Errata

Title & Document Type: 8752A/B Network Analyzer User's Quick Reference

Manual Part Number: 08752-90057

Revision Date: November 1, 1990

HP References in this Manual

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

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

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Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

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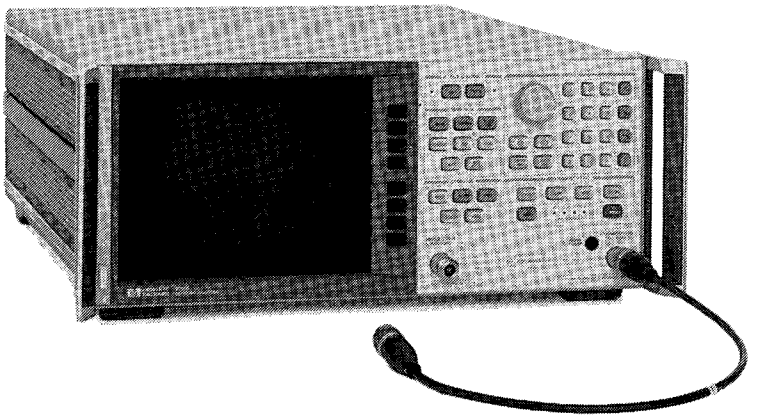
Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

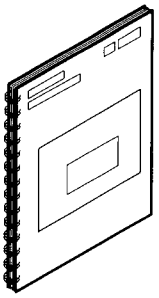
HP 8752A/B Network Analyzer

HEWLETT PACKARD

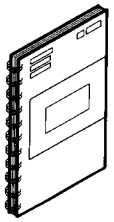
User's Quick Reference



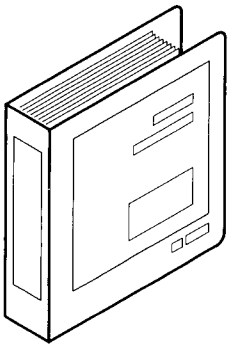
HP 8752 Network Analyzer
Documentation Map



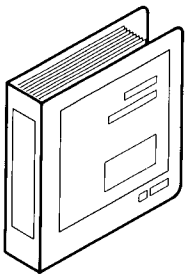
The **User's Guide** walks you through system setup and initial power-on, shows how to make basic measurements, explains commonly-used features, and tells you how to get the most performance from your analyzer.



The **User's Quick Reference** provides a summary of all available user features. It is organized alphabetically by front panel key.

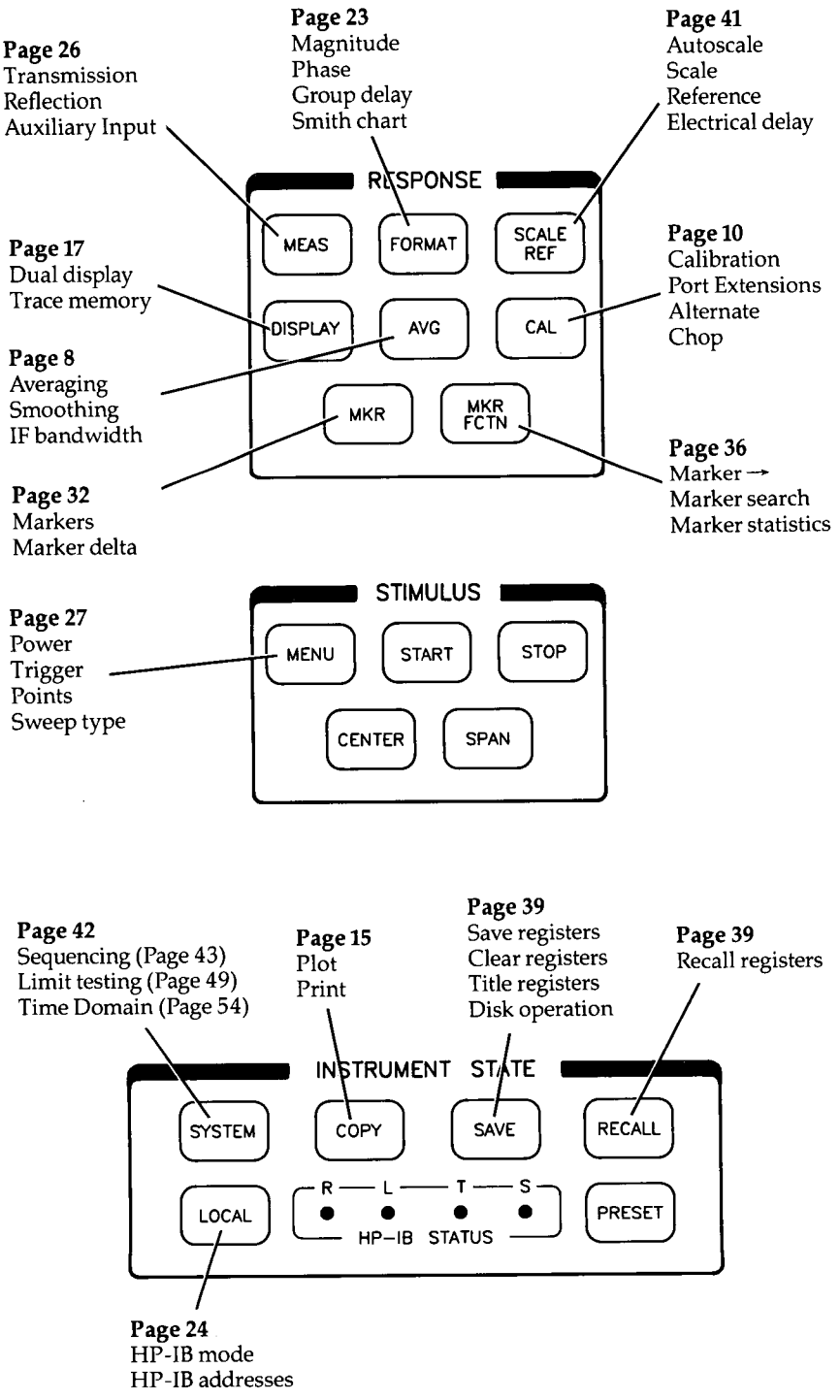


The **Operating Manual** provides general information, specifications, HP-IB Programming information, and in-depth reference information.



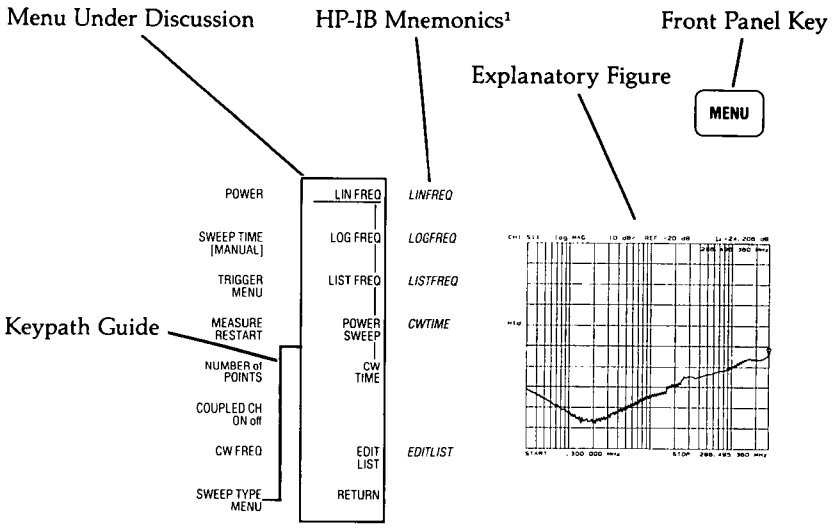
The **Service Manual** explains how to verify conformance to published specifications, adjust, troubleshoot, and repair the instrument.

Functional Index



How To Use This Book

This guide is designed to describe what the softkey menus do and to give enough information for making basic measurement decisions. A typical page of this guide, as shown below, is indexed by the front panel key, shows the keypath to the menu under discussion, and details the menu by option.



Menu Explanation

LIN FREQ Activates a simple linear frequency sweep. With option 010, the analyzer can translate this data to time domain.

LOG FREQ Activates a logarithmic frequency sweep. The data is sampled logarithmically and displayed.

LIST FREQ Sweeps across the user defined frequency list. The sweep may be defined as a single segment sweep (***[SINGLE SEG SWEEP]*** softkey) or an all segment sweep (***[ALL SEGS SWEEP]*** softkey). The frequency list table can be entered and modified with ***[EDIT LIST]***.

Next Menu Page 33

POWER SWEEP Sweeps power at a single frequency. That frequency is set with ***[CW FREQ]***. Power sweep is used to characterize power sensitive networks.

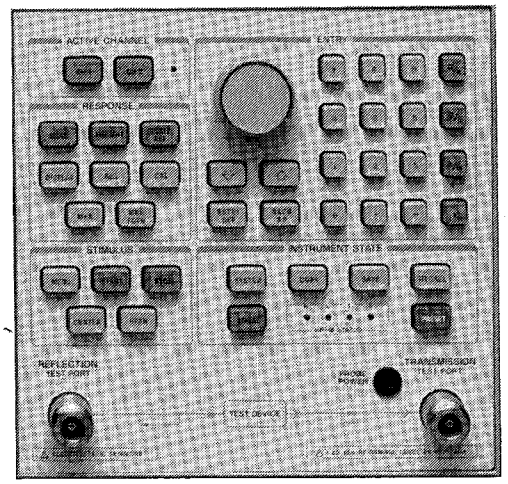
CW TIME Tunes the analyzer to a single frequency and displays the data versus time. The frequency is set with ***[CW FREQ]***. With option 010 (time domain), the analyzer can translate this data to the frequency domain.

EDIT LIST Allows the user to create or modify the frequency list table.

Next Menu Page 33

RETURN Returns to the previous menu.

1. HP-IB is Hewlett-Packard's hardware, software, documentation, and support for IEEE 488 and IEC-625, worldwide standards for interfacing instruments.



Introduction to the HP 8752A/B

The HP 8752's softkey menus provide complete and flexible control of the instrument. The menus have three features that make them easy to understand and use. In situations where you can make one of several selections, the softkeys are connected by vertical lines, and the current choice underlined. In cases where a single key summarizes the selection of one of several choices, the current selection is shown in brackets below the softkey label. Lastly, the state of on/off functions is indicated below the softkey label by capitalizing either on or off.

The following is a brief introduction to the purpose of each functional key area.

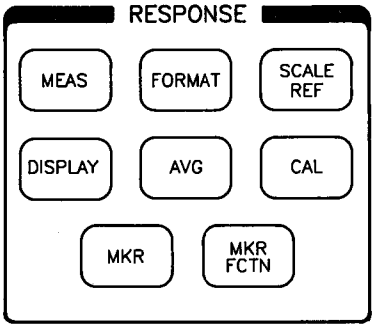
Entry

The entry area controls the value in the active entry area of the display. The step keys and the knob vary the active entry value, and the key pad enters new values. A partially entered value is indicated by the data entry arrow, which points to the last digit pressed. The units terminator keys enter the value. Any units terminator can enter any parameter, the only difference being the power of ten by which the entered value is scaled.

Stimulus

The stimulus menu controls the RF source. It lets you set the power, the sweep time, and the number of points. The power can range from −20 to +5 dBm, the sweep time from 2 msec to 24 hours, and the number of points from 3 to 1601. You can uncouple the channels so they have independent stimulus settings, and you can select the sweep type. The HP 8752 can sweep frequency linearly, logarithmically, or from an operator-defined frequency list. It can also lock onto a CW frequency and sweep time.

The **[START]**, **[STOP]**, **[CENTER]**, and **[SPAN]** keys control the stimulus span measured. During frequency sweeps, they control frequency. During power sweeps they control power, and during time sweeps, they control time.



Response

The response keys control data measurement and data processing.

MEAS Selects either transmission or reflection measurements.

FORMAT Selects the format of the data. Display the magnitude, phase, group delay, real portion, imaginary portion, or SWR of the data, or display the data in a polar format or on a Smith chart.

SCALE REF Controls the size and placement of the trace on the graticule. Add a linear phase shift to the data using the electrical delay function under this key.

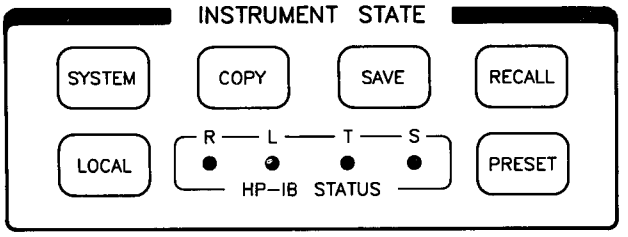
DISPLAY Controls trace memory, vector trace math, split and dual channel display, intensity, color modification, display title, and frequency blanking.

AVG Controls the trace noise reduction techniques. Average the data over time, reduce the IF bandwidth, or smooth a noisy trace.

CAL Accesses the calibration features of the analyzer.

MKR Controls the four markers. Use the markers to read numeric values off the trace. The marker values indicate either absolute trace position, or trace position relative to a delta reference. The delta reference can be a marker, or it can be a fixed point.

MKR FCTN Controls the active marker functions. Use the marker position to set the stimulus parameters; use the search feature to place the marker at a specific amplitude; and use the statistics functions to characterize passband shapes and to give trace statistics.



Active Channel

The active channel keys select the active channel. Except when coupled between channels, softkey functions apply only to the active channel.

Instrument State

The instrument state keys control functions that do not directly affect the measurement or display of data. In addition, these keys control time domain (option 010), test sequence function , and limit lines/limit testing.

SYSTEM This key controls test sequencing function, limit testing, service functions, and time domain (option 010.) Time domain is a transform that calculates the impulse and step response of a device from the frequency domain information.

COPY Accesses the plotting and printing capabilities of the instrument. You can plot on an HP-GL plotter, or you can print on a compatible printer.

SAVE Stores, clears, and titles the save/recall registers. When a register is saved, the entire instrument state is stored. A register can be saved internally or to an external disk drive.

RECALL Recalls the save/recall registers. When a register is recalled, the instrument is returned to the state it was in when the register was saved.

LOCAL Controls the HP-IB aspects of the instrument. Select system controller mode for manual operation of the instrument, set the HP-IB address of the HP 8752, and enter the addresses of the peripherals.

PRESET Performs a self check, and brings the instrument back to the preset state.

The Display

Turning dual channel on displays both channels at once, adding display notations for the second channel. The notations change slightly for polar and Smith chart display, the only scale information being the value at the outer circle. The marker values change also.

Status Notations

The status notations area of the CRT is used to show the current status of various functions for the active channel. The table below lists each notation and its meaning.

Notation	Definition
*	Instrument source or receiver parameters changed since last complete sweep.
↑	Trace in progress.
Hld	Trace is in hold.
ext	Waiting for external trigger.
man	Waiting for a manual trigger.
Gat	Gating is on (see option 010, time domain).
P↓	Source power output has tripped.
P?	ALC is unleveled at start of sweep.
Cor.	Error correction is on.
C?	Error correction is on but questionable. Caused by interpolation — change in power sweep time, or IF bandwidth.
Avg	Trace averaging is on.
(n)	n = averaging factor.
Smo	Trace smoothing is on.
Del	Electrical delay or phase offset has been added in.

Common Warning Messages

CHANGE HP-IB to SYST CONT or PASS CONTROL
HP-IB control is needed before a plot, print, or disk access. See page 24.

CORRECTION TURNED OFF
The measurement state was changed, so correction was turned off. See page 10.

TEST PORT POWER TRIPPED, RESEST UNDER POWR MENU
The power at an input exceeded safety levels, so the RF source power was reduced. Power can be restored by turning power trip off. See page 30.

SOURCE PARAMETERS CHANGED
When error correction was turned on, the stimulus state of the last calibration was recalled. See page 30. Refer to "Calibration Validity" under "[CAL] Key" in the Measurement Calibration section of the Operating Manual.

SWEEP TIME INCREASED
The entered sweep time was too fast for the current measurement. Sweep time increased to the minimum possible time.

AVG

Average Key

Reducing Trace Noise

The HP 8752 has three functions that help reduce the effect of noise on the data: averaging, variable IF bandwidth, and smoothing.

Both averaging and IF bandwidth increase sensitivity to coherent signals. Averaging reduces random noise by averaging the vector data from sweep to sweep. Narrowing the IF bandwidth reduces the amount of noise measured. Smoothing, on the other hand, filters the displayed trace, making noisy data more readable.

Averaging

The HP 8752 uses an exponentially weighted running vector average for IF averaging. The weight is one over the effective averaging factor. The effective averaging factor is displayed under the Avg notation. It begins at 1, and counts up to the user entered averaging factor, incrementing once per sweep. The noise is reduced, often visibly, with each new sweep as the effective averaging factor increments.

IF Bandwidth

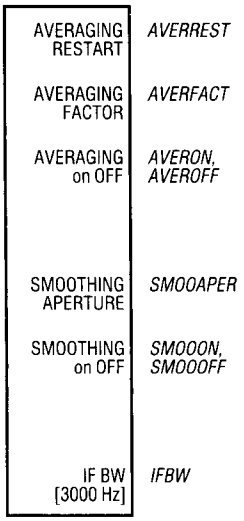
The IF bandwidth is the effective receiver bandwidth. Reducing the IF bandwidth reduces the noise that is measured during the sweep, but also may slow down the sweep. While averaging requires multiple sweeps to reduce noise, narrowing the IF bandwidth reduces the noise on every sweep.

Smoothing

The HP 8752 uses a linear block moving average to smooth the trace. The effect is to remove sharp edges from the trace, much like video filtering. The smoothing aperture is the width of the linear block average that is moved across the trace. Larger apertures smooth out the trace more, reducing the resolution with which individual trace features can be resolved.

When measuring group delay, smoothing is used to increase the group delay aperture. The smoothing aperture becomes the group delay aperture when smoothing is on.

AVG



AVERAGING RESTART Clears the average and restarts it with the next sweep.

AVERAGING FACTOR Enters the averaging factor. The effective averaging factor appears under the Avg notation. It will count up to the entered averaging factor and stop, indicating that the displayed trace has reached the desired level of averaging.

AVERAGING on OFF Averages each new sweep into the trace, reducing random noise over time. The Avg notation comes on.

SMOOTHING APERTURE Specifies the percent of the trace that is to be used as the smoothing aperture. The equivalent aperture in the current stimulus units is noted below the active entry area. A narrow aperture allows finer detail.

SMOOTHING on OFF Smooths the displayed trace, much like video filtering. Turns on the Smo notation.

IF BW [3000 Hz] Sets the IF bandwidth. A narrow bandwidth reduces the noise floor but may slow down the sweep speed.

CAL

Calibration Key

Below are listed the measurement errors that the HP 8752 calibrations will correct.

Transmission and Reflection Frequency Response.

Frequency response is the simplest error correction. The calibration standard for reflection is either a short or an open, and for transmission is a "thru". In correcting for frequency response, the analyzer also corrects for differences in path length and attenuation between the measurement channels. All calibrations correct for frequency response.

Directivity

In a reflection measurement, it is necessary to separate the forward traveling signal from the reflected signal. The relative leakage of the forward signal into the reflected signal is characterized by directivity. The calibration standard for measuring directivity is a load. All calibrations, except response, correct for directivity.

Crosstalk (Isolation)

Signal leakage from one test port to the other represents a source of measurement error. The calibration for isolation is done by terminating the ports and measuring the signal leaking between the RF paths. Isolation is an option in the response/isolation calibration.

Source Match

If the output measurement port is not precisely the characteristic impedance of the measurement system, undesired reflections result. To remove such reflections, the source match is calculated from the responses of a short, an open, and a load. The 1-port calibration corrects for source match.

Load Match

The same problem as source match, but referring to the input port. The HP 8752 does not correct for load match.

NOTE: By convention, when the connector sex is provided in parentheses for a calibration standard, it refers to the sex of the test port connector, not the actual standard. For example, short (m) indicates that the test port connector (or cable or adapter) is male, not the short circuit connector.

CAL

CORRECTION on OFF	*CORR ON* *CORROFF*
INTERPOL on OFF	*CORI ON* *CORI OFF*
CALIBRATE MENU	
RESUME CAL SEQUENCE	*RESC*
CAL KIT [N 50Ω]	
MORE	

NOTE: For the purpose of the following menu descriptions, the HP 8752A default value (50Ω) will be shown. If you have an HP 8752B, the default value is 75Ω.

CORRECTION on OFF Turns on error correction. The analyzer uses the most recent calibration data for the parameter being displayed. If the stimulus state has been changed since calibration, the state is recalled. Turns on the Cor notation.

INTERPOL on OFF Allows you to change the number of points or decrease the frequency range of a measurement without losing calibration.

CALIBRATE MENU Performs a new calibration. Correction is automatically turned on at the completion of the calibration sequence.

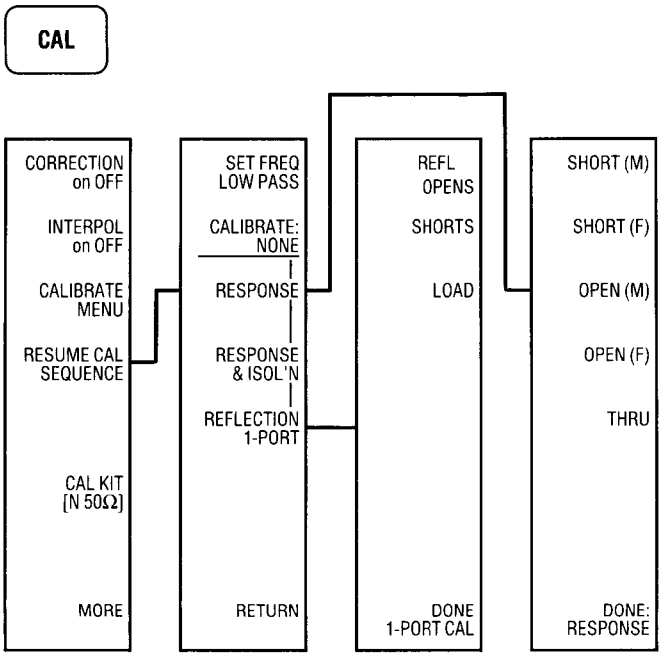
Next Menu Page 12

RESUME CAL SEQUENCE If a calibration sequence was interrupted, this softkey allows the user to re-enter the sequence at the point of exit.

CAL KIT [N 50Ω] The analyzer uses a mathematical model when performing a measurement calibration. The variables in this formula hold the characteristics of the calibration standards (open, short, or load). There is a built-in set of variables for each Hewlett-Packard calibration kit available for this analyzer. Since calibration kits only apply to a specific connector and impedance type, Hewlett-Packard offers several kits for use with this analyzer. The sets of variables included in this analyzer reflect Hewlett-Packard kits. However, this softkey also leads to menus which allow you to enter customized variables for use with non-HP calibration kits.

MORE Leads to the calibration parameter menu.

Next Menu Page 13



SET FREQ LOW PASS — Changes the frequency sweep to accommodate time domain low pass mode (option 010). If this mode is used, the frequencies must be set before calibration.

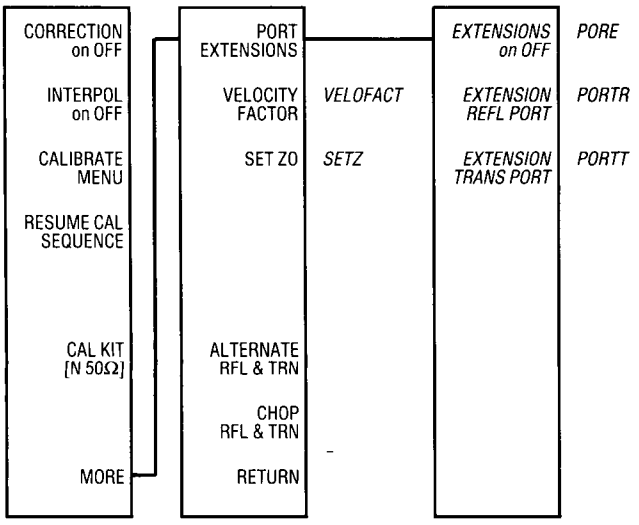
CALIBRATE: NONE

RESPONSE — Corrects for frequency response as described on page 10. Requires only one standard, using either an open or a short for reflection, or a "thru" for transmission.

RESPONSE & ISOL'N — In transmission, corrects for frequency response and isolation errors. In reflection, corrects for frequency response and directivity errors. Requires two standards.

REFLECTION 1-PORT — Corrects for frequency response, directivity, and source match errors from port 1 reflection measurements. Requires three standards.

CAL



PORT EXTENSIONS Allows the user to enter the reference plane extensions for the Reflection and Transmission ports. Extends the apparent reference plane to the end of any device attached to the port.

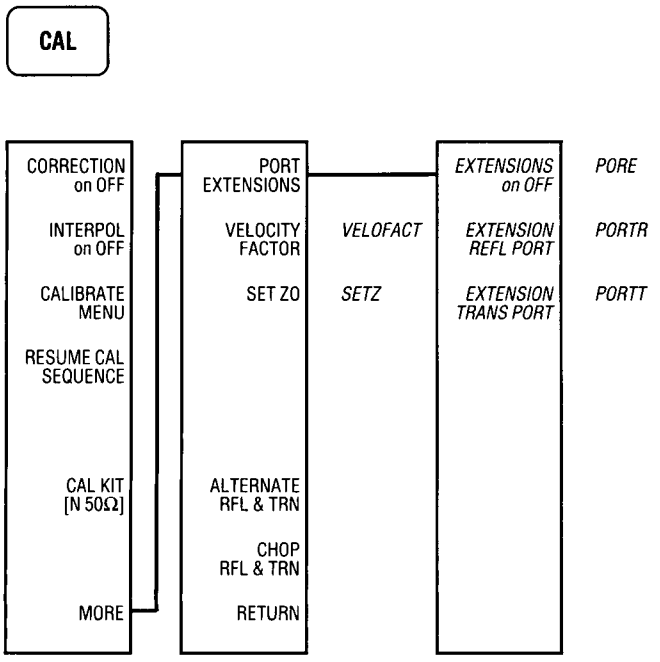
VELOCITY FACTOR Enters the velocity factor that the analyzer uses to calculate equivalent electrical length.

SET Z0 Sets the characteristic impedance used in calculating measured impedance.

ALTERNATE RFL & TRN Alternately samples channels while performing a measurement.

CHOP RFL & TRN Simultaneously samples channels allowing simultaneous measurements of reflection and transmission.

RETURN Returns to the previous menu.



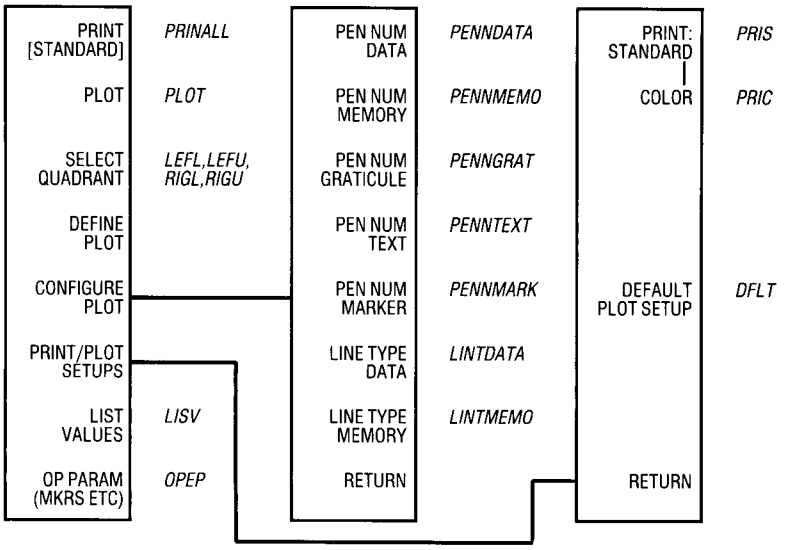
EXTENSIONS on OFF Turns the Port Extension feature on or off.

EXTENSION REFL PORT After pressing the softkey, enter the desired amount of electrical length for the Reflection Port.

EXTENSION TRANS PORT After pressing the softkey, enter the desired amount of electrical length for the Transmission Port.

Copy Key

COPY



PRINT [STANDARD] Copies the HP 8752 display onto an external printer. Identifies the printer selected; *[STANDARD]* (for black and white), or *[COLOR]*. The HP 8752 must be in either system controller or pass control mode.

PLOT Plots the current data on an external plotter, according to the current plot definition and configuration. The HP 8752 must be in either system controller or pass control mode.

SELECT QUADRANT Allows the user to select either a full-page plot, or a plot in one of the four quadrants.

DEFINE PLOT Defines what parts of the display are to be plotted.

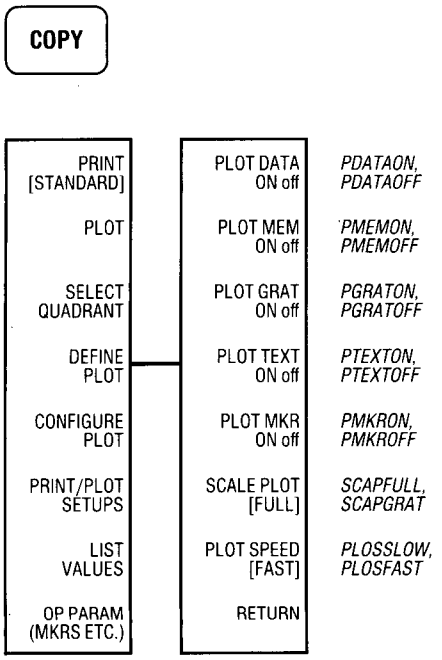
Next Menu Page 16

CONFIGURE PLOT Specifies the pens to be used during plotting and enters the line types for data and memory traces. (Details in *Reference* section.)

PRINT/PLOT SETUPS Presents a menu to select a standard (black and white) or color printer as the default, and lets you reset the plot definitions.

LIST VALUES Lists the values for each point of the trace.

OP PARAM (MKRS ETC) Displays a list of key operating parameters (including marker values) and their current values.



PLOT DATA ON off Includes the data trace on the plot.

PLOT MEM ON off Includes the memory trace on the plot.

PLOT GRAT ON off Includes the graticule on the plot.

PLOT TEXT ON off Includes all of the display text on the plot, except for the marker values, frequency list table, and limits table.

PLOT MKR ON off Plots the markers and their values visible on the display.

SCALE PLOT [FULL] *[FULL]* is the normal plot mode. *[GRAT]* expands the graticule to fill the plot area as defined by P1 and P2*. Allows plotting on printed forms.

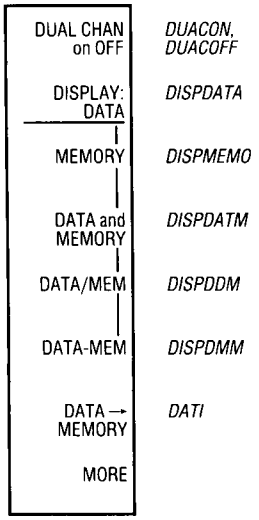
PLOT SPEED [FAST] Changes between normal plotting at *[FAST]* speed, and low speed plotting at *[SLOW]* speed for transparencies.

RETURN Returns to the previous menu.

* P1 and P2 are opposite corner points which determine a customized plot size. P1 and P2 are set on the plotter.

Display Key

DISPLAY



DUAL CHAN on OFF Displays both channels at once. They will be placed on separate graticules if split display mode (next page) is on.

DISPLAY: DATA Displays the current data, as opposed to a stored memory trace.

MEMORY Displays the trace memory of the active channel, using the current display format, scale, and reference. Works only if a trace has been stored in memory.

DATA and MEMORY Displays both the current data and memory traces, with identical scaling and format.

DATA/MEM Vector trace math. Divides the data by memory, normalizing the data to the memory. The math is performed on the linear data, before display formatting.

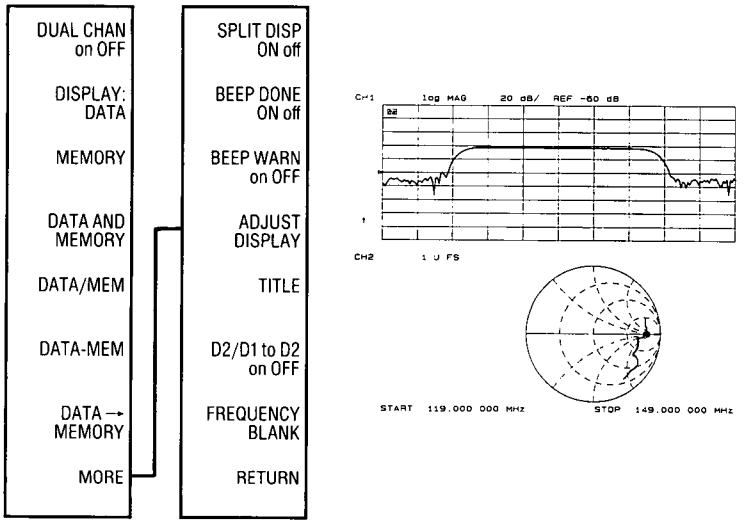
DATA-MEM Subtracts the memory from the data. The vector subtraction is performed on the linear data, before display formatting.

DATA → MEMORY Stores the active trace in the memory of the active channel.

MORE Leads to more display choices.

Next Menu Page 18

DISPLAY



SPLIT DISP ON off — Displays each channel on a separate graticule when dual channel mode (previous page) is on.

BEEP DONE ON off — Sounds the beeper whenever the analyzer finishes certain functions, such as data to memory, measuring a calibration standard, or saving an instrument state.

BEEP WARN on OFF — Sounds the beeper when a warning message is displayed.

ADJUST DISPLAY — Leads to the "Adjust Display" menu (next page).

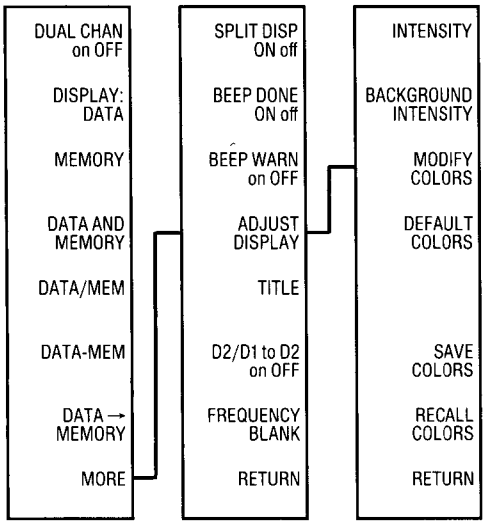
TITLE — Leads to the "Title" menu (page 21).

D2/D1 to D2 on OFF — Displays on channel 2 the data of channel 2 divided by the data of channel 1, when ON (preset state shown). Both channels must be on, with the same number of points.

FREQUENCY BLANK — Prevents the display, plotting, or printing of frequency information.

RETURN — Returns to the "Display" menu (previous page).

DISPLAY



INTENSITY Sets the display intensity as a percentage of the brightest setting. The factory-set default value is stored in non-volatile memory.

BACKGROUND INTENSITY Controls background intensity in the same way as display intensity.

MODIFY COLORS Leads to the color modification menu (see next page)

DEFAULT COLORS Returns all color settings to the factory-set default values.

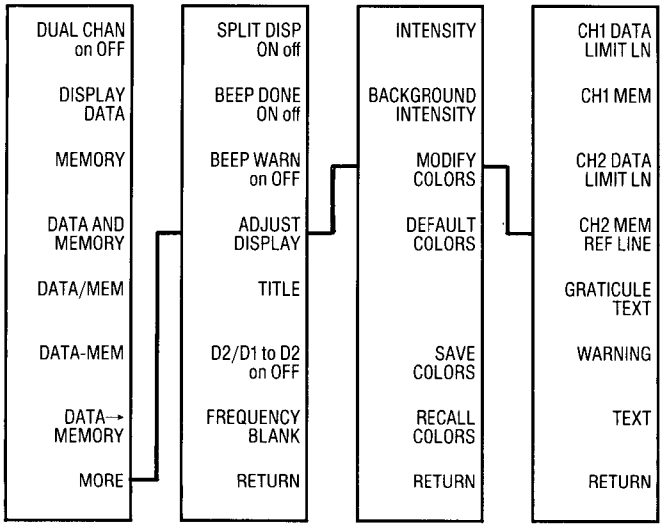
SAVE COLORS Saves the modified version of the color set.

RECALL COLORS Recalls previously saved color sets (if any).

RETURN Returns to the "Display More" menu (previous page).

DISPLAY

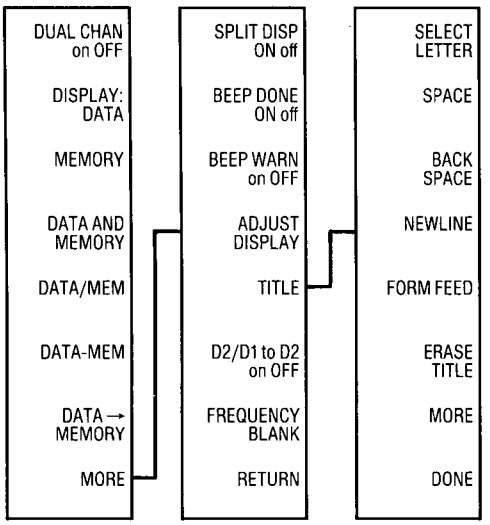
[MORE]



Note: the modify color keys lead to a second color menu that allows modification of tint, brightness, and color. If varying tint has no visible effect, increase the color percentage first.

CH1 DATA LIMIT LN	Selects channel 1 data trace and limit line for color modification.
CH1 MEM	Selects channel 1 memory trace for color modification.
CH2 DATA LIMIT LN	Selects channel 2 data trace and limit line for color modification.
CH2 MEM REF LINE	Selects channel 2 memory trace and reference line for color modification.
GRATICULE TEXT	Selects the graticule and some softkey text for color modification.
WARNING	Selects the warning annotation (like error messages) for color modification.
TEXT	Selects all non-data text (for example, "operating parameters") for color modification.
RETURN	Returns to the "Adjust Display" menu (previous page).

DISPLAY



SELECT LETTER Adds the selected alphanumeric character (above the cursor) to the title. (Use the knob to place the cursor under the desired character, press *[SELECT LETTER]*.)

SPACE Adds a space (as between words) to the title.

BACK SPACE Deletes the last character (or space) from the title.

NEWLINE Adds the symbol [NL] to the title. In test sequencing mode, it is sent as a line feed-carriage return command to a HP-IB controllable device (such as a printer).

FORM FEED Adds the symbol [FF] to the title. In test sequencing, this sends a form feed command to a device such as a printer.

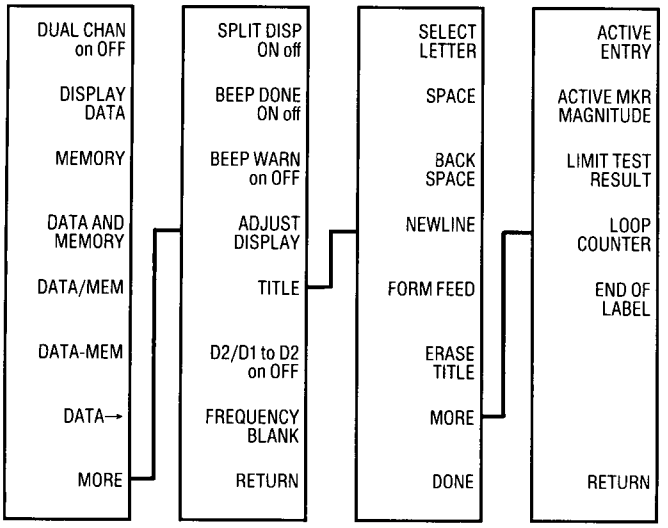
ERASE TITLE Erases the title displayed.

MORE Leads to the "Title More" menu (next page).

DONE Returns to the "Display More" menu (page 18).

DISPLAY

[MORE]



These keys cause the named data to be printed out with the title. For details see the "Test Sequencing" chapter of the *Operating Manual*.

ACTIVE ENTRY Prints the name of the active entry.

ACTIVE MKR MAGNITUDE Prints the active marker amplitude.

LIMIT TEST RESULT Prints the result of a limit test.

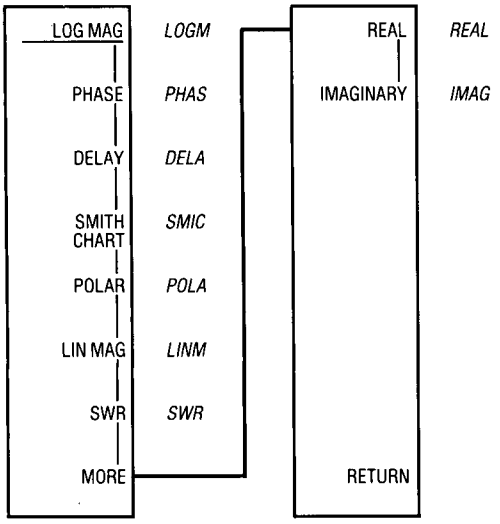
LOOP COUNTER Prints the current value of the loop counter. Refer to the "Test Sequencing" chapter of the *Operating Manual*.

END OF LABEL Terminates the HP-GL "LB" (label) command.

RETURN Returns to "Title" menu (previous page)

Format Key

FORMAT



LOG MAG Displays the log magnitude of the data in dB.

PHASE Displays the phase portion of the data in degrees.

DELAY Displays group delay. Group delay is the derivative of phase with respect to frequency. Since the aperture is the frequency step, it will vary across log and list frequency sweeps. Smoothing can increase the aperture.

SMITH CHART Displays the data on a Smith chart. There are special marker modes for this format. See page 35.

POLAR Displays the data in a polar format. There are special marker modes for this format. See page 35.

LIN MAG Displays the linear magnitude of the data.

SWR Displays the data formatted into SWR.

MORE Leads to more display choices. Refer to the reference portion of the *Operating Manual* for descriptions of REAL and IMAGINARY.

LOCAL

Local Key

Introduction

The analyzer can control certain peripheral devices over HP-IB, namely compatible printers, plotters and disk drives. It also allows other devices to control the same peripherals and the analyzer itself. Because of possible conflicts arising over peripheral control, the analyzer has three different HP-IB modes.

System Controller

If the you want the analyzer to take control of the peripherals and there are no other active controller devices on the bus, put the it in system controller mode. This is the mode intended for manual operation.

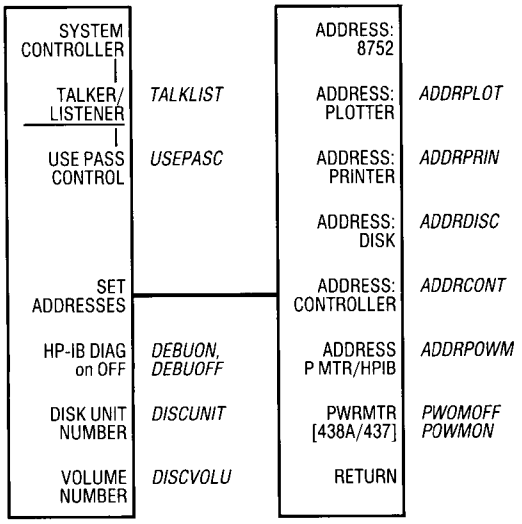
Talker/Listener

This mode allows an external controller to command the analyzer to access peripherals. In this mode, the controller coordinates all bus activity. This is the normal program control mode.

Pass Control

If another active controller is present, pass control mode allows you to request a plot, print, or disk storage from the front panel. In order for this mode to operate, the external controller must detect the analyzer's request for control, and then pass control it. When the transmission is complete, the analyzer will pass control back.

LOCAL



SYSTEM CONTROLLER This is the normal manual operation mode, allowing the analyzer to control peripherals over HP-IB. It is intended to be used only when no other controller is on HP-IB.

TALKER/ LISTENER This is the normal remote operation mode, making the analyzer dependent on an external controller for peripheral control.

USE PASS CONTROL This mode allows both local and remote use of the analyzer. Requires a smart controller.

SET ADDRESSES Leads to the HP-IB address menu. This menu allows the operator to enter the HP-IB addresses of peripherals.

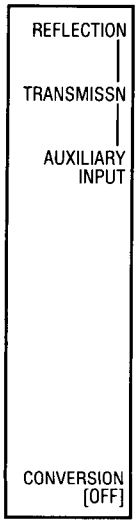
HP-IB DIAG on OFF Scrolls incoming HP-IB commands across the display.

DISK UNIT NUMBER Selects which disk unit in a multiple-unit disk drive is accessed by the load/store to disk functions.

VOLUME NUMBER Selects which volume of a hard disk is accessed by the load/ store to disk functions. Should be set to 0 for flexible disk drives.

MEAS

Measurement Key



REFLECTION Measures reflections from the DUT using the Reflection Port.

TRANSMISSN Measures transmission through the DUT using the Transmission Port.

AUXILIARY INPUT Displays a DC or low frequency AC auxiliary voltage on the vertical axis, using the real format. An external signal source such as a detector or function generator can be connected to the rear panel Auxiliary Input connector.

CONVERSION [OFF] Formats the data as transmittance, admittance, or inverted data.

Menu Key

MENU

POWER	*POWE*
SWEEP TIME [AUTO]	*SWET*
TRIGGER MENU	*SWEA*
NUMBER OF POINTS	
MEASURE RESTART	*POIN*
COUPLED CH ON off	*COUCON, COUCOFF*
CW FREQ	*CWFREQ*
SWEEP TYPE MENU	

POWER Leads to the power menu, which controls the output power and slope compensation.

Next Menu Page 28

SWEEP TIME [AUTO] Controls sweep time. Two modes are available, *auto* and *manual*. The brackets indicate the current mode. Auto mode maintains the fastest sweep time possible, manual mode maintains a user-selected sweep time. Sometimes manual mode is forced to slow the sweep time. Refer to the "Stimulus" chapter in the *Operating Manual* for details. Pressing ***[SWEEP TIME [AUTO]*** and entering a value (other than zero) activates manual mode. Pressing ***[SWEEP TIME [AUTO]*** **0 [x1]** activates auto mode.

TRIGGER MENU Leads to the sweep trigger menu.

Next Menu Page 29

NUMBER of POINTS Enters the number of data points per trace, ranging from 3 to 1601. A greater number of points gives greater data density, but slows the sweep and requires more memory for saving instrument states and performing calibrations.

MEASURE RESTART Restarts the sweep.

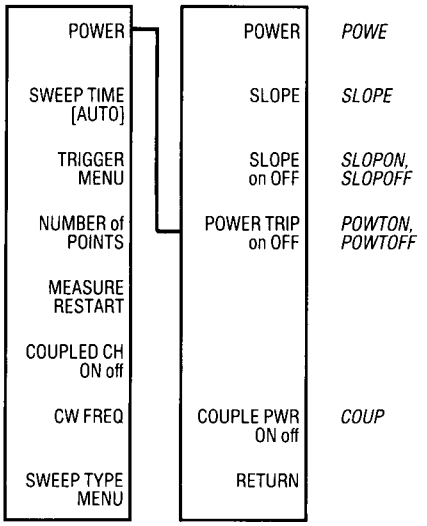
COUPLED CH ON off Locks both channels into the same stimulus values. Uncoupled channels cause the analyzer to alternate between the two sets of stimulus values. When channel coupling is on, changing stimulus values on one channel automatically changes the other channel as well.

CW FREQ Sets the frequency for CW time sweep, or power sweep.

SWEEP TYPE MENU Leads to the sweep type menu.

Next Menu Page 30

MENU



POWER Sets the RF source power.

SLOPE Enters the desired increase in RF power per GHz of sweep.

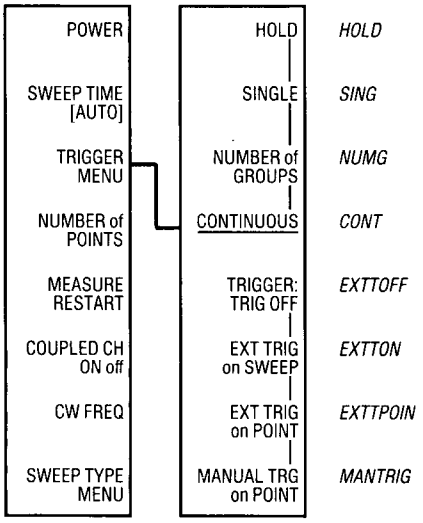
SLOPE on OFF Increases the output power with frequency, the sweep starting at the selected power level and increasing with the entered slope value. Counteracts frequency related losses. Calibrate with slope on if it is to be used.

POWER TRIP on OFF When on, an overload condition was detected on one of the inputs and power was reduced to its minimum level. Turning trip off restores the power level with the *[POWER]* key.

COUPLE PWR ON off When this function is on, the power between channels is coupled. When this function is off, the power between channels is uncoupled. When power between channels is coupled, changing power on one channel automatically changes power on the other as well.

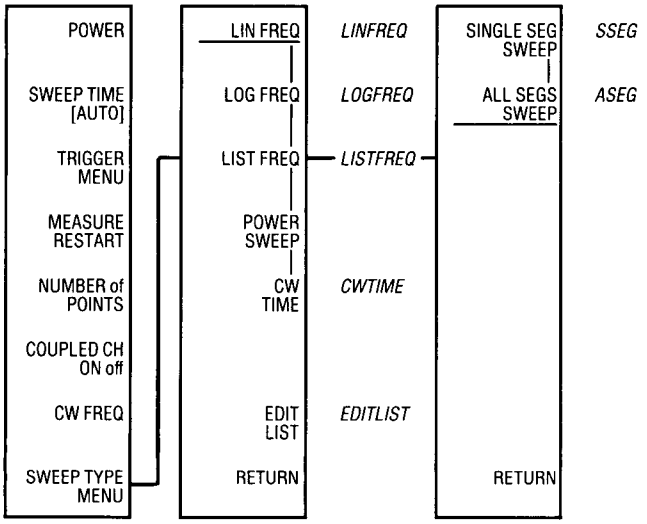
RETURN Returns to the previous menu.

MENU



HOLD	Stops updating the sweep.
SINGLE	Executes a single sweep, and then goes into hold.
NUMBER of GROUPS	Executes the entered number of sweeps, and then goes into hold.
CONTINUOUS	Continuously updates the sweep.
TRIGGER TRIG OFF	Turns off external triggers, and allows the analyzer to trigger sweeps as soon as it is ready.
EXT TRIG on SWEEP	Enables an external source to trigger an entire sweep.
EXT TRIG on POINT	Enables an external source to trigger a sweep point by point.
MANUAL TRG on POINT	Enables the user to trigger a sweep from the HP 8752's front panel.

MENU



LIN FREQ Activates a simple linear frequency sweep. With option 010, the analyzer can translate this data to time domain.

LOG FREQ Activates a logarithmic frequency sweep. The data is sampled logarithmically and displayed.

LIST FREQ Sweeps across the user defined frequency list. The sweep may be defined as a single segment sweep (*[SINGLE SEG SWEEP]* softkey) or an all segment sweep (*[ALL SEGS SWEEP]* softkey). The frequency list table can be entered and modified with *[EDIT LIST]*.

Next Menu Page 31

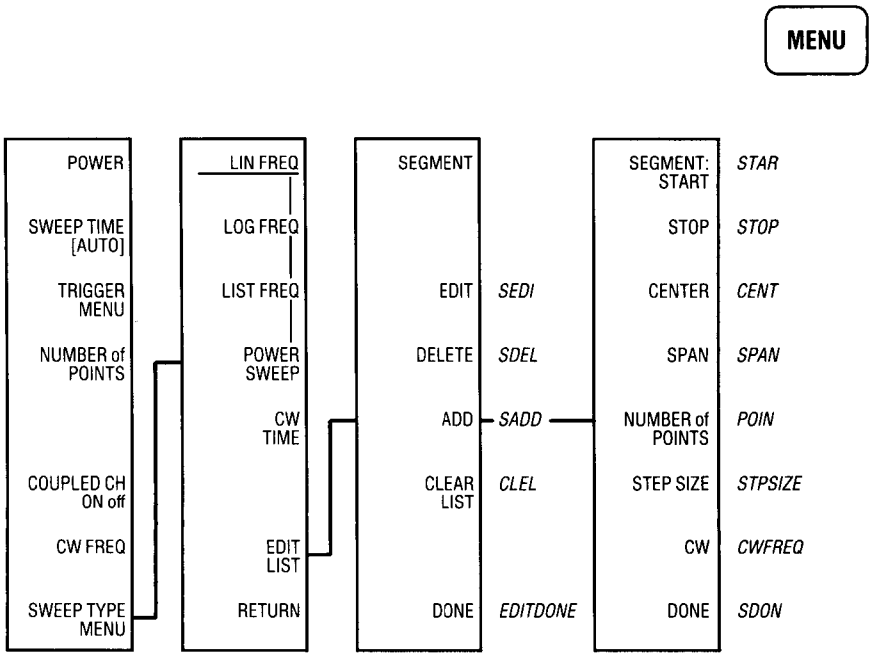
POWER SWEEP Sweeps power at a single frequency. That frequency is set with *[CW FREQ]*. Power sweep is used to characterize power sensitive networks.

CW TIME Tunes the analyzer to a single frequency and displays the data versus time. The frequency is set with *[CW FREQ]*. With option 010 (time domain), the analyzer can translate this data to the frequency domain.

EDIT LIST Allows the user to create or modify the frequency list table.

Next Menu Page 31

RETURN Returns to the previous menu.



List Frequency Mode

List frequency mode customizes the sweep to your specific measurement needs. You can define either the specific frequencies to be measured, or a series of subsweeps with the span and number of points desired. Once the list has been defined, the analyzer will measure according to the list. Displayed is a single trace, the composite data of all the sweep segments or a single sweep segment.

List frequency mode works with all the display functions, including calibration, markers, limit testing, averaging, trace memory, and vector trace math, but does not work with interpolated error correction.

The list frequency table is entered through *[EDIT LIST]*. Enter a series of up to 30 sweep segments. Each segment can contain a single point or multiple points. The total number of points in the frequency list table cannot exceed 1632.

The default for list frequency sweep is a sweep of all the segments in the frequency list table. To sweep a single segment, select the *[SINGLE SEG SWEEP]* softkey in the list frequency menu. Different segments can be swept by changing the segment number using the front panel rotary knob, the step keys, or the keypad.

Markers

The analyzer markers provide numerical readout of trace data. The markers are controlled from the **[MKR]** key, and the active functions involving markers are controlled from **[MKR FCTN]**.

In addition to turning markers on and off, **[MKR]** provides extensive control of the markers and the marker values.

Delta Markers

This is a relative mode, where the marker values show the position of the active marker relative to the delta reference marker. The delta mode is turned on by defining one of the four markers as the delta reference.

Marker Zero

Another relative mode, except that the marker values show position relative to a fixed point. Marker zero enters the position of the active marker as the fixed offset. Alternatively, the operator can specify the fixed point with *[FIXED MKR POSITION]*. Marker zero is canceled by turning delta mode off.

Coupled Markers

Normally, the markers have the same stimulus values on each channel, but they can be uncoupled so that each channel has independent markers.

Continuous Markers

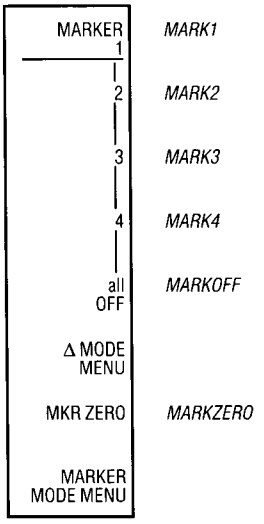
The analyzer can either place the markers on discrete sampled points, or it can move the markers continuously along the trace by interpolating the marker position.

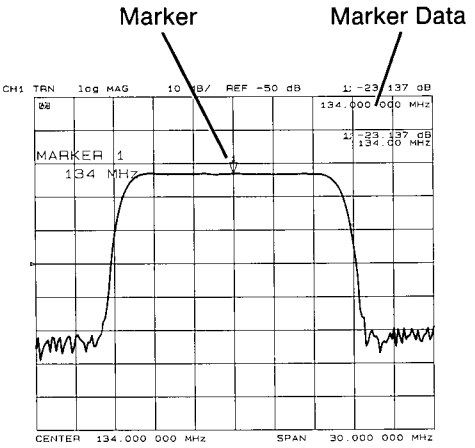
Polar Markers

The analyzer can display the marker value as magnitude and phase, or as a real/imaginary pair. *[LIN MKR]* gives linear magnitude and phase, *[LOG MKR]* gives log magnitude and phase. *[Re/Im]* gives the real value first, then the imaginary value.

Smith Markers

The same selections are available as for polar markers, plus complex admittance and impedance. For complex impedance, the displayed values are real impedance, imaginary impedance, and equivalent capacitance/inductance. The equivalent capacitance/inductance is calculated from the imaginary impedance and frequency. For admittance, the analyzer displays an inverse Smith chart.





Marker example

MARKER 1 Turns on marker 1, and makes it the active marker. The annotation Δ REF = 1 indicates that this marker is the delta reference marker.

2 Turns on marker 2.

3 Turns on marker 3.

4 Turns on marker 4.

all OFF Turns off all markers.

Δ MODE MENU Leads to the delta mode menu.

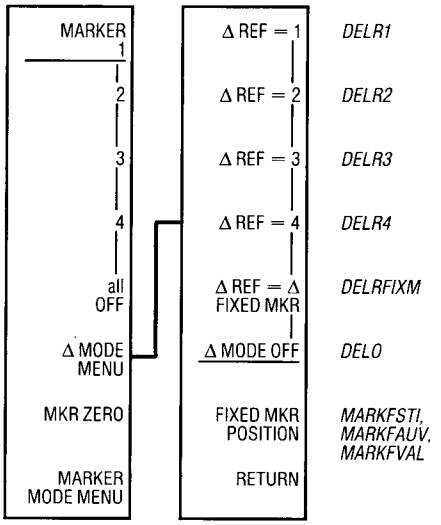
Next Menu Page 34

MKR ZERO Zeros the marker values. Once activated, all marker values are the difference between the current position of the active marker and the zero position. Canceled by turning delta mode off.

MARKER MODE MENU Allows the user to select special marker modes.

Next Menu Page 35

MKR



Δ REF = 1 Marker 1 becomes the delta reference marker. With a delta reference defined, all marker amplitude and stimulus values are the offset between the active marker position and the delta reference position.

Δ REF = 2 Makes marker 2 the delta reference.

Δ REF = 3 Makes marker 3 the delta reference.

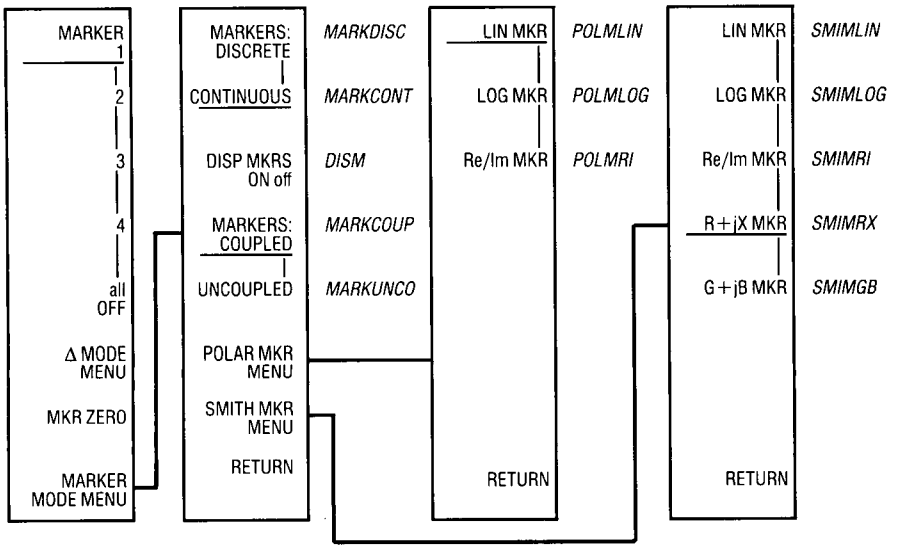
Δ REF = 4 Makes marker 4 the delta reference.

Δ REF = Δ FIXED MKR Turns on a fixed delta reference. A small triangle marks the reference point defined. All marker values are relative to this point. The fixed position is entered with marker zero or *[FIXED MKR POSITION]*.

Δ MODE OFF Returns markers to absolute mode.

FIXED MKR POSITION Leads to a menu that allows the user to specify fixed marker offsets. Marker zero (page 33) enters the marker position as the fixed marker position.

RETURN Returns to the previous menu.



MARKERS: DISCRETE Puts markers only on measured points.

CONTINUOUS Interpolates the marker placement and values between measured points.

DISP MKRS ON off Allows you to display or plot readouts for all markers that are on.

MARKERS: COUPLED Puts the markers on the same stimulus values on each channel.

UNCOUPLED Makes the markers independent between the channels.

POLAR MKR MENU Selects the marker readout format for polar display. The analyzer will display the marker values as linear or log magnitude, or as a real/imaginary pair. See page 32.

SMITH MKR MENU Selects the marker readout format for a Smith chart display. Same as polar markers with the additional choices of complex impedance or admittance. See page 32.

RETURN Returns to the previous menu.

MKR
FCTN

The marker functions use the markers for setting instrument parameters, as search markers, and in calculating various statistics.

MARKER →

These functions change instrument parameters.

Marker Search

These functions place the marker at an amplitude-related point on the trace. Turning tracking on makes the analyzer search every new trace for the target point.

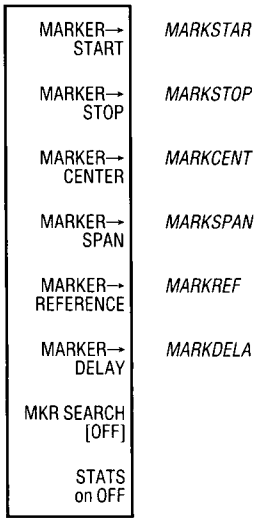
Widths

This analyzes a bandpass or band reject shape on the trace. It calculates center, bandwidth, and Q according to the operator-entered widths value. The widths value is the amplitude value that defines the band start and stop. If a delta reference is on, this function uses it as the reference point of the widths value. For example, with a delta reference marker at the passband maximum and the widths value set to −3 dB, the widths search will find the 3 dB cutoff points of the bandpass and calculate the 3 dB bandwidth and Q.

Statistics (Stats)

Calculates the mean, standard deviation, and peak-to-peak values of the section of the displayed trace between the active marker and the delta reference. If there is no delta reference, the analyzer calculates the statistics for the entire trace.

MKR
FCTN



MARKER → START Changes the start stimulus value to the marker stimulus value.

MARKER → STOP Changes the stop stimulus value to the marker stimulus value.

MARKER → CENTER Changes the center stimulus value to the marker stimulus value.

MARKER → SPAN Takes the span between the active marker and the delta reference marker, and makes that the stimulus span.

MARKER → REFERENCE Changes the reference value to the marker amplitude value.

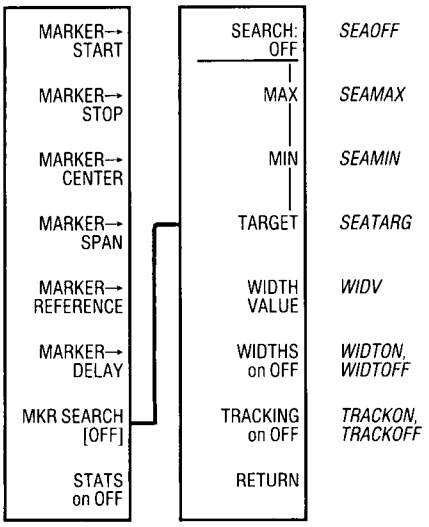
MARKER → DELAY Flattens the phase trace at the marker by adding in electrical delay. See page 41.

MKR SEARCH [OFF] Leads to the search menu, from which the marker placement search parameter is selected.

Next Menu Page 38

STATS on OFF Activates the trace statistics function. See page 36.

MKR FCTN



SEARCH: OFF Turns the active search function off.

MAX Moves the marker to the trace maximum.

MIN Moves the marker to the trace minimum.

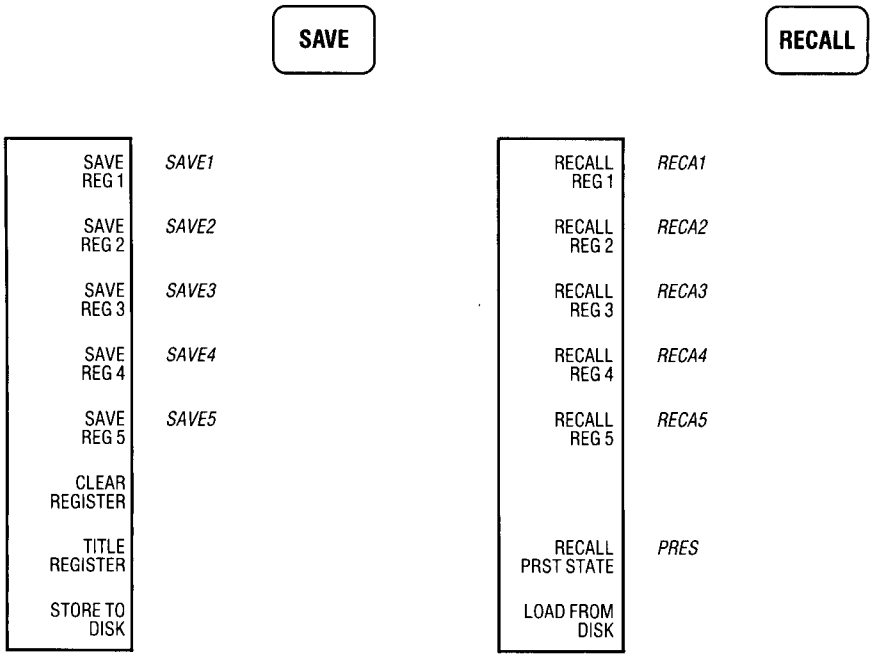
TARGET Moves the marker to the specified amplitude value on the trace. Leads to a menu with search right and search left options to resolve multiple solutions.

WIDTH VALUE The amplitude parameter for the widths search. See page 36.

WIDTHS on OFF Calculates the center stimulus, bandwidth, and Q of a bandpass or band reject shape on the trace. The width value is the amplitude search parameter that defines the passband or reject band.

TRACKING on OFF Makes the analyzer track the search with each new sweep.

RETURN Returns to the previous menu.



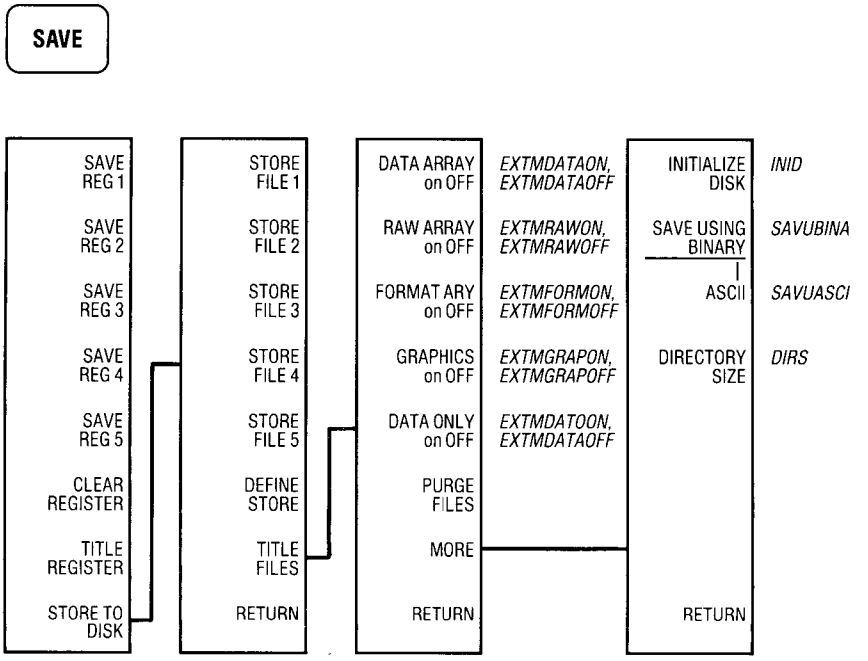
Instrument State Storage/Retrieval

The analyzer will store complete instrument states for later retrieval, and has five internal registers as well as direct disk access for this purpose.

The size of an instrument state is proportional to the number of points in the sweep, and dependent on the use of calibration, limit testing, and list frequencies. If these functions are on when the instrument state is saved, the information used by these functions is also saved.

Certain memory-intensive sets of information, such as calibration data, trace data, and trace memory, are stored in volatile memory. Volatile memory is lost whenever power is turned off, whereas the short-term memory lasts several days with the power off.

The menus indicate whether a register has been saved or not. If a register has not been saved, the save softkey is *[SAVE]*, and if it has, the save softkey will read *[RE-SAVE]*. Similarly, if a register has not been saved, there is no recall or clear option given for that register.



Disk Access

The disk access functions are controlled through the *[STORE TO DISK]* and *[LOAD FROM DISK]* menus under the **[SAVE]** and **[RECALL]** keys, respectively. In addition to the complete instrument state, optional information that is not included in the internal registers can be stored on disk.

The optional information is selected using the *[DEFINE STORE]* menu. Measurement data can be saved in several forms: raw data, error corrected data, or formatted data. Most commonly, the error-corrected "data array" is stored. The raw data is the data prior to error correction, and formatted data is the data after such formatting as electrical delay, time domain, smoothing, and trace math. Aside from measurement data, user graphics can also be saved.

To store a state on disk, first title a file using the *[TITLE FILES]* menu. Then store the current instrument state on disk by selecting the file under the *[STORE TO DISK]* menu.

To load a file from disk, press **[RECALL]** *[LOAD FROM DISK] [READ FILE TITLES]*, and select the desired file. If there are more than five files on the disk, press *[READ FILE TITLES]* again and the analyzer will display the next five files on the disk.

The analyzer must be in either system controller or pass control mode, and the correct disk unit and volume number must set in the **[LOCAL]** menu. The disk unit number selects a drive in a dual floppy or hard disk drive. The volume number specifies which volume is to be accessed in hard disk drives.

Scale Reference Key

SCALE REF

AUTO SCALE	*AUTO*
SCALE/DIV	*SCAL*
REFERENCE POSITION	*REFP*
REFERENCE VALUE	*REFV*
MARKER→ REFERENCE	*MARKREF*
MARKER→ DELAY	*MARKDELA*
ELECTRICAL DELAY	*ELED*
PHASE OFFSET	*PHAO*

AUTO SCALE	Finds the trace and scales it so that it fits on the graticule.
SCALE/DIV	Changes the trace scaling.
REFERENCE POSITION	Moves the reference line up and down the graticule, 0 being the bottom of the graticule, and 10 the top.
REFERENCE VALUE	Changes the value of the reference line. In polar and Smith chart formats, the reference value is the value at the outer circle.
MARKER → REFERENCE	Makes the amplitude at the active marker the reference value.
MARKER → DELAY	Sets the electrical delay so that the group delay is 0 at the marker. This flattens the phase trace at the marker.
ELECTRICAL DELAY	Adds or subtracts electrical time delay from the data. Simulates adding or removing linear phase from a measurement.
PHASE OFFSET	Adds the specified offset to the measured phase value.

SYSTEM

System Key

DO SEQUENCE

CONTINUE SEQUENCE

NEW SEQ/ MODIFY SEQ

DONE SEQ MODIFY

SEQUENCING MENU

LIMIT MENU

TRANSFORM MENU

SERVICE MENU

Test Sequencing Function

Sequencing allows any list functions to be executed automatically with a single key-stroke. The sequences can be entered from the front panel, read from an external disk, or down loaded over HP-IB from an external controller.

Limit Testing

The analyzer's limit testing feature provides pass/fail testing in frequency, time, or power domains.

Time Domain (Option 010)

The analyzer uses the inverse Fourier transform to calculate the time domain step and impulse responses of a DUT. Furthermore, it allows the user to position a time gate over the data, which it then applies directly to frequency domain data. The transform can also convert CW time domain data to frequency domain for baseband analysis.

Test Sequencing

SYSTEM

DO SEQUENCE

CONTINUE SEQUENCE

NEW SEQ/ MODIFY SEQ

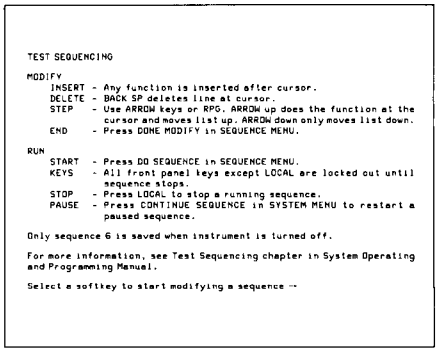
DONE SEQ MODIFY

SEQUENCING MENU

LIMIT MENU

TRANSFORM MENU

SERVICE MENU



Test Sequencing Function

The Test Sequencing Function allows you to combine a series of features such as limit testing and marker functions, with if/then decision capabilities into a test executable by a single keystroke.

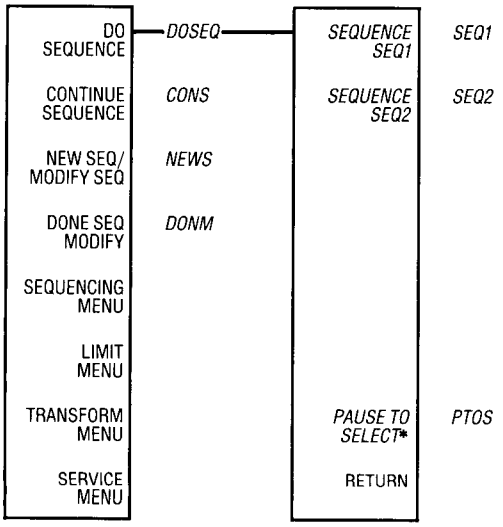
Creating a test sequence is virtually identical to making a manual measurement using the front panel. Once you have entered sequencing mode all you need to do is make the desired measurement. The analyzer will record the keystrokes, storing them where they can be called up and repeated with a single keystroke. Test sequences may be stored in six internal registers, or to an external disk.

The analyzer allows you to cascade multiple sequences to increase efficiency and reduce test times when performing long, more elaborate tests.

This feature also allows you to send HP-IB output strings to automatically control external devices, such as signal generators, power supplies, or relay actuators.

SYSTEM

Test Sequencing



* Only appears when creating or modifying a sequence.

The first four softkeys in the System Menu are devoted to commonly used test sequencing functions. Sequencing allows the instrument to memorize a series of key-strokes and execute them automatically on command. The common sequencing tasks covered are running a sequence (DO SEQUENCE), continuing a paused sequence, creating/editing a sequence, and ending the creation/editing process (DONE SEQ MODIFY).

DO SEQUENCE — This key shows all sequences residing in memory. To execute one of them, press the softkey next to the sequence name. This key can be pressed during the creation of a sequence, in this case it performs a one-way jump to another sequence.

CONTINUE SEQUENCE — Resumes sequence operation. A sequence will pause during execution if it encounters the sequencing PAUSE command. This allows the operator to change test setup or insert a new device under test. The user is prompted to press this key to continue sequence operation.

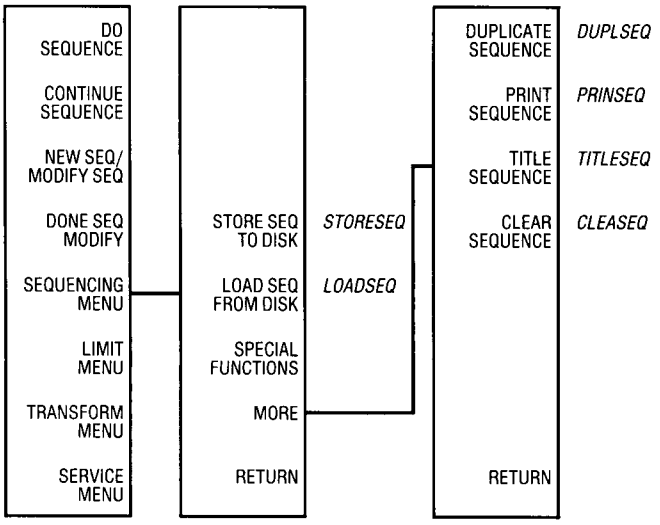
NEW SEQ/ MODIFY SEQ — Activates the edit mode and presents the new/modify sequence menu with a list of sequences that can be created or modified.

DONE SEQ MODIFY — Terminates the edit mode.

SEQUENCING MENU — Leads to sequencing utility features such as saving, loading, renaming, printing, and deleting sequences. This also leads to advanced sequencing features such as decision making and loop counter.

Test Sequencing

SYSTEM



STORE SEQ TO DISK Stores a sequence to an external disk.

LOAD SEQ FROM DISK Loads a sequence from an external disk.

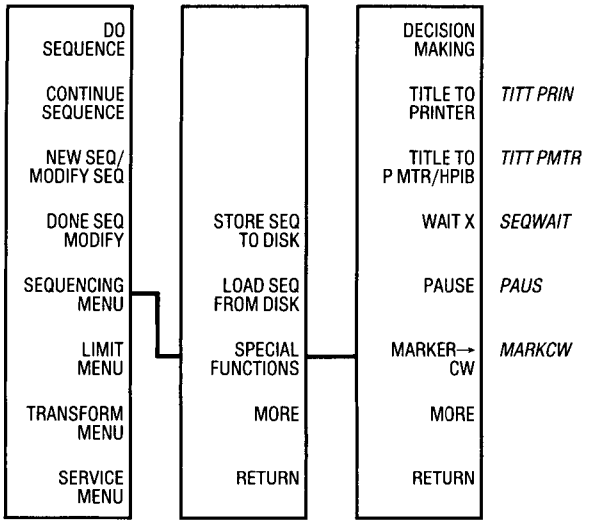
SPECIAL FUNCTIONS Leads to the display of titling and decision making features.

MORE Leads to more display choices, such as duplicating, printing, titling, and clearing a sequence.

RETURN Returns to the previous menu.

SYSTEM

Test Sequencing



DECISION MAKING Leads to a menu that controls pass/fail testing capability and loop counter control.

TITLE TO PRINTER Enables you to send a title (including letters, numbers, and some punctuation) to a device over HP-IB. This command appends a carriage return/line feed to the title string.

TITLE TO P MTR/HPIB Enables you to send a command in the form of a title to a HP-IB controllable device. This command does not appeand a carriage return/line feed.

WAIT X This will pause the execution of a sequence for X seconds.

PAUSE This command will temporarily stop the execution of a sequence. The keyboard will be freed up allowing the user to change an instrument parameter, or modify an equipment configuration. The sequence can be re-started by pressing the *[CONTINUE SEQUENCE]* softkey.

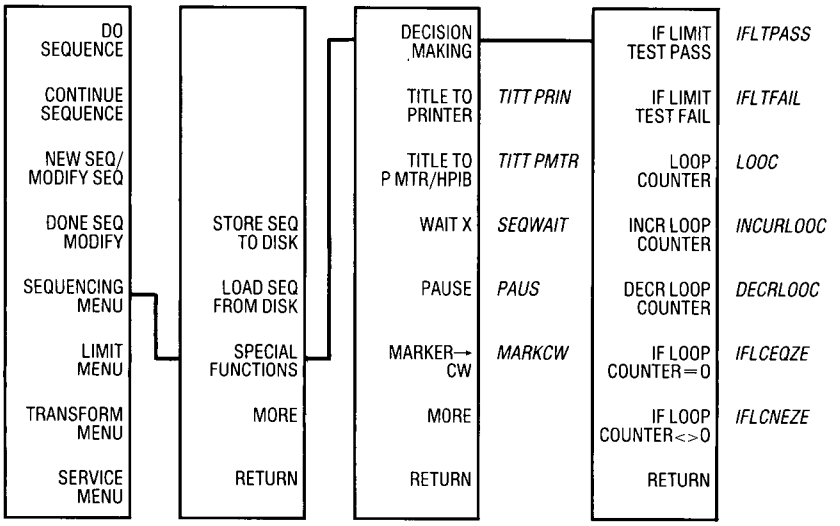
MARKER → CW Move the CW frequency to the marker stimulus value.

MORE Leads to more choices (see page 48).

RETURN Returns to the previous menu.

Test Sequencing

SYSTEM



IF LIMIT TEST PASS Jumps to one of the six sequence positions (SEQUENCE 1 through 6) if the limit test passes. This command executes any sequence residing in the selected position. Sequences may jump to themselves as well as to any of the other sequences in memory.

IF LIMIT TEST FAIL Jumps to one of the six sequence positions (SEQUENCE 1 through 6) if the limit test fails. This command executes any sequence residing in the selected position.

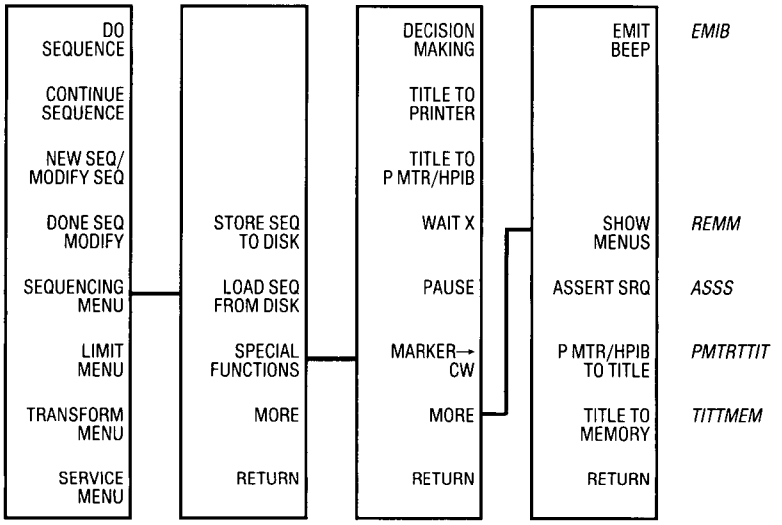
LOOP COUNTER Sets the value of the loop counter. Enter any number from 0 to 32767 and terminate with the **[x1]** key. The default value of the counter is zero. This command should be placed in a sequence that is separate from the measurement sequence so it doesn't keep resetting the counter value.

INCR LOOP COUNTER Increments the value of the loop counter by 1.

DECR LOOP COUNTER Decrements the value of the loop counter by 1.

IF LOOP COUNTER = 0 Prompts the user to select a destination sequence position (SEQUENCE 1 through 6). When the value of the loop counter reaches zero, the sequence in the specified position will run.

IF LOOP COUNTER <>0 Prompts the user to select a destination sequence position (SEQUENCE 1 through 6). When the value of the loop counter is no longer zero, the sequence in the specified position will run.



EMIT BEEP Emits a beep of fixed tone and duration during the execution of a sequence.

SHOW MENUS Enables the recall of menus from within a sequence. This is especially useful when prompting someone for a softkey response in an interactive test situation.

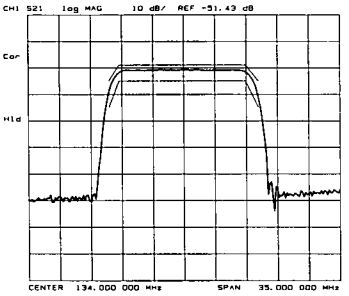
ASSERT SRQ Enables the analyzer to signal an external controller that it has completed the execution of a sequence.

P MTR/HPIB TO TITLE Enables the analyzer to read a value from an HP-IB instrument. For more information, see the "Test Sequence Function" chapter in the *Operating* manual.

TITLE TO MEMORY Store the value read by the *[P MTR/HPIB TO TITLE]* key into the memory data array.

RETURN Returns to the previous menu.

SYSTEM



Limit Testing

Refer to the User's Guide for Tutorial Information.

Limit testing provides pass/fail testing in frequency or time domains.

Up to 36 limit test segments (18 per channel) can be entered into the limit table. After entry, these segments can then be modified using the *[EDIT LIMIT LINE]* softkey.

The limit table created will be in the current stimulus domain , so that the stimulus values might be frequency or time. The entered stimulus value marks the beginning of the limit segment. The operator enters the limit maximum and minimum at that point. After defining the line, you can select the type of limit segment that is to start at the point.

The upper and lower limits of a sloping line segment connect to the upper and lower limits of the next segment.

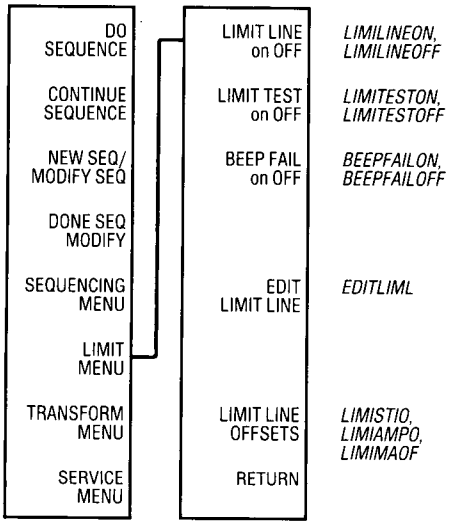
The upper and lower limits of a flat line segment extend horizontally to the start of the next segment.

A single point either forms the end of a limit line, or acts as a stand-alone test point.

When limit testing is turned on, the analyzer tests each point that is in a limit test region, and displays a pass or fail message.

SYSTEM

Limit Testing



LIMIT LINE on OFF Draws the limit lines.

LIMIT TEST on OFF Tests each sweep for measured points that are out-of-limit.

BEEP FAIL on OFF Sounds the beeper when the limit test fails.

EDIT LIMIT LINE Allows the user to enter and modify limit lines.

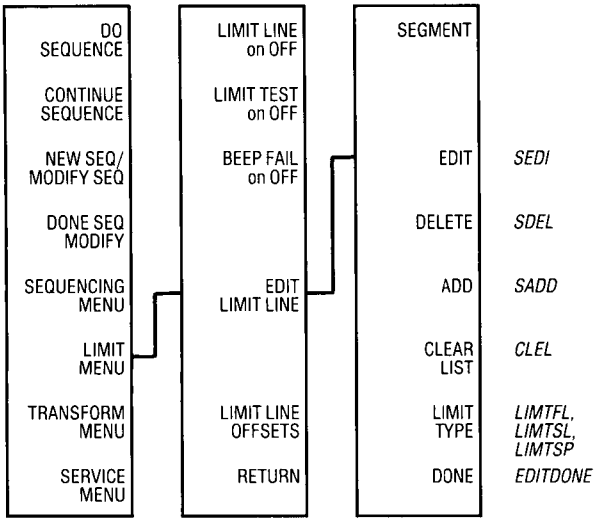
Next Menu Page 51

LIMIT LINE OFFSETS Allows the user to offset the limit lines in stimulus and amplitude.

RETURN Returns to the previous menu.

Limit Testing

SYSTEM



SEGMENT Selects the segment to be edited either by entering the segment number, or by using the front panel knob or step keys.

EDIT Brings the selected segment up for editing.

DELETE Deletes the entry indicated by the pointer.

ADD Adds a new entry at the pointer.

Next Menu Page 52

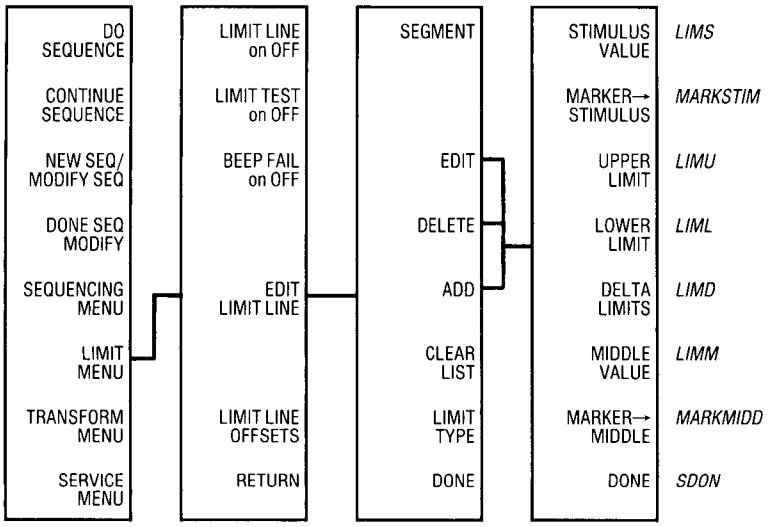
CLEAR LIST Clears the present list.

LIMIT TYPE Allows the user to select the type of limit for the current segment. There are sloping line (SL), flat line (FL), or single point (SP) limit types.

DONE Returns to the previous menu.

SYSTEM

Limit Testing



STIMULUS VALUE Enters the starting stimulus value of this segment.

MARKER→ STIMULUS Enters the marker stimulus as the start of this segment.

UPPER LIMIT Enters the top limit.

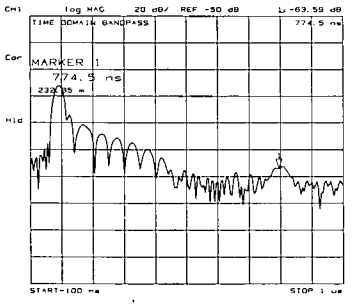
LOWER LIMIT Enters the bottom limit.

DELTA LIMITS Instead of upper/lower limits, enters amplitude between the the limit lines.

MIDDLE VALUE Instead of upper/lower limits, enters the center amplitude between the limit lines.

MARKER→ MIDDLE Makes the marker amplitude the middle value between the limit lines.

DONE Returns to the previous menu.



Time Domain (Option 010)

The analyzer uses the inverse Fourier transform to calculate the time domain step and impulse responses of the DUT. Furthermore, it allows the user to position a time gate over the data, which it then applies directly to the frequency domain data. The transform can also convert CW time domain data to frequency domain for baseband analysis.

Window

A true frequency domain impulse or step response would cover all frequencies from zero to infinity. The abrupt limits on the actual frequency sweep cause ringing in time domain. Ringing is reduced by windowing (greater windowing, less ringing,) at the expense of effective impulse width.

Demodulation (Demod)

This is intended for use with the CW time to frequency transformation. Amplitude demodulation removes any phase modulation prior to transforming the data. Phase demodulation removes any amplitude modulation. With no demodulation, the transformed data shows the combined amplitude and phase modulation effects.

Low Pass Versus Bandpass

Time domain low pass mode simulates traditional TDR measurements. For this to work, however, the frequencies must be set at harmonic intervals. This is done with *[SET FREQ]*. Bandpass mode avoids this restriction, but is limited to the impulse response. The advantage of bandpass mode is that it allows time domain measurements on highly frequency-selective devices.

Gating

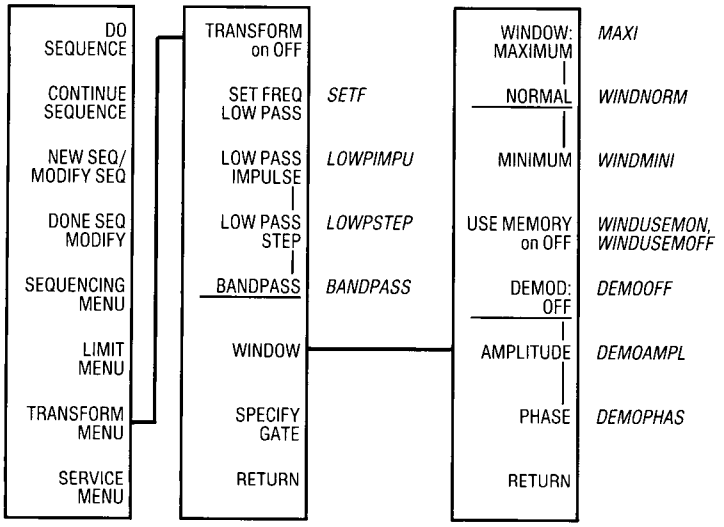
The operator can place a time domain bandpass filter on the data, which is called a gate. In effect, the analyzer will remove all responses received before the gate start time and after the gate stop time.

Gate Shape

The analyzer allows the user to control the shape of the gate. Minimum gate trades off rapid filter cutoff for less passband ripple.

SYSTEM

Time Domain



TRANSFORM on OFF Turns on the transform and displays the time domain response of a linear frequency sweep, or the frequency domain response of a CW time sweep.

SET FREQ LOW PASS Sets the frequencies to harmonic intervals, keeping the number of points the same. Required for low pass mode.

LOW PASS IMPULSE Makes the transform display the impulse response. Use the real data format.

LOW PASS STEP Makes the transform display the step response of the DUT. Use the real data format.

BANDPASS Makes the transform display the impulse response. Can operate with band-limited frequency data. The most useful data formats are linear and log magnitude.

WINDOW Places a window over the frequency domain data to minimize the effect of abrupt frequency cutoff at the ends of the sweep. Also controls amplitude and phase demodulation.

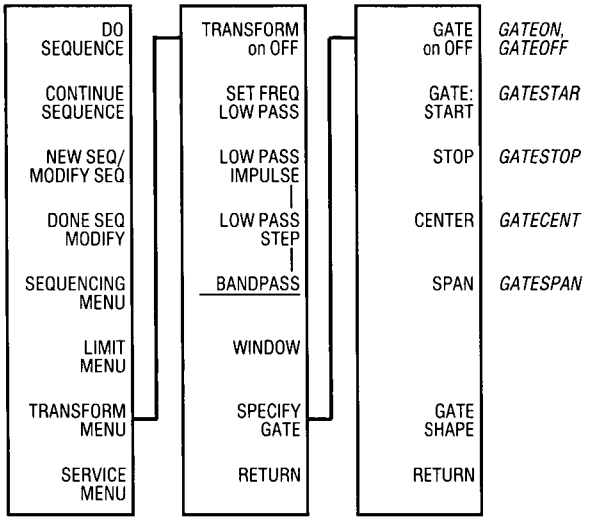
SPECIFY GATE Allows you to place a time gate over both frequency and time domain data. The gate shape is selectable.

Next Menu Page 55

RETURN Returns to the previous menu.

Time Domain

SYSTEM



GATE on OFF	Turns the gate on and off. Although the gate is set in the time domain, it is actually applied to the frequency domain data.
GATE: START	Sets the start time of the gate.
STOP	Sets the stop time of the gate.
CENTER	Sets the center of the gate.
SPAN	Sets the span of the gate.
GATE SHAPE	Allows the user to trade a very flat gate passband at maximum gate shape with very fast cutoff at minimum gate.
RETURN	Returns to the previous menu.

Index

November, 1990

Printed in U.S.A.
HP Part No. 08752-90057

HEWLETT PACKARD