Errata

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HP References in this Manual

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

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Agilent Technologies

HP 8751A Network Analyzer

HP-IB Programming Manual

SERIAL NUMBERS

This manual applies directly to instruments with serial number prefix 3146. For additional important information about serial numbers, read "Serial Number" in the General Information section of the Operation Manual.

HEWLETT PACKARD

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General Information

This manual is a tutorial introduction to remote operation of the HP 8751A Network Analyzer using an HP 9000 series 200 or 300 computer with BASIC programming examples. The following is a brief description of each chapter and appendix.

Chapter 2 describes programming basics and provides example programs.

Chapter 3 lists HP-IB commands in alphabetic order.

Appendix A summarizes HP-IB commands according to their softkey labels.

Appendix B describes the status byte register and the other registers of the HP 8751A.

Appendix C provides the codes of the front panel keys for using the KEY HP-IB command.

Appendix D describes the calibration types and the standard classes, and the calibration coefficients.

Appendix E provides information on the waveform analysis function.

Appendix F provides reference information for converting HP-IB programs of the HP 8753C into HP 8751A programs.

Error Messages lists error messages with explanations.

The reader should become familiar with the operation of the HP 8751A before controlling it by HP-IB. This manual is not intended to teach the BASIC programming language or to discuss HP-IB theory of operation; refer to the following documents which are better suited to these tasks.

- For more information concerning the operation of the HP 8751A, refer to the following:

  HP 8751A User's Guide

  HP 8751A Reference Manual

- For more information concerning BASIC, refer to the manual set for the BASIC revision being used:

  BASIC Programming Techniques

  BASIC Language Reference

- For more information concerning HP-IB, refer to the following:

  BASIC Interfacing Techniques

  Tutorial Description of the Hewlett-Packard Interface Bus

  Condensed Description of the Hewlett-Packard Interface Bus

2

Programming Basics

This chapter describes programming basics and provides example programs.

Preparing for HP-IB Control

To run the examples in this chapter, the following equipment is required:

Required Equipment

1. HP 8751A Network Analyzer
2. HP 9000 Series 200 or 300 computer or an IBM compatible PC with a measurement co-processor or card (HP 82300 or 82324) with enough memory to hold BASIC, needed binaries (refer to "Powering Up the System"), and at least 64 kilobytes of program space.

   A disk drive is required to load BASIC, if no internal disk drive is available.
3. BASIC 3.0 or higher operating system.
4. HP 10833A/B/C/D HP-IB cables to interconnect the computer, the HP 8751A, and any peripherals.

Optional Equipment

1. HP 87511A S-parameter Test Set
2. HP 85032B 50 Ω type-N calibration kit
3. HP 11857D Cable Kit
4. Accessory kit
5. Device under test (DUT)
6. Cables to connect DUT
7. Printer

Powering Up the System

1. Set up the HP 8751A as shown in Figure 2-1.

   Connect the HP 8751A to the computer with an HP-IB cable.

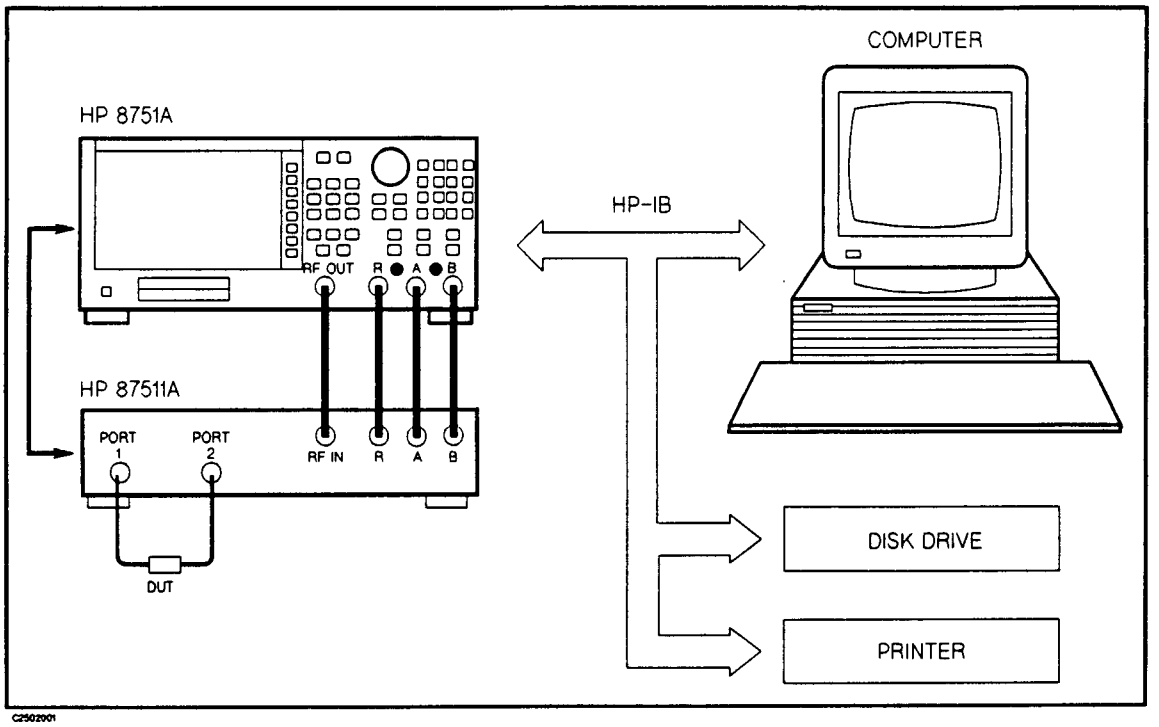


Figure 2-1. HP-IB Connections in a Typical Setup

2. Turn on the computer and load the BASIC operating system.

   Load the following BASIC binary extensions:

   HPIB, GRAPH, IO, KBD, and ERR.

   Depending on the disk drive, a binary such as CS80 may be required.

3. Turn the HP 8751A ON.

   To verify the HP 8751A's address, press [LOCAL] and select **SET ADDRESSES** **ADDRESS: 8751**. If the address has been changed from the default value (17), return it to 17 while performing the examples in this document by pressing [1] [7] [x1].

   Make sure the HP 8751A is in the **ADDRESSABLE ONLY** mode, as indicated under the [LOCAL] key. This is the only mode in which the HP 8751A will accept HP-IB commands.

4. On the computer, type the following:

   `OUTPUT 717;"PRES"` [Return] (or [EXECUTE])

   This will preset the HP 8751A. If preset does not occur, there is a problem. First check all HP-IB addresses and connections: most HP-IB problems are caused by an incorrect address and bad or loose HP-IB cables.

Note

Only the HP 9000 Model 226 and 236 computers have an [EXECUTE] key. The Model 216 has an [EXEC] key with the same function. All other computers use the [Return] key for both the execute and enter functions. The notation [Return] is used in this document.

Measurement Programming

This section describes how to organize the commands into a measurement sequence. Figure 2-2 shows a typical measurement sequence.

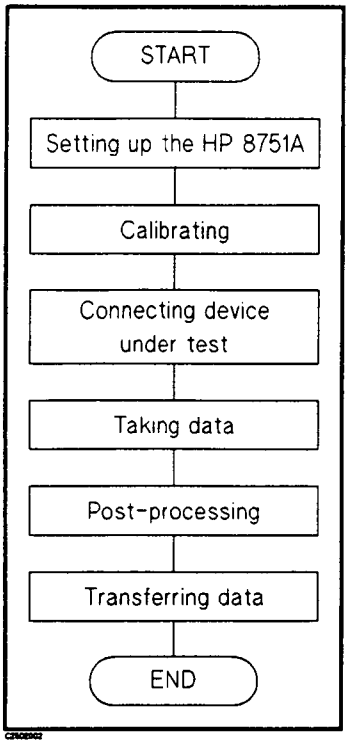


Figure 2-2. Typical Measurement Sequence

- Setting up the HP 8751A

  Define the measurement by setting all of the basic measurement parameters. These include all the stimulus parameters: sweep type, span, sweep time, number of points, and RF power level. They also include the parameter to be measured, and both IF averaging and IF bandwidth. These parameters define the way data is gathered and processed within the instrument, and to change one of these parameters requires that a new sweep be triggered.

  There are other parameters that can be set within the HP 8751A that do not affect data gathering directly, such as smoothing, trace scaling or trace math. These functions are classed as post processing functions: they can be changed with the HP 8751A in the hold mode, and the data will correctly reflect the current state.

  The save/recall registers provide a rapid way of setting up an entire instrument state.

- Calibrating

  Measurement calibration is normally performed once the HP 8751A state has been defined. Measurement calibration is not required to make a measurement, but it does improve measurement accuracy.

  There are several ways to calibrate the HP 8751A as follows:

  - The simplest is to stop the program and have the operator perform the calibration from the front panel.

- Alternatively, the computer can be used to guide the operator through the calibration, as discussed in "Frequency Response Calibration" and "1-Port Reflection Calibration".
- The last option is to transfer calibration data from a previous calibration back into the instrument, as discussed in "Reading Calibration Data".

- Connecting device under test

  Have the operator connect and adjust the device. The computer can be used to speed the adjustment process by setting up such functions such as limit testing, bandwidth searches, and trace statistics. All adjustments take place at this stage so that there is no danger of taking data from the device while it is being adjusted.

- Taking data

  With the device connected and adjusted, measure its frequency response, and store the data in the HP 8751A so that there is a valid trace to analyze.

  The single sweep command `SING` is designed to ensure a valid sweep. All stimulus changes are completed before the sweep is started, and the HP-IB hold state is not released until the formatted trace is displayed. When the sweep is complete, the HP 8751A is put into the hold mode, storing the data inside the HP 8751A.

  The number of groups command `NUMG` is designed to work the same as single sweep, except that it triggers n sweeps. This is useful, for example, in making a measurement with an averaging factor of n. Both single sweep and number of groups restart averaging.

- Post-processing

  With valid data to operate on, the post-processing functions can be used. Referring ahead to Figure 2-9, any function that affects the data after the error correction stage can be used. The most useful functions are trace statistics, marker searches, and electrical delay offset. If a 2-port calibration is active, then any of the four S-parameters can be viewed without taking a new sweep.

- Transferring data

  Lastly, read the results out of the HP 8751A. All the data output commands are designed to ensure that the data transmitted reflects the current state of the HP 8751A:

  - `OUTPDATA`, `OUTPRAW`, `OUTPFORM`, etc., will not transmit data until all formatting functions have been completed.
  - `OUTPLIML`, `OUTPLIMM`, and `OUTPLIMF` will not transmit data until the limit test has occurred, if limit testing is turned ON.
  - `OUTPMARK` will activate a marker if one is not already selected, and it will make sure that any current marker searches have completed before transmitting data.
  - `OUTPMSTA` makes sure that statistics have been calculated for the current trace before transmitting data. If statistics is not turned ON, it will turn statistics ON to update the current values, and then turn it OFF.
  - `OUTPMWID` makes sure that a bandwidth search has been executed for the current trace before transmitting data. If bandwidth search is not turned ON, it will turn the search ON to update the current values, and then turn it OFF.

  Data transfer is discussed further in "Data Transfer from the HP 8751A to a Computer".

Basic Programming Examples

Note

Because the sample programs are design to control the HP 8751A from external controller using HP-IB, you will have to change some statements when you use HP 8751A Instrument BASIC (Option 002) to control the internal network function.

Change as follows:

"ASSIGN @Hp8751 TO 717" to "ASSIGN @Hp8751 TO 800"
"ASSIGN @Dt TO 717;FORMAT OFF" to "ASSIGN @Dt TO 800;FORMAT OFF"
"ABORT 7" to "ABORT 8"

Where 717 is an external controller's device selector (HP-IB interface code 7 and HP-IB address 17). 800 is the internal HP-IB device selector when Instrument BASIC controls the internal network function.

Setting Up a Measurement

In general, the procedure for setting up measurements on the HP 8751A via HP-IB follows the same sequence as if the setup was performed manually. There is no required order, as long as the desired frequency range, number of points and power level are set prior to performing the calibration.

By interrogating the HP 8751A to determine the actual values of the start and stop frequencies, or the center frequency and frequency span, the computer can keep track of the actual frequencies.

This example illustrates how a basic measurement can be set up on the HP 8751A. The program will first select the desired parameter, the measurement format, and then the frequency range.

This example sets up a measurement of transmission log magnitude on channel 1. When prompted for the center frequency and the frequency span, enter any value in Hz from 1.0×10^5 (for the S-parameter Test Set) to 5.0×10^8. These will be entered into the HP 8751A, and the frequencies will be displayed.

```
10    !
20    ! Setting Up a Measurement
30    !
40    ASSIGN @Hp8751 TO 717  ! If you use iBASIC, replace "717" with "800".
50    ABORT 7                ! If you use iBASIC, replace "7" to "8"
60    CLEAR @Hp8751
70    !
80    OUTPUT @Hp8751;"PRES"             ! Preset HP 8751A
90    OUTPUT @Hp8751;"CHAN1; S21; LOGM"
100   INPUT "Enter center frequency (Hz).",F_cent
110   INPUT "Enter frequency span (Hz).",F_span
120   OUTPUT @Hp8751;"CENT ";F_cent     ! Set Center frequency
130   OUTPUT @Hp8751;"SPAN ";F_span     ! Set frequency span
140   !
150   OUTPUT @Hp8751;"CENT?"
160   ENTER @Hp8751;F_centr
170   OUTPUT @Hp8751;"SPAN?"
180   ENTER @Hp8751;F_spanr
190   PRINT "Center frequency:",F_centr;"Hz"
200   PRINT "Frequency span:",F_spanr;"Hz"
210   END
```

Figure 2-3. Sample Program: Setting Up a Measurement

Line 40	Assign the HP 8751A HP-IB address. If you are using the Instrument BASIC (Option 002) to control the internal network function, change 717 to 800
Lines 50 and 60	Prepare for HP-IB control.
Line 80	Preset the HP 8751A.
Line 90	Make channel 1 the active channel, and measure transmission parameter, S_{21}, display its magnitude in dB.
Lines 100 and 110	Input the center frequency and the frequency span.
Lines 120 and 130	Send the center frequency and the frequency span to the HP 8751A.
Lines 150 through 180	Query the center frequency and the frequency span.
Lines 190 and 200	Show the current center frequency and the frequency span.

Performing a Measurement Calibration

This section will demonstrate how to coordinate a measurement calibration by HP-IB control. The HP-IB program follows the key strokes required to calibrate from the front panel: there is a command for every step.

The general keystrokes sequence is to select the calibration, measure the calibration standards, and then declare the calibration done. The actual sequence depends on the calibration kit and changes slightly for 2-port calibrations, which are divided into three calibration sub-sequences.

Calibration Kits

The calibration kit tells the HP 8751A what standards to expect at each step of the calibration. The set of standards associated with a given calibration is termed a class. Refer to Appendix D for the relation between the calibration types and the standard classes.

For example, measuring the SHORT during a 1-port calibration is one calibration step. All of the SHORTs that can be used for this calibration step make up the class, which is called class $S_{11}B$. For the 7 mm calibration kits, class $S_{11}B$ has only one standard. For type-N calibration kits, class $S_{11}B$ has two standards: male and female SHORTs.

When doing a 1-port calibration using the 7 mm calibration kit by HP-IB, sending `CLASS11B` will automatically measure the SHORT. In type-N, sending `CLASS11B` brings up the menu with the male and female SHORT options. To select a standard, use `STANA` or `STANB`. The `STAN` command is appended with the letters A through G, corresponding to the standards list under softkeys 1 through 7, softkey 1 being the topmost softkey.

Each full 2-port calibration is divided into three sub-sequences: transmission, reflection, and isolation. Each sub-sequence is treated like a calibration in its own right; each must be opened, have all the standards measured, and then be declared done. The opening and closing statements for the transmission sub-sequence are `TRAN` and `TRAD`. The opening and closing statements for the reflection sub-sequence are `REFL` and `REFD`. The opening and closing statements for isolation are `ISOL` and `ISOD`.

Frequency Response Calibration

The following program does a response calibration using a THRU calibration device. This program simplifies the calibration for the operator by giving explicit directions on the computer's display.

```
100   !
110   ! Frequency Response Calibration
120   !
130   ASSIGN @Hp8751 TO 717 ! If you use iBASIC, replace "717" "800".
140   ABORT 7               ! If you use iBASIC, replace "7" with "8".
150   CLEAR 717
160   !
170   OUTPUT @Hp8751;"PRES"
180   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
190   INPUT "Enter center frequency (Hz).",F_cent
200   INPUT "Enter frequency span (Hz).",F_span
210   OUTPUT @Hp8751;"CENT ";F_cent  ! Set Center frequency
220   OUTPUT @Hp8751;"SPAN ";F_span  ! Set Span frequency
230   !
240   OUTPUT @Hp8751;"HOLD"     ! Sweep mode is HOLD
250   OUTPUT @Hp8751;"CALKN50"  ! Select 50ohms type-N Cal. kit
260   OUTPUT @Hp8751;"CALIRESP" ! Select Response cal.
270   INPUT "Connect THRU, then press [Return].",Dum$
280   ON INTR 7 GOTO Sweep_end  ! Define a branch when an interrupt occurs
290   OUTPUT @Hp8751;"CLES"     ! Clear all status register
300   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable STB and ESB
310 REPEAT                      ! Wait until all status register is clear
320   UNTIL SPOLL(@Hp8751)=0    ! Check STB
330   ENABLE INTR 7;2           ! Enable interrupt
340   OUTPUT @Hp8751;"STANE"    ! Measure THRU
350 Loop_top:  GOTO Loop_top    ! Wait until the meas. end
360 Sweep_end:!
370   !
380   OUTPUT @Hp8751;"RESPDONE" ! Calculating cal coefficient
390   OUTPUT @Hp8751;"*OPC?"    ! \ Wait until calculating ends
400   ENTER @Hp8751;Dum         ! /
410   OUTPUT @Hp8751;"CONT"     !
420   DISP "Response cal completed."
430   END
```

Figure 2-4. Sample Program: Frequency Response Calibration

Line 240	Set the trigger to the HOLD mode.
Line 250	Select the 50 Ω type-N calibration kit.
Line 260	Open the calibration by calling the response calibration.
Line 270	Ask for a THRU, and wait for the operator to connect it.
Line 290	Clear all status registers.

Line 340	Select and measures the THRU. There is more than one standard in this calibration, so you must identify the specific standard within this calibration. The THRU is the third softkey selection from the top in the menu, so use the STANC command to select THRU as the standard.
Lines 350	Wait for the standard to be measured.
Lines 380 through 400	Affirm completion of the calibration, and wait for calculation completion.
Line 410	Set the trigger to the CONTINUOUS mode.

1-Port Reflection Calibration

The following program does a 1-port calibration using the 50 Ω type-N calibration kit. The program assumes that the port being calibrated is a 50 Ω, type-N female test port. This program simplifies the calibration for the operator by giving explicit directions on the computer display.

```
10    !
20    ! 1-port Reflection Calibration
30    !
40    ASSIGN @Hp8751 TO 717 ! When iBASIC is used, replace "717" with "800".
50    ABORT 7               ! When iBASIC is used, replace "7" with "8".
60    CLEAR @Hp8751
70    !
80    OUTPUT @Hp8751;"PRES"
90    OUTPUT @Hp8751;"CHAN1; S21; LOGM"
100   INPUT "Enter center frequency (Hz).",F_cent
110   INPUT "Enter frequency span (Hz).",F_span
120   OUTPUT @Hp8751;"CENT ";F_cent
130   OUTPUT @Hp8751;"SPAN ";F_span
140   !
150   OUTPUT @Hp8751;"HOLD"     ! Sweep mode is HOLD
160   OUTPUT @Hp8751;"CALKN50"  ! 50 ohms type N cal kit
170   OUTPUT @Hp8751;"CALIS111" ! S11 cal
180   !
190   INPUT "Connect OPEN at port 1, then press [Return].",Dum$
200   OUTPUT @Hp8751;"CLASS11A" ! OPEN standard
220   Command$="STANA"          ! Female OPEN std. measurement
230   GOSUB Op_end              ! Measure std. and wait until measurement ends
240   OUTPUT @Hp8751;"DONE"     ! Complete meas. of OPEN std.
250   !
260   INPUT "Connect SHORT at port 1, then press [Return].",Dum$
270   OUTPUT @Hp8751;"CLASS11B" ! SHORT standard
290   Command$="STANA"          ! Female SHORT std. measurement
300   GOSUB Op_end              ! Measure std. and wait until measurement ends
310   OUTPUT @Hp8751;"DONE"     !
320   !
```

Figure 2-5. 1-Port Reflection Calibration (1/2)

```
330   INPUT "Connect LOAD at port 1, then press [Return].",Dum$
350   Command$="CLASS11C"  ! LOAD std. measurement
360   GOSUB Op_end         ! Measure std. and wait until measurement ends
370   !
380   OUTPUT @Hp8751;"SAV1"  ! Calculate cal coefficient
390   OUTPUT @Hp8751;"*OPC?" ! Wait until calculating ends
400   ENTER @Hp8751;Dum      !
410   OUTPUT @Hp8751;"CONT"  ! Sweep mode is CONT
420   DISP "1-port cal completed."
430   STOP
440   !
450 Op_end:!
460   ON INTR 7 GOTO Sweep_end ! Define a branch when an interrupt occurs.
470   OUTPUT @Hp8751;"CLES"    ! Clear status registers
480   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
490   REPEAT                   ! Wait until status registers are clear.
500   UNTIL SPOLL(@Hp8751)=0   ! Check STB
510   ENABLE INTR 7;2          ! Set enable interrupt
520   OUTPUT @Hp8751;Command$  ! Measure std
530 Loop_top:GOTO Loop_top     ! Wait until measurement end
540 Sweep_end:!
550   RETURN
560   END
```

Figure 2-5. 1-Port Reflection Calibration (2/2)

Line 170	Open the calibration by calling the S_{11} 1-port calibration.
Line 200	Select the OPEN standard.
Line 220	Select the female OPEN standard.
Line 230	Start measuring the standard and wait until the measurement ends.
Line 240	Complete the OPEN standard measurement.
Line 270	Select the SHORT standard.
Line 290	Select the female SHORT standard.
Line 310	Complete the SHORT standard measurement.
Line 350	Select the LOAD standard, and start measuring the standard.
Line 380	Save the calibration.
Line 410	Set the trigger to the CONTINUOUS mode.
Line 450 through 500	Start measuring a standard and wait until sweep ends.

Data Transfer from the HP 8751A to a Computer

Trace information can be read out of the HP 8751A in several ways. Data can be read off the trace selectively using the markers, or the entire trace can be read out.

Using Markers to Obtain Trace Data at Specific Points

If only specific information such as a single point off the trace or the result of a marker search is needed, the marker output command can be used to read the information.

Marker data is read out with the command OUTPMARK. This command causes the HP 8751A to transmit three numbers: marker value 1, marker value 2, and marker stimulus value. Refer to Table 2-1 for all the different possibilities for values one and two.

```
100   !
110   ! Using Markers to Obtain Trace Data at Specific Points
120   !
130   ASSIGN @Hp8751 TO 717 ! If you use iBASIC, replace "717" with "800".
140   ABORT 7               ! If you use iBASIC, replace "7" with "8".
150   CLEAR @Hp8751
160   !
170   OUTPUT @Hp8751;"PRES" ! Preset HP 8751A
180   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
190   INPUT "Enter center frequency (Hz).",F_cent
200   INPUT "Enter frequency span (Hz).",F_span
210   OUTPUT @Hp8751;"CENT ";F_cent
220   OUTPUT @Hp8751;"SPAN ";F_span
230   !
240   ON INTR 7 GOTO Sweep_end       ! Define branch when interrupt occurs
250   OUTPUT @Hp8751;"CLES"          ! Clear all status register
260   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
270   REPEAT                         ! Wait until status registers are clear
280   UNTIL SPOLL(@Hp8751)=0         ! Check STB
290   ENABLE INTR 7;2                ! Set enable interrupt
300   OUTPUT @Hp8751;"SING"          ! Sweep mode is SINGLE
310 Loop_top:GOTO Loop_top           ! Wait until sweep end
320 Sweep_end:  !
330   !
340   OUTPUT @Hp8751;"AUTO"       ! Auto scale
350   OUTPUT @Hp8751;"MARK1"      ! Marker 1 ON
360   OUTPUT @Hp8751;"SEAMAX"     ! Search MAX
370   OUTPUT @Hp8751;"OUTPMARK?"  ! Output marker value
380   ENTER @Hp8751;Val1,Val2,Stim
390   DISP "Min val:",Val1;"dB"
400   DISP "Stim:",Stim;"Hz"
410   END
```

Figure 2-6. Sample Program: Using Markers to Obtain Trace Data at Specific Points

Lines 240 through 320 Collect one sweep of data, and wait for completion.

Line 340 Bring the trace data in view on the HP 8751A's display.
Line 350 Activate marker 1.
Line 360 Have the HP 8751A search for the trace maximum.
Line 370 Output the marker values at that point.
Line 380 Read marker value 1, marker value 2, and the stimulus value.

Table 2-1. Units as a Function of Display Format

Display Format	Marker Mode	OUTPMARK value 1, value 2	OUTPFORM value 1, value 2	Marker Readout[1] value, aux value
LOG MAG		dB,[2]	dB,[2]	dB,[2]
PHASE		degrees,[2]	degrees,[2]	degrees,[2]
DELAY		seconds,[2]	seconds,[2]	seconds,[2]
SMITH	LIN MKR	lin mag, degrees	real, imag	lin mag, degrees
CHART	LOG MKR Re/Im R + jX G + jB	dB, degrees real, imag real, imag ohms real, imag Siemens	real, imag real, imag real, imag real, imag	dB, degrees real, imag real, imag ohms real, imag Siemens
POLAR	LIN MKR LOG MKR Re/Im	lin mag, degrees dB, degrees real, imag	real, imag real, imag real, imag	lin mag, degrees dB, degrees real, imag
LIN MAG		lin mag,[2]	lin mag,[2]	lin mag,[2]
REAL		real,[2]	real,[2]	real,[2]
SWR		SWR,[2]	SWR,[2]	SWR,[2]

1 The marker readout values are the marker values displayed in the upper left hand corner of the display. They also correspond to the value and aux value associated with the fixed marker.

2 Value not significant in this form, but is included in data transfers.

Trace Transfer

Getting trace data out of the HP 8751A with a 200/300 series computer can be broken down into three steps:

1. Setting up the receive array.
2. Telling the HP 8751A to transmit the data.
3. Accepting the transferred data.

Data inside the HP 8751A is always stored in pairs, to accommodate real/imaginary values, for each data point. Therefore, the receiving array has to be two elements wide, and as deep as the number of points being measured. The memory space for this array must be declared before any data is transferred from the HP 8751A to the computer.

Data Format. The HP 8751A can transmit data over HP-IB in four different formats. The type of format affects what kind of data array is declared (real or integer), since the format determines what type of data is transferred.

- Form 2

  IEEE 32-bit floating point format. In this mode, each number takes 4 bytes. This means that a 201 point transfer takes 1,608 bytes. Figure 2-7 shows the data transfer format of Form 2.

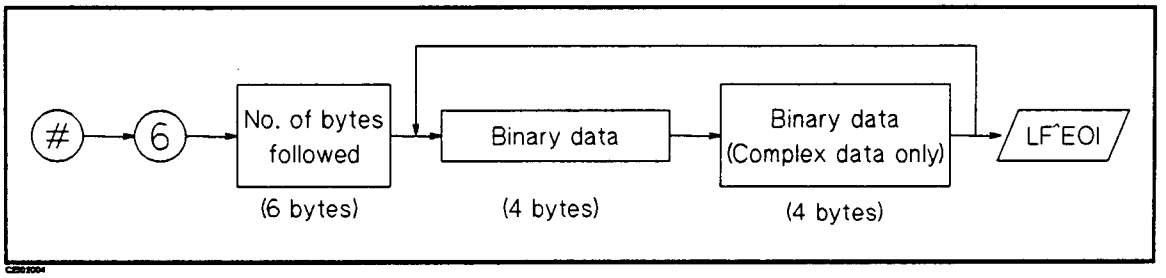


Figure 2-7. Form 2 Data Transfer Format

- Form 3

  IEEE 64-bit floating point format. In this mode, each number takes 8 bytes. This means that a 201-point transfer takes 3,216 bytes. Data is stored internally in the 200/300 series computer with the IEEE 64-bit floating point format, eliminating the need for any reformatting by the computer. Figure 2-8 shows the data transfer format of Form 3.

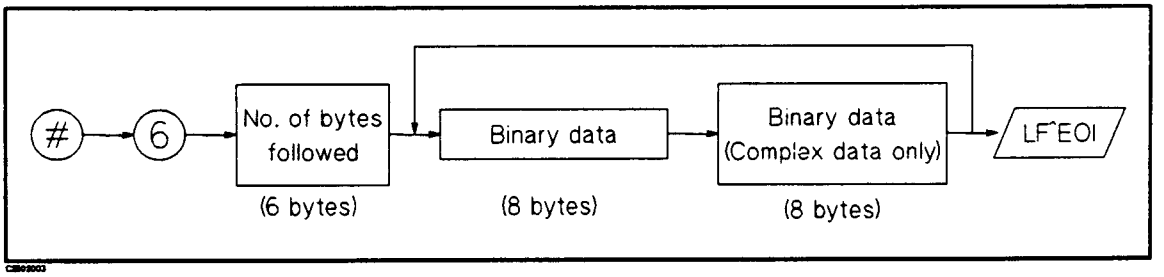


Figure 2-8. Form 3 Data Transfer Format

- Form 4

  ASCII data transfer format. In this mode, each number is sent as a 24 character string, each character being a digit, sign, or decimal point.

- Form 5

  MS-DOS® personal computer format. This mode is a modification of IEEE 32-bit floating point format with the byte order reversed. Form 5 also has a four byte header which must be read in so that data order is maintained. In this mode, an MS-DOS® PC can store data internally without reformatting it.

Data Levels. Different levels of data can be read out of the HP 8751A (Refer to Figure 2-9).

- Raw data

  The basic measurement data, reflecting the stimulus parameters, IF averaging, and IF bandwidth. If a full 2-port measurement calibration is ON, there are four raw arrays kept: one for each raw S-parameter. The data is read out with the commands `OUTPRAW{1-4}?`. Normally, only raw data array 1 is available, and it holds the current parameter. If a 2-port calibration is ON the four arrays S_{11}, S_{21}, S_{12}, and S_{22} are on, respectively. This data is in real/imaginary pairs.

- Error corrected data

  This is the raw data with error correction applied. The array is for the currently measured parameter, and is in real/imaginary pairs. The error corrected data is read out with `OUTPDATA?` or `OUTPDATAP?`. `OUTPMEMO?` or `OUTPMEMOP?` reads the trace memory if available, which is also error corrected. Neither raw nor error corrected data reflect such post-processing functions as electrical delay offset, or trace math.

- Unformatted data

  This is the array of the complex number pairs which will be converted into a scalar number in the next stage. The unformatted data is read out with `OUTPUFORM?`.

- Formatted data

  This is the array of data being displayed. It reflects all post-processing functions such as electrical delay, and the units of the array read out depends on the current display format. Refer to Table 2-1 for various units as a function of display format. The formatted data is read out with `OUTPFORM?`, `OUTPRFORM?`, `OUTPFORMP?`, `OUTPTMEM?`, `OUTPRTMEM?`, `OUTPTMEMP?`, `OUTPIFORM?`, `OUTPIRFORM?`, `OUTPITMEM?` or `OUTPIRTMEM?`.

- Calibration coefficients

  The results of a calibration are stored arrays of calibration coefficients which are used by the error correction routines. Each array corresponds to a specific error term in the error model. The calibration coefficients are read out with `OUTPCALC{01|12}?`.

Formatted data is generally the most useful, being the same information seen on the display. However, if post-processing is not necessary, as may be the case with smoothing, error corrected data is more desirable. Error corrected data also gives you the opportunity to load the data into the instrument and apply post-processing at a later time.

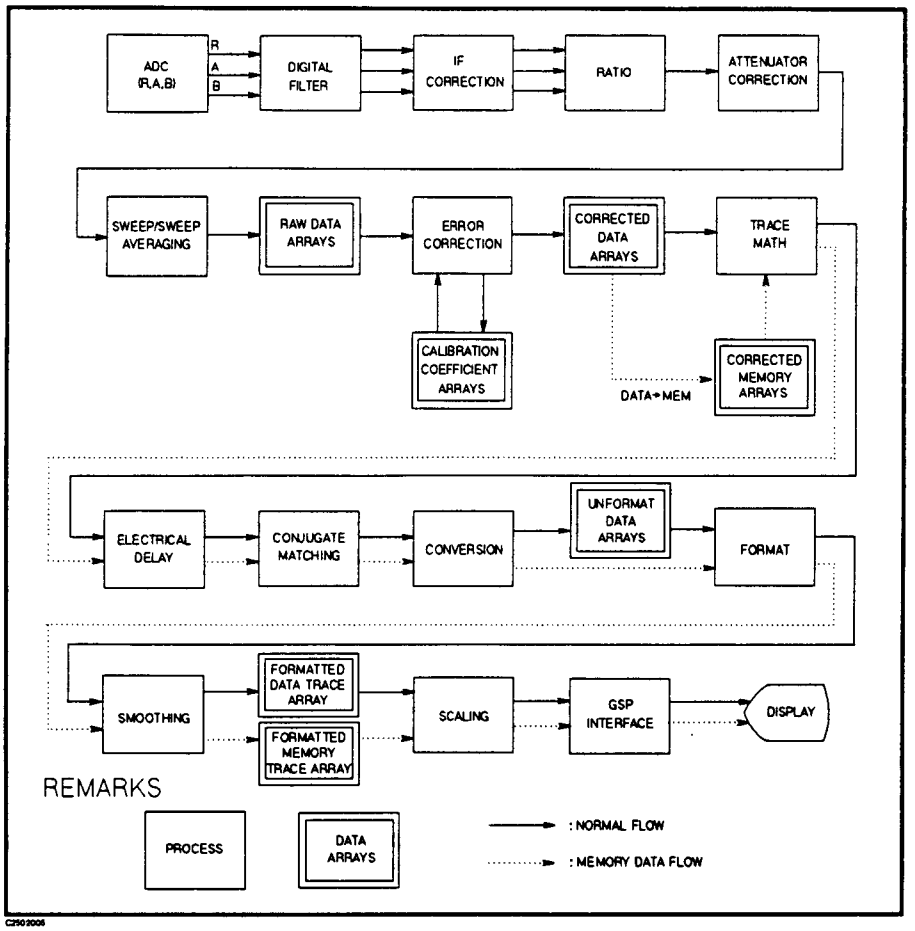


Figure 2-9. Data Processing Flow

Table 2-2. HP-IB Commands to Output Data Array

Data Output	Active Channel						Inactive Channel	
	RAW Data	Corrected Data		Unformatted Data	Formatted Data		Formatted Data	
		Data	Memory		Data Trace	Memory Trace	Data Trace	Memory Trace
Complex Data at All Points[1]	OUTPRAW1? OUTPRAW2? OUTPRAW3? OUTPRAW4?	OUTPDATA?	OUTPMEMO?	OUTPUFORM?	OUTPFROM?	OUTPTMEM?	OUTPPIFORM?	OUTPITMEM?
Complex Data at Specified Point[2]		OUTPDATAP?	OUTPMEMOP?		OUTPFORMP?	OUTPTMMP?		
Real Data at All Point[3]					OUTPRFORM?	OUTPRTMEM?	OUTPIRFORM?	OUTPIRTMEM?

1 Number of data output is two times of the Number Of Points (NOP).

2 Number of data output is two (a real part and an imaginary part).

3 Number of data output is equal to NOP.

Data Transfer Using ASCII Transfer Format (Form 4). When Form 4 is used, each number is sent as a 24 character string, each character being a digit, or decimal point.

```
10    !
20    ! Data Transfer Using ASCII Transfer Format
30    !
40    DIM Dat(1:201),Stim(1:201)
50    ASSIGN @Hp8751 TO 717  ! When iBASIC is used, replace "717" with "800".
60    ABORT 7                ! When iBASIC is used, replace "7" with "8".
70    CLEAR @Hp8751
80    !
90    OUTPUT @Hp8751;"PRES"             ! Preset HP 8751A
100   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
110   INPUT "Enter center frequency (Hz).",F_cent
120   INPUT "Enter frequency span (Hz).",F_span
130   OUTPUT @Hp8751;"CENT ";F_cent
140   OUTPUT @Hp8751;"SPAN ";F_span
150   !
160   ON INTR 7 GOTO Sweep_end       ! Define branch when interrupt occurs
161   OUTPUT @Hp8751;"CLES"          ! Clear status registers
163   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
164   REPEAT                         ! Wait until status registers are clear
165   UNTIL SPOLL(@Hp8751)=0         ! Check STB
166   ENABLE INTR 7;2                ! Set enable interrupt
170   OUTPUT @Hp8751;"SING"          ! Sweep mode is SINGLE
180 Loop_top:GOTO Loop_top           ! Wait until sweep end
190 Sweep_end:           !
220   !
230   OUTPUT @Hp8751;"POIN?"      ! Query NOP
240   ENTER @Hp8751;Nop
260   OUTPUT @Hp8751;"FORM4"      ! Set ASCII Transfer Format
270   !
280   OUTPUT @Hp8751;"OUTPRFORM?" ! Real part of the formatted trace data
290   ENTER @Hp8751;Dat(*)
300   !
310   OUTPUT @Hp8751;"OUTPSTIM?"  ! Stimulus data
320   ENTER @Hp8751;Stim(*)
330   !
340   FOR I=1 TO Nop
350     PRINT Stim(I);"Hz",Dat(I);"dB"
360   NEXT I
380   END
```

Figure 2-10. Sample Program: Data Transfer using ASCII Transfer Format (Form 4)

Lines 230 and 240	Find out how many points to expect.
Line 260	Tell the HP 8751A to use the ASCII transfer format.
Line 280	Request the real part of the formatted trace data.

Line 290	Transfer the data from the HP 8751A to the computer, and put it in the receiving array `Dat(*)`.
Lines 310 and 320	Request and transfer the stimulus data.

Data Transfer using IEEE 64-bit Floating Point Format (Form 3). To use Form 3, the computer is told to stop formatting the incoming data with the ENTER statement. This is done by defining an I/O path with formatting OFF. Form 3 also has an eight-byte header to deal with. The first two bytes are the ASCII characters "#6" that indicate that a fixed length block transfer follows, and the next 6 bytes form an integer containing number of bytes in the block to follow. The header must be read in so that data order is maintained.

```
10    !
20    ! Data Transfer Using IEEE 64-bit Floating Point Format
30    !
40    DIM Dat(1:201),Stim(1:201)
50    ASSIGN @Hp8751 TO 717 ! When iBASIC is used,, replace "717" with "800".
60    ABORT 7               ! When iBASIC is used, replace "7" to "8".
70    CLEAR @Hp8751         ! When iBASIC is used,, replace "717" with "800".
80    !
90    OUTPUT @Hp8751;"PRES"            ! Preset HP 8751A
100   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
110   INPUT "Enter center frequency (Hz)",F_cent
120   INPUT "Enter frequency span (Hz)",F_span
130   OUTPUT @Hp8751;"CENT ";F_cent
140   OUTPUT @Hp8751;"SPAN ";F_span
150   !
160   ON INTR 7 GOTO Sweep_end ! Define branch when interrupt occurs
170   OUTPUT @Hp8751;"CLES"    ! Clear all status register
180   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
190   REPEAT                   ! Wait until status registers are clear.
200   UNTIL SPOLL(@Hp8751)=0   ! Check STB
210   ENABLE INTR 7;2          ! Set enable interrupt
220   OUTPUT @Hp8751;"SING"    ! Sweep mode is SINGLE
230 Loop_top:GOTO Loop_top     ! Wait until measurement ends
240 Sweep_end:                 !
250   !
260   OUTPUT @Hp8751;"POIN?"   ! Query NOP
270   ENTER @Hp8751;Nop
280   OUTPUT @Hp8751;"FORM3"       ! IEEE 64-bit Floating Point Format
290   ASSIGN @Dt TO 717;FORMAT OFF ! Define a data I/O path
300                                ! If iBASIC is used, change 717 to 800.
310   OUTPUT @Hp8751;"OUTPRFORM?"  ! Real part of formatted data trace
320   ENTER @Dt USING "#,8A";A$    ! Enter header
330   ENTER @Dt;Dat(*)             ! Enter data
340   ENTER @Dt USING "#,1A";B$    ! Enter terminator
350   !
360   OUTPUT @Hp8751;"OUTPSTIM?"   ! Stimulus data
370   ENTER @Dt USING "#,8A";A$    ! Enter header
380   ENTER @Dt;Stim(*)            ! Enter data
```

Figure 2-11. Sample Program: Data Transfer using IEEE 64-bit Floating Point Format (Form 3) (1/2)

```
390   ENTER @Dt USING "#,1A";B$     ! Enter terminator
400   !
410   ASSIGN @Dt TO *               ! Clear I/O path
420   FOR I=1 TO Nop
430     PRINT Stim(I);"Hz",Dat(I);"dB"
440   NEXT I
450   END
```

Figure 2-11.
Sample Program: Data Transfer using IEEE 64-bit Floating Point Format (Form 3) (2/2)

Line 280	Tell the HP 8751A to output data using Format 3.
Line 290	Define a data I/O path with ASCII formatting OFF. The I/O path points to the HP 8751A, and can be used to read or write data to the HP 8751A, as long as that data is in binary rather than ASCII format.
Line 320	Enter the header.
Line 330	Enter the data.
Line 340	Enter the terminator.
Line 410	Close the I/O path.

Application Example

The following example measures the transmission parameter of a bandpass filter and obtains the typical parameters: −3 dB bandwidth, Center frequency, and Insertion loss.

```
10    !
20    ! Bandpass Filter Test
30    !
40    ASSIGN @Hp8751 TO 717 ! When iBASIC is used, replace "717" with "800".
50    ABORT 7               ! When iBASIC is used, replace "7" to "8".
60    CLEAR @Hp8751
70    !
80    OUTPUT @Hp8751;"PRES" ! Preset HP 8751A
90    OUTPUT @Hp8751;"CHAN1; S21; LOGM" ! Set up measurement parameters
100   INPUT "Enter center frequency (Hz).",F_cent
110   INPUT "Enter frequency span (Hz).",F_span
120   OUTPUT @Hp8751;"CENT ";F_cent
130   OUTPUT @Hp8751;"SPAN ";F_span
140   !
150   OUTPUT @Hp8751;"HOLD"       ! Perform cal measurement
160   OUTPUT @Hp8751;"CALKN50"
170   OUTPUT @Hp8751;"CALIRESP"
180   INPUT "Connect THRU, then press [Return].",Dum$
200   Command$="STANC"
210   GOSUB Op_end
220   OUTPUT @Hp8751;"RESPDONE"
230   INPUT "Cal completed. Connect DUT, then press [Return].",Dum$
240   !
250   OUTPUT @Hp8751;"CLES"       ! Clear all status register
260   Command$="SING"             ! Trigger a sweep
270   GOSUB Op_end                ! Wait until sweep ends
280   !
290   OUTPUT @Hp8751;"MARK1"      ! Marker 1 ON
300   OUTPUT @Hp8751;"SEAMAX"     ! Search MAX.
310   OUTPUT @Hp8751;"OUTPMARK?"  ! Query marker value
320   ENTER @Hp8751;Loss
330   !
340   OUTPUT @Hp8751;"DELR1"      ! Select MKR1 as delta ref. marker
350   OUTPUT @Hp8751;"WIDV -3"    ! Width value is -3
360   OUTPUT @Hp8751;"WIDTON"     ! Width ON
370   OUTPUT @Hp8751;"OUTPMWID?"  ! Query width parameters
380   ENTER @Hp8751;Bw,Cent,Q
390   !
```

Figure 2-12. Sample Program: Application Example (Bandpass Filter Test) (1/2)

```
400   PRINT "-3dB bandwidth= ",Bw;"Hz"
410   PRINT "Center frequency= ",Cent;"Hz"
420   PRINT "Insertion loss= ",Loss;"dB"
430   STOP
440   !
450 Op_end:!
460   ON INTR 7 GOTO Sweep_end ! Define a branch when an interrupt occurs.
470   OUTPUT @Hp8751;"CLES"    ! Clear status registers
480   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
490   REPEAT                   ! Wait until status registers are clear.
500   UNTIL SPOLL(@Hp8751)=0   ! Check STB
510   ENABLE INTR 7;2          ! Set enable interrupt
520   OUTPUT @Hp8751;Command$  ! Measure std
530 Loop_top:GOTO Loop_top     ! Wait until measurement end
540 Sweep_end:!
550   RETURN
510   END
```

Figure 2-12. Sample Program: Application Example (Bandpass Filter Test) (2/2)

Lines 80 through 130	Set up measurement.
Lines 150 through 230	Do a response calibration.
Lines 250 through 270	Collect one sweep of data.
Lines 290 through 320	Get the insertion loss value using the marker search function.
Lines 340 through 380	Take the −3 dB bandwidth value and the center frequency value using the bandwidth search function.

Advanced Programming Examples

Using List Frequency Mode

The list frequency mode lets you select the specific points or frequency spacing between points at which measurements are to be made. Sampling specific points reduces the measurement time since additional time is not spent measuring device characteristics at unnecessary frequencies.

This example shows how to create a list frequency table and send it to the HP 8751A. The command sequence for entering a list frequency table imitates the key sequence followed when entering a table from the front panel: there is a command for every key press. Editing a segment is also the same as the key sequence, but the HP 8751A automatically reorders each edited segment in order of increasing start frequency.

This example takes advantage of the computer's capabilities to simplify creating and editing the table. The table is entered and completely edited before being transmitted to the HP 8751A. To simplify the programming task, options such as entering step size are not included.

```
10    !
20    ! Using List Frequency Mode
30    !
40    DIM Table(1:31,1:3)
50    ASSIGN @Hp8751 TO 717 ! When iBASIC is used, change "717" to "800".
60    ABORT 7               ! When iBASIC is used, change "7" to "8".
70    CLEAR @Hp8751
80    !
90    INPUT "Number of segments?",Numb
100   !
110   PRINTER IS CRT
120   CLEAR SCREEN
130   PRINT USING "10A,10A,10A,20A";"Segment","Start(Hz)","Stop(Hz)",
      "Number of points"
140   !
150   FOR I=1 TO Numb
160     GOSUB Loadpoin
170   NEXT I
180   !
190   LOOP
200     INPUT "Do you want to edit? (Y/N)",An$
210   EXIT IF An$="N" OR An$="n"
220     INPUT "Segment Number?",I
230     GOSUB Loadpoin
240   END LOOP
250   !
260   OUTPUT @Hp8751;"PRES"           ! Preset HP 8751A
270   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
```

Figure 2-13. Sample Program: Using List Frequency Mode (1/2)

```
280   !
290   OUTPUT @Hp8751;"EDITLIST"       ! Freq. List Edit mode
300   OUTPUT @Hp8751;"CLEL"           ! Clear list
310   FOR I=1 TO Numb
320     OUTPUT @Hp8751;"SADD"               ! Add new segment
330     OUTPUT @Hp8751;"STAR ";Table(I,1)  ! Start freq. of segment
340     OUTPUT @Hp8751;"STOP ";Table(I,2)  ! Stop freq. of segment
350     OUTPUT @Hp8751;"POIN ";Table(I,3)  ! Number of points
360     OUTPUT @Hp8751;"SDON"              ! Complete editing segment
370   NEXT I
380   OUTPUT @Hp8751;"EDITDONE"      ! Complete editing list
390   OUTPUT @Hp8751;"LISFREQ"       ! List freq. mode ON
400   OUTPUT @Hp8751;"LISDOBASE"     ! List Display Order Base
410   !
420   ON INTR 7 GOTO Sweep_end       ! Define branch when interrupt occurs
430   OUTPUT @Hp8751;"CLES"          ! Clear all status registers
440   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
450   REPEAT                         ! Wait until status registers are clear
460   UNTIL SPOLL(@Hp8751)=0         ! Check STB
470   ENABLE INTR 7;2
480   OUTPUT @Hp8751;"SING"          ! Trigger a sweep
490 Loop_top:GOTO Loop_top
500 Sweep_end:           !
510                      !
520   OUTPUT @Hp8751;"AUTO"          ! Auto scale
530   STOP
540   !
550 Loadpoin:   !
560   INPUT "Enter start frequency (Hz)",Table(I,1)
570   INPUT "Enter stop frequency (Hz)",Table(I,2)
580   INPUT "Enter number of points",Table(I,3)
590   IF Table(I,3)=1 THEN Table(I,2)=Table(I,1)
600   PRINT TABXY(0,I+1);I;TAB(10);Table(I,1);TAB(20);Table(I,2);
      TAB(35);Table(I,3)
610   RETURN
620   END
```

Figure 2-13. Sample Program: Using List Frequency Mode (2/2)

Line 90	Find out how many segments to expect.
Lines 110 through 130	Clear the screen and print the table header.
Lines 150 through 170	Read in each segment.
Lines 190 through 240	Edit the table until editing is no longer needed.
Line 290	Activate the frequency list edit mode, and open the list frequency table for editing.
Line 300	Delete any existing segments.
Lines 310 through 370	Enter the segment values.
Line 380	Close the table.
Line 390	Turn on the list frequency mode.

Line 400	Display the trace for only the listed frequency ranges.
Lines 550 through 610	Enter in a segment.
Lines 560 through 580	Enter the segment values.
Line 570	Set the stop frequency equal to the start frequency to avoid ambiguity, if only one point is in the segment.
Line 600	Print the segment out.

Using Limit Lines to Perform Limit Testing

This example shows how to create a limit table and send it to the HP 8751A. The command sequence for entering a limit table imitates the key sequence followed when entering a table from the front panel: there is a command for every key press. Editing a limit is also the same as the key sequence, but remember that the HP 8751A automatically reorders the table in order of increasing start frequency.

This example takes advantage of the computer's capabilities to simplify creating and editing the table. The table is entered and completely edited before being transmitted to the HP 8751A. To simplify the programming task, options such as entering offsets are not included.

```
10    !
20    ! Setting Up Limit Lines
30    !
40    DIM Table(1:31,1:3)
50    ASSIGN @Hp8751 TO 717 ! When iBASIC is used, replace "717" with "800".
60    ABORT 7               ! When iBASIC is used, replace "7" to "8".
70    CLEAR @Hp8751
80    !
90    OUTPUT @Hp8751;"PRES"   ! Preset HP 8751A
100   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
110   OUTPUT @Hp8751;"SING"   ! Sweep mode is SINGLE
120   INPUT "Enter start frequency (Hz)",F_start
130   INPUT "Enter stop frequency (Hz)",F_stop
140   OUTPUT @Hp8751;"STAR ";F_start
150   OUTPUT @Hp8751;"STOP ";F_stop
160   !
170   INPUT "Number of limits?",Numb
180   !
190   PRINTER IS 1
200   CLEAR SCREEN
210   PRINT USING "10A,15A,15A,15A";"Segment","Stimulus(Hz)",
      "Upper(dB)","Lower(dB)"
220   !
230   FOR I=1 TO Numb
240     GOSUB Loadlimit
250   NEXT I
260   !
270   LOOP
280     INPUT "Do you want to edit? (Y/N)",An$
290   EXIT IF An$="N" OR An$="n"
300     INPUT "Segment Number?",I
310     GOSUB Loadlimit
320   END LOOP
330   !
```

Figure 2-14. Sample Program: Setting up Limit Lines (1/2)

```
340   OUTPUT @Hp8751;"EDITLIML"      ! Edit limit line table
350   OUTPUT @Hp8751;"LIMCLEL"       ! Delete limit table
360   FOR I=1 TO Numb
370     OUTPUT @Hp8751;"LIMSADD"          ! Add segment
380     OUTPUT @Hp8751;"LIMS ";Table(I,1) ! Stimulus break point
390     OUTPUT @Hp8751;"LIMU ";Table(I,2) ! Upper limit value
400     OUTPUT @Hp8751;"LIML ";Table(I,3) ! Lower limit value
410     OUTPUT @Hp8751;"LIMSDON"          ! Complete editing segment
420   NEXT I
430   !
440   OUTPUT @Hp8751;"LIMEDONE"   ! Complete editing limit table
450   OUTPUT @Hp8751;"LIMILINEON" ! Display limit line
460   OUTPUT @Hp8751;"LIMITESTON" ! Limit test ON
470   ON INTR 7 GOTO Sweep_end    ! Define branch when interrupt occurs
480   OUTPUT @Hp8751;"CLES"       ! Clear all status register
490   OUTPUT @Hp8751;"*SRE 4;ESNB 1" ! Set enable bits of STB and ESB
500   REPEAT                      ! Wait until status registers are clear
510   UNTIL SPOLL(@Hp8751)=0      ! Check STB
520   ENABLE INTR 7;2             ! Set enable interrupt
530   OUTPUT @Hp8751;"SING"       ! Trigger a sweep
540 Loop_top:  GOTO Loop_top
550 Sweep_end:                    !
560                               !
570   OUTPUT @Hp8751;"OUTPFAIP?"  ! Ask number of fail point
580   ENTER @Hp8751;Result        ! Enter number of fail point
590   IF Result=0 THEN
600      PRINT "PASS"
610   ELSE
620      PRINT "FAIL"
630   END IF
640   STOP
650   !
660 Loadlimit:!
670   INPUT "Enter stimulus value (Hz)",Table(I,1)
680   INPUT "Enter upper limit value (dB)",Table(I,2)
690   INPUT "Enter lower limit value (dB)",Table(I,3)
700   PRINT TABXY(0,I+1);I;TAB(11);Table(I,1);TAB(27);Table(I,2)
      ;TAB(42);Table(I,3)
710   RETURN
720   END
```

Figure 2-14. Sample Program: Setting up Limit Lines (2/2)

Line 40	Create a table to hold the limit values. It will contain the stimulus value (frequency), the upper limit value, and the lower limit value.
Line 170	Find out how many limits to expect.
Lines 190 through 210	Clear the screen and print the table header.
Lines 230 through 250	Read in each segment.
Lines 270 through 320	Edit the table until editing is no longer needed.

Line 340	Begin editing the limit line table.
Line 350	Delete any existing limits.
Lines 360 through 420	Enter the segment values.
Line 440	Close the table.
Line 450	Display the limits.
Line 460	Activate the limit testing.
Lines 570 through 630	Detect result of the test and display PASS or FAIL.
Lines 660 through 710	Enter a segment.

Storing and Recalling Instrument States

This example demonstrates ways of storing and recalling entire instrument states using HP-IB.

Coordinating disk storage

This example shows how to save and recall the instrument STATES from the disk installed in the built-in disk drive.

```
10    !
20    ! Storing Instrument States
30    !
40    DIM Err$[50]
50    ASSIGN @Hp8751 TO 717 ! When iBASIC is used, replace "717" with "800".
60    ABORT 7               ! When iBASIC is used, replace "7" to "8".
70    CLEAR @Hp8751
80    OUTPUT @Hp8751;"*CLS"
90    OUTPUT @Hp8751;"PRES" ! Preset HP 8751A
100   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
110   INPUT "Enter center frequency (Hz).",F_cent
120   INPUT "Enter frequency span (Hz).",F_span
130   OUTPUT @Hp8751;"CENT ";F_cent
140   OUTPUT @Hp8751;"SPAN ";F_span
150   !
160   INPUT "File name? (up to 8 char.)",Name$
161   OUTPUT @Hp8751;"STODDISK"               ! Storage device is DISK
170   OUTPUT @Hp8751;"SAVDSTA """;Name$;""";" ! Save Instrument states
180   OUTPUT @Hp8751;"*OPC?"
190   ENTER @Hp8751;Dum
200   OUTPUT @Hp8751;"OUTPERRO?"
210   ENTER @Hp8751;Err,Err$
220   IF Err THEN
230     PRINT "Error occurred."
240     PRINT Err$
250     STOP
260   ELSE
270     INPUT "Save done. Press [Return] to recall.",Dum$
280   END IF
290   !
300   OUTPUT @Hp8751;"PRES"
310   OUTPUT @Hp8751;"RECD """;Name$;"_S""" ! Recall instrument state
315         ! If DOS format disk is used, replace "_S" with ".STA".
320   OUTPUT @Hp8751;"*OPC?"
330   ENTER @Hp8751;Dum
340   DISP "Done."
350   END
```

Figure 2-15. Sample Program: Storing Instrument States

Line 160	Get the name of the file to be created.
Line 170	Save the instrument states and the calibration coefficients with the file name. The file name must be preceded and followed by double quotation marks, and the only way to do that with an OUTPUT statement is to use two sets of quotation marks: "".
Lines 180 and 190	Wait for completion of the save operation.
Lines 200 and 210	Determine whether or not an error occurred.
Lines 220 through 280	If an error is detected, print the error number and the error message. If an error is not detected, prompt the user to continue the program.
Line 310	Add the extension to the file name and recall the file.

Reading Calibration Data

This example demonstrates how to read measurement calibration data out of the HP 8751A, and how to return the data to the HP 8751A.

The data used to perform measurement error correction is stored inside the HP 8751A in up to twelve calibration coefficient arrays. Each array stores a specific error coefficient, and is stored and transmitted as an error corrected data array: each point is a real/imaginary pair, and the number of points in the array is the same as the number of points in the sweep. The four data formats also apply to the transfer of calibration coefficient arrays. Appendix D specifies where the calibration coefficients are stored for different calibration types.

A computer can read out the error coefficients using the `OUTPCALC{01-12}` commands. Each calibration type uses only as many arrays as needed, starting with array 1. Therefore, it is necessary to know the type of calibration about to be read out: attempting to read an array not being used in the current calibration causes the "REQUESTED DATA NOT CURRENTLY AVAILABLE" warning to be displayed.

A computer can also store calibration coefficients in the HP 8751A. To do this, declare the type of calibration data about to be stored in the HP 8751A just as if you were about to perform that calibration. Then, instead of calling up different classes, transfer the calibration coefficients using the `INPUCALC{01-12}` commands. When all the coefficients are in the HP 8751A, activate the calibration by issuing the command `SAVC`, to have the HP 8751A take a sweep measurement.

This example reads the response calibration coefficients into a very large array, from which they can be examined, modified, stored, or returned to the HP 8751A.

```
10    !
20    ! Reading Calibration Data
30    !
40    DIM Dat(1:201,1:2)
50    DIM Head$[6]
60    ASSIGN @Hp8751 TO 717  ! When iBASIC is used, replace "717" with "800".
70    ABORT 7     ! When iBASIC is used, replace "7" to "8".
80    CLEAR @Hp8751
90    !
100   INPUT "Connect THRU and press [Return] to do cal.",Dum$
110   GOSUB Setup
120   GOSUB Cal
130   OUTPUT @Hp8751;"SAVC"    ! Re-draw trace
140   OUTPUT @Hp8751;"POIN?"   ! Ask Number of points
150   ENTER @Hp8751;Nop        ! Enter NOP
170   !
180   INPUT "Press [Return] to transmit cal data.",Dum$
190   ASSIGN @Dt TO 717;FORMAT OFF  ! Set data I/O path
200   OUTPUT @Hp8751;"FORM3"        ! IEEE 64-bit Floating Point Format
210   OUTPUT @Hp8751;"OUTPCALC01?"  ! Query calibration array
220   ENTER @Dt USING "#,8A";A$     ! Enter header
230   ENTER @Dt;Dat(*)              ! Enter data
240   ENTER @Dt USING "#,1A";B$     ! Enter terminator
250   INPUT "Transmit done. Disconnect THRU and press [Return].",Dum$
260   !
270   GOSUB Setup
280   GOSUB Cal
290   OUTPUT @Hp8751;"SAVC"         ! Re-draw trace
300   !
310   INPUT "Press [Return] to retransmit cal data.",Dum$
320   V$=VAL$(Nop*2*8)
330   Numv=LEN(V$)
340   Head$="000000"                ! Initialize header value
350   FOR I=1 TO Numv
360     Head$[7-I,7-I]=V$[Numv-I+1,Numv-I+1]
370   NEXT I
380   !
390   OUTPUT @Hp8751;"INPUCALC01 ";       ! Store cal data by HP-IB
400   OUTPUT @Dt USING "#,8A";"#6"&Head$ ! Send header
410   OUTPUT @Dt;Dat(*),END               ! Send data
420   OUTPUT @Hp8751;"SAVC"               ! Re-draw trace
430   !
440   ASSIGN @Dt TO *                     ! Clear I/O path
460   DISP "Retransmit completed. Connect DUT."
470   OUTPUT @Hp8751;"CONT"               ! Sweep mode is CONT
480   STOP
490   !
```

Figure 2-16. Reading Calibration Data (1/2)

```
500 Setup:  !
510   F_cent=7.E+7
520   F_span=200000.
530   OUTPUT @Hp8751;"PRES;"
540   OUTPUT @Hp8751;"CHAN1; S21; LOGM"
550   OUTPUT @Hp8751;"CENT ";F_cent
560   OUTPUT @Hp8751;"SPAN ";F_span
570   OUTPUT @Hp8751;"SING"
580   RETURN
590   !
600 Cal:  !
620   OUTPUT @Hp8751;"CALIRESP"
630   ON INTR 7 GOTO Sweep_end
640   OUTPUT @Hp8751;"CLES"
650   OUTPUT @Hp8751;"*SRE 4;ESNB 1"
660   REPEAT
670   UNTIL SPOLL(@Hp8751)=0
680   ENABLE INTR 7;2
690   OUTPUT @Hp8751;"STANC"
700 Loop_top:GOTO Loop_top
710 Sweep_end:          !
720   !
730   OUTPUT @Hp8751;"RESPDONE"
740   OUTPUT @Hp8751;"*OPC?"
750   ENTER @Hp8751;Dum
760   RETURN
770   END
```

Figure 2-16. Reading Calibration Data (2/2)

Line 50	Declare the dimension part of the file header.
Line 110	Preset and set up the HP 8751A, and hold the trigger.
Line 120	Perform a response calibration.
Line 130	Re-draw the trace with the calibration data.
Line 210	Request outputting the calibration data.
Line 220	Enter the file header.
Line 230	Enter the calibration data.
Line 240	Enter the file terminator.
Line 280	Perform the calibration to set the correction ON.
Line 320	Calculate the number of bytes transferred, and represents it in the string format.
Line 330	Count the number of characters in the string which contains the number of bytes transferred.
Line 340	Enter 0 as the initial value in all header arrays.
Line 350 through 370	Place the number of bytes transferred to the header array digit by digit from the sixth array to the first array of the header.
Line 390 through 410	Send the file header and calibration data.

Miscellaneous Programming Examples

Controlling Peripherals

The purpose of this section is to demonstrate how to coordinate printers or plotters with the HP 8751A.

The HP 8751A has two operating modes with respect to HP-IB, as set under the (LOCAL) menu: System controller mode and Addressable only mode. The system controller mode is used when no controller is present. The addressable only mode is how a computer can control the HP 8751A and passes active control to the HP 8751A so that the HP 8751A can plot or print.

Note that the HP 8751A assumes that the address of the computer is correctly stored in its HP-IB addresses menu under the `ADDRESS: CONTROLLER` entry. If this address is incorrect, control will not return to the computer.

If the HP 8751A is in Addressable only mode and receives a command telling it to plot or print, it sets bit 1 in the event status register to indicate that it needs control of the bus. If the computer then uses the HP-IB control command to pass control to the HP 8751A, the HP 8751A will take control of the bus, and access the peripheral. When the HP 8751A no longer needs control, it will pass it back to the computer.

Control should not be passed to the HP 8751A before it has set event status register bit 1, Request Active Control. If the HP 8751A receives control before the bit is set, control is passed immediately back.

While the HP 8751A has control, it is free to address devices to talk and listen as needed. The only functions denied it are the ability to assert the interface clear line (IFC), and remote line (REN). These are reserved for the system controller. As active controller, the HP 8751A can send messages to and read replies back from printers and plotters.

This example prints the display.

```
10    !
20    ! Controlling Peripherals
30    !
40    DIM Err$[100]
50    ASSIGN 717 TO @Hp8751  !
60    !
70    OUTPUT @Hp8751;"*CLS"    ! Clear status reporting system
80    OUTPUT @Hp8751;"*ESE 2" ! Enable Request Active Control bit of ESE
90    !
100   OUTPUT @Hp8751;"PRINALL"
110   REPEAT
120     Stat=SPOLL(@Hp8751)
130   UNTIL BIT(Stat,5)
140   !
150   PASS CONTROL @Hp8751    ! Pass active control to HP 8751
160   DISP "Printing."
170   REPEAT
180     STATUS 7,6;Hpib
190   UNTIL BIT(Hpib,6)
200   DISP "Done."
205   ABORT 7                  ! Return active control to system controller
210   !
220   OUTPUT @Hp8751;"OUTPERRO?"
230   ENTER @Hp8751;Err,Err$
240   IF Err THEN DISP Err$
250   END
```

Figure 2-17. Sample Program: Controlling Peripherals

Line 70	Clear the status reporting system.
Line 80	Enable the Request Active Control bit in the event status register.
Line 100	Request printing.
Lines 110 through 130	Wait until the HP 8751A requests control.
Line 150	Pass active control to the HP 8751A.
Line 170 through 190	Wait until the print is finished and control is returned.
Line 205	Return active control to the system controller.
Line 220 through 240	If an error occurred, print the error number and the error message.

Transferring disk data files

The built-in disk drive is often used to store data files in addition to instrument states. The file name is then appended with two characters to indicate what is in the file. "_D" indicates the file contains the internal data array using the SAVE DATA ONLY or the SAVDDAT command. Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for the file structure.

This example demonstrates how to recall a data file stored by the built-in disk drive into a computer using the disk drive connected to the computer.

Before running the program, store the data to the disk installed in the built-in disk drive, remove the disk, and put the disk in to the computer's disk drive.

```
10    !
20    ! Transferring Disk Data Files
30    !
50    INTEGER Nop
60    DIM Sw$(1:7)[8],Numseg(1:7)
70    DATA "Raw",8,"Cal",24,"Data",2,"Mem",2,"Unform",2,"Trace",2
      ,"Tracemem",2
80    !
90    INPUT "File name (with extension)?",File$
100   ASSIGN @Path TO File$
110   ENTER @Path USING "6X,#"
120   Numdat=0
130   PRINT "Data contained:"
140   FOR I=1 TO 7
150     READ Dat$,Num
160     GOSUB Datasw
170   NEXT I
180   PRINT
190   ENTER @Path USING "4X,#"
200   !
210   INPUT "Press [Return] to read data.",Dum$
220   FOR J=1 TO Numdat
230     FOR I=1 TO Numseg(J)
240       PRINT Sw$(J);I
250       GOSUB Dataseg
260       PRINT
270     NEXT I
280     PRINT
290     IF JNumdat THEN INPUT "Press [Return] to read next data.",Dum$
300   NEXT J
310   ASSIGN @Path TO *
320   STOP
330   !
```

Figure 2-18. Sample Program: Transferring Disk Data Files

```
340 Dataseg:  !
350   ENTER @Path;Nop
360   ENTER @Path USING "4X,#"
370   FOR K=1 TO Nop
380     ENTER @Path;X,Y
390     PRINT K,X,Y
400   NEXT K
410   ENTER @Path USING "4X,#"
420   RETURN
430   !
440 Datasw:  !
450   ENTER @Path USING "B,#";Sw
460   IF Sw THEN
470     Numdat=Numdat+1
480     Sw$(Numdat)=Dat$
490     Numseg(Numdat)=Num
500     PRINT Sw$(Numdat)
510   END IF
520   RETURN
530   END
```

Figure 2-18. Sample Program: Transferring Disk Data Files (2/2)

Lines 50 and 60	Set up the data of possible data groups.
Line 90	Get the file name to load. The file name must be included the extension: "_D"(for LIF) or .DAT(for DOS).
Line 100	Define an I/O path which points to the chosen file.
Line 110	Enter bytes for internal use only.
Line 120 through 170	Read the data switches and examine the data contained.
Line 190	Enter bytes of internal use only.
Line 220 through 300	Enter a data group.
Line 230 through 270	Enter a data segment.
Line 310	Close the I/O path.
Lines 340 through 420	Read a data switch.
Lines 440 through 520	Enter a data segment.
Line 450	Enter the number of data bytes which follow.
Line 460	Enter bytes of internal use only.
Lines 470 through 500	Read the data.
Line 510	Enter the bytes of internal use only.

Status Reporting

The HP 8751A has a status reporting mechanism that gives information about specific functions and events inside the HP 8751A. The status byte is an 8-bit register with each bit summarizing the state of one aspect of the HP 8751A. For example, the error queue summary bit will always be set if there are any errors in the queue. The value of the status byte can be read with the SPOLL statement. This command does not automatically put the HP 8751A into the remote mode, thus giving the operator access to the HP 8751A front panel functions. Reading the status byte does not affect its value. The sequencing bit can be set by the operator during execution of a test sequence.

The status byte also summarizes two event status registers and one operational status register that monitor specific conditions inside the HP 8751A. The status byte also has a bit that is set when the HP 8751A is issuing a service request over HP-IB, and a bit that is set when the HP 8751A has data to send out over HP-IB. Refer to Appendix B for a definition of the status registers.

The error queue holds up to 20 instrument errors and warnings in the order that they occurred. Each time the HP 8751A detects an error condition and displays a message on the CRT, it also puts the error in the error queue. If there are any errors in the queue, bit 3 of the status byte will be set. The errors can be read from the queue with the OUTPERRO? command, which causes the HP 8751A to transmit the error number and the error message of the oldest error in the error queue (first in first out).

It is also possible to generate interrupts using the status reporting mechanism. The status byte bits can be enabled to generate a service request (SRQ) when set. The computer can in turn be set up to generate an interrupt on SRQ.

To be able to generate an SRQ, a bit in the status byte has to be enabled using *SRE *n*. A one in a bit position enables that bit in the status byte. Therefore, *SRE 8 enables an SRQ on bit 3, check error queue, since 8 equals 0000 1000 in binary representation. That means that whenever an error is put into the error queue and bit 3 is set, and the SRQ line is asserted. The only way to clear the SRQ is to disable bit 3, re-enable bit 3, or read out all the errors from the queue.

A bit in the event status register can be enabled so that it is summarized by bit 5 of the status byte. If any bit is enabled in the event status register, bit 5 of the status byte will also be set. For example, *ESE 66 enables bits 1 and 6 of the event status register, since 66 equals 0100 0010 in binary representation. Therefore, whenever active control is requested or a front panel key is pressed, bit 5 of the status byte will be set. Similarly, ESNB *n* enables bits in event status register B so that they will be summarized by bit 2 in the status byte.

To generate an SRQ from an event status register, enable the desired event status register bit. Then enable the status byte to generate an SRQ. For instance, *ESE 32 and *SRE 32 enable the syntax error bit, so that when the syntax error bit is set, the summary bit in the status byte will be set, and it enables an SRQ on bit 5 of the status byte.

During the sample program (Figure 2-19) is running, you can try get into the subroutine "Err_report:" when this program is executed in an external controller and Instrument BASIC is installed in your HP 8751A.

Type a command in command line on the HP 8751A from the keyboard to occur an error:

For example :

```
OUTPUT 800;"HELLO"
```

Because HELLO is not the command of HP 8751A, an error will occur.

```
10    !
20    ! Generating Interrupts
30    !
40    ASSIGN @Hp8751 TO 717
50    !
60    OUTPUT @Hp8751;"*CLS"      ! Clear status reporting system
70    OUTPUT @Hp8751;"*ESE 32"   ! Enable bit-5 of ESR
80    OUTPUT @Hp8751;"*SRE 32"   ! Enable bit-5 or status byte
90    !
100   ON INTR 7 GOSUB Err_report
110   ENABLE INTR 7;2
120   !
130   LOOP
140   END LOOP
150   STOP
160   !
170 Err_report:!
180   Stat=SPOLL(@Hp8751)
190   OUTPUT @Hp8751;"*ESR?"
200   ENTER @Hp8751;Estat
210   PRINT "Syntax error detected."
220   !
230   OUTPUT @Hp8751;"OUTPERRO?"  ! Ask error
240   ENTER @Hp8751;Err,Err$      ! Enter error number and message
250   PRINT Err,Err$
260   !
270   ENABLE INTR 7
280   RETURN
290   END
```

Figure 2-19. Sample Program: Generating Interrupts

Line 60	Clear the status reporting system.
Line 70	Enable bit 5 of the event status register.
Line 80	Enable bit 5 of the status byte so that an SRQ will generated when a syntax error occurs.
Line 100	Tell the computer where to branch on an interrupt.
Line 110	Tell the computer to enable an interrupt from interface 7 (HP-IB) when value 2 (bit 1: SRQ bit) of the interrupt register is set. A branch to **Err_report** will disable the interrupt, so the return from **Err_report** re-enables it. If there is more than one instrument on the bus capable of generating an SRQ, it is necessary to use serial poll to determine which device has issued the SRQ. In this case, we assume the HP 8751A issued it. A branch to **Err_report** will disable the interrupt, so the return from **Err_report** re-enable it.
Line 130 and 140	Do nothing loop.
Line 180	Clear the SRQ bit of the status byte.

Lines 190 and 200	Read the register to clear the bit.
Lines 230 through 250	Instruct the HP 8751A to output the error number and the error message, and print them.

3

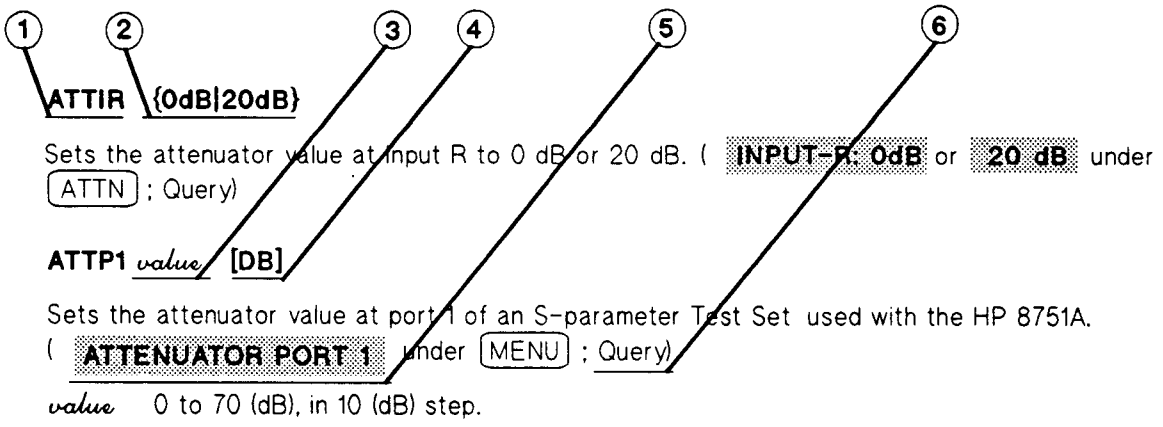
HP-IB Programming Reference

This chapter provides a reference for HP-IB operation of the HP 8751A. Use this information as a reference to the syntax requirements and general function of the individual commands.

This chapter lists the commands in alphabetical order. Refer to Appendix A for a functional list of the commands.

Refer to the *Reference Manual* for the details of each function, or to the *Service Manual* for the details of the service related functions.

HP-IB Command Syntax



① Upper case bold characters represent the program codes which must appear exactly as shown with no embedded spaces. Upper and lower case characters are equivalent.

② Characters enclosed in the { } brackets are qualifiers attached to the root mnemonic. There can be no spaces or symbols between the root mnemonic and its appendage.

For example:

{ON|OFF} shows that either ON or OFF can be attached to the root mnemonic. CONM{ON|OFF} means CONMON or CONMOFF.

{1-4} shows that the numeral 1, 2, 3, or 4 can be attached to the root mnemonic. DELR{1-4} means DELR1, DELR2, DELR3, or DELR4.

③ A constant or a pre-assigned simple or complex numeric or string variable transferred to the HP 8751A. There must be a space between it and the code.

④ Square brackets indicate that the enclosed information is optional.

⑤ Key or softkey which has the same function.

⑥ "Query" indicates that the command can be queried. Refer to "Query Commands".

Note

A semicolon (;) is required as a separator for each program command except for the last command.

For example, either of the following is acceptable.

```
OUTPUT Hp8751;"CHAN1; S11; LOGM;"
OUTPUT Hp8751;"CHAN1; S11; LOGM"
```

Query Commands

All instrument functions can be interrogated to find the current On/Off state or value.

For instrument state commands, append the question mark (?) character instead of {ON|OFF} to interrogate the state of the functions. The HP 8751A responds to the next controller ENTER operation with a "1" or a "0" to indicate ON or OFF, respectively.

For settable functions such as SCAL *value*, using SCAL? causes the HP 8751A to respond to the next controller ENTER operation by outputting the current function value then clearing the instrument entry area.

If a command that does not have a defined response is interrogated, the instrument outputs a zero.

- Example 1

  AB

```
OUTPUT Hp8751;"AB?;"
ENTER Hp8751;Reply
PRINT "Input port is AB?",
IF Reply then PRINT "Yes"
IF NOT Reply the PRINT "No"
```

- Example 2

  ATTIA{0DB|20DB}

```
OUTPUT Hp8751;"ATTIA?;"
ENTER Hp8751;Reply$
PRINT "Port A attenuator value is ";Reply$
```

- Example 3

  ADDRCONT *value*

```
OUTPUT Hp8751;"ADDRCONT?;"
ENTER Hp8751;Reply
PRINT "Controller HP-IB address is ";Reply
```

Suffix

The following suffixes can be used as the units of the stimulus values:

Frequency: Hz (default), MHz

Power: dBm (default)

Attenuator: dB (default)

Log mag: dB (default)

Delay time: s (default)

Phase: deg (default)

Capacitance: F (default)

Inductance: H (default)

Impedance: ohm (default)

If no suffix is used, the HP 8751A assumes the default values for the instruction. Upper and lower case characters are equivalent.

Code Naming Conventions

The HP-IB Commands of HP 8751A are derived from their front panel key titles (where possible), according to the naming conventions below.

Some codes require additional parameters (on, off, 1, 2, etc.). Codes that have no front panel equivalent are HP-IB only commands, and use a similar convention based on the common name of the function. Where possible, HP 8751A codes are compatible with HP 8753 and HP 8510 codes.

Table 3-1. HP-IB Code Naming Conventions

Convention	For HP-IB Code Use	Example	
		Key Title	HP-IB Code
One word	First four letters	POWER START	POWE STAR
Two words	First three letters of first word and first letter of second word	ELECTRICAL DELAY SEARCH RIGHT	ELED SEAR
Two words in a group	First four letters of both	MARKER → CENTER	MARKCENT
Three Words	First three letters of first word, first letter of second word, and first four letters of third word	CAL KIT: 7mm SEARCH RNG STORE	CALK7MM SEARSTOR

AB

Calculates and displays the complex ratio of input A to input B.

(A/B under [MEAS]; Query)

ABODCALI

Aborts the dc detector's output voltage linearity calibration.

(ABORT DC CAL under [CAL])

ACTLHFRE

Sets the active inductor (L) high frequency.

(Under SERVICE MENU under [SYSTEM]; Query)

ACTLLFRE

Sets the active inductor (L) low frequency.

(Under SERVICE MENU under [SYSTEM]; Query)

ACTLNORM

Sets the active inductor (L) normal.

(Under SERVICE MENU under [SYSTEM]; Query)

ADDRCONT *value*

Sets the HP-IB address which the HP 8751A will use to communicate with an external controller.

(ADDRESS: CONTROLLER under [LOCAL]; Query)

value 0 to 30

ADDRPLOT *value*

Sets the HP-IB address which the HP 8751A will use to communicate with the plotter.

(ADDRESS: PLOTTER under [LOCAL]; Query)

value 0 to 30

ADDRPRIN *value*

Sets the HP-IB address which the HP 8751A will use to communicate with the printer.

(`ADDRESS: PRINTER` under [LOCAL]; Query)

value 0 to 30

ANAOCH1

Selects channel 1 for waveform analysis. For details, refer to Appendix E. (Query)

ANAOCH2

Selects channel 2 for waveform analysis. For details, refer to Appendix E. (Query)

ANAODATA

Selects a data trace for waveform analysis. For details, refer to Appendix E. (Query)

ANAOMEMO

Selects a memory trace for waveform analysis. For details, refer to Appendix E. (Query)

ANARANG *value*[*suffix*],*value*[*suffix*]

Sets the waveform analysis stimulus range by entering the START and STOP values. For details, refer to Appendix E. (Query)

value 5 to 5.0×10^8 (Hz, Frequency sweep) or
-50 to $+15$ (Power sweep)

suffix Refer to "Suffix"

ANARFULL

Sets the analysis range equal to the full stimulus range. For details, refer to Appendix E.

AR

Calculates and displays the complex ratio of input A to input R.

(`A/R` under [MEAS]; Query)

ASCE *string*

Sets user defined extension for ASCII save file in MS-DOS format. Default setting is "`.TXT`". Modified extension is kept in SRAM even if power is OFF.

(`DEFINE EXTENSION ASCII DATA` under [SAVE] : Query)

string Extension name. Up to 3 characters

ATTIA{0DB|20DB}

Sets the attenuator value at input A to 0 dB or 20 dB.

(`INPUT-A: 0dB` or `20dB` under [ATTEN]; Query)

ATTIB{0DB|20DB}

Sets the attenuator value at input B to 0 dB or 20 dB.

(`INPUT-B: 0dB` or `20dB` under [ATTEN]; Query)

ATTIR{0dB|20dB}

Sets the attenuator value at input R to 0 dB or 20 dB.

(`INPUT-R: 0dB` or `20dB` under [ATTEN]; Query)

ATTP1 *value* [dB]

Sets the attenuator value at port 1 of an S-parameter test set used with the HP 8751A.

(`ATTENUATOR PORT 1` under [MENU]; Query)

value 0 to 70, in 10 step

ATTP2 *value* [dB]

Sets the attenuator value at port 2 of an S-parameter test set used with the HP 8751A.

(`ATTENUATOR PORT 2` under [MENU]; Query)

value 0 to 70, in 10 step

AUTO

Selects the scale/div value automatically to fit the trace data to the display.

(`AUTO SCALE` under [SCALE REF])

AVER{ON|OFF}

Sets the averaging function ON or OFF for the active channel.

(`AVERAGING on off` under [AVG]; Query)

AVERFACT *value*

Sets the averaging factor.

(`AVERAGING FACTOR` under AVG; Query)

value 1 to 999

AVERREST

Resets and restarts averaging.

(`AVERAGING RESTART` under AVG)

BACI *value*

Sets the background intensity of the display as a percent of the white level.

(`BACKGROUND INTENSITY` under DISPLAY; Query)

value 0 to 100

BDC

Displays a dc voltage at input B.

(`Bdc` under MEAS; Query)

BDCR

Calculates and displays the ratio of a dc voltage at input B to the reference signal at input R.

(`Bdc/R` under MENU; Query)

BEEPDONE{ON|OFF}

Sets the operation completion beeper ON or OFF.

(`BEEP DONE on off` under DISPLAY; Query)

BEEPFAIL{ON|OFF}

Sets the limit fail beeper ON or OFF.

(`BEEP FAIL on off` under SYSTEM; Query)

BEEPWARN{ON|OFF}

Sets the warning beeper ON or OFF.

(`BEEP WARN on off` under DISPLAY; Query)

BR

Calculates and displays the complex ratio of input B to input R.

(`B/R` under MENU; Query)

C0 *value*

Enters the constant term of the open circuit capacitor model value, C_0.

(`C0` under CAL)

value 0 to 1,000 ($\times 10^{-15}$ F)

C1 *value*

Enters the constant term of the open circuit capacitor model value, C_1.

(`C1` under CAL)

value 0 to 1,000 ($\times 10^{-27}$ F/Hz)

C2 *value*

Enters the constant term of the open circuit capacitor model value, C_2.

(`C2` under CAL)

value 0 to 1,000 ($\times 10^{-36}$ F/Hz^2)

CALCASSI

Shows the tabular listing of the calibration kit class assignment.

(`CLASS ASSIGNMENT` under COPY)

CALI *parameter*

Selects the measurement calibration type. (Query)

parameter	*description*
NONE	No calibration
RESP	Response measurement calibration
RAI	Response and isolation measurement calibration
S111	1-Port measurement calibration at port 1
S221	1-Port measurement calibration at port 2
FUL2	Full 2-Port measurement calibration
ONE2	One-path 2-Port measurement calibration

CALIFUL2

Selects the full 2-port measurement calibration.

(`FULL 2-PORT` under CAL; Query)

CALIONE2

Selects the one-path 2-port measurement calibration.

(`ONE-PATH 2-PORT` under CAL; Query)

CALIRAI

Selects the response and isolation measurement calibration.

(`RESPONSE & ISOL'N` under CAL; Query)

CALIRESP

Selects the response measurement calibration.

(`RESPONSE` under CAL; Query)

CALIS111

Selects the 1-port measurement calibration at port 1.

(`S11 1-PORT` under CAL; Query)

CALIS221

Selects the 1-port measurement calibration at port 2.

(`S22 1-PORT` under CAL; Query)

CALK *parameter*

Selects the calibration kit. (Query)

parameter	*description*
APC7	7 mm
N50	Type-N 50 Ω
N75	Type-N 75 Ω
USED	User-defined

CALK7MM

Selects the 7 mm calibration kit.

(CAL KIT: 7mm under CAL; Query)

CALKN50

Selects the 50 Ω type-N calibration kit.

(N 50Ω under CAL; Query)

CALKN75

Selects the 75 Ω type-N calibration kit.

(N 75Ω under CAL; Query)

CALKUSED

Selects a calibration kit model defined or modified by the user.

(USER KIT under CAL; Query)

CALN

Selects using no calibration.

(CALIBRATE: NONE under CAL; Query)

CALP

Calculates the parameters of the conjugate matching circuit.

(CALCULATE PARAMETERS under DISPLAY)

CALS *value*

Provides the tabular listing of the standard setting.

(STD NO.1 to STD NO.8 under COPY)

value 1 to 8

CBRI *value*

Sets the color brightness in percent.

(BRIGHTNESS under DISPLAY; Query)

value 0 to 100 (%)

CENT *value* [*suffix*]

Sets the center stimulus value.

([CENTER], or CENTER under [MENU]; Query)

value	5 to 5.0×10^8 (Hz, frequency sweep) −50 to +15 (dBm, power sweep only)
suffix	Refer to "Suffix"

CHAD *string*

Changes the current directory (only MS-DOS format).

(CHANGE DIRECTORY under [SAVE])

string	Directory path

CHAIRANG

Changes the IF range set channel (R to A to B).

(Under SERVICE MENU under [SYSTEM])

CHAN1

Selects channel 1 as the active measurement channel. ([CH 1]; Query)

CHAN2

Selects channel 2 as the active measurement channel. ([CH 2]; Query)

CLAD

Completes specifying a class.

(CLASS DONE (SPE'D) under [CAL])

CLASS11{A|B|C}

Selects port 1 (S11) one-port calibration standard class: S11A (open), S11B (short), or S11C (load).

([S11] : OPEN, SHORT, or LOAD under [CAL])

CLASS22{A|B|C}

Selects port 2 (S22) one-port calibration standard class: S22A (open), S22B (short), or S22C (load).

([S22] : OPEN, SHORT, or LOAD under (CAL))

CLEL

Clears the current frequency list.

(CLEAR LIST YES under (MENU))

CLEM{1-8}

Clears the marker.

(MARKER 1 to MARKER 8 under (MKR))

CLES

Clears the status byte, the event status register, the event status register B, and the operational status register.

CLEPTRIP

Clears the power trip.

(CLEAR POWER TRIP under (MENU))

COLO{CH1D|CH1M|CH2D|CH2M|GRAT|TEXT|WARN}

Specifies the display element to change color: channel 1 data, channel 1 memory and limit lines, channel 2 data, channel 2 memory and limit lines, a text, or a warning message.

(CH1 DATA, CH1 MEM LIMIT LN, CH2 DATA, CH2 MEM LIMIT LN, GRATICULE, TEXT, WARNING under (DISPLAY))

COLOIBT

Specifies display element color: the HP Instrument BASIC text.

(IBASIC under (DISPLAY))

COLO{PEN1|PEN2|PEN3|PEN4|PEN5|PEN6}

Specifies display element color: the graphics pen pallet.

(`PEN 1` to `PEN 6` under DISPLAY)

COLOR *value*

Specifies the saturation percent of the specified display element.

(`COLOR` under DISPLAY; Query)

value 0 to 100 (%)

CONM{ON|OFF}

Sets conjugate matching ON or OFF.

(`CONJ MATCH on off` under DISPLAY; Query)

CONPCP *value* [F]

Displays or changes parameter value Cp for the selected conjugate matching circuit.

(`Cp` under DISPLAY; Query)

value 1.0×10^{-18} to 1.0×10^{9} (F)

CONPCS *value* [F]

Displays or changes parameter value Cs for the selected conjugate matching circuit.

(`Cs` under DISPLAY; Query)

value 1.0×10^{-18} to 1.0×10^{9} (F)

CONPLP *value* [H]

Displays or changes parameter value Lp for the selected conjugate matching circuit.

(`Lp` under DISPLAY; Query)

value 1.0×10^{-18} to 1.0×10^{9} (H)

CONPLS *value* [H]

Displays or changes parameter value Ls for the selected conjugate matching circuit.

(`PARAMETER:Ls` under DISPLAY; Query)

value 1.0×10^{-18} to 1.0×10^{9} (H)

CONPDISP{ON|OFF}

Displays or does not display the conjugate matching parameters on the CRT.

(`CNJ.P DISP on off` under (DISPLAY))

CONT

Continuous trigger.

(`CONTINUOUS` under (MENU); Query)

CONV *parameter*

Selects the measurement data conversion setting(impedance, admittance, or multiple phase). (Query)

parameter	*description*
OFF	Conversion OFF
ZREF	Z:reflection
ZTRA	Z:transmission
YREF	Y:reflection
YTRA	Y:transmission
ONEDS	Reciprocal (1/S)
MP4	Multiply phase by 4
MP8	Multiply phase by 8
MP16	Multiply phase by 16

CONVMP{4|8|16}

Multiplies the current phase trace by a multiplier factor specified by a qualifier (4, 8, or 16).

(`4 * Phase,8 * Phase,16 * Phase` under (MEAS); Query)

CONV1DS

Expresses the data in inverse S-parameter values.

(`1/S` under (MEAS); Query)

CONVOFF

Turns off all parameter conversion operations.

(`OFF` under (MEAS); Query)

CONVYREF

Converts reflection data to its equivalent admittance values.

(`Y: Refl` under MEAS; Query)

CONVYTRA

Converts transmission data to its equivalent admittance values.

(`Y: Trans` under MEAS; Query)

CONVZREF

Converts reflection data to its equivalent impedance values.

(`Z: Refl` under MEAS; Query)

CONVZTRA

Converts transmission data to its equivalent impedance values.

(`Z: Trans` under MEAS; Query)

COPA

Aborts printing or plotting in progress.

(`COPY ABORT` under COPY)

COPT{ON|OFF}

Sets the time stamp function ON or OFF.

(`COPY TIME on off` under COPY; Query)

CORR{ON|OFF}

Sets the error correction function ON or OFF.

(`CORRECTION on off` under CAL; Query)

COUC{ON|OFF}

Sets the channel coupling of stimulus values ON or OFF.

(`COUPLED CH on off` under MENU; Query)

CRED *string*

Create a directory (only MS-DOS format).

(`CREATE DIRECTORY` under SAVE)

string Up to 8 characters for directory name and up to 3 characters for extension

CURD?

Outputs current directory.

(`CURRENT DIRECTORY` under SAVE)

CWFREQ *value* [*suffix*]

Sets the frequency for power sweep.

(`CWFREQ` under MENU; Query)

value 5 to 5.0×10^8 (Hz)
suffix Hz or MHz

DATI

Stores the active channel data to trace memory.

(`DATA → MEM` under DISPLAY)

DAYMYEAR

Sets the displayed date mode to day/month/year order.

(`DayMonYear` under SYSTEM; Query)

DCBUS *value*

Selects the DC bus.

(Under `SERVICE MENU` under SYSTEM; Query)

value 0 to 20

DCCOR{ON|OFF}

Sets the dc detector linearity correction ON or OFF.

(`DC CORR on off` under CAL; Query)

DEFC

Returns all traces, lines, and text to the default colors.

(DEFAULT COLORS under [Display])

DEFS *value*

Defines the number of the calibration standards to be modified.

(DEFINE STANDARD under [CAL])

value 1 to 8

DELA

Selects the Delay format for the current measurement.

(DELAY under [FORMAT]; Query)

DELO

Sets the delta marker mode OFF.

(Δ MODE OFF under [MKR]; Query)

DELR{1-8}

Selects the delta reference marker.

(Δ REF = 1 to Δ REF = 8 under [MKR]; Query)

DELRFIXM

Sets the user-specified fixed reference marker.

(ΔREF=Δ FIXED MKR under [MKR]; Query)

DESTOFF

Sets destructive RAM testing OFF. (DATA in RAM will be restored when test is completed.)

(Under SERVICE MENU under [SYSTEM]; Query)

DESTON

Sets destructive RAM testing ON. (DATA in RAM will be lost.)

(Under SERVICE MENU under [SYSTEM]; Query)

DFLT

Returns the plotting parameters to the default values.

(`DEFAULT SETUP` under COPY)

DISA *parameter*

Selects the display allocation mode. (Query) (Option 002 only)

parameter	*description*
ALLI	All instrument
HIHB	Half instrument half BASIC
ALLB	All BASIC
BASS	BASIC status

DISAALLB

Displays only the HP Instrument BASIC display on the HP 8751A's CRT.

(`ALL BASIC` under DISPLAY; Query) (Option 002 only)

DISAALLI

Displays only the measurement graticule on the HP 8751A's CRT.

(`ALL INSTRUMENT` under DISPLAY; Query) (Option 002 only)

DISABASS

Displays only the HP Instrument BASIC status on the HP 8751A's CRT.

(`BASIC STATUS` under DISPLAY; Query) (Option 002 only)

DISAHIHB

Displays the measurement graticule (top half) and the HP Instrument display (bottom half) on the HP 8751A's CRT.

(`HALF INSTR HALF BASIC` under DISPLAY; Query) (Option 002 only)

DISFDOS

Sets the format for initializing the flexible disk in the internal disk drive in MS-DOS format.

(`DEFINE FORMAT,DOS` under SAVE ; Query)
Supported MS-DOS formats are:

- 720 kbyte, 80 tracks, double-sided, 9 sector/track
- 1.44 Mbyte, 80 tracks, double-sided, 18 sector/track

DISFLIF

Sets the format for initializing the flexible disk in the HP 8751A's internal disk drive in LIF (Logical Interchange Format) format.

(`DEFINE FORMAT,LIF` under [SAVE] ; Query)

DISL{1|2}

Selects list sweep table 1 or 2 to be displayed and hard copied.

(`DISL1` or `DISL2` under [COPY])

DISLLIST

Displays the limit table on the display.

(`DISPLAY LIST` under [COPY])

DISMCTSP

Displays the list sweep stimulus range in the center and span format.

(`CTR & SPAN` under [COPY]; Query)

DISMMD

Selects the middle and delta format for the limit testing table.

(`MID & DLT` under [COPY]; Query)

DISMNUM

Displays the list sweep stimulus resolution in the number of points format.

(`NUMBER of POINTS` under [COPY]; Query)

DISMSTEP

Displays the list sweep stimulus resolution in the step size format.

(`STEP SIZE` under [COPY]; Query)

DISMSTSP

Displays the list sweep stimulus range in the start and stop format.

(`DISP MODE: ST & SP` under [COPY]; Query)

DISMUL

Selects the upper and lower format for the limit testing table.

(DISP MODE: UPR & LWR under [COPY]; Query)

DISP *parameter*

Selects the display trace type. (Query)

parameter	*description*
DATA	Data only
MEMO	Memory only
DATM	Data and memory
DDM	Data divided by memory
DMM	Data minus memory

DISPDATA

Displays a trace of measured data.

(DISPLAY: DATA under [DISPLAY]; Query)

DISPDATM

Displays traces of both measured data and memory data.

(DATA and MEMORY under [DISPLAY]; Query)

DISPDDM

Displays the trace of the results of measured data divided by memory data.

(DATA/MEM under [DISPLAY]; Query)

DISPDMM

Displays the trace of the results of measured data subtracted from memory data.

(DATA-MEM under [DISPLAY]; Query)

DISPMEMO

Displays a trace of memory data.

(MEMORY under [DISPLAY]; Query)

DONE

Completes the measurement of the selected standard calibration.

(`DONE: OPENS`, `DONE: SHORTS`, or `DONE:LOADS` under (CAL))

DSKEY

Disables the front panel keys and the rotary knob. To enable the keys and knob again, send the `ENKEY` command.

DUAC{ON|OFF}

Selects the dual (ON) or single (OFF) channels display.

(`DUAL CHAN on off` under (DISPLAY); Query)

EDITDONE

Completes editing the frequency list for the list sweep.

(`LIST DONE` under (MENU))

EDITLIML

Begins editing the limit line table.

(`EDIT LIMIT LINE` under (SYSTEM))

EDITLIS1

Selects list 1 for editing.

(`EDIT: LIST 1` under (MENU); Query)

EDITLIS2

Selects list 2 for editing.

(`LIST 2` under (MENU); Query)

EDITLIST

Begins editing the frequency list.

(`EDIT LIST` under (MENU))

ELED *value* [s]

Sets the electrical delay.

(ELECTRICAL DELAY under SCALE REF; Query)

value −10 to 10 (s)

ENKEY

Re-enables the front panel keys and the rotary knob which have been disabled by the DSKEY command.

ESB?

Outputs the event status register B value.

ESNB *value*

Specifies the bits of event status register B.

value 0 to 32,767 ($=2^{15}-1$)

EXEDCALI

Executes the dc detector lineality calibration.

(EXECUTE DC CAL under CAL)

EXET

Executes the service test.

(Under SERVICE MENU under SYSTEM)

EXPP

Selects the expanded phase format for the current measurement.

(EXPANDED PHASE under FORMAT; Query)

EXTRLOCK?

Outputs the state of the external reference (locked or unlocked).

(Under SERVICE MENU under SYSTEM)

EXTT *parameter*

Selects the external trigger mode. (Query)

parameter	*description*
OFF	External trigger OFF (internal trigger mode ON)
ONSWEE	On sweep
ONPOIN	On point
MAN	Manual trigger mode on point

EXTTOFF

Sets the internal measurement trigger mode (external trigger OFF).

(`TRIGGER: TRIG OFF` under (MENU); Query)

EXTTON

Sets the external measurement trigger mode to ON. When triggered, one measurement sweep is executed.

(`EXT. TRIG ON SWEEP` under (MENU); Query)

EXTTPOIN

Sets the external measurement trigger mode to ON. When triggered, one point is measured.

(`EXT. TRIG ON POINT` under (MENU); Query)

FBUS *value*

Selects the frequency bus.

(Under `SERVICE MENU` under (SYSTEM))

value 0 to 5

FILC *string1, string2, string3, string4*

File copy command.

(`FILE UTILITIES` under (SAVE))

string1	Source file name
string2	Source device name ("DISK" or "MEMORY")
string3	Destination file name
string4	Destination device name ("DISK" or "MEMORY")

string2 and *string4* must be either "DISK" or "MEMORY". "DISK" selects the built-in flexible disk and "MEMORY" selects the RAM disk memory. FILC can not copy files between the RAM disk memory and the flexible disk when the RAM disk and flexible disk formats are different.

FIRLANOR

Sets first local ALC to NORMAL.

(Under SERVICE MENU under [SYSTEM]; Query)

FIRLAOPE

Sets first local ALC to OPEN.

(Under SERVICE MENU under [SYSTEM]; Query)

FIRLPNOR

Sets first local PLL to NORMAL.

(Under SERVICE MENU under [SYSTEM]; Query)

FIRLPOPE

Sets first local PLL to OPEN.

(Under SERVICE MENU under [SYSTEM]; Query)

FIRR?

Outputs the firmware revision.

(Under SERVICE MENU under [SYSTEM])

FMT *parameter*

Selects the display format. (Query)

parameter	*description*
LOGM	Log magnitude format
PHAS	Phase format
DELA	Delay format
SMIC	Smith chart format
POLA	Polar chart format
LINM	Linear magnitude format
SWR	SWR format
REAL	Real format
IMAG	Imaginary format
EXPP	Expanded phase format
INVSCHAR	Admittance Smith chart
LOGMP	Log magnitude and phase format
LOGMD	Log magnitude and delay format

FNDAUTO

Sets FN DAC to AUTO.

(Under SERVICE MENU under SYSTEM; Query)

FNDMANU

Sets FN DAC to MANUAL.

(Under SERVICE MENU under SYSTEM; Query)

FNDVALU *value*

Sets the FN DAC value.

(Under SERVICE MENU under SYSTEM; Query)

value 0 to 255

FNVNORM

Sets FN VCO to NORMAL.

(Under SERVICE MENU under SYSTEM; Query)

FNVOPEN

Sets FN VCO to OPEN.

(Under SERVICE MENU under SYSTEM; Query)

FORM2

Sets the IEEE 32-bit floating point format to transfer trace data and waveform analysis (Refer to Appendix E) data via HP-IB.

FORM3

Sets the IEEE 64-bit floating point format to transfer the trace data and waveform analysis (Refer to Appendix E) data via HP-IB.

FORM4

Sets the ASCII transfer format to transfer the trace data and waveform analysis (Refer to Appendix E) data via HP-IB.

FORM5

Sets MS-DOS format to transfer the trace data and waveform analysis (Refer to Appendix E) data via HP-IB.

FREO

Erases the frequency annotation on the display. Preset to turn ON.

(`FREQUENCY BLANK` under DISPLAY; Query)

FULP

Selects full page plotting.

(`FULL PAGE` under COPY; Query)

FWDI

Selects forward isolation calibration.

(`FWD ISOL'N ISOL'N STD` under CAL)

FWDM

Selects forward match calibration.

(`FWD. MATCH THRU` under CAL)

FWDT

Selects forward transmission calibration.

(`FWD. TRANS. THRU` under CAL)

GRAE *string*

Sets user defined extension for HP-GL file saved in MS-DOS format. Default setting is ".HPG". The modified extension is kept in SRAM even when power is turned OFF.

(`DEFINE EXTENSION GRAPHICS` under SAVE : Query)

string Extension name. Up to 3 characters

GRODAPER *value* [pct]

Sets the group delay aperture.

(`GROUP DELAY APERTURE` under AVG; Query)

value 1 to 200 (%)

HOLD

Holds the present measurement.

(HOLD under (MENU); Query)

IFBW *value* [*suffix*]

Sets the bandwidth value for IF bandwidth reduction.

(IF BW under (AVG); Query)

value	2, 20, 200, 1,000, or 4,000 (Hz)
suffix	Hz or MHz

IFBWAUTO

Automatically selects the proper IF bandwidth for each measurement point.

(IF BW AUTO under (AVG); Query)

IFRAUTO

Sets the auto range mode for the IF range of the selected channel.

(Under SERVICE MENU under (SYSTEM); Query)

IFRCH?

Outputs the IF range set channel.

(Under SERVICE MENU under (SYSTEM))

IFRX1

Sets the X1 range for the IF range.

(Under SERVICE MENU under (SYSTEM); Query)

IFRX1X8

Sets X1, X8 range for the IF range.

(Under SERVICE MENU under (SYSTEM); Query)

IFRX64

Sets X64 range for the IF range.

(Under SERVICE MENU under [SYSTEM]; Query)

IFRX8X1

Sets X8, X1 range for the IF range.

(Under SERVICE MENU under [SYSTEM]; Query)

IMAG

Displays only the imaginary (reactive) portion of the measured data in Cartesian format.

(IMAGINARY under [FORMAT]; Query)

INID

Initializes the disk in the built-in flexible disk drive.

(INITIALIZE DISK under [SAVE]/[RECALL])

INP8IO

Inputs data from the 4-bit parallel input port to the HP 8751A.

INP8IO?

Inputs data from the 4-bit parallel input port to the HP 8751A, and outputs the data to a computer.

INPUCALC{01-12} *value*

Stores the measurement calibration error coefficient set real/imaginary pairs input via HP-IB into instrument memory. Refer to Appendix D for calibration array assignments.

value Complex number (Data format: real, imaginary)

INPUCALK *value*

Stores the calibration kit data transmitted by the OUTPCALK? command.

value Block data (Data format: HP 8751A internal format (714 bytes of binary data))

INPUDATA *value*

Inputs the error corrected data.

value Complex number (Data format: real, imaginary)

INPUFORM *value*

Inputs formatted data.

value Complex number (Data format: real, imaginary)

INPURAW{1-4} *value*

Inputs raw data.

value Complex number
(Data format: real, imaginary)

INPUUFORM *value*

Inputs unformatted data. This command is invalid, when MEMORY or DATA and MEMORY is selected as a trace.

value Complex number (Data format: real, imaginary)

INTE *value*

Sets the display intensity as a percent of the brightest setting.

(INTENSITY under DISPLAY; Query)

value 0 to 100 (%)

INVSCHAR

Displays an inverse Smith chart (admittance Smith chart) format.

(INV SMITH CHART under FORMAT; Query)

ISOD

Completes the isolation part of the 2-port calibration.

(ISOLATION DONE under CAL)

ISOL

Begins the isolation part of the 2-port calibration.

(ISOLATION under CAL)

KEY *value*

Sends the key code for a key or a softkey on the front panel. This is equivalent to actually pressing a key. Refer to Appendix C for key codes.

value 0 to 49

KITD

Ends the calibration kit modification process.

(KIT DONE under CAL)

LABEFWD{M|T} *string*

Defines the label for forward match or forward transmission class when modifying the calibration kit.

(FWD. MATCH or LABEL: FWD. TRANS. under CAL)

string Up to ten characters may be used.

LABERES{I|P} *string*

Defines the label for response and isolation, or response class when modifying the calibration kit.

(RESPONSE & ISOL'N or RESPONSE under CAL)

string Up to ten characters may be used.

LABEREV{M|T} *string*

Defines the label for reverse match or reverse transmission class when modifying the calibration kit.

(REV.MATCH or REV.TRANS. under CAL)

string Up to ten characters may be used.

LABES11{A|B|C} *string*

Defines the label for S11A (opens), S11B (shorts), or S11C (loads) class when modifying the calibration kit.

(LABEL: S11A, S11B, or S11C under CAL)

string Up to ten characters may be used.

LABES22{A|B|C} *string*

Defines the label for S22A (opens), S22B (shorts), or S22C (loads) class when modifying the calibration kit.

(`LABEL: S22A`, `S22B`, or `S22C` under CAL)

string Up to ten characters may be used

LABK *string*

Defines the calibration kit label when modifying the calibration kit.

(`LABEL KIT` under CAL)

string Up to ten characters may be used.

LABS *string*

Defines the calibration standard label when modifying the calibration kit.

(`LABEL STD` under CAL)

string Up to ten characters may be used.

LEFL

Sets the plot quadrant to the lower left.

(`LEFT LOWER` under COPY; Query)

LEFU

Sets the plot quadrant to the upper left.

(`LEFT UPPER` under COPY; Query)

LIMCLEL

Clears all of segments in the limit test.

(`CLEAR LIST YES` under SYSTEM)

LIMD *value* [*suffix*]

Sets the limits delta value from the specified middle value.

(`DELTA LIMITS` under SYSTEM; Query)

value
0 to 5.0×10^5 (dB) (Log mag format)
0 to 5.0×10^5 (deg) (Phase and Expanded phase formats)
0 to 5.0×10^5 (s) (Delay format)
0 to 5.0×10^5 (ohm) (Smith chart and admittance chart formats)
0 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats)
0 to 5.0×10^5 (SWR format)

LIMD *value* [*suffix*]

suffix Refer to "Suffix"

LIMEDONE

Completes editing the limit table.

(`DONE` under SYSTEM)

LIMIAMPO *value* [*suffix*]

Sets an amplitude offset value for limit testing.

(`AMPLITUDE OFFSET` under SYSTEM; Query)

value -5.0×10^5 to 5.0×10^5 (dB) (Log mag format)
-5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase format)
-5.0×10^5 to 5.0×10^5 (s) (Delay format)
-5.0×10^5 to 5.0×10^5 (Ω) (Smith chart and admittance chart formats)
-5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats)
-5.0×10^5 to 5.0×10^5 (SWR format)

suffix Refer to "Suffix"

LIMILINE{ON|OFF}

Sets limit lines ON or OFF.

(`LIMIT LINE on off` under SYSTEM; Query)

LIMIMAOF

Sets the active marker value to the amplitude offset for limit testing.

(`MARKER → AMP. OFS` under SYSTEM)

LIMISTIO *value* [*suffix*]

Sets a stimulus offset value for limit testing.

(`STIMULUS OFFSET` under SYSTEM; Query)

value -5.0×10^8 to 5.0×10^8 (Hz, frequency sweep)
-50 to 50 (dBm, power sweep)

suffix Refer to "Suffix"

LIMITEST{ON|OFF}

Sets the limit testing ON or OFF.

(`LIMIT TEST on off` under SYSTEM; Query)

LIML *value* [*suffix*]

Sets the lower limit value for a limit testing segment.

(`LOWER LIMIT` under SYSTEM; Query)

value	-5.0×10^5 to 5.0×10^5 (dB) (Log mag format) -5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase formats) -5.0×10^5 to 5.0×10^5 (s) (Delay format) -5.0×10^5 to 5.0×10^5 (Ω) (Smith chart and admittance chart formats) -5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats) -5.0×10^5 to 5.0×10^5 (SWR format)
suffix	Refer to "Suffix"

LIMM *value* [*suffix*]

Sets the middle value of delta limits.

(`MIDDLE VALUE` under SYSTEM; Query)

value	-5.0×10^5 to 5.0×10^5 (dB) (Log mag format) -5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase formats) -5.0×10^5 to 5.0×10^5 (s) (Delay format) -5.0×10^5 to 5.0×10^5 (Ω) (Smith Chart and admittance chart formats) -5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats) -5.0×10^5 to 5.0×10^5 (SWR format)
suffix	Refer to "Suffix"

LIMS *value* [*suffix*]

Sets the starting stimulus value of a limit testing segment.

(`STIMULUS VALUE` under SYSTEM; Query)

value	5 to 5.0×10^8 (Hz, frequency sweep) −50 to 15 (dBm, power sweep)
suffix	Refer to "Suffix"

LIMSADD

Adds a new segment to the end of the limit list.

(ADD under SYSTEM)

LIMSDEL

Deletes a limit testing segment.

(DELETE under SYSTEM)

LIMSDON

Completes editing the limit segments.

(DONE under SYSTEM)

LIMSEDI *value*

Opens the segment to define or modify the stimulus and limit values.

(EDIT under SYSTEM; Query)

value 1 to 18

LIMU *value* [*suffix*]

Sets the upper limit value for a limit testing segment.

(UPPER LIMIT under SYSTEM; Query)

value -5.0×10^5 to 5.0×10^5 (dB) (Log mag format)
-5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase formats)
-5.0×10^5 to 5.0×10^5 (s) (Delay format)
-5.0×10^5 to 5.0×10^5 (ohm) (Smith chart and admittance chart formats)
-5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats)
-5.0×10^5 to 5.0×10^5 (SWR format)

suffix Refer to "Suffix"

LINFREQ

Activates a linear frequency sweep.

(LIN FREQ under MENU; Query)

LINM

Displays the linear magnitude format.

(`LIN MAG` under FORMAT; Query)

LINT{DATA|MEMO} *value*

Selects the line type of a trace for plotting.

(`LINE TYPE DATA` or `LINE TYPE MEMORY` under COPY)

value 0 to 7

LISDFBASE

Displays the measured data for the range between the minimum and maximum frequency set in the "Edit List Menu."

(`LIST DISP: FREQ BASE` under MENU; Query)

LISDOBASE

Displays the measured data for only the frequency ranges set in the "Edit List Menu."

(`ORDER BASE` under MENU; Query)

LISFREQ

Activates the frequency list sweep mode.

(`LIST FREQ` under MENU; Query)

LISSLIS1

Activates LIST 1 for the list sweep.

(`SWEEP BY: LIST 1` under MENU; Query)

LISSLIS2

Activates LIST 2 for the list sweep.

(`LIST 2` under MENU; Query)

LISV

Displays a tabular listing of all the stimulus values and their current measured values.

(LIST VALUES under [COPY])

LOGFREQ

Activates log frequency sweep mode.

(LOG FREQ under [MENU]; Query)

LOGM

Displays in log magnitude format.

(LOG MAG under [FORMAT]; Query)

LOGMD

Displays the log magnitude trace and delay trace simultaneously.

(LOG MAG & DELAY under [FORMAT]; Query)

LOGMP

Displays the log magnitude trace and phase trace simultaneously.

(LOG MAG & PHASE under [FORMAT]; Query)

MANTRIG

Triggers measurement at a single point.

(MANUAL TRG ON POINT under [MENU]; Query)

MARD<ON|OFF>

Displays (ON) or does not display (OFF) markers and the marker information on the screen. (Query)

MARK{1-8} *value* [*suffix*]

Selects the active marker, and moves it to the specified stimulus value.

(MARKER 1 to MARKER 8 under [MKR]; Query)

value	5 to 5.0×10^{8} (Hz, frequency sweep) −50 to +15 (dBm, power sweep)
suffix	Refer to "Suffix"

MARKBUCK *value*

Moves the active marker to specified data point number.

value 1 to "number of points"

MARKCENT

Changes the stimulus center value to the active marker value.

(MARKER → CENTER under (MKR FCTN))

MARKCONT

Interpolates between measured points to allow the markers to be placed at any point on the trace.

(CONTINUOUS under (MKR); Query)

MARKCOUP

Couples the marker stimulus values for the two display channels.

(MARKERS: COUPLED under (MKR); Query)

MARKDELA

Enters the group delay at the active marker point of a fixed frequency aperture to the electrical delay to balance the phase of the DUT.

(MARKER → DELAY under (SCALE REF))

MARKDISC

Places markers only on measured trace points determined by the stimulus settings.

(MARKERS: DISCRETE under (MKR); Query)

MARKFAUV *value* [*suffix*]

Sets the fixed marker auxiliary value offset.

(FIXED MKR AUX VALUE under (MKR); Query)

value -5.0×10^6 to 5.0×10^6 (Ω, Smith chart and admittance chart formats)
-5.0×10^6 to 5.0×10^6 (deg, polar format)

suffix Refer to "Suffix"

MARKFSTI *value* [*suffix*]

Sets the fixed marker stimulus value offset.

(`FIXED MKR STIMULUS` under (MKR); Query)

value -5.0×10^9 to 5.0×10^9 (Hz, frequency sweep)
$-99{,}999$ to $99{,}999$ (dBm, power sweep)

suffix Refer to "Suffix"

MARKFVAL *value* [*suffix*]

Sets the fixed marker position value offset.

(`FIXED MKR VALUE` under (MKR); Query)

value -5.0×10^5 to 5.0×10^5 (dB) (Log mag format)
-5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase formats)
-5.0×10^5 to 5.0×10^5 (s) (Delay format)
-5.0×10^5 to 5.0×10^5 (Ω) (Smith chart and admittance chart formats)
-5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats)
-5.0×10^5 to 5.0×10^5 (SWR format)

suffix Refer to "Suffix"

MARKL{ON|OFF}

Displays (ON) or does not display (OFF) the list of stimulus values and response values of all markers.

(`MKR LIST on off` under (MKR); Query)

MARKMIDD

Sets the middle value for the delta limit using the active marker value.

(`MIDDLE VALUE` under (SYSTEM))

MARKODATA

Enables the marker to move on the measurement data trace.

(`MARKERS ON [DATA]` under (MKR); Query)

MARKOFF

Turns off all the markers and the delta reference marker.

(`ALL MKR OFF` under (MKR); Query)

MARKOMEMO

Enables the marker to move on the memory data trace.

(`MARKERS ON [MEMO]` under (MKR); Query)

MARKPEAD

Changes the differential stimulus value and the response value of the peak when searching for the local max, min, and peak-to-peak.

(`MARKER → PEAK DEF` under (MKR FCTN))

MARKREF

Changes the reference value to the active marker's response value, without changing the reference position.

(`MARKER → REFERENCE` under (SCALE REF) or (MKR FCTN))

MARKSPAN

Changes the start and stop values of the stimulus span to the active marker and the delta reference marker.

(`MARKER → SPAN` under (MKR FCTN))

MARK{STAR|STOP}

Changes the stimulus start or stop value to the active marker value.

(`MARKER → START`, `MARKER → STOP` under (MKR FCTN))

MARKSTIM

Sets the stimulus value of a segment to the active marker value.

(`MARKER → STIMULUS` under (SYSTEM))

MARKTIME{ON|OFF}

Sets the x-axis marker readout to the sweep time (ON), or cancels the setting (OFF).

(`MKR TIME on off` under (MKR); Query)

MARKUNCO

Allows the marker stimulus values to be controlled independently on each channel.

(UNCOUPLED under (MKR); Query)

MARKZERO

Puts a fixed reference marker at the present active marker position, and makes the fixed marker stimulus and response values at that position equal to zero.

(MKR ZERO under (MKR))

MEAS *parameter*

Selects the parameters or inputs to be measured. (Query)

parameter	*description*
AR	A/R measurement
BR	B/R measurement
AB	A/B measurement
A	A measurement
B	B measurement
R	R measurement
S11	S11 measurement
S12	S12 measurement
S21	S21 measurement
S22	S22 measurement
BDC	Bdc measurement
BDCR	Bdc/R measurement

MEASA

Measures the absolute power amplitude at input A.

(A under (MEAS); Query)

MEASB

Measures the absolute power amplitude at input B.

(B under (MEAS); Query)

MEASR

Measures the absolute power amplitude at input R.

(R under (MEAS); Query)

MEASTAT{ON|OFF}

Calculates and displays the mean, standard deviation, and peak-to-peak values among the search range (ON), or does not display them (OFF).

(`STATICS` under (MKR FCTN); Query)

MIXLPNOR

Sets the mixer local port to NORMAL.

(Under `SERVICE MENU` under (SYSTEM); Query)

MIXLPTES

Sets the mixer local port to TEST.

(Under `SERVICE MENU` under (SYSTEM); Query)

MODI1

Leads to the modify calibration kit menu, where a calibration kit can be user-modified.

(`MODIFY` under (CAL))

MONDYEAR

Changes the displayed date to the "month:day:year" format.

(`DATE MODE: MonDayYear` under (SYSTEM); Query)

NEXP

Displays the next page of information in a tabular listing onto the display.

(`NEXT PAGE` under (COPY))

NUMG *value*

Triggers a user-specified number of sweeps, and returns to the HOLD mode.

(`NUMBER OF GROUPS` under (MENU))

value	Greater than 0

OFSD *value* [s]

Specifies the one-way electrical delay from the measurement (reference) plane to the standard.

(OFFSET DELAY under CAL)

value −10 to 10 (s)

OFSL *value*

Specifies energy loss, due to skin effect, along a one-way length of coaxial cable offset.

(OFFSET LOSS under CAL)

value 0 to 1.0×10^{19} (Ω/s)

OFSZ *value* [ohm]

Specifies the characteristic impedance of the coaxial cable offset.

(OFFSET Z0 under CAL)

value 0.1 to 5.0×10^{6} (Ω)

OMII

Omits the correction for isolation of a 2-port calibration.

(OMIT ISOLATION under CAL)

OPEP

Lists the key parameters for both channels 1 and 2 on the display.

(OPERATING PARAMETERS under COPY)

OSE *value*

Enables the operational status register.

value 0 to 32,767

OSER?

Outputs the current value in the event register of an operational status register.

OSR?

Outputs the operational status register value.

OSNT

Sets the negative transition filter of an operational status register. For details, refer to Appendix B. (Query)

OSPT

Sets the positive transition filter of an operational status register. For details, refer to Appendix B. (Query)

OUT8IO *value*

Outputs the data to the 8-bit parallel output port.

value 0 to 32,767

OUTPCALC{01-12}?

Outputs the active calibration set array of the active channel (Data format: real, imaginary). Refer to Appendix D for the calibration set array.

OUTPCALK?

Outputs the active calibration kit. (Data format: block data (714 bytes of binary data))

OUTPDATA?

Outputs the error corrected data (Data format: real, imaginary).

OUTPDATAP? *value*

Outputs the error corrected data at the specified point (Data format: real, imaginary).

value 1 to "number of points"

OUTPERRO?

Outputs the error message in the error queue (Data format: Error number (ASCII), "string").

OUTPFAIP?

Outputs number of the failed point of the limit test.

OUTPFBUS?

Outputs the FBUS data.

(Under SERVICE MENU under [SYSTEM])

OUTPFILT? *value*[*suffix*]

Outputs filter parameters within the range specified by the ANARANG command. Command parameter sets the offset of *x*dB to the maximum peak value to determine the cutoff points. For details, refer to Appendix E. (Data format:loss, bandwidth, center frequency, Q, ΔL.F, ΔR.F)

value Relative offset value from maximum
suffix Refer to "Suffix"

OUTPFORM?

Outputs the formatted trace data (Data format: real, imaginary)

OUTPFORMP? *value*

Outputs the formatted trace data at the specified point (Data format: real, imaginary)

value 1 to "number of points"

OUTPIFORM?

Outputs the formatted data from the inactive channel (Data format: real, imaginary)

OUTPINP8IO?

Outputs the data entered from the 4-bit parallel input port.

OUTPIRFORM?

Outputs the real part of the formatted data from the inactive channel.

OUTPIRTMEM?

Outputs the real part of the trace memory data from the inactive channel.

OUTPITMEM?

Outputs the trace memory data from the inactive channel. (Data format: real, imaginary)

OUTPLIMF?

Outputs the limit test results only for the failed points. (Data format: stimulus, result (0 for fail, −1 for no test), upper limit, lower limit; Form 4)

OUTPLIML?

Outputs the limit test results for each point. (Data format: stimulus, result (1 for pass, 0 for fail, −1 for no test), upper limit, lower limit; Form 4)

OUTPLIMM?

Outputs the limit test result for the marker position. (Data format: stimulus, result (1 for pass, 0 for fail, −1 for no test), upper limit, lower limit)

OUTPMARK?

Outputs the active marker values. (Data format: marker value, marker aux. value, stimulus)

OUTPMAX?

Outputs the maximum value within the range specified with the **ANARANG** command. For details, refer to Appendix E. (Data format:maximum, stimulus)

OUTPMEAN?

Outputs the mean value within the range specified with the **ANARANG** command. For details, refer to Appendix E. (Data format:mean)

OUTPMEMO?

Outputs the memory data from the active channel. (Data format: real, imaginary)

OUTPMEMOP? *value*

Outputs the memory data from the active channel at a specified point. (Data format: real, imaginary)

value 1 to "number of points"

OUTPMSTA?

Outputs the marker statistics. (Data format: mean, standard deviation, peak to peak)

OUTPMIN?

Outputs the minimum value within the range specified with the ANARANG command. For details, refer to Appendix E. (Data format:minimum, stimulus)

OUTPMINMAX?

Outputs the maximum and minimum values within the range specified with the ANARANG command. For details, refer to Appendix E. (Data format:maximum, stimulus, minimum, stimulus)

OUTPMWID?

Outputs the results of the bandwidth search. (Data format: bandwidth, center, Q)

OUTPMWIL?

Outputs the results of the bandwidth search with the insertion loss value. (Data format: bandwidth, center, Q, and loss)

OUTPMWLF?

Outputs the results of the bandwidth search with the insertion loss, the difference between the center frequency and the lower cutoff frequency (ΔL.F), and the difference between the center frequency and the upper cutoff frequency (ΔR.F) values. (Data format: bandwidth, center, Q, loss, ΔL.F, and ΔR.F)

OUTPRAW{1-4}?

Outputs the uncorrected data arrays for the active channel. (Data format: real, imaginary)

OUTPRESO?

Outputs the series resonant (Resonant) and parallel resonant (Anti-Resonant) parameters, 0° phase point frequency fr (Resonant frequency) and fa (Anti-Resonant frequency), and the corresponding gain values Gr and Ga. For details, refer to Appendix E. (Data format:Gr, fr, Ga, fa)

OUTPRFORM?

Outputs the real part of the formatted data from the active channel.

OUTPRTMEM?

Outputs the real part of the trace memory data from the active channel.

OUTPSTIM?

Outputs the stimulus array data from the active channel.

OUTPTESS? *value*

Outputs the specified test number's result.

(Under `SERVICE MENU` under (SYSTEM))

value 0 to 85

OUTPTITL?

Outputs the display title for the active channel (less than 54 characters).

OUTPTMEM?

Outputs the memory trace data from the active channel. (Data format: real, imaginary)

OUTPTMEMP? *value*

Outputs the memory trace data from the active channel at a specified point. (Data format: real, imaginary)

value 1 to "number of points"

OUTPUFORM?

Outputs the unformatted data from the active channel. (Data format: real, imaginary)

PARS{ON|OFF}

Sets the partial search of the marker search function on or off.

(`PART SRCH on off` under (MKR FCTN); Query)

PEADX *value* [*suffix*]

Defines the differential stimulus value of the peak for searching for the local max, min, and peak-to-peak.

(`PEAK DEF: ΔX` under (MKR FCTN); Query)

value −5000 to 5000 (MHz) (Frequency sweep)
−500 to 500 (dBm) (Power sweep)

suffix Refer to "Suffix".

PEADY *value* [*suffix*]

Defines the differential response value of the peak for searching for the local max, min, and peak-to-peak.

(ΔY under MKR FCTN; Query)

value	−5.0E+5 to 5.0E+5 (dB) (Log mag format) −5.0E+5 to 5.0E+5 (deg) (Phase and Expanded phase formats) −5.0E+5 to 5.0E+5 (s) (Delay format) −5.0E+5 to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats) −5.0E+5 to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats) −5.0E+5 to 5.0E+5 (SWR format)
suffix	Refer to "Suffix".

PHAO *value* [deg]

Adds or subtracts a phase offset.

(PHASE OFFSET under SCALE REF; Query)

value	−360 to +360 (deg).

PHAS

Displays a Cartesian format of the phase portion of the data, measured in degrees.

(PHASE under FORMAT; Query)

PLOALL

Selects plotting all the information displayed on the display except for the softkey.

(PLOT: ALL under COPY; Query)

PLOC *parameter*

Selects the plot elements. (Query)

parameter	*description*
DONLY	Data only
DGRAT	Data and graticule
ALL	All information displayed

PLODGRAT

Selects the measured data and memory data with the graticules for plotting.

(DATA & GRATCL under COPY; Query)

PLODONLY

Selects the measured data and the memory data without the graticules for plotting.

(DATA ONLY under COPY; Query)

PLOS{FAST|SLOW}

Sets the plotting speed to fast or slow.

(PLOT SPEED under COPY)

PLOT

Plots the display to a graphics plotter.

(PLOT under COPY)

POIN *value*

Sets the number of the data points per sweep.

(NUMBER of POINTS under MENU; Query)

value 2 to 801.

POLA

Displays in the polar format.

(POLAR under FORMAT; Query)

POLM *parameter*

Selects the polar marker. (Query)

parameter	*description*
LOG	Log
LIN	Linear
RI	Real and imaginary

POLMLIN

Displays the linear magnitude and the phase of the active polar marker.

(LIN MKR under MKR; Query)

POLMLOG

Displays the logarithmic magnitude and the phase of the active polar marker.

(LOG MKR under MKR; Query)

POLMRI

Displays a real and imaginary pair of the active polar marker.

(Re/Im MKR under MKR; Query)

PORE{ON|OFF}

Sets the reference plane extension mode ON or OFF.

(EXTENSIONS on off under CAL; Query)

PORT1 *value* [s]

Extends the reference plane for measurement of S_{11}, S_{21}, and S_{12}.

(EXTENSION PORT 1 under CAL; Query)

value −10 to 10 (s)

PORT2 *value* [s]

Extends the reference plane for measurement of S_{22}, S_{12}, and S_{21}.

(EXTENSION PORT 1 under CAL; Query)

value −10 to 10 (s)

PORTA *value* [s]

Adds electrical delay to the input A reference plan for any A input measurements including S-parameters.

(EXTENSION INPUT A under CAL; Query)

value −10 to 10 (s)

PORTB *value* [s]

Adds electrical delay to the input B reference plane for any B input measurements including S-parameters.

(EXTENSION INPUT B under CAL; Query)

value −10 to 10 (s)

PORTR *value* [s]

Adds electrical delay to extend the reference plane at input R to the end of cable.

(EXTENSION INPUT R under CAL; Query)

value −10 to 10 (s)

POWDAUTO

Sets the power DAC to auto.

(Under SERVICE MENU under SYSTEM)

POWDMANU

Sets the power DAC to MANUAL.

(Under SERVICE MENU under SYSTEM)

POWDVALU *value*

Sets the power DAC value.

(Under SERVICE MENU under SYSTEM)

value 0 to 4,095

POWE *value* [dBm]

Sets the source output level.

(POWER under MENU; Query)

value −50 to +15 (dBm)

POWLANOR

Sets the power level ALC to NORMAL.

(Under SERVICE MENU under SYSTEM)

POWLAOPE

Sets the power level ALC to OPEN.

(Under SERVICE MENU under SYSTEM)

POWS

Activates a power sweep mode.

(POWER SWEEP under (MENU); Query)

PREP

Displays the previous page of information in a tabular listing.

(PREV PAGE under (COPY))

PRES

Presets the instrument state. ((PRESET))

PRIC

Selects color printing.

(COLOR under (COPY); Query)

PRICFIXE

Selects the default colors for printing a hard copy.

(PRINT COLOR [FIXED] under (COPY); Query)

PRICVARI

Selects the colors as similar as possible to the display for printing a hard copy.

(PRINT COLOR [VARIABLE] under (COPY); Query)

PRINALL

Copies the measurement display to the printer according to plotting options.

(PRINT under (COPY))

PRIS

Sets the print command to the default selection.

(PRINT: STANDARD under (COPY); Query)

PSOFT{ON|OFF}

Selects the plot softkey label option ON or OFF.

PURG *string*

Removes a file saved on the disk in the built-in flexible disk drive.

(PURGE FILE under [SAVE]/[RECALL])

string File name, up to 10 characters including the extension

QUAD *parameter*

Selects the quadrant plot setting.

parameter	*description*
LEFU	Upper left
LEFL	Lower left
RIGU	Upper right
RIGL	Lower right
FULP	Full-size

RAID

Completes the response and isolation calibration.

(DONE RESP ISOL'N CAL under [CAL])

RAIISOL

Selects the isolation class for the response and isolation calibration.

(ISOL'N STD under [CAL])

RAIRESP

Selects the response class for the response and isolation calibration.

(RESPONSE under [CAL])

REAL

Displays only the real (resistive) portion of the measured data in Cartesian format.

(REAL under [FORMAT]; Query)

RECC

Recalls the previously saved color set.

(RECALL COLORS under [DISPLAY])

RECCOFF

Sets the receiver correction OFF.

(Under SERVICE MENU under [SYSTEM]; Query)

RECCON

Sets the receiver correction ON.

(Under SERVICE MENU under [SYSTEM]; Query)

RECD *string*

Loads the instrument states or data from the disk in the built-in flexible disk drive.

(RECALL FILE under [SAVE]/[RECALL])

string File name, Up to 10 characters including the extension

REFD

Completes with the reflection part of the full 2-port calibration.

(REFLECT'N DONE under [CAL])

REFL

Begins the reflection part of the full 2-port calibration.

(REFLECT'N under [CAL])

REFP *value*

Sets the position of the reference line on the graticule of a Cartesian format.

(REFERENCE POSITION under [SCALE REF]; Query)

value 0 to 10 (Div)

REFV *value* [*suffix*]

Changes the value of the reference line, moving the measurement trace correspondingly.

(**REFERENCE VALUE** under SCALE REF; Query)

value	−500 to 500 (dB) (Log mag format) -5.0×10^{6} to 5.0×10^{6} (deg) (Phase or Expanded phase formats) −0.5 to 0.5 (s) (Delay format) 1.0×10^{-11} to 500 (Units) (Smith chart, admittance chart, or Polar formats) -5.0×10^{6} to 5.0×10^{6} (Units) (Lin man, Real, or Imaginary formats) -5.0×10^{6} to 5.0×10^{6} (SWR format)
suffix	Refer to "Suffix"

RESAVD *string*

Updates an already saved file on the disk in the built-in flexible disk drive.

(**RE-SAVE FILE** under SAVE)

string	File name up to 10 characters including the extension

RESC

Resumes the last measurement calibration sequence.

(**RESUME CAL SEQUENCE** under CAL)

RESD

Turns off the tabular listing and returns the measurement display to the screen.

(**RESTORE DISPLAY** under COPY)

RESPDONE

Completes the response calibration.

(**DONE: RESPONSE** under CAL)

REST

Aborts the sweep in progress, then restarts the measurement.

(**MEASURE RESTART** under MENU)

REVI

Selects the reverse isolation calibration.

(REV ISOL'N ISOL'N STD under [CAL])

REVM

Selects the reverse match calibration.

(REV. MATCH THRU under [CAL])

REVT

Selects the reverse transmission calibration.

(REV. TRANS. THRU under [CAL])

RFOPNORM

Sets the RF OSC PLL to NORMAL.

(Under SERVICE MENU under [SYSTEM]; Query)

RFOPOPEN

Sets the RF OSC PLL to OPEN.

(Under SERVICE MENU under [SYSTEM]; Query)

RIGL

Draws a quarter-page plot in the lower right quadrant of the page.

(RIGHT LOWER under [COPY]; Query)

RIGU

Draws a quarter-page plot in the upper right quadrant of the page.

(RIGHT UPPER under [COPY]; Query)

RPLENV?

Searches all sets of neighboring peaks and their included valleys for the maximum perpendicular height from the valley minimum point included between neighboring peaks, to the intersection of an imaginary slope line drawn between the maximum peak points of the neighboring peaks in range specified by ANARANG, and outputs the resultant data via HP-IB. For details, refer to Figure E-7 in Appendix E.

RPLHEI?

Searches for the maximum height between neighboring ripple peaks and outputs the resultant data via HP-IB. For details, refer to Figure E-3 in Appendix E.

RPLLHEI?

Searches for the maximum height between neighboring ripple peaks (measured from the ripple maximum peak point to the valley minimum point to the left of the ripple peak) and outputs the resultant data via HP-IB. For details, refer to Figure E-6 in Appendix E.

RPLMEA?

Averages all heights between neighboring local maximums and minimums within a specified range and outputs the result by HP-IB. If no ripple is detected, a zero is returned. For details, refer to Figure E-8 in Appendix E.

RPLPP?

Searches for the maximum ripple peak to peak value and outputs the resultant data via HP-IB. For details, refer to Figure E-1 in Appendix E.

RPLRHEI?

Searches for the maximum height between neighboring ripple peaks (measured from the ripple peak to the valley point to the right of the ripple peak) and outputs the resultant data via HP-IB. For details, refer to Figure E-5 in Appendix E.

RSCO

Resets the modified colors to the default colors.

(`RESET COLOR` under DISPLAY)

S11

Selects the S-parameter test set for measurement of S_{11}.

(`Refl: FWD S11 (A/R)` under MEAS; Query)

S12

Selects the S-parameter test set for measurement of S_{12}.

(`Trans: REV S12 (A/R)` under MEAS; Query)

S21

Selects the S-parameter test set for measurement of S_{21}.

(`Trans: FWD S21 (B/R)` under MEAS; Query)

S22

Selects the S-parameter test set for measurement of S_{22}.

(`Refl: REV S22 (B/R)` under MEAS; Query)

SADD

Adds a new segment to a list sweep table.

(`ADD` under MENU)

SAV1

Saves the 1-port calibration results.

(`DONE: 1-PORT CAL` under CAL)

SAV2

Saves the 2-port calibration results.

(`DONE: 2-PORT CAL` under CAL)

SAVC

Re-draws a trace using current error coefficient array data.

SAVCA{ON|OFF}

Selects whether or not the calibration coefficients arrays are to be saved.

(`CAL ARY on off` under SAVE; Query)

SAVDALL *string*

Saves the instrument states, the data array, and the memory array to the disk in the built-in flexible disk drive.

(`SAVE ALL` under SAVE)

string File name, up to 8 characters

SAVDA{ON|OFF}

Sets the data arrays to be saved (ON) or not (OFF).

(`DATA ARY on off` under SAVE; Query)

SAVDASC "*string*"

Save the current measurement data in ASCII file format.

(`ASCII SAVE DATA ONLY` under SAVE)

string File name, up to 8 characters

SAVDDAT *string*

Saves the internal data arrays which is defined by the `SAVRA{ON|OFF}`, `SAVCA{ON|OFF}`, `SAVDA{ON|OFF}`, `SAVMA{ON|OFF}`, `SAVUA{ON|OFF}`, `SAVTA{ON|OFF}`, and `SAVTMA{ON|OFF}`.

(`SAVE DATA ONLY` under SAVE)

string File name up to 8 characters

SAVDGRA "*string*"

Saves the current display image in an HP-GL file.

(`ASCII SAVE GRAPHICS` under SAVE)

string File name up to 8 characters

SAVDSTA *string*

Saves only the instrument states and the calibration coefficients to the disk in the built-in flexible disk drive.

(`SAVE STATE ONLY` under SAVE)

string File name up to 8 characters

SAVEUSEK

Stores the user-modified or user-defined calibration kit into memory.

(`SAVE USER KIT` under CAL)

SAVMA{ON|OFF}

Sets the memory arrays to be saved (ON) or not (OFF).

(`MEMORY ARY on off` under SAVE; Query)

SAVRA{ON|OFF}

Sets the raw data arrays to be saved (ON) or not (OFF).

(`RAW ARY on off` under SAVE; Query)

SAVTA{ON|OFF}

Sets the trace arrays to be saved (ON) or not (OFF).

(`TRACE ARY on off` under SAVE; Query)

SAVTMA{ON|OFF}

Sets the memory trace arrays to be saved (ON) or not (OFF).

(`T.MEM ARY on off` under SAVE; Query)

SAVUA{ON|OFF}

Sets the unformatted data arrays to be saved (ON) or not (OFF).

(`UNFORM ARY on off` under SAVE; Query)

SCAC

Couples the data and memory trace to be scaled.

(`D&M SCALE [COUPLE]` under SCALE REF; Query)

SCAFDATA

Selects the data trace to be scaled.

(`SCALE FOR [DATA]` under SCALE REF; Query)

SCAFMEMO

Selects the memory trace to be scaled.

(`SCALE FOR [MEMORY]` under SCALE REF; Query)

SCAL *value* [*suffix*]

Changes the response value scale per graticule division.

(`SCALE/DIV` under SCALE REF; Query)

value 0.001 to 500 (dB/div) (Log mag format)
0.01 to 500 (deg/div) (Phase format)
1.0×10^{-11} to 10,000 (deg) (Expanded phase format)
1.0×10^{-14} to 10 (s/div) (Delay format)

1.0×10^{-11} to 10,000 (Units FS) (Smith chart, admittance chart, and Polar format)
1.0×10^{-11} to 10,000 (Units/div) (Lin mag, Real, and Imaginary formats)
1.0×10^{-11} to 10,000 (/div) (SWR format)

suffix Refer to "Suffix"

SCAPFULL

Selects the normal full size scale for plotting.

(SCALE: FULL under [COPY])

SCAPGL

Fits the lower graticule to the user-defined P1 and P2.

(LOWER GRATICULE under [COPY])

SCAPGU

Fits the upper graticule to the user-defined P1 and P2.

(UPPER GRATICULE under [COPY])

SCAU

Uncouples the data and memory trace to be scaled.

(D&M SCALE [UNCOUPLE] under [SCALE REF]; Query)

SDEL

Deletes a segment from a list sweep table.

(DELETE under [MENU])

SDON

Completes editing a segment of a list sweep table.

(SEGMENT DONE under [MENU])

SEAL

Searches the trace for the next occurrence of the target value to the left of the marker.

(SEARCH LEFT under [MKR FCTN])

SEALMAX

Moves the active marker to the maximum peak point on the trace in the search range.

(LOCAL MAX under MKR FCTN; Query)

SEALMIN

Moves the active marker to the minimum peak point on the trace in the search range.

(LOCAL MIN under MKR FCTN; Query)

SEAM *parameter*

Selects the marker search function. (Query)

parameter	*description*
OFF	Marker search function OFF
MAX	Maximum
MIN	Minimum
TARG	Target
MEAN	Mean
LMAX	Local maximum
LMIN	Local minimum
PPEAK	Peak to peak

SEAMEAN

Moves the active marker to the mean point on the trace.

(SEARCH: MEAN under MKR FCTN; Query)

SEAMAX

Moves the active marker to the maximum point on the trace.

(MAX under MKR FCTN; Query)

SEAMIN

Moves the active marker to the minimum point on the trace.

(MIN under MKR FCTN; Query)

SEAOFF

Turns off the marker search function.

(SEARCH: OFF under MKR FCTN; Query)

SEAPPEAK

Moves the active marker and the delta reference marker to the maximum peak point and the minimum peak point on the trace in the search range.

(**PEAK-PEAK** under MKR FCTN; Query)

SEAR

Searches the trace for the next occurrence of the target value to the right of the marker.

(**SEARCH RIGHT** under MKR FCTN)

SEARSTOR

Stores the search range, which is defined between the active marker and the delta reference marker.

(**SEARCH RNG STORE** under MKR FCTN)

SEATARG *value* [*suffix*]

Places the active marker at a specified target point on a trace.

(**TARGET** under MKR FCTN; Query)

value	-5.0×10^5 to 5.0×10^5 (dB) (Log mag format) -5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase formats) -5.0×10^5 to 5.0×10^5 (s) (Delay format) -5.0×10^5 to 5.0×10^5 (Ω) (Smith chart and admittance chart formats) -5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary format) $-5.0\times10^5$to 5.0×10^5 (SWR format)
suffix	Refer to "Suffix"

SEDI *value*

Determines a segment of a list sweep table to be modified.

(**SEGMENT** under MENU; Query)

value	1 to 31

SELC *parameter*

Selects the conjugate matching circuit type. (Query)

parameter	*description*
LSLP	L_s-L_p
LSCP	L_s-C_p
CSLP	C_s-L_p
CSCP	C_s-C_p
LPLS	L_p-L_s
LPCS	L_p-C_s
CPLS	C_p-L_s

CPCS	C_p-C_s

SELCCPCS

Selects the "Cp-Cs" circuit for conjugate matching.

(`Cp-Cs` under DISPLAY; Query)

SELCCPLS

Selects the "Cp-Ls" circuit for conjugate matching.

(`Cp-Ls` under DISPLAY; Query)

SELCCSCP

Selects the "Cs-Cp" circuit for conjugate matching.

(`Cs-Cp` under DISPLAY; Query)

SELCCSLP

Selects the "Cs-Lp" circuit for conjugate matching.

(`Cs-Lp` under DISPLAY; Query)

SELCLPCS

Selects the "Lp-Cs" circuit for conjugate matching.

(`Lp-Cs` under DISPLAY; Query)

SELCLPLS

Selects the "Lp-Ls" circuit for conjugate matching.

(`Lp-Ls` under DISPLAY; Query)

SELCLSCP

Selects the "Ls-Cp" circuit for conjugate matching.

(`Ls-Cp` under DISPLAY; Query)

SELCLSLP

Selects the "Ls-Lp" circuit for conjugate matching.

(**Ls-Lp** under DISPLAY; Query)

SELD

Executes the self diagnostics.

(Under **SERVICE MENU** under SYSTEM)

SETCDATE *year,month,day*

Changes date of the internal clock.

(**MONTH**, **DAY**, and **YEAR** under SYSTEM; Query)

year	1901 to 2059
month	1 to 12
day	1 to 31

SETCTIME *hour,min,sec*

Changes time of the internal clock.

(**HOUR**, **MIN**, and **SEC** under SYSTEM; Query)

hour	0 to 23
min	0 to 59
sec	0 to 59

SETZ *value* [ohm]

Sets the characteristic impedance used by the HP 8751A in calculating measured impedance with the Smith chart markers and conversion parameters.

(**SET Z0** under CAL; Query)

value	0.1 to 5.0×10^6 (Ω)

SING

Makes a single measurement sweep, then sets the HOLD mode.

(**SINGLE** under MENU)

SMIC

Displays a Smith chart format.

(SMITH CHART under FORMAT; Query)

SMIM *parameter*

Selects the form for the Smith marker. (Query)

parameter	*description*
LIN	Linear
LOG	Log
RI	Real and imaginary
RX	R+jX
GB	G+jB

SMIMGB

Displays the complex admittance values of the active marker position on a Smith chart in rectangular form.

(G+jB MKR under MKR; Query)

SMIMLIN

Displays the linear magnitude value and the phase of the active marker position on a Smith chart.

(LIN MKR under MKR; Query)

SMIMLOG

Displays the logarithmic magnitude value and the phase of the active marker on a Smith chart.

(LOG MKR under MKR; Query)

SMIMRI

Displays the values of the active marker on a Smith chart as a real and imaginary pair.

(Re/Im MKR under MKR; Query)

SMIMRX

Displays the complex impedance values of the active marker on a Smith chart in rectangular form.

(R+jX MKR under MKR; Query)

SMOOAPER *value* [pct]

Changes the value of the smoothing aperture as a percent of the span.

(`SMOOTHING APERTURE` under AVG; Query)

value 0.05 to 100 (%)

SMOO{ON|OFF}

Sets the smoothing function to ON or OFF.

(`SMOOTHING on off` under AVG; Query)

SOUCOFF

Sets the source correction to OFF.

(Under `SERVICE MENU` under SYSTEM; Query)

SOUCON

Sets the source correction to ON.

(Under `SERVICE MENU` under SYSTEM; Query)

SPAN *value* [*suffix*]

Sets the frequency span of a segment about a specified center frequency.

(SPAN or `SPAN` under MENU; Query)

value 0 to 499,999,995 (Hz)
suffix Hz or MHz

SPECFWDM *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify standard class required for a forward match (THRU).

(`FWD.MATCH` under CAL)

value 1 to 8

SPECFWDT *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify standard class required for a forward transmission (THRU) calibration.

(`FWD.TRANS.` under CAL)

value 1 to 8

SPECRESI *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify standard class required for a response and isolation calibration.

(RESPONSE & ISOL'N under CAL)

value 1 to 8

SPECRESP *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify standard class required for a response calibration.

(RESPONSE under CAL)

value 1 to 8

SPECREVM *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify standard class required for a reverse match (THRU) calibration.

(REV.MATCH under CAL)

value 1 to 8

SPECREVT *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify standard class required for a reverse transmission (THRU) calibration.

(REV.TRANS. under CAL)

value 1 to 8

SPECS11A *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify the first standard class (S_{11A}) required for an S_{11} 1-port calibration.

(SPECIFY: S11A under CAL)

value 1 to 8

SPECS11B *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify the second standard class (S_{11B}) required for an S_{11} 1-port calibration.

(S11B under CAL)

value 1 to 8

SPECS11C *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify third standard class (S_{11C}) required for an S_{11} 1-port calibration.

(`S11C` under CAL)

value 1 to 8

SPECS22A *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify the first standard class (S_{22A}) required for an S_{22} 1-port calibration.

(`SPECIFY: S22A` under CAL)

value 1 to 8

SPECS22B *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify the second standard class (S_{22B}) required for an S_{22} 1-port calibration.

(`S22B` under CAL)

value 1 to 8

SPECS22C *value*,[*value*,[*value*,[*value*,[*value*,[*value*,[*value*]]]]]]

Enters the standard numbers to specify the third standard class (S_{22C}) required for an S_{22} 1-port calibration.

(`S22C` under CAL

value 1 to 8

SPLD{ON|OFF}

Sets the dual channel display mode: a full-screen single graticule display (OFF), or a split display with two half-screen graticules (ON).

(`SPLIT DISP on off` under DISPLAY; Query)

STAN{A-G}

Measures the calibration standard in the current standard class.

(`OPEN`, `SHORT`, `THRU`, `LOAD`, etc. under CAL)

STAR *value* [*suffix*]

Defines the start frequency of the stimulus. (START; Query)

Sets the start frequency of a segment.

(SEGMENT START under MENU; Query)

value	5 to 5.0×10^8 (Hz, frequency sweep) −50 to 15 (dBm, power sweep)
suffix	Refer to "Suffix"

STDD

Completes the current standard definition.

(STD DONE (DEFINED) under CAL)

STDT *parameter*

Selects the standard type. (Query)

parameter	*description*
OPEN	Open
SHOR	Short
LOAD	Load
DELA	Transmission line
ARBI	Arbitrary impedance

STDTARBI

Defines the standard type to LOAD with an arbitrary impedance.

(ARBITRARY IMPEDANCE under CAL; Query)

STDTDELA

Defines the standard type as transmission line of specified length.

(DELAY/THRU under CAL; Query)

STDTLOAD

Defines the standard type as LOAD (termination).

(LOAD under CAL; Query)

STDTOPEN

Defines the standard type as an OPEN.

(`OPEN` under CAL; Query)

STDTSHOR

Defines the standard type as a SHORT.

(`SHORT` under CAL; Query)

STEODAUT

Sets the step OSC DAC to AUTO.

(Under `SERVICE MENU` under SYSTEM; Query)

STEODMAN

Sets the step OSC DAC to MANUAL.

(Under `SERVICE MENU` under SYSTEM; Query)

STEODVAL *value*

Sets the step OSC DAC value.

(Under `SERVICE MENU` under SYSTEM; Query)

value 0 to 255

STEONORM

Sets the step OSC DAC to NORMAL.

(Under `SERVICE MENU` under SYSTEM; Query)

STEOOPEN

Sets the step OSC DAC to OPEN.

(Under `SERVICE MENU` under SYSTEM; Query)

STODDISK

Selects the built-in flexible disk.

(Under SAVE; Query)

STODMEMO

Selects the RAM disk memory.

(Under [SAVE]; Query)

STOP *value* [*suffix*]

Defines the stop value of the stimulus. ([STOP]; Query)

Sets the stop frequency of a segment.

(`STOP` under [MENU]; Query)

value	5 to 5.0×10^{8} (Hz) −50 to +15 (dBm)
suffix	Refer to "Suffix"

STPSIZE *value* [*suffix*]

Specifies the frequency step for a list sweep table.

(`STEP SIZE` under [MENU]; Query)

value	0 to 499,999,995 (Hz)
suffix	Hz or MHz

SVCO

Saves the modified color set.

(`SAVE COLORS` under [DISPLAY])

SWET *value* [s]

Manually sets the sweep time.

(`SWEEP TIME` under [MENU]; Query)

value	6.0×10^{-4} to 86,400 (s)

SWETAUTO

Automatically sets the sweep time.

(`SWEEP TIME AUTO` under [MENU]; Query)

SWPT *parameter*

Selects the sweep type. (Query)

parameter	*description*
LINF	Linear frequency
LOGF	Log frequency
LIST	Frequency list
POWE	Power

SWR

Selects the SWR display for the active channel.

(`SWR` under FORMAT; Query)

TERI *value* **[ohm]**

Specifies the (arbitrary) impedance of the standard.

(`TERMINAL IMPEDANCE` under CAL)

value 0 to 10,000 (Ω)

TESC

Continues the test.

(Under `SERVICE MENU` under SYSTEM)

TESS?

Outputs the test set identifier: 1 for an S-parameter test set, or 0 for none.

TEST *value*

Selects the test number.

(Under `SERVICE MENU` under SYSTEM; Query)

value 0 to 85

TINT *value*

Adjusts the hue of the specified display element.

(`TINT` under DISPLAY; Query)

value 0 to 100

TITL *string*

Sends the string to the title area on the display.

(TITLE under DISPLAY; Query)

string up to 53 characters

TRACK{ON|OFF}

Tracks the search at the specified target value with each new sweep.

(TRACKING on off under MKR FCTN; Query)

TRAD

Completes the transmission part of the full 2-port calibration.

(TRANS. DONE under CAL)

TRAN

Begins the transmission part of the full 2-port calibration.

(TRANSMISSION under CAL)

VELOFACT *value*

Enters the velocity factor used by the HP 8751A to calculate the equivalent electrical length.

(VELOCITY FACTOR under CAL; Query)

value 0 to 10

WIDSIN

Searches for the cutoff point on the trace within the current cutoff points.

(SEARCH IN under MKR FCTN)

WIDSOUT

Searches for the cutoff point on the trace outside of the current cutoff points.

(SEARCH OUT under MKR FCTN)

WIDT{ON|OFF}

Sets the bandwidth search feature (ON) or not (OFF).

(`WIDTHS on off` under MKR FCTN; Query)

WIDV *value* [*suffix*]

Sets the amplitude parameter that defines the start and stop points for a bandwidth search.

(`WIDTH VALUE` under MKR FCTN; Query)

value -5.0×10^5 to 5.0×10^5 (dB) (Log mag format)
-5.0×10^5 to 5.0×10^5 (deg) (Phase and Expanded phase formats)
-5.0×10^5 to 5.0×10^5 (s) (Delay format)
-5.0×10^5 to 5.0×10^5 (Ω) (Smith chart and admittance chart formats)
-5.0×10^5 to 5.0×10^5 (Units) (Polar, Lin mag, Real, and Imaginary formats)
$-5.0\times10^5$to 5.0×10^5 (SWR format)

suffix Refer to "Suffix"

*CLS

Clears the status byte register, the event register of the standard operation status register structure, and the standard event status register.

*ESE *value*

Sets the enable bits of the standard status register. (Query)

value 0 to 255 (decimal expression of enable bits of the operation status register)

*ESR?

Returns the contents of the standard event status register.

*IDN?

Returns the HP 8751A ID. (Data format: manufacturer, model, serial no., firmware rev.)

*OPC

Tells the HP 8751A to set bit 0 (OPeration Complete bit) in the standard event status register when it completes all pending operations. (Query)

*PCB *value*

Specifies the address of a controller that is temporarily passing HP-IB control to the HP 8751A. (Option 002 only)

value 0 to 30

*RST

Resets the HP 8751A to its initial settings.

*SRE *value*

Sets the enable bits of the status byte register. (Query)

value 0 to 255 (decimal expression of enable bits of the status byte register)

*STB?

Reads the status byte by reading the master summary status bit.

*TRG

Triggers the HP 8751A when the trigger mode is set to EXTERNAL trigger.

*TST?

Executes an internal self-test and returns the test result.

*WAI

Makes the HP 8751A wait until all previously sent commands are completed.

A

HP-IB Commands Summary

This appendix summarizes the HP-IB instrument commands of the HP 8751A according to the their softkey labels.

Active Channel Block

CHAN1	CH 1
CHAN2	CH 2

Response Function Block

MEAS Key

Input Port Menu

AR	A/R
BR	B/R
AB	A/B
MEASA	A
MEASB	B
MEASR	R

S-Parameter Menu

S11	Refl: FWD S11 (A/R)
S21	Trans: FWD S21 (B/R)
S12	Trans: REV S12 (A/R)
S22	Refl: REV S22 (B/R)
BDC	Bdc
BDCR	Bde/R

MEAS *parameter*

Conversion Menu

CONVOFF	OFF
CONVZREF	Z: Refl
CONVZTRA	Z: Trans
CONVYREF	Y: Refl
CONVYTRA	Y: Trans
CONV1DS	1/S
CONV MP{4|8|16}	4 * Phase 8 * Phase 16 * Phase
CONVMP{4|8|16}	
CONV *parameter*	

(FORMAT) Key

Format Menu

LOGM	LOG MAG
PHAS	PHASE
DELA	DELAY
SMIC	SMITH CHART
POLA	POLAR
LINM	LIN MAG
SWR	SWR

Format More Menu

REAL	REAL
IMAG	IMAGINARY
EXPP	EXPANDED PHASE
INVSCHAR	INV SMITH CHART
LOGMP	LOG MAG & PHASE
LOGMD	LOG MAG & DELAY
FMT *parameter*	

(SCALE REF) Key

Scale Reference Menu

AUTO	AUTO SCALE
SCAL *value*	SCALE/DIV
REFP *value*	REFERENCE POSITION
REFV *value*	REFERENCE VALUE
MARKREF	MARKER → REFERENCE
SCAFDATA	SCALE FOR [DATA]

SCAFMEMO	SCALE FOR [MEMORY]
SCAC	D&M SCALE [COUPLE]
SCAU	D&M SCALE [UNCOUPLE]

Electrical Delay Menu

MARKDELA	MARKER → DELAY
ELED *value*	ELECTRICAL DELAY
PHAO *value*	PHASE OFFSET
CONPDISP{ON|OFF}	CONJ.P DISP on off

(DISPLAY) Key

Display Menu

DUAC{ON|OFF}	DUAL CHAN on off
SPLD{ON|OFF}	SPLIT DISP on off
TITL *string*	TITLE

Display More Menu

BEEPDONE{ON|OFF}	BEEP DONE on off
BEEPWARN{ON|OFF}	BEEP WARN on off
FREQ	FREQUENCY BLANK

Display Allocation Menu

DISAALLI	ALL INSTRUMENT
DISAHIHB	HALF INSTR HALF BASIC
DISAALLB	ALL BASIC
DISA *parameter*	

Trace Math Menu

DISPDATA	DISPLAY: DATA
DISPMEMO	MEMORY
DISPDATM	DATA and MEMORY
DISPDDM	DATA/MEM
DISPDMM	DATA−MEM
DATI	DATA → MEM
DISP *parameter*	

Conjugate Matching Menu

CONM{ON|OFF}	CONJ MATCH on off
CALP	CALCULATE PARAMETERS

CONPLS *value*	PARAMETER: Ls
CONPLP *value*	Lp
CONPCS *value*	Cs
CONPCP *value*	Cp

Select Circuit Menu

SELCLSLP	Ls-Lp
SELCLSCP	Ls-Cp
SELCCSLP	Cs-Lp
SELCCSCP	Cs-Cp
SELCLPLS	Lp-Ls
SELCLPCS	Lp-Cs
SELCCPLS	Cp-Ls
SELCCPCS	Cp-Cs
SELC *parameter*	

Adjust Display Menu

INTE *value*	INTENSITY
BACI *value*	BACKGROUND INTENSITY
DEFC	DEFAULT COLORS
SVCO	SAVE COLORS
RECC	RECALL COLORS

Modify Colors Menu

COLOCH1D	CH1 DATA
COLOCH1M	CH1 MEM LIMIT LN
COLOCH2D	CH2 DATA
COLOCH2M	CH2 MEM LIMIT LN
COLOGRAT	GRATICULE
COLOWARN	WARNING
COLOTEXT	TEXT
COLOIBT	IBASIC
COLOPEN{1-6}	PEN 1 to PEN 6

Color Adjust Menu

TINT *value*	TINT
CBRI *value*	BRIGHTNESS
COLOR *value*	COLOR
RSCO	RESET COLOR

AVG Key

Average Menu

AVERREST	AVERAGING RESTART
AVERFACT *value*	AVERAGING FACTOR
AVER{ON|OFF}	AVERAGING on off
SMOOAPER *value*	SMOOTHING APERTURE
SMOO{ON|OFF}	SMOOTHING on off
GRODAPER *value*	GROUP DELAY APERTURE
IFBW *value*	IF BW

IF Bandwidth Menu

IFBWAUTO	IF BW AUTO

CAL Key

Correction Menu

CORR{ON|OFF}	CORRECTION on off
RESC	RESUME CAL SEQUENCE

Select Cal Kit Menu

CALK7MM	CAL KIT: 7mm
CALKN50	N 50Ω
CALKN75	N 75Ω
CALKUSED	USER KIT
MODI1	MODIFY
SAVEUSEK	SAVE USER KIT
CALK *parameter*	

Calibrate More Menu

VELOFACT *value*	VELOCITY FACTOR
SETZ *value*	SET ZO

Reference Plane Menu

PORE{ON|OFF}	EXTENSIONS on off
PORTR *value*	EXTENSION INPUT R
PORTA *value*	EXTENSION INPUT A
PORTB *value*	EXTENSION INPUT B
PORT1 *value*	EXTENSION PORT 1
PORT2 *value*	EXTENSION PORT 2

DC Correction Menu

DCCOR{ON|OFF}	DC CORR on off
EXEDCALI	EXECUTE DC CAL
ABODCALI	ABORT DC CAL

Calibration Menu

CALN	CALIBRATE: NONE
CALIRESP	RESPONSE
CALIRAI	RESPONSE & ISOL'N
CALIS111	S11 1-PORT
CALIS221	S22 1-PORT
CALIFUL2	FULL 2-PORT
CALIONE2	ONE-PATH 2-PORT
CALI *parameter*	

Response Cal Menu

RESPDONE	DONE: RESPONSE

Response and Isolation Cal Menu

RAIRESP	RESPONSE
RAIISOL	ISOL'N STD
RAID	DONE RESPONSE ISOL'N CAL

S11 and S22 1-Port Cal Menus

CLASS11A	[S11] : OPEN
CLASS11B	SHORT
CLASS11C	LOAD
CLASS22A	[S22] : OPEN
CLASS22B	SHORT
CLASS22C	LOAD
SAV1	DONE: 1-PORT CAL
STAN{A-G}	OPEN[M], OPEN[F], SHORT[M], SHORT[F], load1, load2, and so on.
DONE	DONE: OPENS, DONE: SHORTS, or DONE: LOADS

Full 2-Port Cal Menus

REFL	REFLECT'N
TRAN	TRANSMISSION
ISOL	ISOLATION
CLASS11A	[S11] : OPEN

CLASS11B	SHORT
CLASS11C	LOAD
CLASS22A	[S22] : OPEN
CLASS22B	SHORT
CLASS22C	LOAD
REFD	REFLECT'N DONE
FWDT	FWD. TRANS. THRU
FWDM	FWD. MATCH THRU
REVT	REV. TRANS. THRU
REVM	REV. MATCH THRU
STAN{A-G}	OPEN[M], OPEN[F], SHORT[M], load1, load2, thru1, thru2, and so on.
TRAD	TRANS. DONE
OMII	OMIT ISOLATION
FWDI	FWD. ISOL'N ISOL'N STD
REVI	REV. ISOL'N ISOL'N STD
ISOD	ISOLATION DONE
DONE	DONE: OPENS, DONE: SHORTS, or DONE: LOADS

One-Path 2-Port Cal Menus

REFL	REFLECT'N
TRAN	TRANSMISSION
ISOL	ISOLATION
CLASS11A	[S11] : OPEN
CLASS11B	SHORT
CLASS11C	LOAD
REFD	REFLECT'N DONE
FWDT	FWD. TRANS. THRU
FWDM	FWD. MATCH THRU
OMII	OMIT ISOLATION
FWDI	FWD. ISOL'N ISOL'N STD
STAN{A-G}	open1, open2, short1, short2, load1, load2, thru1, thru2, and so on.
ISOD	ISOLATION DONE
SAV2	DONE: 2-PORT CAL
DONE	DONE: OPENS, DONE: SHORTS, or DONE: LOADS

Modify Cal Kit Menu

DEFS *value*	DEFINE STANDARD
LABK *string*	LABEL KIT
KITD	KIT DONE

Define Standard Menus

STDTOPEN	OPEN
STDTSHOR	SHORT
STDTLOAD	LOAD
STDTDELA	DELAY/THRU
STDTARBI	ARBITRARY IMPEDANCE
C0 *value*	C0
C1 *value*	C1
C2 *value*	C2
TERI *value*	TERMINAL IMPEDANCE
LABS *string*	LABEL STD
STDD	STD DONE (DEFINED)
STDT *parameter*	

Specify Offset Menu

OFSD *parameter*	OFFSET DELAY
OFSL *parameter*	OFFSET LOSS
OFSZ *parameter*	OFFSET Z0

Specify Class Menus

SPECS11A *value,value, ...*	SPECIFY: S11A
SPECS11B *value,value, ...*	S11B
SPECS11C *value,value, ...*	S11C
SPECS22A *value,value, ...*	SPECIFY: S22A
SPECS22B *value,value, ...*	S22B
SPECS22C *value,value, ...*	S22C
SPECFWDT *value,value, ...*	FWD.TRANS.
SPECREVT *value,value, ...*	REV.TRANS.
SPECFWDM *value,value, ...*	FWD.MATCH
SPECREVM *value,value, ...*	REV.MATCH
SPECRESP *value,value, ...*	RESPONSE
SPECRESI *value,value, ...*	RESPONSE & ISOL'N
CLAD	CLASS DONE (SPE'D)

Label Class Menus

LABES11A	LABEL: S11A
LABES11B	S11B
LABES11C	S11C
LABES22A	LABEL: S22A
LABES22B	S22B
LABES22C	S22C
LABEFWDT	LABEL: FWD. TRANS.
LABEREVT	REV.TRANS.
LABEFWDM	FWD. MATCH
LABEREVM	REV.MATCH
LABERESP	RESPONSE
LABERESI	RESPONSE & ISOL'N

(MKR) Key

Marker Menu

MARKOFF	ALL MKR OFF
MARKODATA	MARKERS ON [DATA]
MARKOMEMO	MARKERS ON [MEMORY]
MARKL{ON|OFF}	MKR LIST on off
MARKZERO	MKR ZERO

Active Marker Menu

MARK{1-8} *value*	MARKER 1 to 8

Clear Marker Menu

CLEM{1-8}	MARKER 1 to 8

Delta Marker Mode Menu

DELRFIXM	ΔREF=Δ FIXED MKR
DELO	Δ MODE OFF

Delta Marker Menu

DELR{1-8}	Δ REF=1 to Δ REF=8

Fixed Marker Menu

MARKFSTI *value*	FIXED MKR STIMULUS
MARKFVAL *value*	FIXED MKR VALUE
MARKFAUV *value*	FIXED MKR AUX VALUE

Marker Mode Menu

MARKDISC	MARKERS: DISCRETE
MARKCONT	CONTINUOUS
MARKCOUP	MARKERS: COUPLED
MARKUNCO	UNCOUPLED
MARKTIME{ON|OFF}	MKR TIME on off

Polar Marker Menu

POLMLIN	LIN MKR
POLMLOG	LOG MKR
POLMRI	Re/Im MKR
POLM *parameter*	

Smith Marker Menu

SMIMLIN	LIN MKR
SMIMLOG	LOG MKR
SMIMRI	Re/Im MKR
SMIMRX	R+jX MKR
SMIMGB	G+jB MKR
SMIM *parameter*	

(MKR FCTN) Key

Marker Function Menu

MARKSTAR	MARKER → START
MARKSTOP	MARKER → STOP
MARKCENT	MARKER → CENTER
MARKSPAN	MARKER → SPAN
MARKREF	MARKER → REFERENCE
MEASTAT{ON|OFF}	STATISTICS

Search Range Menu

SEARSTOR	SEARCH RNG STORE
PARS{ON|OFF}	PART SRCH on off

Marker Search Menu

SEAOFF	SEARCH: OFF
SEAMAX	MAX
SEAMIN	MIN
SEATARG *value*	TARGET

TRACK{ON|OFF}	TRACKING on off

Target Menu

SEATARG	TARGET
SEAL	SEARCH LEFT
SEAR	SEARCH RIGHT

Marker Search More Menu

SEAMEAN	SEARCH: MEAN
SEALMAX	LOCAL MAX
SEALMIN	LOCAL MIN
SEAPPEAK	PEAK-PEAK
MARKPEAD	MARKER → PEAK DEF
PEADX *value*	PEAK DEF: ΔX
PEADY *value*	ΔY
SEAM *parameter*	

Width Menu

WIDV *value*	WIDTH VALUE
WIDSIN	SEARCH IN
WIDSOUT	SEARCH OUT
WIDT{ON|OFF}	WIDTHS on off

(ATTEN) Key

ATTIAODB	INPUT-A: 0dB
ATTIA20DB	20dB
ATTIBODB	INPUT-B: 0dB
ATTIB20DB	20dB
ATTIRODB	INPUT-R: 0dB
ATTIR20DB	20dB

Stimulus Function Block

STAR *value*	(START)
STOP *value*	(STOP)
CENT *value*	(CENTER)
SPAN *value*	(SPAN)

(MENU) Key

Stimulus Menu

POWE *value*	POWER
POIN *value*	NUMBER of POINTS
REST	MEASURE RESTART
COUC{ON|OFF}	COUPLED CH on off
CWFREQ *value*	CW FREQ

Power Menu

POWE *value*	POWER
CLEPTRIP	CLEAR POWER TRIP
ATTP1 *value*	ATTENUATOR PORT 1
ATTP2 *value*	ATTENUATOR PORT 2

Sweep Time Menu

SWET *value*	SWEEP TIME
SWETAUTO	SWEEP TIME AUTO

Trigger Menu

HOLD	HOLD
SING	SINGLE
NUMG	NUMBER OF GROUPS
CONT	CONTINUOUS
EXTTOFF	TRIGGER: TRIG OFF
EXTTON	EXT. TRIG ON SWEEP
EXTTPOIN	EXT. TRIG ON POINT
MANTRIG	MANUAL TRG ON POINT
EXTT *parameter*	

Sweep Type Menu

LINFREQ	LIN FREQ
LOGFREQ	LOG FREQ
LISFREQ	LIST FREQ [LIST 1] or LIST FREQ [LIST 2]

POWS	POWER SWEEP
LISDFBASE	LIST DISP: FREQ BASE
LISDOBASE	ORDER BASE
EDITLIST	EDIT LIST
SWPT *parameter*	

List Sweep Menu

LISSLIS1	SWEEP by: LIST 1
LISSLIS2	LIST 2

Edit List Menu

EDITLIS1	EDIT: LIST 1
EDITLIS2	LIST 2
SEDI *value*	SEGMENT
SDEL	DELETE
SADD	ADD
CLEL	CLEAR LIST
EDITDONE	LIST DONE

Edit Segment Menu

MARKSTAR	MKR → START
MARKSTOP	MKR → STOP
POINT	NUMBER of POINTS
STPSIZE *value*	STEP SIZE
POWE *value*	POWER
IFBW *value*	IF BW
SDON	SEGMENT DONE

Edit Segment More Menu

STAR *value*	SEGMENT: START
STOP *value*	STOP
CENT *value*	CENTER
SPAN *value*	SPAN

Clear List Menu

CLEL	CLEAR LIST YES

Instrument State Function Block

(SYSTEM) Key

Real Time Clock Menu

SETCTIME *hour,min,sec*	TIME HH:MM:SS
SETCDATE *year,month,day*	DATE MM:DD:YY
MONDYEAR	DATE MODE: MonDayYear
DAYMYEAR	DayMonYear

Limits Menu

LIMILINE{ON|OFF}	LIMIT LINE on off
LIMITEST{ON|OFF}	LIMIT TEST on off
BEEPFAIL{ON|OFF}	BEEP FAIL on off
EDITLIML	EDIT LIMIT LINE

Edit Limits Menu

LIMSEDI *value*	EDIT
LIMSDEL	DELETE
LIMSADD	ADD
LIMEDONE	DONE

Edit Segment Menu

LIMS *value*	STIMULUS VALUE
MARKSTIM	MARKER → STIMULUS
LIMU *value*	UPPER LIMIT
LIML *value*	LOWER LIMIT
LIMD *value*	DELTA LIMITS
LIMM *value*	MIDDLE VALUE
MARKMIDD	MARKER → MIDDLE
LIMEDONE	DONE

Clear List Menu

LIMCLEL	CLEAR LIST YES

Offset Limit Menu

LIMISTIO *value*	STIMULUS OFFSET
LIMIAMPO *value*	AMPLITUDE OFFSET
LIMIMAOF	MARKER → AMP. OFS

(LOCAL) Key

ADDRPLOT *value*	ADDRESS: PLOTTER
ADDRPRIN *value*	ADDRESS: PRINTER
ADDRCONT *value*	ADDRESS: CONTROLLER

(PRESET) Key

PRES	(PRESET)

(COPY) Key

Copy Menu

PRINALL	PRINT [STANDARD]
PLOT	PLOT
COPA	COPY ABORT
COPT{ON|OFF}	COPY TIME on off

Print/Plot Setup Menu

PRIS	PRINT: STANDARD
PRIC	COLOR
PRICFIXE	PRINT COLOR [FIXED]
PRICVARI	PRINT COLOR [VARIABLE]
DFLT	DEFAULT SETUP

Select Quadrant Menu

LEFU	LEFT UPPER
LEFL	LEFT LOWER
RIGU	RIGHT UPPER
RIGL	RIGHT LOWER
FULP	FULL PAGE
QUAD *parameter*	

Define Plot Menu

PLOALL	PLOT: ALL
PLODGRATY	DATA & GRATICL
PLODONL	DATA ONLY
LINTDATA	LINE TYPE DATA
LINTMEMO	LINE TYPE MEMORY
PLOSFAST	PLOT SPEED [FAST]
PLOSSLOW	PLOT SPEED [SLOW]

PLOC *parameter*

Scale Plot Menu

SCAPFULL	SCALE: FULL
SCAPGU	UPPER GRATICULE
SCAPGL	LOWER GRATICULE

Copy More Menu

LISV	LIST VALUES
OPEP	OPERATING PARAMETERS

Copy Cal Kit Menu

CALCASSI	CLASS ASSIGNMENT

Copy Standard Number Menu

CALS *value*	STD NO.1 to STD NO.8

Copy List Sweep Menu

DISL1	DISPLAY: LIST1
DISL2	LIST2
DISMSTSP	DISP MODE: ST & SPAN
DISMNUM	NUMBER of POINTS
DISMSTEP	STEP SIZE

Copy Limit Test Menu

DISLLIST	DISPLAY LIST
DISMUL	DISP MODE: UPR & LWR
DISMMD	MID & DLT

Screen Menu

PRINALL	PRINT [STANDARD]
PLOT	PLOT
COPA	COPY ABORT
COPT{ON|OFF}	COPY TIME on off
NEXP	NEXT PAGE
PREP	PREV PAGE
RESD	RESTORE DISPLAY

SAVE and RECALL Keys

Save Menu

RESAVD *string*	RE-SAVE FILE
SAVDASC	DATA ONLY
SAVDGRA	GRAPHICS
ASCE	ASCII DATA [.TXT]
GRAE	GRAPHICS [.HPG]
STODDISK	STOR DEV [DISK]
STODMEMO	STOR DEV [MEMO]

Define Save Menu

SAVDALL *string*	SAVE ALL
SAVDSTA *string*	SAVE STATE ONLY
SAVDDAT *string*	SAVE DATA ONLY

Define Save Date Menu

SAVRA{ON|OFF}	RAW ARY on off
SAVCA{ON|OFF}	CAL ARY on off
SAVDA{ON|OFF}	DATA ARY on off
SAVMA{ON|OFF}	MEMORY ARY on off
SAVUA{ON|OFF}	UNFORM ARY on off
SAVTA{ON|OFF}	TRACE ARY on off
SAVTMA{ON|OFF}	T.MEM ARY on off

Disk Menu

PURG *string*	PURGE FILE
INID	INITIALIZE DISK
FILC	COPY FILE
CHAD	CHANGE DIRECTORY
CRED	CREATE DIRECTORY
DISFLIF	FORMAT [LIF]
DISFDOS	FORMAT [DOS]

Recall Menu

RECD *string*	RECALL FILE

Service Function

ACTLHFRE
ACTLLFRE
ACTLNORM
CHAIRANG
DCBUS *value*
DESTOFF
DESTON
EXET
EXTRLOCK?
FBUS *value*
FIRLANOR
FIRLAOPE
FIRLPNOR
FIRLPOPE
FIRR?
FNDAUTO
FNDMANU
FNDVALU *value*
FNVNORM
FNVOPEN
IFRAUTO
IFRCH?
IFRX1
IFRX1X8
IFRX64
IFRX8X1
MIXLPNOR
MIXLPTES
OUTPFBUS?
OUTPTESS? *value*
POWDAUTO
POWDMANU
POWDVALU *value*
POWLAOPE
POWLANOR
RECCOFF
RECCON
REOPNORM
REOPOPEN
SELD
SOUCOFF
SOUCON
STEODAUT
STEODMAN
STEODVAL *value*
STEONORM
STEOOPEN
TESC
TEST *value*

Commands Which Don't Have Equivalent Softkey Labels

ANAOCH1
ANAOCH2
ANAODATA
ANAOMEMO
ANARANG *value,value*
ANARFULL
CLES
ESB?
ESNB *value*
FORM2
FORM3
FORM4
FORM5
INP8IO
INPUCALC{01-12} *value*
INPUCALK *value*
INPUDATA *value*
INPUFORM *value*
INPURAW1 *value*
INPURAW2 *value*
INPURAW3 *value*
INPURAW4 *value*
INPUUFORM *value*
KEY *value*
MARKBUCK *value*
OSE *value*
OSER?
OSNT
OSPT
OSR?
OUT8IO *value*
OUTPCALC{01-12}?
OUTPCALK?
OUTPDATA?
OUTPDATAP? *value*
OUTPERRO?
OUTPFAIP?
OUTPFILT? *value*
OUTPFORM?
OUTPFORMP? *value*
OUTPIFORM?
OUTPINP8IO
OUTPIRFORM?
OUTPIRTMEM?
OUTPITMEM?
OUTPLIMF?
OUTPLIML?
OUTPLIMM?
OUTPMARK?
OUTPMAX?
OUTPMEAN?
OUTPMEMO?
OUTPMEMOP? *value*
OUTPMIN?
OUTPMINMAX?
OUTPMSTA?
OUTPMWID?
OUTPRAW1?
OUTPRAW2?
OUTPRAW3?
OUTPRAW4?
OUTPRESO?
OUTPRFORM?
OUTPRTMEM?
OUTPSTIM?
OUTPTITL?
OUTPTMEM?
OUTPTMEMP? *value*
OUTPUFORM?
PSOFT{ON|OFF}
RPLENV?
RPLHEI?
RPLLHEI?
RPLMEA?
RPLPP?
RPLRHEI?
SAVC
TESS?

IEEE 488.2 Common Commands

*CLS
*ESE *value*
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*PCB *value*
*RST
*SRE *value*
*SRE?
*STB?
*TRG
*TST?
*WAI

Status Reporting

Figure B-1 shows the status reporting structure of the HP 8751A. Table B-1, Table B-2, Table B-3, and Table B-4 describe the status bits of each register.

Using status registers, refer to "Status Reporting" in Chapter 2.

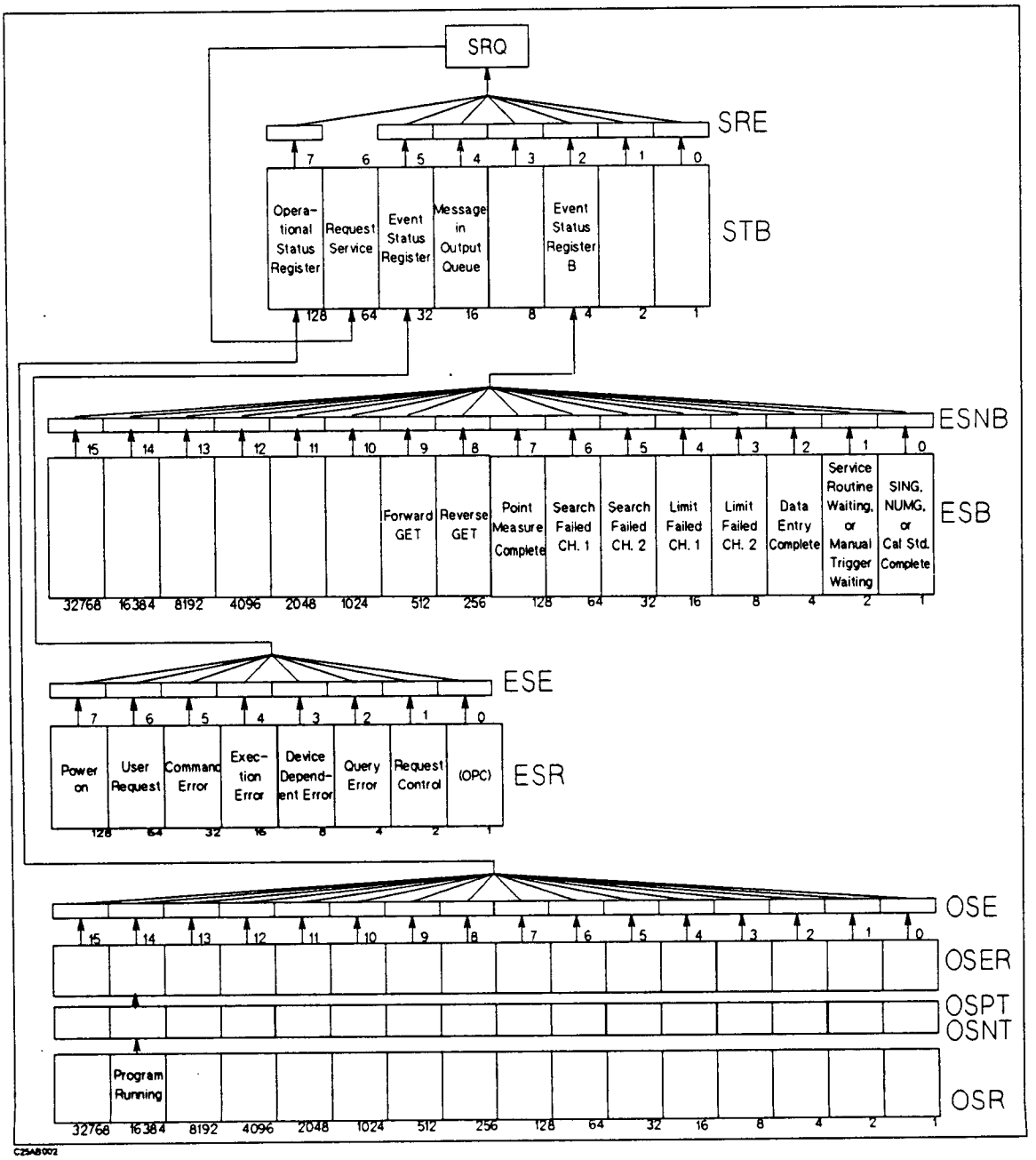


Figure B-1. Status Reporting Structure

Table B-1. Status Bit Definitions of the Status Byte (STB)

Bit	Name	Description
2	Check event status register B	One of the enabled bits in event status register B has been set.
4	Message in output queue	A command has prepared information to be output, but it has not been read yet.
5	Check event status register	One of the enabled bits in the event status register has been set.
6	Request service	One of the enabled status byte bits is causing an SRQ.
7	Operational status summary bit	One of the enabled bits in the operational status register has been set.

Table B-2. Status Bit Definitions of the Event Status Register (ESR)

Bit	Name	Description
0	Operation complete	A command for which OPC has been enabled and completed an operation.
1	Request control	The HP 8751A has been commanded to perform an operation that requires control of a peripheral, and needs control of HP-IB.
2	Query error	1. The HP 8751A has been addressed to talk, but there is nothing in the output queue to transmit. 2. Data in the Output Queue has been lost.
3	Device dependent error	An error other than a command error, a query error, and an execution error has occurred.
4	Execution error	1. A program data element following a header exceeded its input range, or is inconsistent with the HP 8751A's capabilities. 2. A valid program message could not be properly executed due to some instrument condition.
5	Command error	1. An IEEE 488.2 syntax error has been occurred. Possible violations include, a data element violated the HP 8751A listening formats or a data element type is unacceptable to the HP 8751A. 2. A semantic error which indicates that an unrecognized header was received has occurred. Unrecognized headers include incorrect device-specific headers and incorrect or unimplemented IEEE 488.2 common commands. 3. A Group Execute Trigger (GET) was entered into the Input Buffer of a program message.
6	User request	The operator has pressed a front panel key or an optional keyboard key or turned the rotary knob.
7	Power on	A power on sequence has occurred since the last read of the register.

Table B-3. Status Bit Definitions of the Event Status Register B (ESB)

Bit	Name	Description
0	Sweep or group complete, or cal std. complete	A single sweep or group has been completed since the last read of the register. Operates in conjunction with SING or NUMG.
1	Service routine waiting or done, or manual trigger waiting	1. An internal service routine has completed an operation, or is waiting for an operator response. 2. The HP 8751A has set the manual trigger on point mode and is waiting for a manual trigger.
2	Data entry complete	A terminator key has been pressed.
3	Limit failed, Ch 2	Limit test failed on channel 2.
4	Limit failed, Ch 1	Limit test failed on channel 1.
5	Search failed, Ch 2	A marker search was executed on channel 2, but the target value was not found.
6	Search failed, Ch 1	A marker search was executed on channel 1, but the target value was not found.
7	Point measurement complete[1]	One point measurement of a sweep has completed.
8	Waiting for reverse GET	A one-path 2-port calibration is active, and the instrument has stopped, waiting for the operator to connect the device for a reverse measurement.
9	Waiting for forward GET	A one-path 2-port calibration is active, and the instrument has stopped, waiting for the operator to connect the device for a forward measurement.

1 This bit is set only when the related bits of both SRE and ESNB are enabled.

In the case of the manual trigger on point mode, HP 8751A accepts the next trigger while current measurement is in progress (up to the number of points). Use bit 1 and bit 7 correctly to synchronize measurement and external triggering. For example, 1) wait until bit 1 is set, 2) trigger, and 3) wait until bit 7 is set.

Table B-4. Status Bit Definitions of the Operational Status Register (OSR)

Bit	Name	Description
14	Program running	An HP Instrument BASIC program is running.

OSPT, OSNT

OSPT (Operational Status Positive Transition Filter)

Sets the positive transition filter. Setting a bit in OSPT will cause a 0 to 1 transition in the corresponding bit of the associated operational status register (OSR) to cause a 1 to be written in the associated bit of corresponding operational status event register (OSER.

Because only bit 17 of the HP 8751A's OSR is used to show program status, when bit 17 of OSPT is set to 1, starting a program causes a 1 to be written in bit 17 of OSER. (And then a 1 is written in bit 7 of STB.)

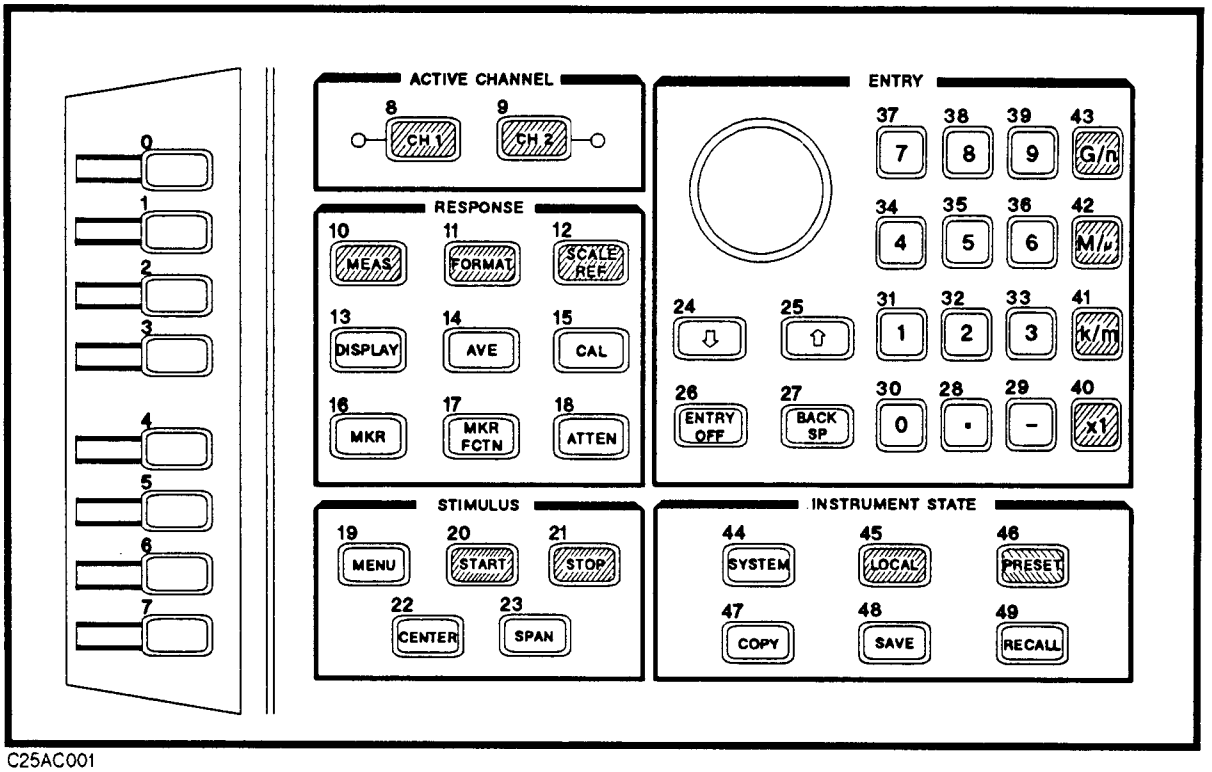
OSNT (Operational Status Negative Transition Filter)

Sets the negative transition filter. Setting a bit in the negative transition filter will cause a 1 to 0 transition in the corresponding bit of the associated operational status register to cause a 1 to be written in the associated bit of corresponding operational status event register.

Because only bit 17 of the HP 8751A's OSR the is used to show program status, when bit 17 of OSNT is set to 1, stopping a program causes a 1 to be written in bit 17 of OSER. (And then a 1 is written in bit 7 of STB.)

Key Codes

Figure C-1 shows the codes of the front panel keys for using the KEY HP-IB command.



C25AC001

Figure C-1. Key Codes

D

Calibration Types and Standard Classes, and Calibration Arrays

Table D-1 lists which standard classes are required for each calibration type. Table D-2 specifies where the calibration coefficients are stored for different calibration types.

Table D-1. Calibration Types and Standard Classes

Class	Response	Response and Isolation	S_{11} 1-port	S_{22} 1-port	One-path 2-port	Full 2-port
Response:	•					
Response and isolation:						
Response		•				
Isolation		•				
Reflection:[1]					•	•
S11A (opens)			•		•	•
S11B (shorts)			•		•	•
S11C (loads)			•		•	•
S22A (opens)				•		•
S22B (shorts)				•		•
S22C (loads)				•		•
Transmission:[1]					•	•
Forward match					•	•
Forward thru					•	•
Reverse match						•
Reverse thru						•
Isolation:[1]					•	•
Forward					•	•
Reverse						•

1 These subheadings must be called when doing 2-port calibrations.

Table D-2. Calibration Array

Array	Response[1]	Response and Isolation[1]	1-port[1]	2-port[12]
1	E_R or E_T	E_X (E_D)[3]	E_D	E_{DF}
2		E_T (E_R)	E_S	E_{SF}
3			E_R	E_{RF}
4				E_{XF}
5				E_{LF}
6				E_{TF}
7				E_{DR}
8				E_{SR}
9				E_{RR}
10				E_{XR}
11				E_{LR}
12				E_{TR}

1 Meaning of first subscript: D=directivity; S=source match; X=crosstalk; L=load match; T=transmission tracking.

Meaning of second subscript: F=forward; R=reverse.

2 One path, 2-port cal duplicates arrays 1 to 6 in arrays 7 to 12.

3 Response and isolation corrects for crosstalk and transmission tracking in transmission measurements, and for directivity and reflection tracking in reflection measurements.

E

Waveform Analysis Commands

The HP 8751A has several commands for analyzing measurement waveforms. These commands allow you to perform analysis with a single command instead of combining marker functions.

This appendix provides information about these waveform analysis commands. The commands are divided into four groups as follows:

- Waveform analysis setting commands
- Ripple analysis commands
- Maximum/Minimum/Mean search commands
- Filter and Resonator analysis commands

Waveform analysis commands are not executable from a softkey. They are available only as HP-IB commands.

When a query command is sent, the HP 8751A searches, calculates, and then returns the resultant data by HP-IB. Nothing will be displayed on the CRT during this time. This makes possible faster and easier operation than using the marker function in an HP-IB program.

Note

Figures E-1 to 7 are concept figures to show how the commands work, and they are different from an actual measurement display. Actually, nothing will change on the CRT when a command is executed.

Setting Commands for Waveform Analysis

The following commands specify the analysis range for the previously mentioned waveform analysis commands.

`ANARANG` *value[suffix],value[suffix]*
`ANARFULL`
`ANAODATA`
`ANAOMEMO`
`ANAOCH1`
`ANAOCH2`

ANARANG *value[suffix],value[suffix]* and ANARFULL

ANARANG sets the stimulus range for the waveform analysis commands. This analysis range is specified independently from the marker search range. When the HP 8751A is turned ON, the default setting for the analysis range is equal to the full stimulus range.

When the analysis range exceeds the stimulus range, the analysis range is reset to match the stimulus range. For example, If the analysis range is set from 80 MHz to 100 MHz when the stimulus range is 75 MHz to 95 MHz, the HP 8751A resets the analysis range to 80 MHz to 95 MHz. If the stimulus setting is modified after the analysis range is set, the HP 8751A resets the analysis range to the full range of the new stimulus range.

Analysis range information can not be saved using the instrument state saving function.

ANARFULL sets the waveform analysis range equal to the full stimulus range.

ANAOCH1/ANAOCH2

These commands select the channel to be used by the waveform analysis commands. ANAOCH1 selects channel 1 and ANAOCH2 selects channel 2. The channel selected is independent of active channel.

ANAODATA and ANAOMEMO

These commands select the object trace to be used by the waveform analysis commands. ANAODATA selects a data trace and ANAOMEMO selects a memory trace for waveform analysis.

Note

The target trace (data or memory) can be specified independently for each channel. The ANAODATA/ANAOMEMO command is effective for the currently selected channel. So, the ANAODATA/ANAOMEMO command should be set after switching channel using the ANAOCH1/ANAOCH2 command.

Ripple Analysis Command

The following commands analyze ripple of trace data and return the resultant data by HP-IB. The effective analysis range for these commands is specified with the ANARANG command. The HP 8751A starts ripple analysis when it receives a query.

```
RPLPP?
RPLHEI?
RPLRHEI?
RPLLHEI?
RPLENV?
RPLMEA?
```

RPLPP?

The RPLPP? command calculates the amplitude between the local maximum and minimum points within a specified range as shown in Figure E-1 and outputs the resultant data by HP-IB. If no ripple is detected, a zero is returned.

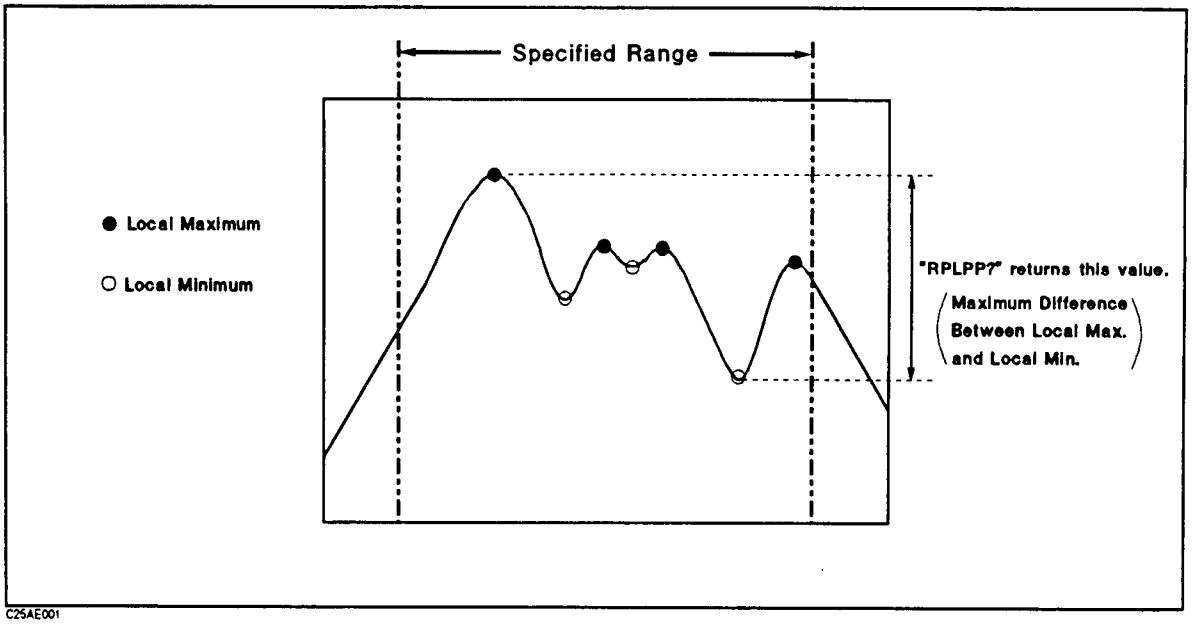


Figure E-1. RPLPP?

```
10 ASSIGN @Hp8751 TO 717                        ! When iBASIC is used,
15                                              ! Change 717 to 800.
20 OUTPUT @Hp8751;"ANARANG 69.99E6,70.01E6" ! Set freq. range for analysis.
25                                              ! (69.99 MHz through 70.01 MHz)
30 OUTPUT @Hp8751;"ANAODATA"                    ! Select DATA trace for analysis
40 OUTPUT @Hp8751;"ANAOCH1"                     ! Select channel 1 for analysis
50 OUTPUT @Hp8751;"RPLPP?"                      ! Search for ripple
60 ENTER @Hp8751;Ripple                         ! Get ripple value
70 PRINT Ripple;" dB"                           ! Print ripple value
80 END
```

Figure E-2. Sample Program for RPLPP

RPLHEI?

The RPLHEI? command searches for the maximum height between all neighboring local maximums and minimums within a specified range, as shown in Figure E-3 and outputs the resultant data by HP-IB. If no ripple is detected, a zero is returned.

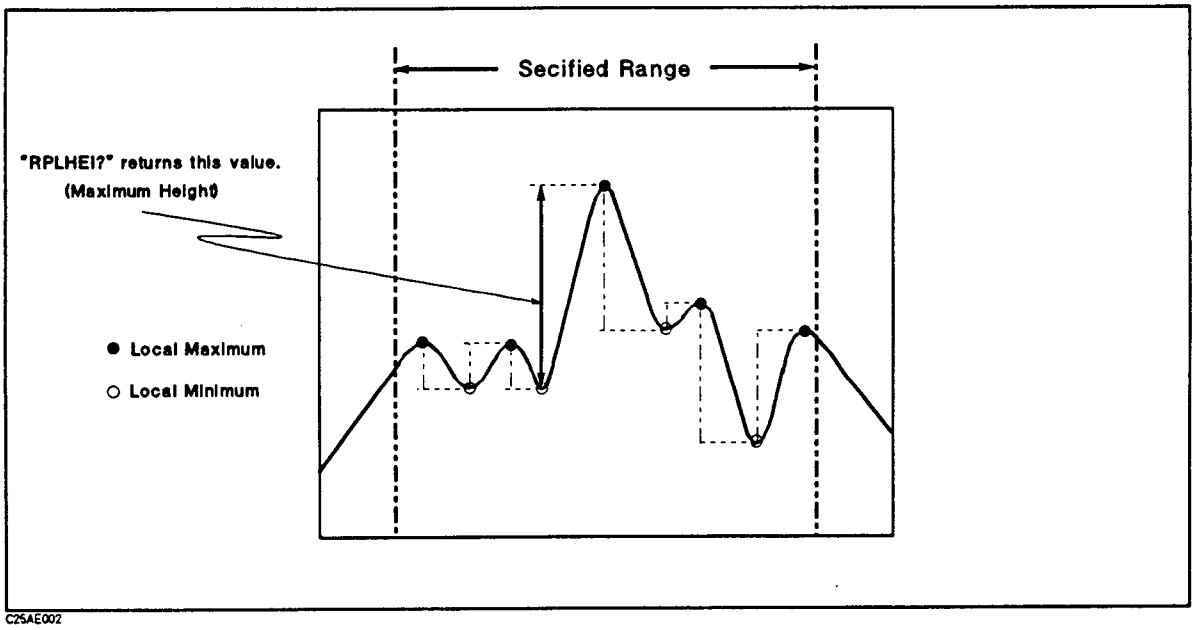


Figure E-3. RPLHEI?

```
10 ASSIGN @Hp8751 TO 717      ! When iBASIC is used, change 717 to 800
20 OUTPUT @Hp8751;"ANARFULL" ! Range for analysis is equal to
25                            ! the stimulus range.
30 OUTPUT @Hp8751;"ANAODATA" ! Select DATA trace for analysis
40 OUTPUT @Hp8751;"ANAOCH1"  ! Select channel 1 for analysis
50 OUTPUT @Hp8751;"RPLHEI?"  ! Search for ripple
60 ENTER @Hp8751;Ripple       ! Get ripple value
70 PRINT Ripple;" dB"         ! Print ripple value
80 END
```

Figure E-4. Sample Program for RPLHEI

RPLRHEI? and RPLLHEI?

These commands also search for the maximum height between neighboring local maximums and minimums within a specified range as does the RPLHEI command. But RPLRHEI? searches only for the local minimum to the right from each local maximum point as shown in Figure E-5, and RPLLHEI? searches only for the local minimum to the left from each local maximum point as shown in Figure E-6. Both commands return the maximum height by HP-IB. If no ripple is detected, a zero is returned.

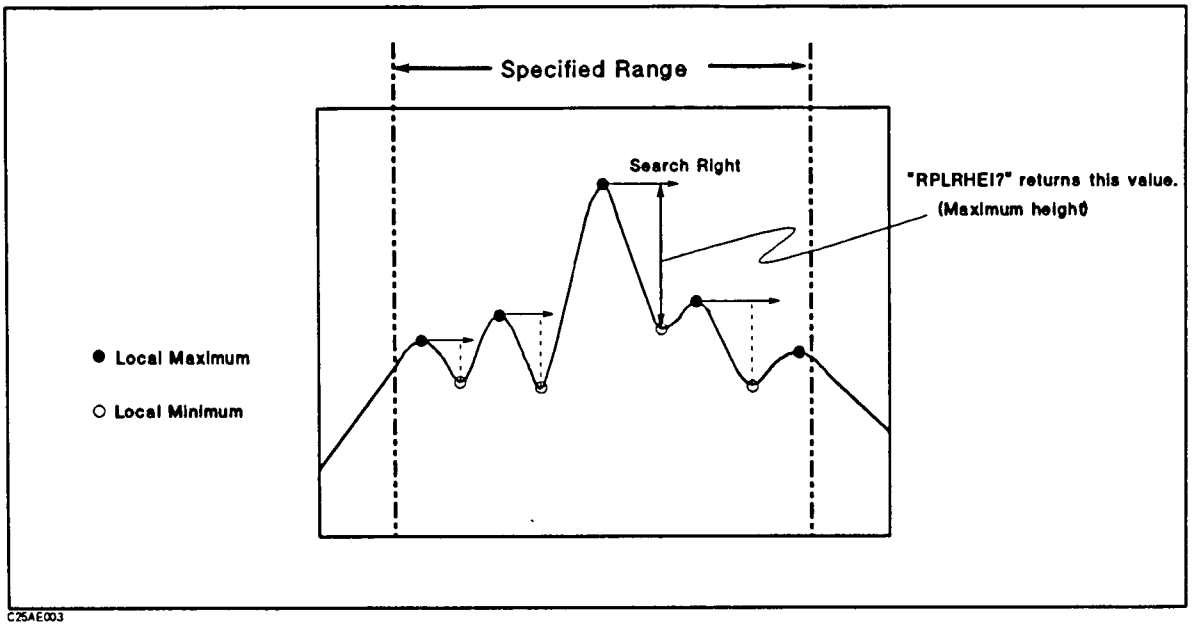


Figure E-5. RPLRHEI?

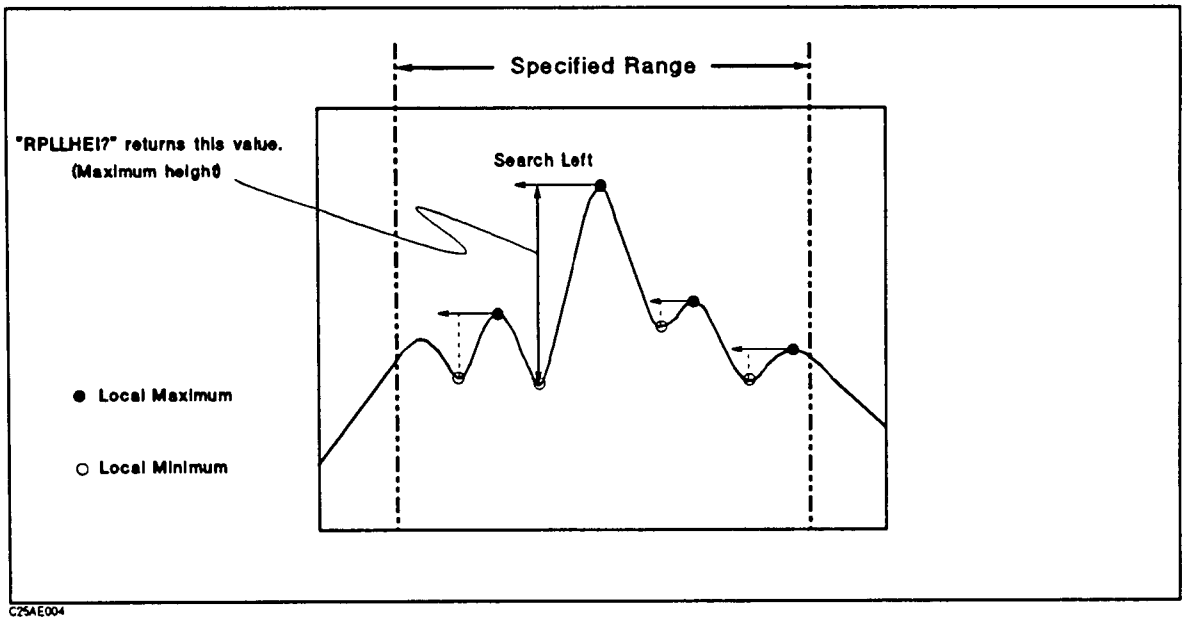


Figure E-6. RPLLHEI?

RPLENV?

This command searches all neighboring peaks and their included valleys for the maximum height, perpendicular from the valley minimum point between neighboring peaks, to the intersection of an imaginary slope line drawn between the neighboring local maximums as shown in Figure E-7, and outputs the resulting maximum envelope value by HP-IB. If no ripple is detected, a zero is returned.

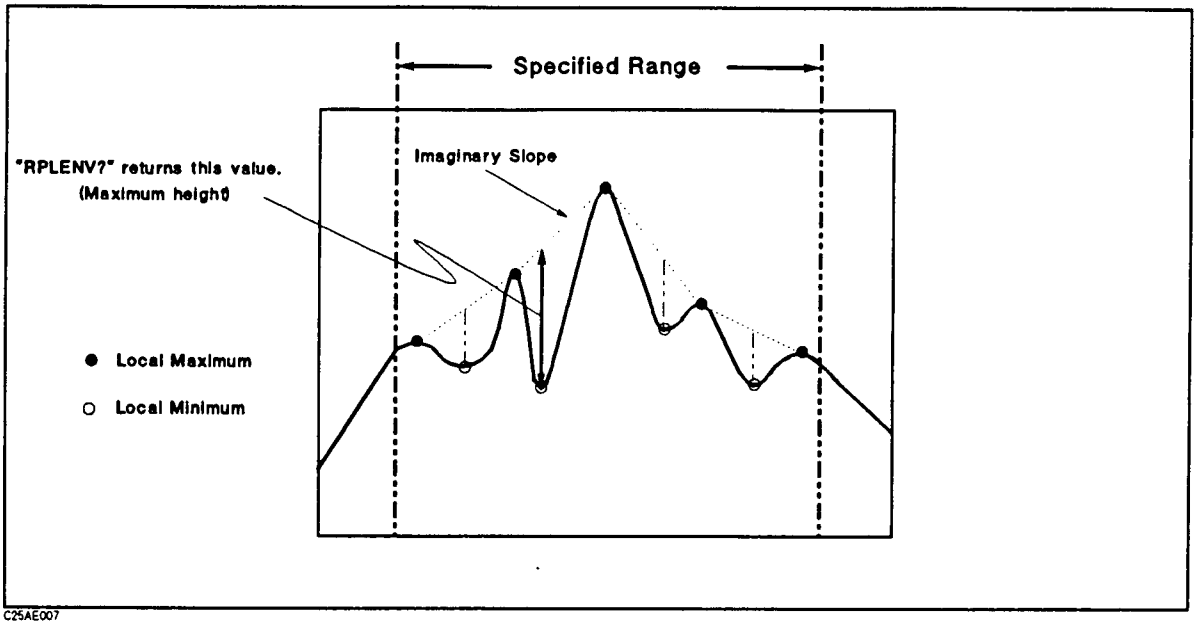


Figure E-7. RPLENV?

RPLMEA?

This command averages all heights between neighboring local maximums and minimums within a specified range as shown in Figure E-8 and outputs the average value by HP-IB. If no ripple is detected, a zero is returned.

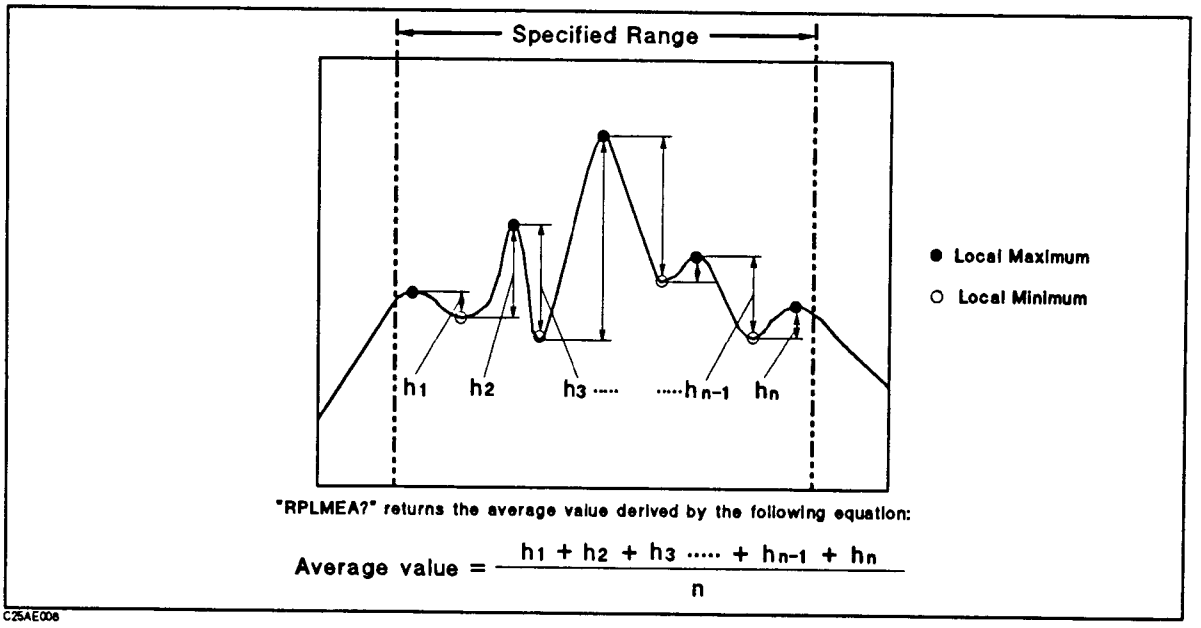


Figure E-8. RPLMEA?

```
110 ASSIGN @Hp8751 TO 717       ! When iBASIC is used, change 717 to 800
120 OUTPUT @Hp8751;"ANARFULL"   ! Range for analysis is equal to
125                             ! the stimulus range.
130 OUTPUT @Hp8751;"ANAODATA"   ! Select DATA trace for analysis
140 OUTPUT @Hp8751;"ANAOCH1"    ! Select channel 1 for analysis
150 OUTPUT @Hp8751;"RPLRHEI?"   ! Search right for ripple
160 ENTER @Hp8751;Right_ripple  ! Get ripple value
170 OUTPUT @Hp8751;"RPLLHEI?"   ! Search left for ripple
180 ENTER @Hp8751;Left_ripple   ! Get ripple value
190 OUTPUT @Hp8751;"RPLENV?"    ! Search for "envelope ripple"
200 ENTER @Hp8751;Env_ripple    ! Get envelope value
210 OUTPUT @Hp8751;"RPLMEA?"    ! Search for ripple and average ripple values
220 ENTER @Hp8751;Mean_ripple   ! Get average value
230 PRINT "Right Ripple ";Right_ripple ! Print ripple values
240 PRINT "Left Ripple  ";Left_ripple  !
250 PRINT "Env. Ripple  ";Env_ripple   !
260 PRINT "Mean Ripple  ";Mean_ripple  !
280 END
```

Figure E-9. Sample Program for RPLRHEI, RPLLHEI, RPLENV and RPLMEA

Maximum/Minimum/Mean Value Search Command

The following commands return the maximum, minimum, and mean value of a trace within the range specified by the ANARANG command.

```
OUTPMAX?
OUTPMIN?
OUTPMINMAX?
OUTPMEAN?
```

OUTPMAX?/OUTPMIN?/OUTPMINMAX?

These commands search for a maximum/minimum/mean value within a specified range and returns it with its corresponding stimulus value by HP-IB. OUTPMAX? returns the maximum value and OUTPMIN? returns the minimum value. OUTPMINMAX? returns both the maximum and minimum values.

OUTPMEAN?

OUTPMEAN? returns the mean value within a specified range by HP-IB.

Filter and Resonator Analysis Command

The following commands are device related. They are easy to use for specific device analysis because they will output many parameters with only a single command.

```
OUTPFILT? value[suffix]
OUTPRESO?
```

OUTPFILT? *value[suffix]*

OUTPFILT? returns filter specific parameters, insertion loss, BW(bandwidth), f_{cent}, Q, ΔL.F and ΔR.F within the range specified by the ANARANG command.

This command has parameter which sets the offset of xdB to the maximum peak value to determine the cutoff point. For example, use "−3dB" for the parameter value of OUTPFILT? command to determine the cutoff point to 3 dB below the maximum peak.

Figure E-10 shows a typical example of a bandpass filter measurement trace. The insertion loss is the absolute value of the difference of the maximum within a specified range and 0 dB. BW is the stimulus width between two cutoff points (f_1 and f_2) and the center point of two cutoff points are given as f_{cent}. Q is calculated as:

$$Q = \frac{\sqrt{f_1 \times f_2}}{BW}$$

ΔL.F is the stimulus difference between the left xdB cutoff point and the center point of a specified range. Similarly, ΔR.F is the difference between the right cutoff point and the center of a specified range.

Zeros will be returned for all parameters when two xdB points can not be found.

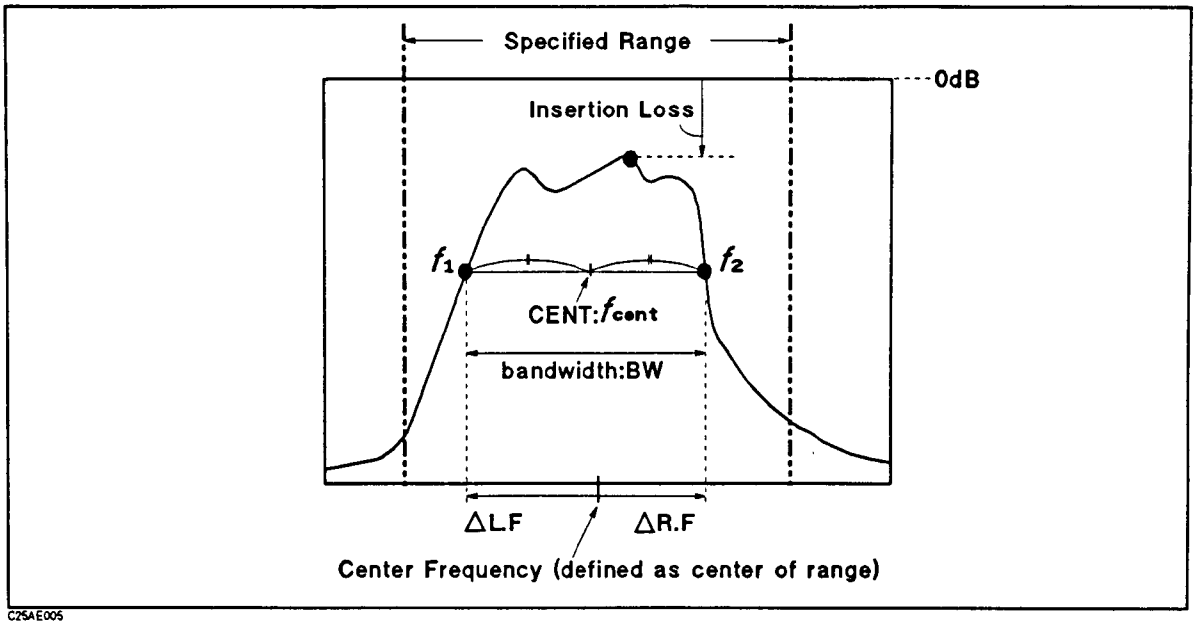


Figure E-10. Output Filter Parameters Example

```
100 ASSIGN @Hp8751 TO 717                      ! If iBASIC is used,
105                                            ! Change 717 to 800.
110 OUTPUT @Hp8751;";PRES"                     ! Preset the HP 8751A.
120 OUTPUT @Hp8751;";HOLD"                     ! Sweep hold
130 OUTPUT @Hp8751;";DISAALLB"                 ! Display allocation is ALL BASIC
140 OUTPUT @Hp8751;";CENT 70E6;SPAN 100E3"     ! CENTER 70 MHz, SPAN 100 kHz
150 OUTPUT @Hp8751;";S21"                      ! Measure S21
160 OUTPUT @Hp8751;"ANARANG 69.95E6,70.05E6"   ! Analysis range is between
165                                            ! 69.95 MHz and 70.05 MHz
170 OUTPUT @Hp8751;"ANAOCH1"                   ! Select CHANNEL 1 to be used
175                                            ! by the analysis command.
180 OUTPUT @Hp8751;"ANAODATA"                  ! Select DATA TRACE to be used
180                                            ! by the analysis command.
190 OUTPUT @Hp8751;";SING"                     ! Trigger sweep
200 OUTPUT @Hp8751;"OUTPFILT? -3"              ! Query -3 dB bandwidth and
                                               ! other filter parameters.
210 ENTER @Hp8751;Il,Bw,Fc,Q,Lf,Rf             ! Get filter parameters
220 PRINT "INSERTION LOSS  ",Il;"dB"           ! Print parameters
230 PRINT "BANDWIDTH       ",Bw/1000;"kHz"
240 PRINT "CENTER FREQUENCY",Fc/1.E+6;"MHz"
250 PRINT "Q FACTOR        ",Q
260 PRINT "LEFT FREQ.      ",Lf/1000;"kHz"
270 PRINT "RIGHT FREQ.     ",Rf/1000;"kHz"
280 END
```

Figure E-11. Sample Program for OUTPFILT

OUTPRESO?

OUTPRESO? returns resonator specific parameters, the resonant frequency(f_r) and the anti-resonant frequency(f_a) within a specified range, and the magnitude values(G_r, G_a). (Data format: G_r, f_r, G_a, f_a)

Figure E-12 shows a typical example of an X'tal resonator measurement trace. When the OUTPRESO? command is sent, the HP 8751A searches for the 0° phase point, from the left to end of the specified range. The HP 8751A regards the first point found as the resonant point and the second point found as the anti-resonant point and returns the stimulus and magnitude data by HP-IB.

If there are three or more 0° points within a specified range, the HP 8751A returns data on the first two points found. If there is only one 0° point within a specified range, the HP 8751A considers this point to be the resonant point and returns zeros for G_a and f_a. If there is no 0° phase point within a specified range, the HP 8751A will return zeros for all parameters.

This command is available only when in the LOG MAG & Phase format. So, the **ANAODATA**, **ANAOMEMO** commands are disregarded. If the format is not "LOG MAG & Phase", the HP 8751A will return zeros for all parameters.

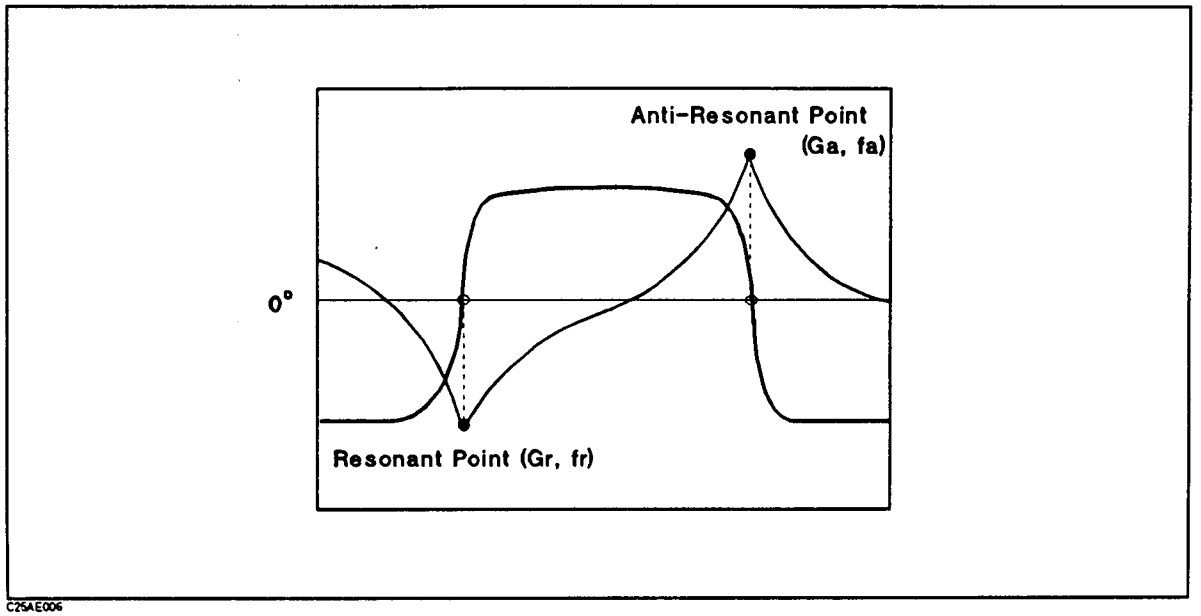


Figure E-12. OUTPRESO?

```
100 ASSIGN @Hp8751 TO 800              ! If iBASIC is used,
115                                    ! Change 717 to 800.
110 ASSIGN @Hp8751a TO 800;FORMAT OFF  ! Path for ENTER statement
120 OUTPUT @Hp8751;";HOLD"             ! Sweep hold
130 OUTPUT @Hp8751;";DISAALLB"         ! Display allocation is ALL  BASIC
140 OUTPUT @Hp8751;"ANARFULL"          ! Analysis range is full
150 OUTPUT @Hp8751;"ANAOCH1"           ! Select CHANNEL 1 to be used by
155                                    ! the analysis command.
160 OUTPUT @Hp8751;"ANAODATA"          ! Select DATA TRACE to be used
165                                    !  by the analysis command.
170 OUTPUT @Hp8751;"FORM3"             ! Set format to IEEE 64
180 OUTPUT @Hp8751;"OUTPRESO?"         ! Query Res/Ant-res. point.
190 ENTER @Hp8751 USING "#,8A";A$      ! Enter header
200 ENTER @Hp8751a;Zr,Fr,Za,Fa         ! Get result
210 ENTER @Hp8751 USING "#,1A";B$      ! Enter tail
220 PRINT "RES POINT  ",Zr;"dB"        ! Print parameters
230 PRINT "RES F  ",Fr/1.E+6;"MHz"
240 PRINT "ANT.R POINT        ",Za
250 PRINT "ANT.R FREQ.      ",Fa/1.E+6;"MHz"
260 END
```

Figure E-13. Sample Program for OUTPRESO

F

Comparison of the HP 8751A and HP 8753C Network Analyzer HP-IB Commands

This document provides reference information for converting HP-IB programs of the HP 8753C into HP 8751A programs.

Functional Difference between HP 8753C and HP 8751A

Most of the differences between HP 8753C and HP 8751A programs are due to functional differences of the instruments, as detailed below:

1. Some functions of the HP 8753C are not supplied by the HP 8751A. These functions are:
   - Time domain transform
   - Test sequence
   - Five internal learn string registers
   - Power meter cal
   - External source(auto, manual) mode, Tuned receiver mode
   - Harmonic measurement
2. HP-IB bus mode is different.
   - HP 8753C
     - SYSTEM CONTROLLER
     - TALKER/LISTENER & USE PASS CONTROL
   - HP 8751A
     - SYSTEM CONTROLLER
     - ADDRESSABLE ONLY

   In the SYSTEM CONTROLLER mode, the HP 8753C and the HP 8751A have the same capability except for control of an external disk drive or power meter, which is not available with the HP 8751A. ADDRESSABLE ONLY mode of the HP 8751A has the capability of both TALKER/LISTENER mode and USE PASS CONTROL mode of the HP 8753C.
3. Save-recall function of the HP 8751A is different from that of the HP 8753C. Unlike the HP 8751A, the HP 8753C has multiple internal save-recall registers and can control an external disk drive. The HP 8751A has a built-in disk drive for multiple save or recall of instrument states, calibration arrays, list sweep tables, or data.

Built-in Disk Drive

The HP 8751A has built-in disk drive which store data, instrument states or list sweep table. Save-recall commands for the HP 8751A are listed below.

`RESAVD["string"];`	Update a file already saved.
`SAVDALL["string"];`	Save the instrument states and the Data and Memory array.
`SAVDSTA["string"];`	Save the instrument states including list sweep tables and the calibration coefficient.
`SAVDDAT["string"];`	Save the internal data arrays defined by:
	`SAVRA<ON|OFF>;` Raw data array
	`SAVCA<ON|OFF>;` Calibration coefficient array
	`SAVDA<ON|OFF>;` Data array
	`SAVMA<ON|OFF>;` Memory array
	`SAVUA<ON|OFF>;` Unformatted array
	`SAVTA<ON|OFF>;` Trace array
	`SAVTMA<ON|OFF>;` Memory trace array
`PURG["string"];`	Purge file.
`INID;`	Initializes the disk.
`RECD["string"];`	Load the instrument states or data from disk.

For more information, see operation manual of HP 8751A.

Comparison of HP-IB commands for the HP 8751A and HP 8753C

Most HP-IB commands for the HP 8753C are the same as the commands for the HP 8751A. These commands are referred to as "same" in the table below. Some of the commands listed below have the same function for the two instruments, but have different syntax. Also listed are commands used by the HP 8753C only.

There is one difference between HP 8753C and HP 8751A command syntax. For the HP 8751A, a space must be placed between the command and value or string.

For example: `AVERFACT[value];`

- `AVERFACT␣8` must be used for the HP 8751A, and can be used for the HP 8753C. (␣ is a space.)
- `AVERFACT8` can be used for the HP 8753C
- `TITL␣""DEVICE1""` must be used for the HP 8751A, and can be used for the HP 8753C
- `TITL""DEVICE1""` can be used for the HP 8753C

Note

The `WAIT` statement is used for the detection of the end of sweep in the HP 8753C. The equivalent code for the HP 8751A is as follows:

```
REPEAT
  OUTPUT @Hp8751;"ESB?"
  ENTER @Hp8751;Stat
UNTIL BIT(Stat,0)
```

HP 8753C Commands	HP 8751A Commands	Description
AB;	same	A/B measurement
ADDRCONT;	same	External controller HP-IB address
ADDRDISC[value];	HP 8753C only	External disk drive HP-IB address
		The HP 8751A cannot control an external disk as a system controller. See "Built-in Disk Drive".
ADDRPLOT[value];	same	Plotter HP-IB address
ADDRPRIN[value];	same	Printer HP-IB address
ALTAB;	COUCOFF; (only Dual Channel mode)	Alternate sweep
		The HP 8751A selects alternate sweep when coupled channel is turn off (COUCOFF;), or alternate measurement at each point when coupled channel is turn on (COUCON;).
ANAB;	HP 8753C only	Analog bus Enable
ANAI;	HP 8753C only	Analog Input measurement
AR;	same	A/R measurement
ASEG;	HP 8753C only	Measure all frequency list segments
		The HP 8751A always measures all segments.
ASSS;	HP 8753C only	Assert sequence status bit
		Test sequence is not available.
ATTP<1|2>[value];	same	Port attenuator value
AUTO;	same	Autoscale
AVERFACT[value];	same	Averaging factor
AVER<ON|OF>;	same	Averaging function
AVERREST;	same	Reset and restarts averaging
BACI[0-100];	same	Background intensity of CRT
BEEPDONE<ON|OFF>;	same	Operation completion beeper
BEEPFAIL<ON|OFF>;	same	Limit fail beeper
BEEPWARN<ON|OFF>;	same	Warning beeper
BR;	same	B/R measurement
C0;	same	Open circuit capacitor, C_0
C1;	same	Open circuit capacitor, C_1
C2;	same	Open circuit capacitor, C_2
C3;	HP 8753C only	Open circuit capacitor, C_3
		Not available with the HP 8751A.
CAL1;	KEY 15;KEY 2;	Display calibration menu
CALIFUL2;	same	Full 2-port cal
CALIONE2;	same	One-path 2-port cal
CALIRAI;	same	Response and isolation cal

HP 8753C Commands	HP 8751A Commands	Description
CALIRESP;	same	Response cal
CALIS111;	same	S_{11} 1-port cal
CALIS221;	same	S_{22} 1-port cal
CALK35MM;	HP 8753C only	3.5 mm cal kit
CALK7MM;	same	7 mm cal kit
CALKN50;	same	50 Ω type-N cal kit
CALKN75;	same	75 Ω type-N cal kit
CALKUSED;	same	User cal kit
CALN;	same	No cal
CBRI[0-100];	same	Color brightness
CENT[value[suffix]];	same	Center stimulus value
CHAN1;	same	Channel 1 as active channel
CHAN2;	same	Channel 2 as active channel
CHOPAB;	COUCON;	Chopper sweep
		The HP 8751A selects chopper sweep (alternate measurement at each point) when coupled channel is turn on (COUCON;). See also ALTAB;.
CLAD;	same	Complete specifying the class
CLASS11A;	same	S_{11} 1-port cal standard class
CLASS11B;	same	S_{11} 1-port cal standard class
CLASS11C;	same	S_{11} 1-port cal standard class
CLASS22A;	same	S_{22} 1-port cal standard class
CLASS22B;	same	S_{22} 1-port cal standard class
CLASS22C;	same	S_{22} 1-port cal standard class
CLEA<1-5>;	HP 8753C only	Clear Save & Recall register
CLEARALL;	HP 8753C only	Clear all Save & Recall registers
		HP 8751A has no multiple internal save-recall registers. See "Built-in Disk Drive".
CLEAL;	CLEL;	Clear frequency list
CLEL;	same	Clear frequency list
CLES;	*CLS;	Clear status byte
CLS;	*CLS;	Clear status byte
COAX;	HP 8753C only	Select cal standard as Coaxial
		HP 8751A always uses Coaxial.
COLOCH1D;	same	Channel 1 Data to change color
COLOCH1M;	same	Channel 1 Memory to change color
COLOCH2D;	same	Channel 2 Data to change color
COLOCH2M;	same	Channel 2 Memory to change color
COLOGRAT;	same	Graticule to change color
COLOTEXT;	same	Text to change color

HP 8753C Commands	HP 8751A Commands	Description
COLOWARN;	same	Warning message to change color
COLOR[0-100];	same	Saturation percent
CONT;	same	Continuous trigger
CONV1DS;	same	1/S conversion operation
CONVOFF;	same	No conversion operation
CONVYREF;	same	Y:REF conversion operation
CONVYTRA;	same	Y:TRANSE conversion operation
CONVZREF;	same	Z:REF conversion operation
CONVZTRA;	same	Z:TRANSE conversion operation
COPYFRFT;	HP 8753C only	Copy file titles to register titles
COPYFRRT;	HP 8753C only	Copy register titles to disk
		The HP 8751A has no multiple internal save-recall registers. See "Built-in Disk Drive".
CORI<ON|OFF>;	HP 8753C only	Interpolative error correction
		The HP 8751A automatically activates interpolation and has no command to manually turned it off.
CORR<ON|OFF>;	same	Error correction
COUC<ON|OFF>;	same	Channel coupling of stimulus value
COUP<ON|OFF>;	HP 8753C only	Couple power when uncoupled channels
CWFREQ[value[suffix]];	same	Frequency for single frequency mode
CWTIME;	HP 8753C only	CW time sweep mode is not available
DATI;	same	Store Data to Trace Memory
DEFC;	same	Default color
DEFS;	same	Define cal standard
DELA;	same	Delay format
DELO;	same	Delta marker mode OFF
DELR<1-4>;	DELR<1-8>;	Delta reference marker
		HP 8753C has 4 markers. HP 8751A has 8 markers.
DELRFIXM;	same	Fixed reference marker
DEMOAMPL;	HP 8753C only	Amplitude demodulation
DEMOOFF;	HP 8753C only	Demodulation OFF
DEMOPHAS;	HP 8753C only	Phase demodulation
		Time domain is not available to HP 8751A.
DFLT;	same	Default plotting parameters
DISM<ON|OFF>;	MARKL<ON|OFF>;	Marker list
DISPDATA;	same	Display DATA
DISPDATM;	same	Display DATA and MEMORY

HP 8753C Commands	HP 8751A Commands	Description
DISPDDM;	same	Display DATA/MEMORY
DISPDMM;	same	Display DATA−MEMORY
DISPMEMO;	same	Display MEMORY only
DIVI;	DISPDDM;	Display DATA/MEMORY
DONE;	same	Complete cal measurement of standard class
DOWN;	Key 24;	Decrement active function value
DUAC<ON|OFF>;	same	Dual channel
DUPLSE<1-6>SEQ<1-6>;	HP 8753C only	Duplicate test sequence
		Test sequence is not available to HP 8751A.
EDITDONE;	same	Complete editing frequency list
EDITLIML;	same	Edit limit line table
EDITLIST;	same	Edit frequency list
ELED;	same	Electrical delay
EMIB;	HP 8753C only	Beep during test sequence
		Test sequence is not available to HP 8751A
ENTO;	KEY 26;	Entry OFF
ESB?;	same	Output event status register B
ESE[value];	*ESE[value];	Set enable bit of standard status register
ESNB[value];	same	Specify bits of event status register B
ESR?;	*ESR?;	Output event status register
EXET;	same	Execute service test
EXTMDATA<ON|OFF>;	HP 8753C only	Error-corrected data
EXTMFORM<ON|OFF>;	HP 8753C only	Formatted data
EXTMGRAP<ON|OFF>;	HP 8753C only	User graphics
EXTMRAW<ON|OFF>;	HP 8753C only	Raw data arrays
		Specify data types included in register storage to disk. The HP 8751A cannot control an external disk as a system controller. See also "Built-in Disk Drive".
EXTT<ON|OFF>;	same	External trigger mode
EXTTPOIN;	same	External trigger on point
FOCU[1-100];	HP 8753C only	CRT focus
FORM1;	HP 8753C only	Instrument internal binary
FORM2;	same	IEEE 32-bit floating point
FORM3;	same	IEEE 64-bit floating point
FORM4;	same	ASCII
FORM5;	same	PC-DOS 32-bit floating point

HP 8753C Commands	HP 8751A Commands	Description
FREQ;	same	Frequency blank
FREQOFFS<ON|OFF>;	HP 8753C only	Frequency offset mode
		Frequency offset operation is not available to HP 8751A
FRER;	CONT;	Continuous trigger
FULP;	same	Full page plot
FWDI;	same	Forward isolation class
FWDM;	same	Forward match
FWDT;	same	Forward transmission
GATECENT[value[suffix]];	HP 8753C only	Gate center
GATE<ON|OFF>;	HP 8753C only	Gate
GATESPAN;	HP 8753C only	Gate time span
GATESTAR;	HP 8753C only	Gate start time
GATESTOP;	HP 8753C only	Gate stop time
GATEMAXI;	HP 8753C only	Maximum shape gate
GATSMINI;	HP 8753C only	Minimum shape gate
GATESNORM;	HP 8753C only	Normal shape gate
GATESWIDE;	HP 8753C only	Wide shape gate
		Gating time domain response is not available to HP 8751A.
HOLD;	same	Trigger hold
IDN?;	*IDN?;	Output ID
IFBW[value];	same	IF bandwidth
IMAG;	same	Imaginary format
INID;	same	Initialize disk
INPUCALC<01-12>;	same	Input cal data
INPUCALK;	same	Input cal kit data
INPUDATA;	same	Input cal data
INPUFORM;	same	Input formatted data
INPULEAS;	HP 8753C only	Learn string
INPURAW<1-4>;	same	Input Raw data
INSMEXSA;	HP 8753C only	External source, auto
INSMEXSM;	HP 8753C only	External source, manual
INSMNETA;	HP 8753C only	Standard analyzer
INSMTUNR;	HP 8753C only	Turned receiver
		External source mode and tuned receiver mode are not available to HP 8751A. The HP 8751A works only as standard analyzer.
INTE[0-100];	same	CRT intensity
ISOD;	same	Done with isolation of 2-port cal
ISOL;	same	Begin isolation part of 2-port cal

HP 8753C Commands	HP 8751A Commands	Description
KEY[keycode];	same	Send keycode. Some keycodes are different from the HP 8753C's. See keycode table in HP 8751A HP-IB Programming manual, Appendix C.
KITD;	same	Done with modify cal kit
KOR?;	HP 8753C only	Output key code or knob count
LABEFWDM["string"];	same	Forward match class label
LABEFWDT["string"];	same	Forward transmission class label
LABERESI["string"];	same	Response and isolation class label
LABERESP["string"];	same	Response class label
LABEREVM["string"];	same	Reverse match label
LABEREVT["string"];	same	Reverse transmission label
LABES11A["string"];	same	S_{11A} class label
LABES11B["string"];	same	S_{11B} class label
LABES11C["string"];	same	S_{11C} class label
LABES22A["string"];	same	S_{22A} class label
LABAS22B["string"];	same	S_{22B} class label
LABES22C["string"];	same	S_{22C} class label
LABK["string"];	same	Calibration kit label
LABS["string"];	same	Calibration standard label
LEFL;	same	Plot to left lower
LEFU;	same	Plot to left upper
LIMD[value];	same	Delta limit
LIMIAMPO[value];	same	Limit line amplitude offset
LIMILINE<ON|OFF>;	same	Limit line
LIMIMAOF[value[suffix]];	same	Marker to limit line amplitude offset
LIMISTIO[value[suffix]];	same	Limit line stimulus offset
LIMITEST<ON|OFF>;	same	Limit test
LIML[value];	same	Lower limit
LIMM[value];	same	Middle limit
LIMS[value];	same	Limit segment start stimulus value
LIMTFL;	HP 8753C only	Flat line
LIMTSL;	HP 8753C only	Sloping line
LIMTSP;	HP 8753C only	Single point
LIMU[value];	same	Upper limit
LINFREQ;	same	Linear frequency sweep
LINM;	same	Linear magnitude format
LINTDATA[value];	same	Line type to plot Data trace
LINTMEMO[value];	same	Line type to plot Memory trace
LISFREQ;	same	Frequency list sweep
LISV;	same	List data value

HP 8753C Commands	HP 8751A Commands	Description
LOAD<1-5>;	HP 8753C only	Recall disk file
LOADREC<1-5>;	HP 8753C only	Load receiver cal data
LOADSOU<1-5>;	HP 8753C only	Load source cal data
		HP 8751A does not have multiple internal save-recall register. See "Built-in Disk Drive".
LOGFREQ;	same	Log frequency sweep
LOGM;	same	Log magnitude format
LRN?;	HP 8753C only	Output learn string
MANTRIG;	same	Manual trigger on a single point
MARK<1-4>[value[suffix]];	MARK<1-8>[value[suffix]];	Select active marker
		HP 8753C has 4 markers. HP 8751A has 8 markers.
MARKBUCK[0-(NOP-1)];	MARKBUCK[1-NOP];	Move active marker to specified point
MARKCENT[value[suffix]];	same	Marker → CENTER
MARK<COUP|UNCO>;	same	Marker coupling
MARKDELA;	same	Marker → DELAY
MARK<DISC|CONT>;	same	Select Discrete or Continuous
MARKFAUV[value[suffix]];	same	Fixed marker auxiliary value offset
MARKFSTI[value[suffix]];	same	the fixed marker stimulus value offset
MARKFVAL[value];	same	Fixed marker position value offset
MARKMAXI;	SEAMAX;	Search maximum value
MARKMIDD;	same	Change segment middle value to marker amplitude
MARKMINI;	SEAMIN;	Search minimum value
MARKOFF;	same	Marker OFF
MARKREF;	same	Marker → REFERENCE
MARKSPAN;	same	Marker → SPAN
MARKSTAR;	same	Marker → START
MARKSTIM;	same	Change segment stimulus value to marker stimulus value
MARKSTOP;	same	Marker → STOP
MARKZERO;	same	Move fixed marker to active marker position
MAXF[value[suffix]];	HP 8753C only	Maximum frequency of cal standard
		You do not need to define the maximum frequency with the HP 8751A frequency range.
MEASA;	same	A measurement
MEASB;	same	B measurement
MEASR;	same	R measurement
MEASTAT<ON|OFF>;	same	Select trace statistics

HP 8753C Commands	HP 8751A Commands	Description
MENUAVG;	KEY 14;	Display Average menu
MENUCAL;	KEY 15;	Display Correction menu
MENUCOPY;	KEY 47;	Display Copy menu
MENUDISP;	KEY 13;	Display Display menu
MENUFORM;	KEY 11;	Display Format menu
MENUMARK;	KEY 16;	Display Marker menu
MENUMEAS;	KEY 10;	Display Input Port menu or S-parameter menu
MENUMRKF;	KEY 17;	Display Marker Function menu
MENU<ON|OFF>;	HP 8753C only	Softkey menu ON/OFF
MENURECA;	KEY 49;	Display Recall (File) menu
MENUSAVE;	KEY 48;	Display Save menu
MENUSCAL;	KEY 12;	Display Scale menu
MENUSTIM;	KEY 19;	Display Stimulus menu
MENUSYST;	KEY 44;	Display System menu
MINF[value[suffix]];	HP 8753C only	Minimum frequency of cal standard
		You do not need to define the minimum frequency with the HP 8751A frequency range.
MINU;	DISPDMM;	DATA-MEMORY
MODI1;	same	Modify cal kit menu
NEXP;	same	Next page
NOOP;	HP 8753C only	No operation
NUMG[value];	same	Number of groups
OFSD[value[suffix]];	same	Offset delay
OFSL[value];	same	Offset loss
OFSOINDR[value];	HP 8753C only	Optical refractive index
OFSOLENG[value];	HP 8753C only	Physical length
OFSOLOSS[value];	HP 8753C only	Optical loss
OFSORPOW[value];	HP 8753C only	Percent reflectance
OFSZ[value];	same	Electrical offset line Z_0
OMII;	same	Omit isolation cal of 2-port cal
OPC[?];	*OPC[?];	Operation complete
OPEP;	same	List parameters
OUTPACTI;	HP 8753C only	Active function value
OUTPAFR;	HP 8753C only	Single processor RF frequency
OUTPAPER;	HP 8753C only	Smoothing aperture
OUTPCALC<01-12>;	OUTPCALC<01-12>?;	Active cal set array
OUTPCALK;	OUTPCALK?;	Current cal kit
OUTPCALR;	HP 8753C only	Receiver cal data
OUTPCALS;	HP 8753C only	Source cal data
		External source mode and tuned receiver mode are not available.

HP 8753C Commands	HP 8751A Commands	Description
OUTPDATA;	OUTPDATA?;	Active channel corrected data
OUTPERRO;	OUTPERRO?;	Error message
OUTPFORM;	OUTPFORM?;	Active channel formatted data
OUTPIDEN;	*IDN?;	Instrument ID string
OUTPKEY;	HP 8753C only	Last key pressed
OUTPLEAS;	HP 8753C only	Instrument learn string
OUTPLIMF;	OUTPLIMF?;	Limit test, failed point
OUTPLIML;	OUTPLIML?;	Limit test, each point
OUTPLIMM;	OUTPLIMM?;	Limit test, marker position
OUTPMARK;	OUTPMARK?;	Actve marker
OUTPPUL;	HP 8753C only	Pulse width
OUTPMEMO;	OUTPMEMO?;	Current memory data
OUTPMSTA;	OUTPMSTA?;	Marker stats
OUTPMWID;	OUTPMWID?;	Bandwidth search
OUTPMWIL;	HP 8753C only	Band search
OUTPPLOT;	HP 8753C only	HP-GL plot string
OUTPPMCAL<1|2>	HP 8753C only	Power meter cal
OUTPPRIN;	HP 8753C only	Raster dump to printer
OUTPRAW<1-4>;	OUTPRAW<1-4>?;	Raw data
OUTPRFFR;	HP 8753C only	External source frequency
		External source mode is not available to HP 8751A.
OUTPSEQ<1-6>;	HP 8753C only	Test sequence
		Test sequence function is not available to HP 8751A.
OUTPSTAT;	*STB?;.	Status byte
OUTPTESS;	OUTPTESS?;	Test status
OUTPTITL;	OUTPTITL?;	Display title
OUTPTPLL;	HP 8753C only	True PLL sequence
PAUS;	HP 8753C only	Pause in test sequence
		Test sequence function is not available.
PCB[value];	*PCB[value];	Pass Control Back address
PDATAOFF;	The following commands are almost the same:	Data trace plot OFF
	DISPMEMO;PLOALL;	Memory trace and all information displayed
	DISPMEMO;PLODGART;	Memory trace and graticule
	DISPMEMO;PLODONLY;	Memory trace only

HP 8753C Commands	HP 8751A Commands	Description
PDATAON;	The following commands are almost the same:	Data trace plot on
	DISPDATA;PLOALL;	Data trace and all information displayed
	DISPDDM;PLOALL;	Both Data and Memory trace, and all information displayed
	DISPDATA;PLODGART;	Data trace and graticule
	DISPDDM;PLODGART;	Both Data and Memory trace, and graticule
	DISPDATA;PLODONLY;	Data trace only
	DISPDDM;PLODONLY;	Both Data and Memory trace only
PENDATA[value];	HP 8753C only	Data trace plot color
PENGART[value];	HP 8753C only	Graticule plot color
PENMARK[value];	HP 8753C only	Markers and marker text plot color
PENMEMO[value];	HP 8753C only	Memory trace plot color
PENTEXT[value];	HP 8753C only	Text and user graphics plot color
		If PRICFIX; is active, the HP 8751A prints a hard copy with default color. If PRICVARI; is active, the HP 8751A prints a hard copy with color as similar as possible to the display.
PGRATOFF;	PLODONLY;	Graticule plot OFF
PGRATON;	PLODGART; PLOALL;	Graticule plot ON PLODONLY; plots trace only, PLODGART; plots both trace and graticule, and PLOALL; plots all the information displayed.
PHAO[value];	same	Phase offset
PHAS;	same	Phase format
PLOS<FAST|SLOW>;	same	Plotting speed
PLOT;	same	Plot display
PMEMOFF;	The following commands are almost the same:	Memory trace plot OFF
	DISPDATA;PLOALL;	Data trace and all information displayed
	DISPDATA;PLOGRAT;	Data trace and graticule
	DISPDATA;PLODDONLY;	Data trace only

HP 8753C Commands	HP 8751A Commands	Description
PMEMON;	The following commands are almost the same:	Memory trace plot ON
	DISPMEMO;PLOALL;	Memory trace and all information displayed
	DISPDDM;PLOALL;	Both Data and Memory trace, and all information displayed
	DISPMEMO;PLOGRAT;	Memory trace and graticule
	DISPDDM;PLOGRAT;	Both Data and Memory trace, and graticule
	DISPMEMO;PLODDONLY;	Memory trace only
	DISPDDM;PLODDONLY;	Both Data and Memory trace only
PMARKOFF;	The following commands are almost the same	Marker and Marker text plot OFF
	PLODGRAT;	Trace and graticule
	PLODONLY;	Trace only
PMARKON;	The following command is almost the same:	Marker and Marker text plot ON
	PLOALL;	All information displayed
POIN[value];	same	Number of points
POLA;	same	Polar format
POLMLIN;	same	Linear marker for polar format
POLMLOG;	same	Log marker for polar format
POLMRI;	same	Real & imaginary marker for polar format
PORE<ON|OFF>;	same	Port extensions
PORT1[value[suffix]];	same	Port1 extension
PORT2[value[suffix]];	same	Port2 extension
PORTA[value[suffix]];	same	A port extension
PORTB[value[suffix]];	same	B port extension
PORTR[value[suffix]];	same	R port extension
POWE[value];	same	Output power level
POWLFREQ;	HP 8753C only	Frequency in power loss list
POWLLIST;	HP 8753C only	Edit power loss list
POWLLOSS;	HP 8753C only	Power loss in power loss list
		Power meter calibration is not available to HP 8751A.
POWS<ON|OFF>;	same	Power sweep
POWT<ON|OFF>;	HP 8753C only	Power trip
		HP 8751A automatically sets power trip function ON. To reset power trip, use CLEPTRIP;.
PRES;	same	Preset
PRIC;	same	Color print
PRINALL;	same	Print
PRIS;	same	Default print set

HP 8753C Commands	HP 8751A Commands	Description
PSOFT<ON|OFF>;	same	Plot softkey labels
PTEXTOFF;	The following commands are almost the same:	Text plot OFF
	PLOGRAT;	Trace and graticule
	PLODONLY;	Trace only
PTEXTON;	The following command is almost the same:	Text plot ON
	PLOALL;	All information displayed
PURG<1-5>;	HP 8753C only	HP 8751A has not internal save-recall register. See above, "Built-in Disk Drive".
RAID;	same	Done with response & isolation cal
RAIISOL;	same	Isolation class for response and isolation cal
RAIRESP;	same	Response class for response and isolation cal
REAL;	same	Real format
RECA<1-5>;	HP 8753C only	Recall instrument state
		HP 8751A has not internal save-recall register. See above, "Built-in Disk Drive".
RECO;	RECC	Recall color
REFD;	same	Done with reflection part of full 2-port cal
REFL;	same	Reflection part of full 2-port cal
REFP[value];	same	Reference position
REFT;	HP 8753C only	Recall register titles from disk
		The HP 8751A cannot control an external disk as a system controller. See above, "Built-in Disk Drive".
REFV[value];	same	Reference value
RESC;	same	Resume cal sequence
RESD;	same	Restore display
RESPDONE;	same	Done with response cal
REST;	same	Measurement restart
REVI;	same	Reverse isolation class
REVM;	same	Reverse match class
REVT;	same	Reverse transmission class
RIGL;	same	Quarter-page plot in lower right
RIGU;	same	Quarter-page plot in upper right
RSCO;	same	Reset color
RST;	*RST;	Reset

HP 8753C Commands	HP 8751A Commands	Description
S11;	same	S11 measurement
S12;	same	S12 measurement
S21;	same	S21 measurement
S22;	same	S22 measurement
SADD;	same	Add new segment
SAMC<ON|OFF>;	HP 8753C only	Internal sampler correction
SAV1;	same	Done with 1-port cal
SAV2;	same	Done with 2-port cal
SAVC;	same	Re-draw a trace using error coefficient array data
SAVE<1-5>;	HP 8753C only	Save state in register HP 8751A has no multiple internal save-recall registers. See above, "Built-in Disk Drive".
SAVEUSER;	same	Save user kit
SAVUASCI;	HP 8753C only	Save using CITI file ASCII
SAVUBINA;	HP 8753C only	Save using binary
SCAL[value];	same	
SCAPFULL;	same	
SCAPGRAT;	HP 8753C only	Use SCAPGU; to fit the upper graticule or use SCAPGL; to fit the lower, to user-defined P1 and P2 scaling point on the plotter.
SDEL;	same	Delete segment
SDON;	same	Done with editing segment
SEAL;	same	Search left
SEAMAX;	same	Search maximum
SEAMIN;	same	Search minimum
SEAOFF;	same	Search OFF
SEAR;	same	Search right
SEATARG[value];	same	Search target point
SEDI[value];	same	Segment
SETZ;	same	Set characteristic impedance Z_0
SING;	same	Single sweep
SLOPE[value];	HP 8753C only	Power slope value
SLOP<ON|OFF>;	HP 8753C only	Power slope Power slope function is not available to HP 8751A.
SMIC;	same	Smith chart format
SMIMGB;	same	G+jB marker for Smith chart
SMIMLIN;	same	Linear marker for Smith chart

HP 8753C Commands	HP 8751A Commands	Description
SMIMLOG;	same	Log marker for Smith chart
SMIMRI;	same	Real & imaginary marker for Smith chart
SMIMRX;	same	R+jX marker for Smith chart
SMOOAPER[0.1-20[%]];	SMOOAPER[0.05-100[%]].	Smoothing aperture range for HP 8751A is between 0.05% to 100%. Range for HP 8753C is 0.1% to 20%.
SMOO<ON|OFF>;	same	Smoothing function
SOFR;	FIRR?;	Firmware revision
SOFT<1-8>;	KEY<0-7>;	Press softkeys
SPAN[value[suffix]];	same	Stimulus span
SPECFWDM A[,B ... [,G]];	same	FWD MATCH standard class
SPECFWDT A[,B ... [,G]];	same	FWD TRANS standard class
SPECRESI A[,B ... [,G]];	same	Response & isolation standard class
SPECRESP A[,B ... [,G]];	same	Response standard class
SPECREVM A[,B ... [,G]];	same	Rev match standard class
SPECTEVT A[,B ... [,G]];	same	Rev trans standard class
SPECS11A A[,B ... [,G]];	same	S_{11A} standard class
SPECS11B A[,B ... [,G]];	same	S_{11B} standard class
SPECS11C A[,B ... [,G]];	same	S_{11C} standard class
SPECS22A A[,B ... [,G]];	same	S_{22A} standard class
SPECS22B A[,B ... [,G]];	same	S_{22B} standard class
SPECS22C A[,B ... [,G]];	same	S_{22C} standard class
SPEG<ON|OFF>;	HP 8753C only	Gate marker
		Gated time domain is not available to HP 8751A.
SPLD<ON|OF>;	same	Split display
SRE[value];	*SRE[value];	Enable bits of status byte
SSEG[value];	HP 8753C only	Single segment of frequency list
		The HP 8751A always measures all segments.
STAN<A-G>;	same	Measure standard
STAR[value[suffix]];	same	START
STB?;	*STB?;	Status byte
STDD;	same	Done with standard definition
STDTARBI;	same	Arbitrary impedance standard type
STDTDELA;	same	Delay/Thru standard type
STDTLOAD;	same	Load standard type
STDTOPEN;	same	Open standard type
STDTSHOR;	same	Short standard type

HP 8753C Commands	HP 8751A Commands	Description
STOP[value[suffix]];	same	STOP
STOR<1-5>;	HP 8753C only	Store file to disk
		HP 8751A has no multiple internal save-recall registers. See "Built-in Disk Drive".
STPSIZE[value[suffix]];	same	Step size for list sweep
SVCO;	same	Save colors
SWEA;	SWETAUTO;	Sweep time AUTO
SWET[value[suffix]];	same	Sweep time
SWR;	same	SWR format
TALKLIST;	HP 8753C only	Talker/Listener mode
		HP 8753C has two modes for remote programming by HP-IB, Talker/Listener (TALKLIST;) and Use Pass Control (USEPASC;). HP 8751A requires Addressable Only mode for remote programming. This mode combines Talker/Listener and Pass Control modes, eliminating the need to change modes.
TERI[value];	same	Arbitrary impedance value (terminal impedance)
TESS?;	same	Test set ID
TEST[value];	same	Service test number
TINT[0-100];	same	Hue to modify color
TITF<1-5>["string"];	HP 8753C only	Disk file
TITL["string"];	same	CRT title
TITR<1-5>["string"];	HP 8753C only	Save/recall register
TITSEQ<1-6>["string"];	HP 8753C only	Test sequence
TITSQ["string"];	HP 8753C only	Current test sequence
TITTMEM["string"];	HP 8753C only	Trace memory
TITPMTR["string"];	HP 8753C only	Power meter address
TITTPRIN["string"];	HP 8753C only	Printer address
TRACK<ON|OFF>;	same	Marker search tracking
TRAD;	same	Done with full 2-port cal
TRAN;	same	Transmission part of full 2-port cal
TRAP;	HP 8753C only	Frequency with transform ON
TRAS[value[suffix]];	HP 8753C only	Frequency span with transform
TRIG;	*TRIG;	Trigger
TST?;	*TST?;	Self test

HP 8753C Commands	HP 8751A Commands	Description
TTLOH;	HP 8753C only	Active level HIGH
TTLOL;	HP 8753C only	Active level LOW
UP;	KEY 25	Increment active function value
USPASC;	HP 8753C only	Instrument enters Use Pass Control mode
		To control the HP 8751A over HP-IB, HP 8751A requires Addressable Only mode, that lets you also to use pass control. See also TALKLIST;.
VELOFACT[value];	same	Velocity factor
VOFF;	HP 8753C only	Frequency offset value
		Frequency offset operation is not available to HP 8751A.
WAIT;	HP 8753C only[1]	Wait for a clean sweep
*WAI;	same	Wait until all previously sent commands are completed
WAVE;	HP 8753C only	Wave guide cal standard
		HP 8751A uses only coax standard.
WIDT<ON|OFF>;	same	Bandwidth search
WIDV[value];	same	Width value
WINDMAXI;	HP 8753C only	Maximum window
WINDMINI;	HP 8753C only	Minimum window
WINDNORM;	HP 8753C only	Normal window
WINDOW;	HP 8753C only	Arbitary window
WINDUSEMOFF;	HP 8753C only	Above commands define windows
WINDUSEMON;	HP 8753C only	Memory trace defines window
		Time domain is not available to HP 8751A.
WRSK<1-8>["string"];	HP 8753C only	New softkey label

1 See NOTE before Table F-1.

G

Manual Changes

INTRODUCTION

This appendix contains the information required to adapt this manual to earlier versions or configurations of the HP 8751A than the current printing date of this manual. The information in this manual applies directly to the HP 8751A Network Analyzer serial number prefix listed on the title page of this manual.

MANUAL CHANGES

To adapt this manual to your HP 8751A, refer to Table G-1 and Table G-2, and make all of the manual changes listed opposite your instrument's serial number and firmware version.

Instruments manufactured after the printing of this manual may be different than those documented in this manual. Later instrument versions will be documented in a manual changes supplement that will accompany the manual shipped with that instrument. If your instrument's serial number is not listed on the title page of this manual or in Table G-1, it may be documented in a *yellow MANUAL CHANGES* supplement.

Turn on the line switch or execute the "*IDN?" command by HP-IB to confirm the firmware version. Refer to HP-IB Programing Manual for information on the "*IDN?" command. For additional information on serial number coverage, refer to Chapter 1 in General Information.

Table G-1. Manual Changes by Serial Number

Serial Prefix or Number	Make Manual Changes
3026	Change 1
3123	Change 2

Table G-2. Manual Changes by Firmware Version

Version	Make Manual Changes
2.00 and below	Change 1
3.0 through 3.02	Change 2

CHANGE 1

Chapter 1

- Delete the following sentence.

Appendix E provides information about the waveform analysis function.

"Figure 2-15. Sample Program: Storing Instrument States" in chapter 2

- Delete line 161.

Chapter 3

- Delete the following HP-IB commands.

ANAOCH1
ANAOCH2
ANAODATA
ANAOMEMO
ANARANG *value*[*suffix*],*value*[*suffix*]
ANARFULL
ASCE *string*
CHAD *string*
COLO{PEN1|PEN2|PEN3|PEN4|PEN5|PEN6}
CONVMP{4|8|16}
CRED *string*
CURD?
DISFDOS
DISFLIF
FILC
GRAE *string*
OSER?
OSNT
OSPT
OUTPFILT? *value*[*suffix*]
OUTPMAX?
OUTPMEAN?
OUTPMIN?
OUTPMINMAX?
OUTPRESO?
RPLENV?
RPLHEI?
RPLLHEI?
RPLPP?
RPLRHEI?
SAVDASC "*string*"
SAVDGRA "*string*"
STODDISK
STODMEMO

■ Replace the **CONV** command description with the following description:

Selects the measurement data conversion setting, impedance or admittance. (Query)

parameter OFF, ZREF, ZTRA, YREF, YTRA, ONEDS

■ Replace the **FORM2** command description with the following description:

Sets the IEEE 32-bit floating point format to transfer the trace data by HP-IB.

■ Replace the **FORM3** command description with the following description:

Sets the IEEE 64-bit floating point format to transfer the trace data by HP-IB.

■ Replace the **FORM4** command description with the following description:

Sets the ASCII transfer format to transfer the trace data by HP-IB.

■ Replace the **FORM5** command description with the following description:

Sets the DOS format to transfer the trace data by HP-IB.

Appendix A

■ Delete the following items.

ASCE	ASCII DATA [.TXT]
COLOPEN{1-6}	PEN 1 to PEN 6
CONV MP{4|8|16}	4 * Phase 8 * Phase 16 * Phase
CONVMP{4|8|16}	
CRED	CREATE DIRECTORY
DISFDOS	FORMAT [DOS]
DISFLIF	FORMAT [LIF]
FILC	COPY FILE
GRAE	GRAPHICS [.HPG]
SAVDASC	DATA ONLY
SAVDGRA	GRAPHICS
STODDISK	STOR DEV [DISK]
STODMEMO	STOR DEV [MEMO]

"Commands Which Don't Have Equivalent Softkey Labels" in Appendix A

- Delete the following items.

```
ANAOCH1
ANAOCH2
ANAODATA
ANAOMEMO
ANARANG value,value
ANARFULL
RPLENV?
RPLHEI?
RPLLHEI?
RPLPP?
RPLRHEI?
OUTPFILT? value
OUTPMAX?
OUTPMEAN?
OUTPMIN?
OUTPMINMAX?
OUTPRESO?
OSER?
OSNT
OSPT
```

Appendix B

- Replace Figure B-1 with the following figure.

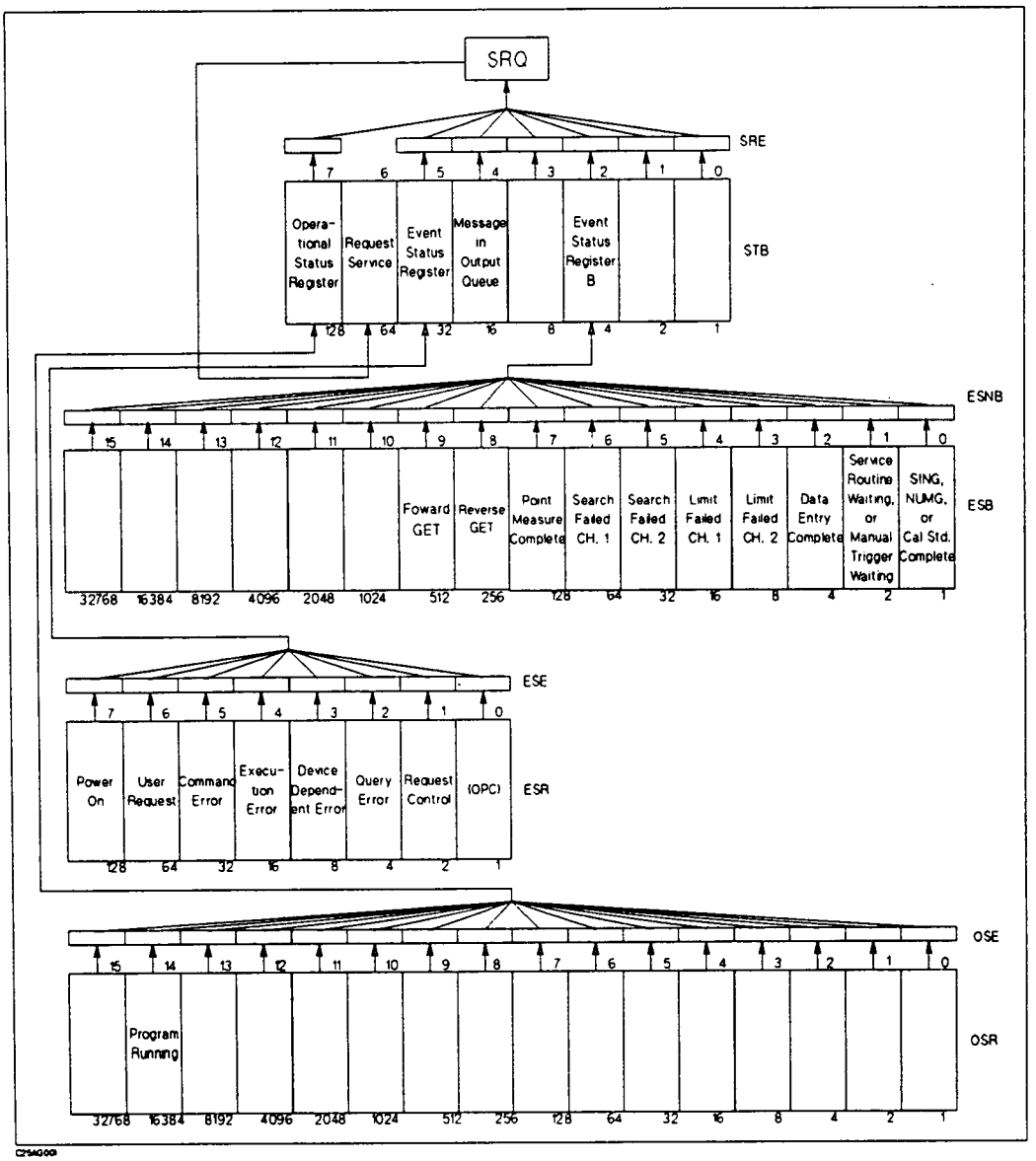


Figure G-1. Status Reporting Structure

- Delete "OSPT, OSNT" section

Appendix E "Waveform Analysis Commands"

- Delete this appendix.

Error Messages

- Delete the following item.

106 CAN'T SAVE GRAPHICS WHEN COPY IN PROGRESS

CHANGE 2

"Figure 2-15. Sample Program: Storing Instrument States" in chapter 2

- Delete line 161.

Chapter 3

- Delete the following HP-IB commands:

  FILC
  STODDISK
  STODMEMO

- Add the following HP-IB commands:

  CURD?

"(SAVE) and (RECALL) Keys" in Appendix A

- Delete the following items

FILC	COPY FILE
DISFLIF	FORMAT [LIF]
DISFDOS	FORMAT [DOS]

- Add the following items:

CURD	CURRENT DIRECTORY
DISFLIF	INITIALIZE [LIF]
DISFDOS	INITIALIZE [DOS]

Error Messages

This section lists the error messages that are displayed on the analyzer display or transmitted by the instrument over HP-IB. Each error message is accompanied by an explanation, and suggestions are provided to help in solving the problem. Where applicable, references are given to related sections of the Operation and Maintenance manuals.

When displayed, error messages are usually preceded with the word "CAUTION:". That part of the error message has been omitted here for the sake or brevity. Some messages are for information only, and do not indicate an error condition. Two listings are provided: the first is in alphabetical order, and the second in numerical order.

In addition to error messages, instrument status is indicate by status notations in the left margin of the display. Examples are "*", "msH", and "P↓". Sometimes these appear in conjunction with error messages. A complete listing of status and notations and their meanings is provided in "Front and Rear Panel" in the *Reference Manual*.

ERROR MESSAGES IN ALPHABETICAL ORDER

160 +12V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

161 +15V(A) OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

158 +18V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

162 +22V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

163 +65V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

157 −12.6V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

156 −15V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

193 1st IF OFFSET OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

191 1st LOCAL AMP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

187 1st LOCAL MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

150 A1 CPU EXT BUS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

142 A1 ROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

A40 HEAT SINK TOO HOT

The temperature sensors on the A4 post-regulator assembly have detected an over-temperature condition. Turn the power OFF and let the instrument cool down for approximately 10 minutes. If this message is displayed again, contact your nearest Hewlett-Packard office.

166 Ach +5V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

174 Ach A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

167 Ach A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

171 Ach RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

177 Ach/Rch IF GAIN OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

6 ADDITIONAL STANDARD NEEDED

Error correction for the selected calibration class cannot be computed until all the necessary standards have been measured.

14 BACKUP DATA LOST

Data check-sum error on the battery backup memory has occurred. The battery is recharged for approximately 10 minutes after power was turned ON.

144 BACKUP RAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

168 Bch −5.2V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

175 Bch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

169 Bch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

172 Bch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

178 Bch/Rch IF GAIN OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

−160 Block data error

Block data is improper.

−168 Block data not allowed

Block data is not allowed.

9 CALIBRATION ABORTED

The calibration in progress was terminated due to the change of the active channel or the stimulus parameters.

7 CALIBRATION REQUIRED

No valid calibration coefficients were found when user attempted to turn calibration ON. Refer to "Measurement Calibration" in the *Reference Manual*.

61 CAN'T CHANGE-ANOTHER CONTROLLER ON BUS

The analyzer cannot assume the mode of system controller until the active controller is removed from the bus or relinquishes the bus.

107 CAN'T SAVE GRAPHICS WHEN COPY IN PROGRESS

If user attempts to save graphics when a print or plot is in progress, this error message is displayed.

−148 Character data not allowed

Character data not allowed for this operation.

−144 Character data too long

Character data is too long (maximum length is 12 characters).

137 CONTINUOUS SWITCHING NOT ALLOWED

The current measurement requires the S-parameter test set to switch automatically between forward and reverse measurements (driving test port 1 and, then test port 2). Refer to "Stimulus Function Block" in the *Reference Manual*.

−253 CORRUPT MEDIA

A legal program command could not be executed because of corrupt media; for example, a bad disk or wrong format.

13 CURRENT PARAMETER NOT IN CAL SET

HP-IB only. Correction is not valid for the selected measurement parameter. Refer to "Measurement Calibration" in the *Reference Manual*.

−222 Data out of range

Numerical parameter of HP-IB command is out of the range defined.

−104 Data type error

Improper data type used (for example, string data was expected, but numeric data was received).

10 DC CALIBRATION ABORTED

Pressing the **ABORT DC CAL** softkey causes the analyzer to abort the DC detector linearity calibration in progress.

98 DC OVERLOAD ON INPUT A

97 DC OVERLOAD ON INPUT B

99 DC OVERLOAD ON INPUT R

The DC voltage at one of the three receiver inputs approach the DC voltage damage level. Refer to "Instrument Specifications" in the *General Information* section for DC damage level information.

−255 DIRECTORY FULL

A legal program command could not be executed because the media directory was full.

143 DRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

145 EEPROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

183 EEPROM WRITE FAILED

Severe error. Contact your nearest Hewlett-Packard office.

12 EXCEEDED 7 STANDARDS PER CLASS

A maximum of seven standards can be defined for any class. Refer to "Measurement Calibration" in the *Reference Manual*.

5 EXTERNAL REFERENCE UNLOCKED

The frequency of the external reference signal input to the connector on the rear panel deviates from 10/N MHz, where N is an integer between 1 to 10, and phase lock can no longer be maintained. Refer to "Front and Rear Panel" in the *Reference Manual* for details about the signal requirements.

159 FAN POWER OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

154 FDC CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

−257 FILE NAME ERROR

A legal program command could not be executed because the file name on the device media was in error; for example, an attempt was made to copy to a duplicate file name.

−256 FILE NAME NOT FOUND

A legal program command could not be executed because the file name on the device media was not found; for example, an attempt was made to read or copy a nonexistent file.

192 FN FREQ TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

182 FN PRETUNE-DAC/MONITOR FAILURE

Severe error. Contact your nearest Hewlett-Packard office.

62 FORMAT NOT VALID FOR MEASUREMENT

The conversion function except the 1/S mode is not valid for the Smith, Inverse Smith, and SWR formats.

32 FORMAT TYPE IS NOT SMITH

The conjugate matching function is only valid in the Smith chart format.

148 FPC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

−105 GET not allowed

GET is not allowed inside a program message.

151 GSP I/F TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

155 HPIB CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

147 INTR TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

−161 Invalid block data

Invalid block data was received (for example, END received before length satisfied).

−141 Invalid character data

Bad character data or unrecognized character data was received.

−121 Invalid character in number

Invalid character in numeric data.

−101 Invalid character

Invalid character was received.

105 INVALID FILE NAME

HP-IB only. The file name for the RECALL, PURGE, or RE-SAVE function must have an "_A", "_D", or "_S" extension. Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for more information.

−103 Invalid separator

The message unit separator (for example, ";", ",") is improper.

−151 Invalid string data

Invalid string data was received (for example, END received before close quote).

−131 Invalid suffix

Units are unrecognized, or the units are not appropriate.

153 KEY CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

108 LIF-DOS COPY NOT ALLOWED

If the user tries to copy a file between the RAM disk and the flexible disk when the format of the RAM disk is different from the format of the flexible disk, this message is displayed.

57 LIF-DOS copy not allowed

If the user tries to copy a file between the RAM disk and the flexible disk when the format of the RAM disk is different from the format of the flexible disk, this message is displayed.

67 LIST TABLE EMPTY OR INSUFFICIENT TABLE

The frequency list is empty. To implement the list frequency mode, add segments to the list table. Refer to "Stimulus Function Block" in the *Reference Manual.*

81 LOCAL MAX NOT FOUND

The maximum peak whose sharpness is defined by the peak define function cannot be found.

82 LOCAL MIN NOT FOUND

The minimum peak whose sharpness is defined by the peak define function cannot be found.

−250 MASS STORAGE ERROR

A mass storage error occurred. This error message is used when the device cannot detect the more specific errors described for errors −251 trough −259.

−254 MEDIA FULL

A legal program command could not be executed because the media was full.

−258 MEDIA PROTECTED

A legal program command could not be executed because the media was protected; for example, the disk was write-protected.

−251 MISSING MASS STORAGE

A legal program command could not be executed because of missing mass storage; for example, attempt to access an external disk drive by using Instrument BASIC.

−252 MISSING MEDIA

A legal program command could not be executed because of a missing media; for example, no disk.

−109 Missing parameter

A command with an improper number of parameters received.

179 MIXER LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

8 NO CALIBRATION CURRENTLY IN PROGRESS

The **RESUME CAL SEQUENCE** softkey is not valid unless a calibration was already in progress. Start a new calibration. Refer to "Measurement Calibration" in the *Reference Manual*.

112 NO DATA TRACE DISPLAYED

The **SCALE FOR [DATA]** is selected while the data trace is not displayed.

77 NO DATA TRACE

The **MARKER ON [DATA]** is selected while the data trace is not displayed.

106 NO LEGAL FILES ON DISK

There are no files on the disk with extensions, "_A", "_D", or "_S". Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for more information.

83 NO MARKER DELTA - PEAK DEF NOT SET

The **MARKER → PEAK DEF** softkey requires that delta marker mode be turned ON, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual*.

80 NO MARKER DELTA - RANGE NOT SET

The **SEARCH RNG STORE** softkey requires that delta marker mode be turned ON, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual*.

79 NO MARKER DELTA - SPAN NOT SET

The **MARKER → SPAN** softkey requires that delta marker mode be turned ON, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual.*

113 NO MEMORY TRACE DISPLAYED

The **SCALE FOR [MEMORY]** is selected while the memory trace is not displayed.

78 NO MEMORY TRACE

The **MARKER ON [MEMORY]** is selected while the memory trace is not displayed.

118 NO VALID Ach ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

119 NO VALID Bch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

123 NO VALID DC FULL SCALE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

126 NO VALID FN PRETUNE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

124 NO VALID HF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

125 NO VALID LF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

30 NO VALID MEMORY TRACE

If a memory trace is to be displayed or otherwise used, a data trace must first be stored to memory. Refer to "Response Function Block" in the *Reference Manual.*

122 NO VALID RATIO A/B CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

120 NO VALID RATIO A/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

121 NO VALID RATIO B/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

117 NO VALID Rch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

127 NO VALID STEP OSC CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

31 NOT AVAILABLE FOR THIS FORMAT

The D&M SCALE [COUPLED] softkey is not valid when the format is either LOG MAG & PHASE, or LOG MAG & DELAY.

41 NOT ENOUGH DATA

HP-IB only. The amount of data sent to the analyzer is less than that expected.

11 NOT VALID FOR PRESENT TEST SET

The calibration requested is inconsistent with the test set present. This message occurs in the following situations:

- A full 2-port calibration is requested with a test set other than an S-parameter test set.
- A one-path 2-port calibration is requested with an S-parameter test set (this procedure is typically used with a transmission/reflection test set).

−128 Numeric data not allowed

Numerical data not allowed for this operation.

−123 Numeric overflow

Numerical data value was too large (exponent magnitude >32,000).

95 OVERLOAD ON INPUT A, POWER REDUCED

94 OVERLOAD ON INPUT B, POWER REDUCED

96 OVERLOAD ON INPUT R, POWER REDUCED

When the power level at one of the three receiver inputs exceeds a certain level greater than the maximum input level, the RF output power level is automatically reduced to minimum and the annotation "P↓" appears in the left margin of the display. Refer to "Stimulus Function Block" in the *Reference Manual*.

−108 Parameter not allowed

Too many parameters for the command received.

21 PLOT ABORTED

Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.

25 PLOTTER NOT READY-PINCH WHEELS UP

If user attempts to plot when the plotter's pinch wheels are up, this message is displayed.

23 PLOTTER:not on, not connected, wrong address

The plotter does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the plotter. Ensure that the plotter address recognized by the analyzer matches the HP-IB address set on the plotter itself. Refer to "Instrument State Function Block" in the *Reference Manual* for instruction on setting peripheral addresses.

181 POOR PRETUNE TRACKING

Severe error. Contact your nearest Hewlett-Packard office.

186 POWER LINEARITY TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

POWER SHUT DOWN (ANALOG SYSTEM)

Severe error. Contact your nearest Hewlett-Packard office.

4 POWER SHUT DOWN (FDD, FRONT PANEL)

Severe error. Contact your nearest Hewlett-Packard office.

20 PRINT ABORTED

Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.

24 PRINT/PLOT IN PROGRESS, ABORT WITH COPY ABORT

If a print or plot is in progress and a second print or plot is attempted, this message is displayed and the second attempt is ignored. To abort a print or plot in progress, press COPY ABORT.

22 PRINTER:not on, not connected, wrong address

The printer does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the HP-IB address set on the printer itself. Refer to "Instrument State Function Block" in the *Reference Manual* for instruction on setting peripheral addresses.

−112 Program mnemonic too long

Program mnemonic is too long (maximum length is 12 characters).

−430 Query DEADLOCKED

Input buffer and output buffer are full; cannot continue.

–400 Query error

Query is improper.

–410 Query INTERRUPTED

Query is followed by DAB or GET before the response was completed.

–440 Query UNTERMINATED after indefinite response

The query which requests arbitrary data response (`*IDN?` and `*OPT?` queries) was sent before usual queries in a program message. (for example, `FREQ?;*IDN?` was expected, but `*IDN?;FREQ?` is received.)

–420 Query UNTERMINATED

Addressed to talk, incomplete program message received.

146 RATE TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

164 Rch +5V(D)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

173 Rch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

165 Rch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

170 Rch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

149 REALTIME CLOCK TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

REAR PANEL FAN STOPPED

The analyzer detected that the rear panel fan stopped and automatically shut down the power.

104 RECALL ERROR: INSTR STATE PRESET

A serious error, for example corrupted data, is detected on recalling a file, and this forced the analyzer to be PRESET.

185 RF AMP FLATNESS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

188 RF MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

194 RF OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

190 RF POWER LEVEL ALC(HF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

189 RF POWER LEVEL ALC(LF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

103 SAVE ERROR

A serious error, for example physically damaged disk surface, is detected on saving a file.

176 SOURCE ATTENUATOR OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

184 STEP OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

−150 String data error

String data is improper.

−158 String data not allowed

String data is not allowed.

−138 Suffix not allowed

A suffix is not allowed for this operation.

−102 Syntax error

Unrecognized command or data type was received.

−124 Too many digits

Numerical data length was too long (more than 255 digits received).

−350 Too many errors

Too many errors occurred in HP-IB commands.

68 TOO MANY SEGMENTS OR POINTS

Frequency list mode is limited to 31 segments or 801 points. Refer to "Stimulus Function Block" in the *Reference Manual* for more information.

50 TOO MANY SEGMENTS

The maximum number of segments for the limit line table is 18. Refer to "Instrument State Function Block" in the *Reference Manual.*

−223 Too much data

Either there is too much binary data to send to the analyzer when the data transfer format is FORM 2, FORM 3 or FORM 5, or the amount of data is greater than the number of points.

40 TOO MUCH DATA

The number of data to be sent to the analyzer is greater than that expected.

−113 Undefined header

Undefined header or an unrecognized command was received (operation not allowed).

180 VCO MISADJUSTED, RETRY THIS TEST

Severe error. Contact your nearest Hewlett-Packard office.

152 VRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

ERROR MESSAGES IN NUMERICAL ORDER

POWER SHUT DOWN (ANALOG SYSTEM)

Severe error. Contact your nearest Hewlett-Packard office.

A40 HEAT SINK TOO HOT

The temperature sensors on the A4 post-regulator assembly have detected an over-temperature condition. Turn the power OFF and let the instrument cool down for approximately 10 minutes. If this message is displayed again, contact your nearest Hewlett-Packard office.

REAR PANEL FAN STOPPED

The analyzer detected that the rear panel fan stopped and automatically shut down the power.

4 POWER SHUT DOWN (FDD, FRONT PANEL)

Severe error. Contact your nearest Hewlett-Packard office.

5 EXTERNAL REFERENCE UNLOCKED

The frequency of the external reference signal input to the connector on the rear panel deviates from 10/N MHz, where N is an integer between 1 to 10, and phase lock can no longer be maintained. Refer to "Front and Rear Panel" in the *Reference Manual* for details about the signal requirements.

6 ADDITIONAL STANDARDS NEEDED

Error correction for the selected calibration class cannot be computed until all the necessary standards have been measured.

7 CALIBRATION REQUIRED

No valid calibration coefficients were found when user attempted to turn calibration ON. Refer to "Measurement Calibration" in the *Reference Manual.*

8 NO CALIBRATION CURRENTLY IN PROGRESS

The **RESUME CAL SEQUENCE** softkey is not valid unless a calibration was already in progress. Start a new calibration. Refer to "Measurement Calibration" in the *Reference Manual.*

9 CALIBRATION ABORTED

The calibration in progress was terminated due to change of the active channel or stimulus parameters.

10 DC CALIBRATION ABORTED

Pressing the **ABORT DC CAL** softkey causes the analyzer to abort the DC detector linearity calibration in progress.

11 NOT VALID FOR PRESENT TEST SET

The calibration requested is inconsistent with the test set present. This message occurs in the following situations:

- A full 2-port calibration is requested with a test set other than an S-parameter test set.
- A one-path 2-port calibration is requested with an S-parameter test set (this procedure is typically used with a transmission/reflection test set).

12 EXCEEDED 7 STANDARDS PER CLASS

A maximum of seven standards can be defined for any class. Refer to "Measurement Calibration" in the *Reference Manual.*

13 CURRENT PARAMETER NOT IN CAL SET

HP-IB only. Correction is not valid for the selected measurement parameter. Refer to "Measurement Calibration" in the *Reference Manual.*

14 BACKUP DATA LOST

Data check-sum error on the battery backup memory has occurred. The battery is recharged for approximately 10 minutes after power was turned ON.

20 PRINT ABORTED

Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.

21 PLOT ABORTED

Pressing the COPY ABORT softkey causes the analyzer to abort the plot in progress.

22 PRINTER:not on, not connect, wrong address

The printer does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the HP-IB address set on the printer itself. Refer to "Instrument State Function Block" in the *Reference Manual* for instruction on setting peripheral addresses.

23 PLOTTER:not on, not connect, wrong address

The plotter does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the plotter. Ensure that the plotter address recognized by the analyzer matches the HP-IB address set on the plotter itself. Refer to "Instrument State Function Block" in the *Reference Manual* for instruction on setting peripheral addresses.

24 PRINT/PLOT IN PROGRESS, ABORT WITH COPY ABORT

If a print or plot is in progress and a second print or plot is attempted, this message is displayed and the second attempt is ignored. To abort a print or plot in progress, press COPY ABORT.

25 PLOTTER NOT READY-PINCH WHEELS UP

If user attempts to plot when the plotter's pinch wheels are up, this message is displayed.

30 NO VALID MEMORY TRACE

If a memory trace is to be displayed or otherwise used, a data trace must first be stored to memory. Refer to "Response Function Block" in the *Reference Manual.*

31 NOT AVAILABLE FOR THIS FORMAT

The D&M SCALE [COUPLED] softkey is not valid when the format is either LOG MAG & PHASE, or LOG MAG & DELAY.

32 FORMAT TYPE IS NOT SMITH

The conjugate matching function is only valid in the Smith chart format.

40 TOO MUCH DATA

The amount of data to be sent to the analyzer is greater than that expected.

41 NOT ENOUGH DATA

HP-IB only. The amount of data sent to the analyzer is less than that expected.

50 TOO MANY SEGMENTS

The maximum number of segments for the limit line table is 18. Refer to "Instrument State Function Block" in the *Reference Manual*.

57 LIF-DOS copy not allowed

If the user tries to copy a file between the RAM disk and the flexible disk when the format of the RAM disk is different from the format of the flexible disk, this message is displayed.

61 CAN'T CHANGE- ANOTHER CONTROLLER ON BUS

The analyzer cannot assume the mode of system controller until the active controller is removed from the bus or relinquishes the bus.

62 FORMAT NOT VALID FOR MEASUREMENT

The conversion function except the 1/S mode is not valid for the Smith, Inverse Smith, and SWR formats.

67 LIST TABLE EMPTY OR INSUFFICIENT TABLE

The frequency list is empty. To implement the list frequency mode, add segments to the list table. Refer to "Stimulus Function Block" in the *Reference Manual*.

68 TOO MANY SEGMENTS OR POINTS

Frequency list mode is limited to 31 segments or 801 points. Refer to "Stimulus Function Block" in the *Reference Manual* for more information.

77 NO DATA TRACE

The `MARKER ON [DATA]` is selected while the data trace is not displayed.

78 NO MEMORY TRACE

The `MARKER ON [MEMORY]` is selected while the memory trace is not displayed.

79 NO MARKER DELTA - SPAN NOT SET

The MARKER → SPAN softkey requires that delta marker mode be turned ON, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual.*

80 NO MARKER DELTA - RANGE NOT SET

The SEARCH RNG STORE softkey requires that delta marker mode be turned ON, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual.*

81 LOCAL MAX NOT FOUND

The maximum peak whose sharpness is defined by the peak define function cannot be found.

82 LOCAL MIN NOT FOUND

The minimum peak whose sharpness is defined by the peak define function cannot be found.

83 NO MARKER DELTA - PEAK DEF NOT SET

The MARKER → PEAK DEF softkey requires that delta marker mode be turned ON, with at least two markers displayed. Refer to "Using Markers" in the *Reference Manual.*

94 OVERLOAD ON INPUT B, POWER REDUCED

95 OVERLOAD ON INPUT A, POWER REDUCED

96 OVERLOAD ON INPUT R, POWER REDUCED

When the power level at one of the three receiver inputs exceeds a certain level greater than the maximum input level, the RF output power level is automatically reduced to minimum and the annotation "P↓" appears in the left margin of the display. Refer to "Stimulus Function Block" in the *Reference Manual.*

97 DC OVERLOAD ON INPUT B

98 DC OVERLOAD ON INPUT A

99 DC OVERLOAD ON INPUT R

The DC voltage at one of the three receiver inputs approach the DC voltage damage level. Refer to "Instrument Specifications" in the *General Information* section for DC damage level information.

103 SAVE ERROR

A serious error, for example physically damaged disk surface, is detected on saving a file.

104 RECALL ERROR: INSTR STATE PRESET

A serious error, for example corrupted data, is detected on recalling a file, and this forced the analyzer to be PRESET.

105 INVALID FILE NAME

HP-IB only. The file name for the RECALL, PURGE, or RE-SAVE function must have an "_A", "_D", or "_S" extension. Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for more information.

106 NO LEGAL FILES ON DISK

There are no files on the disk with extensions, "_A", "_D", or "_S". Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for more information.

107 CAN'T SAVE GRAPHICS WHEN COPY IN PROGRESS

If user attempts to save graphics when a print or plot is in progress, this error message is displayed.

108 LIF-DOS COPY NOT ALLOWED

If the user tries to copy a file between the RAM disk and the flexible disk when the format of the RAM disk is different from the format of the flexible disk, this message is displayed.

112 NO DATA TRACE DISPLAYED

The `SCALE FOR [DATA]` is selected while the data trace is not displayed.

113 NO MEMORY TRACE DISPLAYED

The `SCALE FOR [MEMORY]` is selected while the memory trace is not displayed.

117 NO VALID Rch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

118 NO VALID Ach ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

119 NO VALID Bch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

120 NO VALID RATIO A/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

121 NO VALID RATIO B/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

122 NO VALID RATIO A/B CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

123 NO VALID DC FULL SCALE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

124 NO VALID HF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

125 NO VALID LF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

126 NO VALID FN PRETUNE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

127 NO VALID STEP OSC CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

137 CONTINUOUS SWITCHING NOT ALLOWED

The current measurement requires the S-parameter test set to switch automatically between forward and reverse measurements (driving test port 1 and, then test port 2). Refer to "Stimulus Function Block" in the *Reference Manual*.

142 A1 ROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

143 DRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

144 BACKUP RAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

145 EEPROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

146 RATE TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

147 INTR TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

148 FPC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

149 REALTIME CLOCK TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

150 A1 CPU EXT BUS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

151 GSP I/F TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

152 VRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

153 KEY CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

154 FDC CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

155 HPIB CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

156 −15V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

157 −12.6V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

158 +18V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

159 FAN POWER OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

160 +12V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

161 +15V(A) OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

162 +22V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

163 +65V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

164 Rch +5V(D)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

165 Rch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

166 Ach +5V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

167 Ach A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

168 Bch −5.2V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

169 Bch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

170 Rch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

171 Ach RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

172 Bch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

173 Rch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

174 Ach A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

175 Bch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

176 SOURCE ATTENUATOR OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

177 Ach/Rch IF GAIN OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

178 Bch/Rch IF GAIN OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

179 MIXER LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

180 VCO MISADJUSTED, RETRY THIS TEST

Severe error. Contact your nearest Hewlett-Packard office.

181 POOR PRETUNE TRACKING

Severe error. Contact your nearest Hewlett-Packard office.

182 FN PRETUNE-DAC/MONITOR FAILURE

Severe error. Contact your nearest Hewlett-Packard office.

183 EEPROM WRITE FAILED

Severe error. Contact your nearest Hewlett-Packard office.

184 STEP OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

185 RF AMP FLATNESS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

186 POWER LINEARITY TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

187 1st LOCAL MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

188 RF MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

189 RF POWER LEVEL ALC(LF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

190 RF POWER LEVEL ALC(HF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

191 1st LOCAL AMP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

192 FN FREQ TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

193 1st IF OFFSET OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

194 RF OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

-440 Query UNTERMINATED after indefinite response

The query which requests arbitrary data response (`*IDN?` and `*OPT?` queries) was sent before usual queries in a program message. (for example, `FREQ?;*IDN?` was expected, but `*IDN?;FREQ?` is received.)

-430 Query DEADLOCKED

Input buffer and output buffer are full; cannot continue.

-420 Query UNTERMINATED

Addressed to talk, incomplete program message received.

-410 Query INTERRUPTED

Query is followed by DAB or GET before the response was completed.

-400 Query error

Query is improper.

-350 Too many errors

Too many errors occurred in HP-IB commands.

−258 MEDIA PROTECTED

A legal program command could not be executed because the media was protected; for example, the disk was write-protected.

−257 FILE NAME ERROR

A legal program command could not be executed because the file name on the device media was in error; for example, an attempt was made to copy to a duplicate file name.

−256 FILE NAME NOT FOUND

A legal program command could not be executed because the file name on the device media was not found; for example, an attempt was made to read or copy a nonexistent file.

−255 DIRECTORY FULL

A legal program command could not be executed because the media directory was full.

−254 MEDIA FULL

A legal program command could not be executed because the media was full.

−253 CORRUPT MEDIA

A legal program command could not be executed because of corrupt media; for example, a bad disk or wrong format.

−252 MISSING MEDIA

A legal program command could not be executed because of a missing media; for example, no disk.

−251 MISSING MASS STORAGE

A legal program command could not be executed because of missing mass storage; for example, attempt to access an external disk drive by using Instrument BASIC.

−250 MASS STORAGE ERROR

A mass storage error occurred. This error message is used when the device cannot detect the more specific errors described for errors −251 trough −259.

−223 Too much data

Either there is too much binary data to send to the analyzer when the data transfer format is FORM 2, FORM 3 or FORM 5, or the amount of data is greater than the number of points.

−222 Data out of range

Numerical parameter of HP-IB command is out of the range defined.

−168 Block data not allowed

Block data is not allowed.

−161 Invalid block data

Invalid block data was received (for example, END received before length satisfied).

−160 Block data error

Block data is improper.

−158 String data not allowed

String data is not allowed.

−151 Invalid string data

Invalid string data was received (for example, END received before close quote).

−150 String data error

String data is improper.

−148 Character data not allowed

Character data not allowed for this operation.

−144 Character data too long

Character data is too long (maximum length is 12 characters).

−141 Invalid character data

Bad character data or unrecognized character data was received.

−138 Suffix not allowed

A suffix is not allowed for this operation.

−131 Invalid suffix

Units are unrecognized, or the units are not appropriate.

−128 Numeric data not allowed

Numerical data not allowed for this operation.

−124 Too many digits

Numerical data length was too long (more than 255 digits received).

−123 Numeric overflow

Numerical data value was too large (exponent magnitude > 32,000).

−121 Invalid character in number

Invalid character in numeric data.

−113 Undefined header

Undefined header or an unrecognized command was received (operation not allowed).

−112 Program mnemonic too long

Program mnemonic is too long (maximum length is 12 characters).

−109 Missing parameter

A command with an improper number of parameters was received.

−108 Parameter not allowed

Too many parameters for the command received.

−105 GET not allowed

GET is not allowed inside a program message.

−104 Data type error

Improper data type used (for example, string data was expected, but numeric data was received).

−103 Invalid separator

The message unit separator (for example, ";", ",") is improper.

−102 Syntax error

Unrecognized command or data type was received.

−101 Invalid character

Invalid character was received.