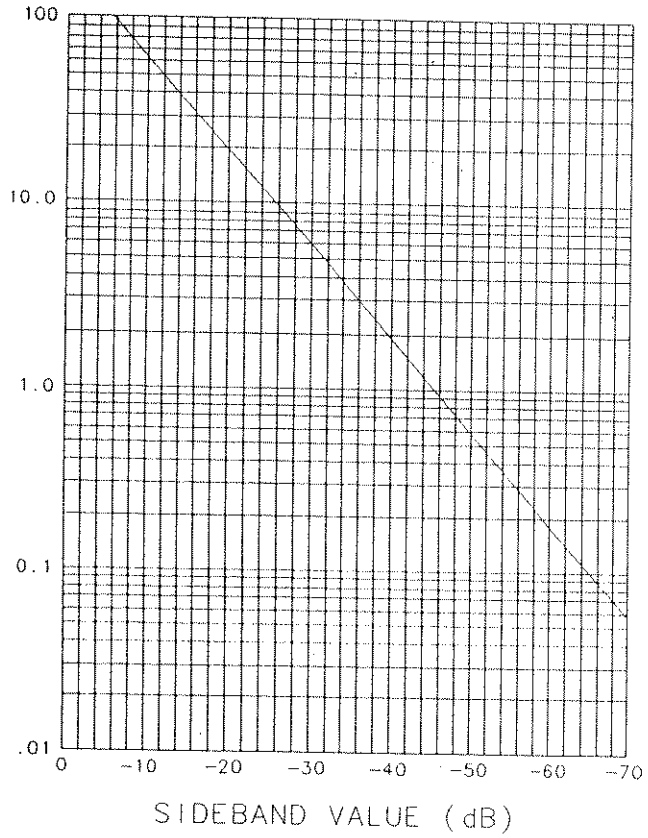

Figure B-1. Percent Modulation

Carrier and First Sideband Charts for Calibrating Deviation

Carrier Bessel NULL Order	t* = ΔF/f	First Sideband	t* = ΔF/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

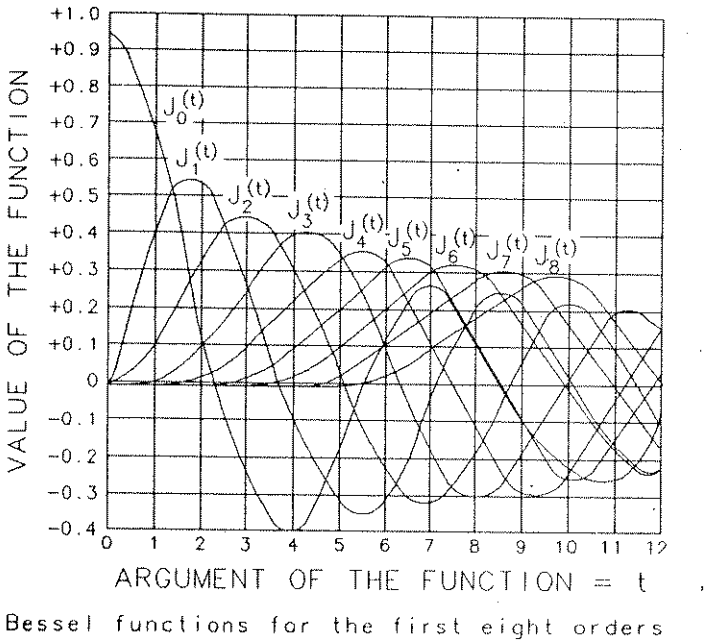

Figure B-2. Bessel Null Graph

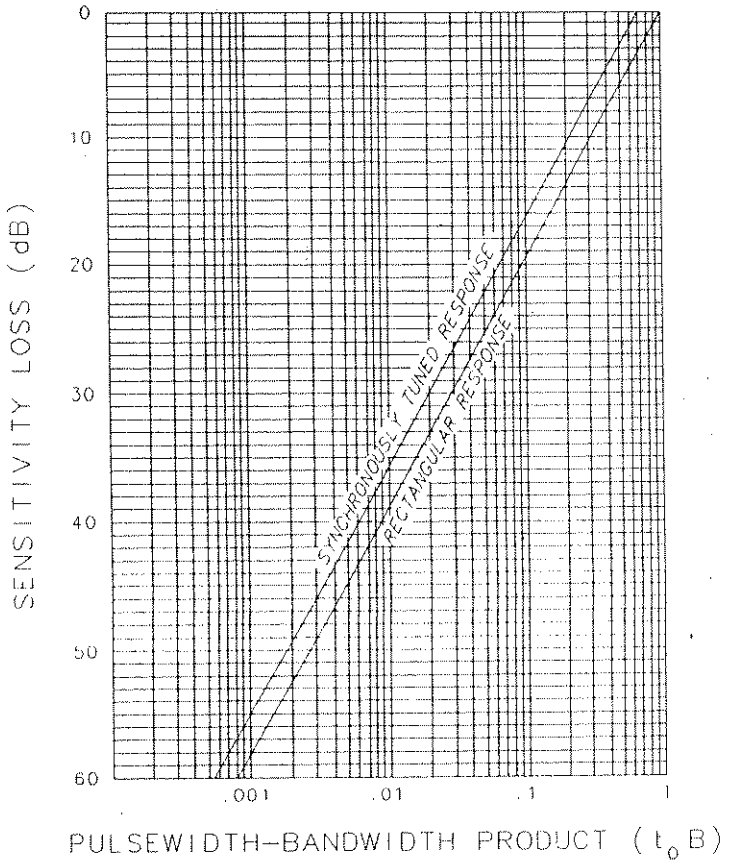

Figure B-3. Loss in Sensitivity (Pulsed RF versus CW)

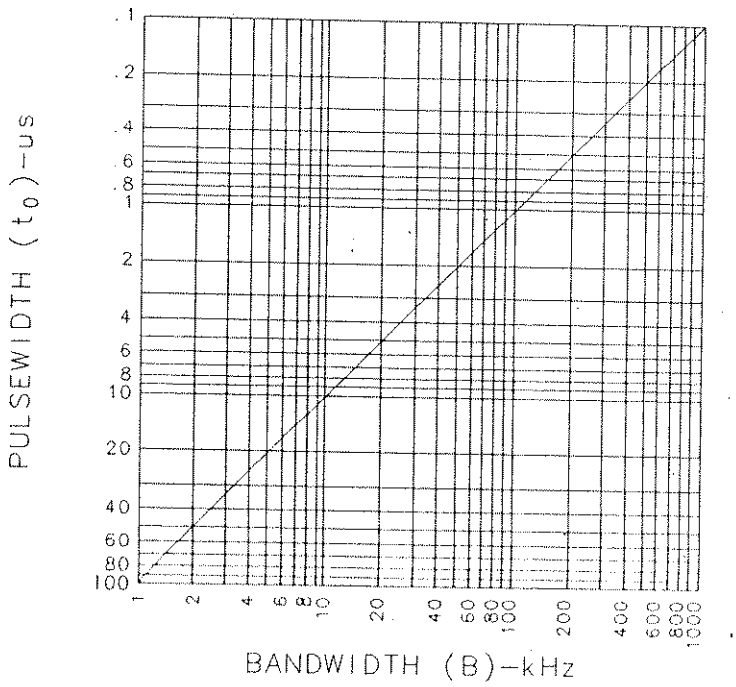

Figure B-4. RES BW Setting for Pulsed RF Computed from $t_oB = 0.1$

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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 ----------> dBm
dBmV
dBuV
Volts
Watts
EXT, PREAMP
INPUT Z, 50 75
REF LVL, OFFSET
MORE, 2 of 2

* 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

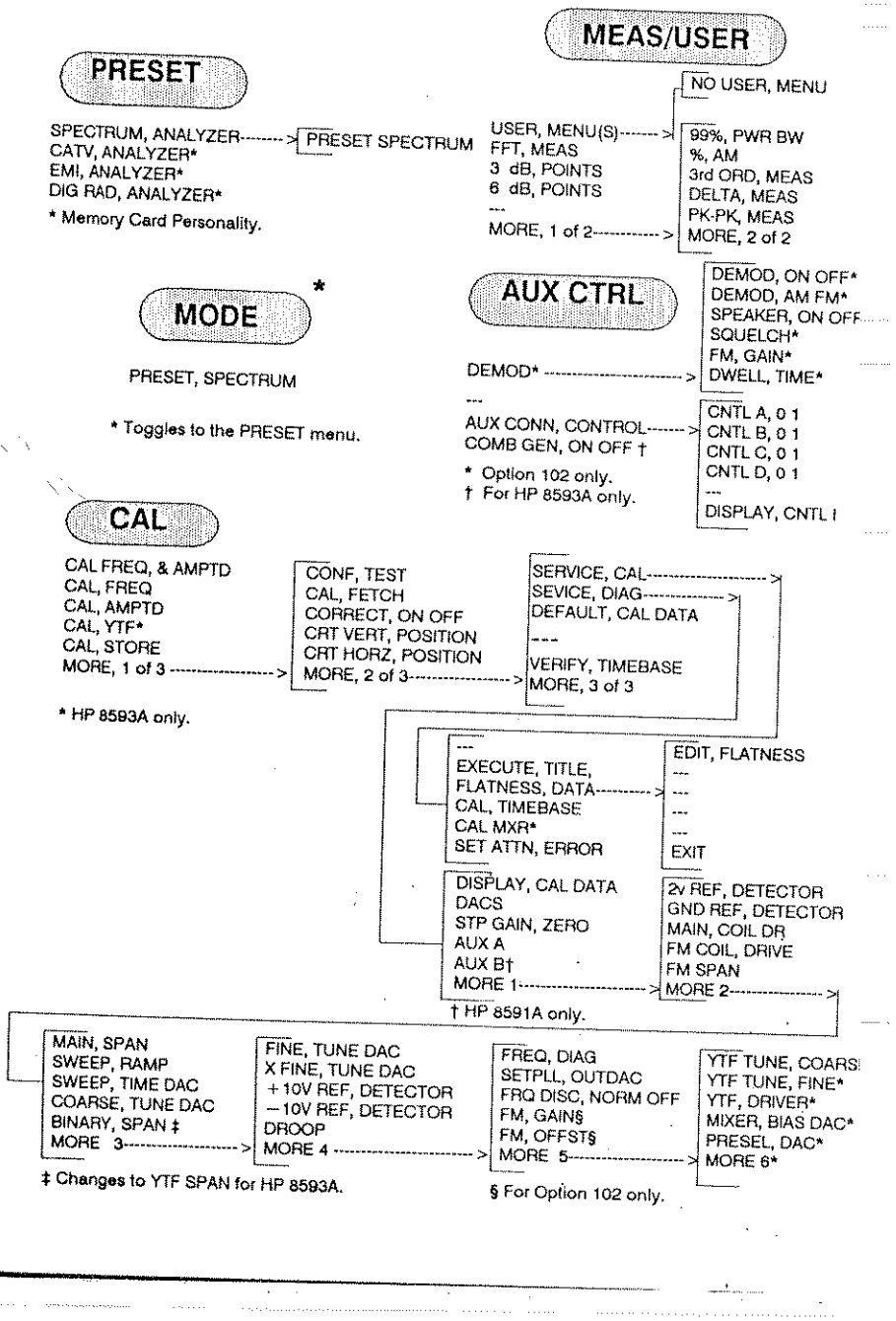
MORE 2 of 2

MKR -->

MARKER, ---> CF
MARKER, ---> REF LVL
MARKER, ---> CF STEP
MKR Δ, ---> SPAN
MINIMUM, ---> MARKER
PEAK MENU ----------> MARKER, ---> CF
MARKER, DELTA
NEXT, PEAK
NEXT PK, RIGHT
NEXT PK, LEFT
PEAK, EXCURSN

PEAK SEARCH

INSTRUMENT STATE



INSTRUMENT STATE (continued)