HP 8751A Network Analyzer

HP-IB Programming Manual

HEWLETT PACKARD

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1

General Information

This manual is an introduction to remote operation of the HP 8751A Network Analyzer using an HP 9000 series 200 or 300 computer. It is a tutorial introduction, using 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 the 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.

Error Messages lists error messages with explanations.

The reader should become familiar with the operation of the HP 8751A before controlling it over HP-IB. This manual is not intended to teach BASIC programming or to discuss HP-IB theory; 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 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.

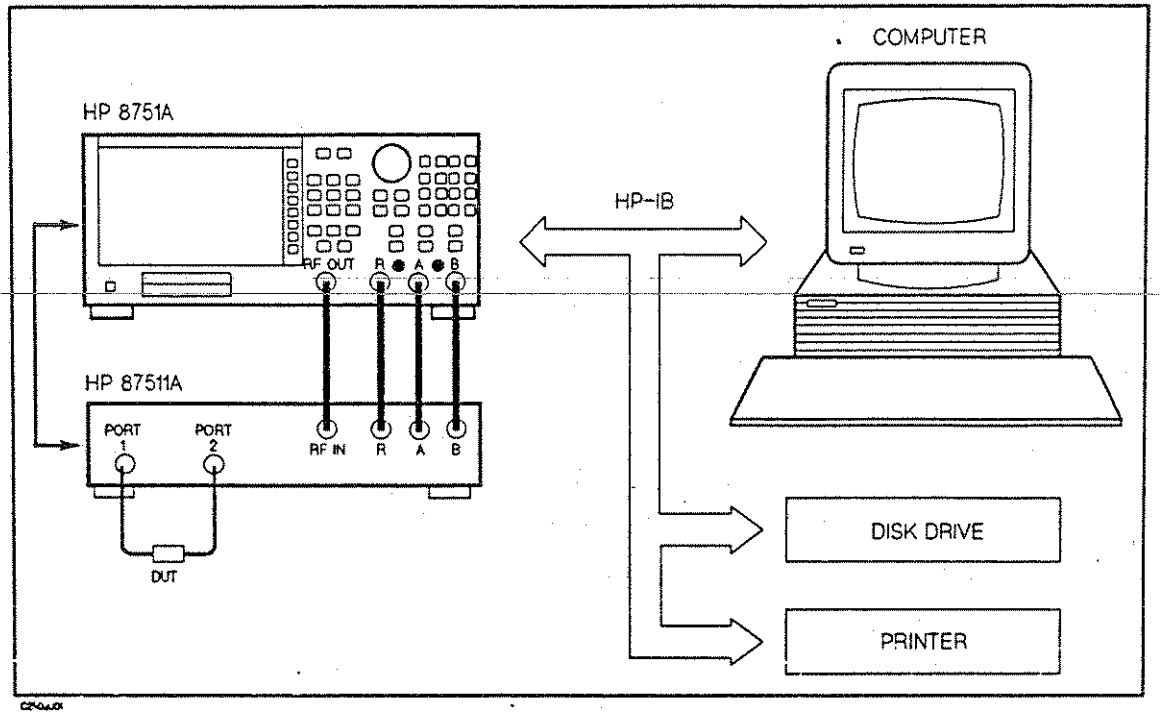


Figure 2-1. HP-IB Connections in a Typical Setup

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] and the presetting the HP 8751A.

   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 computer use the (Return) key as both execute and enter. 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.

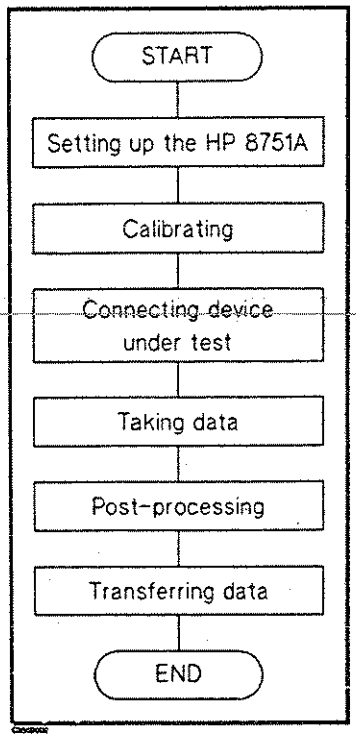


Figure 2-2. Typical Measurement Sequence

- 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 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 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 commands `NUMGn` 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`, `OUTPRAWn`, `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 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

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, the stop, or the center frequencies, or the 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 1.0E+5 (for the S-parameter Test Set) to 5.0E+8. These will be entered into the HP 8751A, and the frequencies will be displayed.

```
10    !
20    ! Setting Up a Measurement
30    !
40    Hp8751=717
50    ABORT 7
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;"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	Assigns HP 8751A HP-IB address.
Lines 50 and 60	Prepares for HP-IB control.
Line 80	Presets the HP 8751A.

Line 90	Makes channel 1 the active channel, and measures the transmission parameter, S_{21}, displaying its magnitude in dB.
Lines 100 and 110	Inputs the center frequency and the frequency span.
Lines 120 and 130	Sets the center frequency and the frequency span to the HP 8751A.
Lines 150 through 180	Queries the center frequency and the frequency span.
Lines 190 and 200	Shows the current center frequency and the frequency span.

Performing a Measurement Calibration

This section will demonstrate how to coordinate a measurement calibration over HP-IB. 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 in it. For type-N calibration kits, class $S_{11}B$ has two standards in it: male and female SHORTs.

When doing a 1-port calibration in 7 mm over 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.

```
10   !
20   ! Frequency Response Calibration
30   !
40   Hp8751=717
50   ABORT 7
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"
160  OUTPUT Hp8751;"CALKN50"
170  OUTPUT Hp8751;"CALIRESP"
180  INPUT "Connect THRU, then press [Return].",Dum$
190  OUTPUT Hp8751;"CLES"
200  OUTPUT Hp8751;"STANC"
210  REPEAT
220    OUTPUT Hp8751;"ESB?"
230    ENTER Hp8751;Stat
240  UNTIL BIT(Stat,0)
250  !
260  OUTPUT Hp8751;"RESPDONE"
270  OUTPUT Hp8751;"*OPC?"
280  ENTER Hp8751;Dum
290  OUTPUT Hp8751;"CONT"
300  DISP "Response cal completed."
310  END
```

Figure 2-4. Sample Program: Frequency Response Calibration

Line 150 — Sets the trigger to the hold mode.

Line 160 — Selects the 50 Ω type-N calibration kit.

Line 170 — Opens the calibration by calling the response calibration.

Line 180 — Asks for a THRU, and waits for the operator to connect it.

Line 190 — Clears all registers.

Line 200 — Selects and measures the THRU. There is more than one standard in this calibration, so we 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 210 through 240	Waits for the standard to be measured. This is indicated by bit 0 of event status register B.
Lines 260 through 280	Affirms the completion of the calibration, and waits for calculation completion.
Line 290	Sets 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    Hp8751=717
50    ABORT 7
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"
160   OUTPUT Hp8751;"CALKN50"
170   OUTPUT Hp8751;"CALIS111"
180   !
190   INPUT "Connect OPEN at port 1, then press [Return].",Dum$
200   OUTPUT Hp8751;"CLASS11A"
210   OUTPUT Hp8751;"CLES"
220   OUTPUT Hp8751;"STANB"
230   GOSUB Op_end
240   OUTPUT Hp8751;"DONE"
250   !
260   INPUT "Connect SHORT at port 1, then press [Return].",Dum$
270   OUTPUT Hp8751;"CLASS11B"
280   OUTPUT Hp8751;"CLES"
290   OUTPUT Hp8751;"STANB"
300   GOSUB Op_end
310   OUTPUT Hp8751;"DONE"
320   !
330   INPUT "Connect LOAD at port 1, then press [Return].",Dum$
340   OUTPUT Hp8751;"CLES"
350   OUTPUT Hp8751;"CLASS11C"
360   GOSUB Op_end
370   !
380   OUTPUT Hp8751;"SAV1"
390   OUTPUT Hp8751;"*OPC?"
400   ENTER Hp8751;Dum
410   OUTPUT Hp8751;"CONT"
420   DISP "1-port cal completed."
430   STOP
440   !
```

```
450 Op_end:
460   REPEAT
470     OUTPUT Hp8751;"ESB?"
480     ENTER Hp8751;Stat
490   UNTIL BIT(Stat,0)
500   RETURN
510   END
```

Figure 2-5. 1-port Reflection Calibration

Line 170	Opens the calibration by calling the S_{11} 1-port calibration.
Line 200	Selects the OPEN standard.
Line 210	Clears all the registers.
Line 220	Selects the female OPEN standard, and starts measuring the standard.
Line 230	Waits until the measurement ends.
Line 240	Completes the OPEN standard measurement.
Line 270	Selects the SHORT standard.
Line 290	Selects the female SHORT standard, and starts measuring the standard.
Line 310	Completes the SHORT standard measurement.
Line 350	Selects the LOAD standard, and starts measuring the standard.
Line 380	Saves the calibration.
Line 410	Sets the trigger to the continuous mode.
Line 450 through 500	Waits until the operation complete bit of the event status register is set to 0.

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.

```
10   !
20   ! Using Markers to Obtain trace data at specific points
30   !
40   Hp8751=717
50   ABORT 7
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;"CLES"
160  OUTPUT Hp8751;"SING"
170  REPEAT
180    OUTPUT Hp8751;"ESB?"
190    ENTER Hp8751;Stat
200  UNTIL BIT(Stat,0)
210  !
220  OUTPUT Hp8751;"AUTO"
230  OUTPUT Hp8751;"MARK1"
240  OUTPUT Hp8751;"SEAMIN"
250  OUTPUT Hp8751;"OUTPMARK?"
260  ENTER Hp8751;Val1,Val2,Stim
270  PRINT "Min val:",Val1;"dB"
280  PRINT "Stimulus:",Stim;"Hz"
290  END
```

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

Lines 150 through 200	Collects one sweep of data, and wait for completion.
Line 220	Brings the trace data in view on the HP 8751A's display.
Line 230	Activates marker 1.

Line 240 Has the HP 8751A search for the trace minimum

Line 250 Outputs the marker values at that point.

Line 260 Reads 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	dB, degrees	real, imag	dB, degrees
	Re/Im	real, imag	real, imag	real, imag
	R + jX	real, imag ohms	real, imag	real, imag ohms
	G + jB	real, imag Siemens	real, imag	real, imag Siemens
POLAR	LIN MKR	lin mag, degrees	real, imag	lin mag, degrees
	LOG MKR	dB, degrees	real, imag	dB, degrees
	Re/Im	real, imag	real, imag	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/imginary values, for each data point. Therefore, the receiving array has to be two elements wide, and as deep as the number of points. This memory space for this array must be declared before any data is to be 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 1608 bytes. Figure 2-7 shows the data transfer format of Form 2.

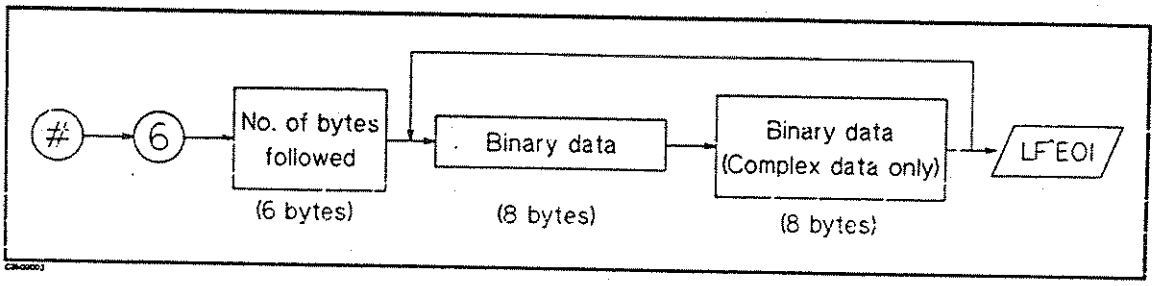


Figure 2-7. Form 2 Data Transfer Format

- Form 3

  IEEE 64-bit floating point format. In this mode, each number takes 8 bytes. This means that a 201-point transfer takes 3216 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.

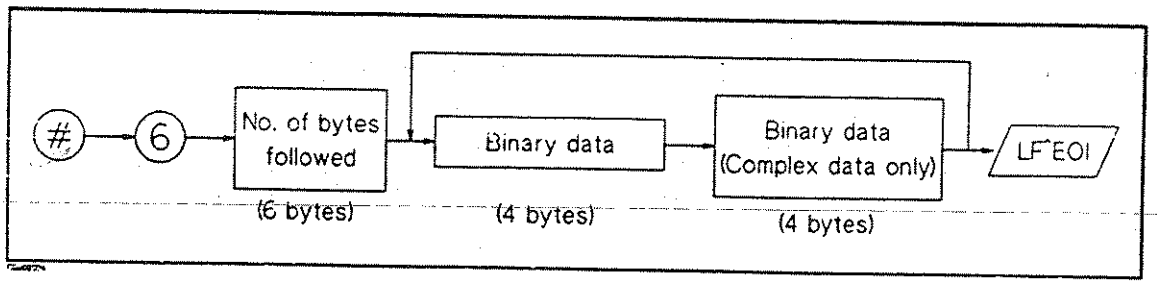


Figure 2-8. Form 3 Data Transfer Format

- 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. Since there are two numbers per point, a 201-point transfer in Form 4 takes 9648 bytes.

- 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 1 is available, and it holds the current parameter. If a 2-port calibration is ON the four arrays to S_{11}, S_{21}, S_{12}, and S_{22} 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 arrays of calibration coefficients which are used in 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 the 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.

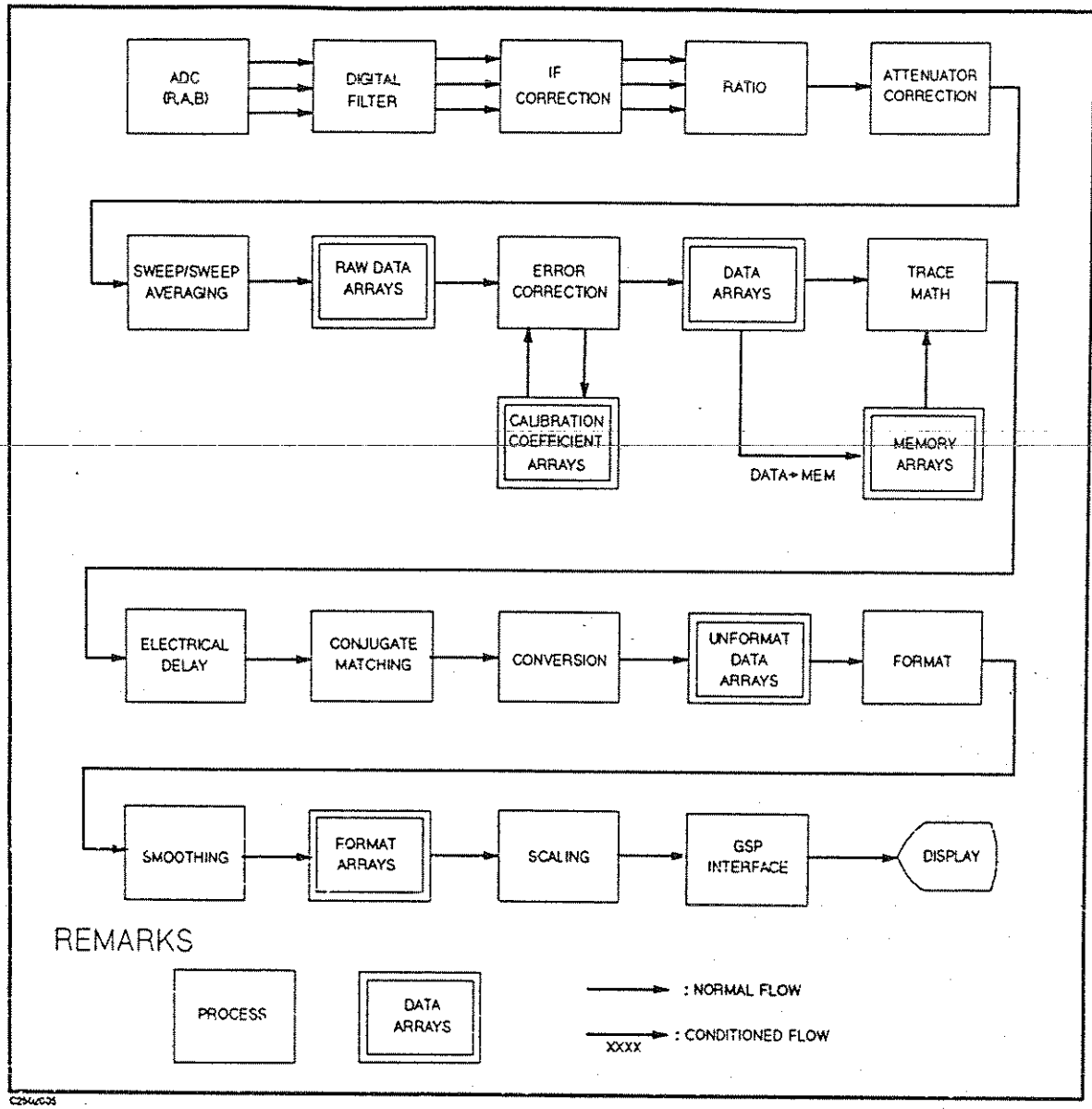


Figure 2-9. Data Processing Chain

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. Since there are two numbers per point, a 201-point transfer in Form 4 takes 9648 bytes.

```
10    !
20    ! Data Transfer using ASCII Transfer Format
30    !
40    OPTION BASE 1
50    Hp8751=717
60    ABORT 7
70    CLEAR Hp8751
80    !
90    OUTPUT Hp8751;"PRES"
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   OUTPUT Hp8751;"CLES"
170   OUTPUT Hp8751;"SING"
180   REPEAT
190     OUTPUT Hp8751;"ESB?"
200     ENTER Hp8751;Stat
210   UNTIL BIT(Stat,0)
220   !
230   OUTPUT Hp8751;"POIN?"
240   ENTER Hp8751;Nop
250   ALLOCATE Dat(Nop),Stim(Nop)
260   OUTPUT Hp8751;"FORM4"
270   !
280   OUTPUT Hp8751;"OUTPRFORM?"
290   ENTER Hp8751;Dat(*)
300   !
310   OUTPUT Hp8751;"OUTPSTIM?"
320   ENTER Hp8751;Stim(*)
330   !
340   FOR I=1 TO Nop
350     PRINT Stim(I);"Hz",Dat(I);"dB"
360   NEXT I
370   DEALLOCATE Dat(*),Stim(*)
380   END
```

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

Line 40	Specifies the default lower bound of arrays to 1.
Lines 230 and 240	Finds out how many points to expect.
Line 250	Create arrays to hold the trace data and the stimulus data.

Line 260	Tells the HP 8751A to use the ASCII transfer format.
Line 280	Requests the real part of the formatted trace data.
Line 290	Transfers the data from the HP 8751A to the computer, and puts it in the receiving array.
Lines 310 and 320	Requests and transfers the stimulus data.
Line 370	Deallocates memory space.

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    OPTION BASE 1
50    Hp8751=717
60    ABORT 7
70    CLEAR Hp8751
80    !
90    OUTPUT Hp8751;"PRES"
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   OUTPUT Hp8751;"CLES"
170   OUTPUT Hp8751;"SING"
180   REPEAT
190     OUTPUT Hp8751;"ESB?"
200     ENTER Hp8751;Stat
210   UNTIL BIT(Stat,0)
220   !
230   OUTPUT Hp8751;"POIN?"
240   ENTER Hp8751;Nop
250   ALLOCATE Dat(Nop),Stim(Nop)
260   OUTPUT Hp8751;"FORM3"
270   ASSIGN @Dt TO Hp8751;FORMAT OFF
280   !
290   OUTPUT Hp8751;"OUTPRFORM?"
300   ENTER @Dt USING "#,8A";A$
310   ENTER @Dt;Dat(*)
320   ENTER @Dt USING "#,1A";B$
330   !
340   OUTPUT Hp8751;"OUTPSTIM?"
350   ENTER @Dt USING "#,8A";A$
360   ENTER @Dt;Stim(*)
370   ENTER @Dt USING "#,1A";B$
380   !
390   ASSIGN @Dt TO *
400   FOR I=1 TO Nop
410     PRINT Stim(I);"Hz",Dat(I);"dB"
420   NEXT I
430   DEALLOCATE Dat(*),Stim(*)
```

```
440   END
```

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

Line 260	Tells HP 8751A to output data using Form 3.
Line 270	Defines 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 300	Enters the header.
Line 310	Enters the data.
Line 320	Enters the terminator.
Line 390	Closes the I/O path.

Application Example

The following example is to measure the transmission parameter a bandpass filter and to get the typical parameters: −3 dB bandwidth, Center frequency, and Insertion loss.

```
10    !
20    ! Bandpass Filter Test
30    !
40    Hp8751=717
50    ABORT 7
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"
160   OUTPUT Hp8751;"CALKN50"
170   OUTPUT Hp8751;"CALIRESP"
180   INPUT "Connect THRU, then press [Return].",Dum$
190   OUTPUT Hp8751;"CLES"
200   OUTPUT Hp8751;"STANC"
210   GOSUB Op_end
220   OUTPUT Hp8751;"RESPDONE"
230   INPUT "Cal completed. Connect DUT, then press [Return].",Dum$
240   !
250   OUTPUT Hp8751;"CLES"
260   OUTPUT Hp8751;"SING"
270   GOSUB Op_end
280   !
290   OUTPUT Hp8751;"MARK1"
300   OUTPUT Hp8751;"SEAMAX"
310   OUTPUT Hp8751;"OUTPMARK?"
320   ENTER Hp8751;Loss,Val2,Stim
330   !
340   OUTPUT Hp8751;"DELR1"
350   OUTPUT Hp8751;"WIDV -3"
360   OUTPUT Hp8751;"WIDTON"
370   OUTPUT Hp8751;"OUTPMWID?"
380   ENTER Hp8751;Bw,Cent,Q
390   !
400   PRINT "-3 dB bandwidth:",Bw;"Hz"
410   PRINT "Center frequency:",Cent;"Hz"
420   PRINT "Insertion loss:",Loss;"dB"
430   STOP
440   !
450 Op_end:  !
```

```
460   REPEAT
470     OUTPUT Hp8751;"ESB?"
480     ENTER Hp8751;Stat
490   UNTIL BIT(Stat,0)
500   RETURN
510   END
```

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

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

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 transmit 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    OPTION BASE 1
50    Hp8751=717
60    ABORT 7
70    CLEAR Hp8751
80    !
90    INPUT "Enter number of segments",Numb
100   ALLOCATE Table(Numb,3)
110   !
120   PRINTER IS 1
130   OUTPUT 2;CHR$(255)&"K";
140   PRINT USING "10A,10A,10A,20A";"Segment","Start(Hz)","Stop(Hz)",
"Number of Points"
150   !
160   FOR I=1 TO Numb
170     GOSUB Loadpoin
180   NEXT I
190   !
200   LOOP
210     INPUT "Do you want to edit?  (Y/N)",An$
220   EXIT IF An$="N" OR An$="n"
230     INPUT "Enter segment number",I
240     GOSUB Loadpoin
250   END LOOP
260   !
270   OUTPUT Hp8751;"PRES"
280   OUTPUT Hp8751;"CHAN1; S21; LOGM"
290   !
300   OUTPUT Hp6751;"EDITLIST"
310   OUTPUT Hp8751;"CLEL"
```

```
320   FOR I=1 TO Numb
330     OUTPUT Hp8751;"SADD"
340     OUTPUT Hp8751;"STAR ";Table(I,1)
350     OUTPUT Hp8751;"STOP ";Table(I,2)
360     OUTPUT Hp8751;"POIN ";Table(I,3)
370     OUTPUT Hp8751;"SDON"
380   NEXT I
390   OUTPUT Hp8751;"EDITDONE"
400   OUTPUT Hp8751;"LISFREQ"
410   OUTPUT Hp8751;"LISDOBASE"
420   !
430   OUTPUT Hp8751;"CLES"
440   OUTPUT Hp8751;"SING"
450   REPEAT
460     OUTPUT Hp8751;"ESB?"
470     ENTER Hp8751;Stat
480   UNTIL BIT(Stat,0)
490   OUTPUT Hp8751;"AUTO"
500   STOP
510   !
520 Loadpoin:   !
530   INPUT "Enter start frequency (Hz)",Table(I,1)
540   INPUT "Enter stop frequency (Hz)",Table(I,2)
550   INPUT "Enter number of points",Table(I,3)
560   IF Table(I,3)=1 THEN Table(I,2)=Table(I,1)
570   PRINT TABXY(0,I+1);I;TAB(10);Table(I,1);TAB(20);Table(I,2);TAB(35);
Table(I,3)
580   RETURN
590   END
```

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

Line 90	Finds out how many segments to expect.
Line 100	Creates a table to hold the segments. Keeps start frequency, stop frequency, and number of points.
Lines 120 through 140	Clears the screen and print the table header.
Lines 160 through 180	Reads in each segment.
Lines 200 through 250	Edits the table until editing is no longer needed.
Line 300	Activates the frequency list edit mode, and opens the list frequency table for editing.
Line 310	Deletes any existing segments.
Lines 320 through 380	Enters the segment values.
Line 390	Closes the table.
Line 400	Turns on list frequency mode.
Line 410	Displays the trace for only the listed frequency ranges.

Lines 520 through 580	Enters in a segment.
Lines 530 through 550	Enters the segment values.
Line 560	Makes the stop frequency equal to the start frequency to avoid ambiguity, if only one point is in the segment.
Line 570	Prints the segment out.

Using Limit Lines to Perform Limit Testing

This example shows how to create a limit table and transmit 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    OPTION BASE 1
50    Hp8751=717
60    ABORT 7
70    CLEAR Hp8751
80    !
90    OUTPUT Hp8751;"PRES"
100   OUTPUT Hp8751;"CHAN1; S21; LOGM"
110   INPUT "Enter start frequency (Hz)",F_start
120   INPUT "Enter stop frequency (Hz)",F_stop
130   OUTPUT Hp8751;"STAR ";F_start
140   OUTPUT Hp8751;"STOP ";F_stop
150   !
160   INPUT "Enter number of limits",Numb
170   ALLOCATE Table(Numb,3)
180   !
190   PRINTER IS 1
200   OUTPUT 2;CHR$(255)&"K";
210   PRINT USING "10A,15A,15A,15A";"Segment","Stimulus(Hz)","Upper(dB)",
"Lower(dB)"
220   !
230   FOR I=1 TO Numb
240     GOSUB Loadlimit
250   NEXT I
260   !
270   LOOP
280     INPUT "Do you want to edit? (Y/N)",An$
290   EXIT IF An$="N" OR An$="n"
300     INPUT "Enter segment number",I
310     GOSUB Loadlimit
320   END LOOP
330   !
340   OUTPUT Hp8751;"EDITLIML"
350   OUTPUT Hp8751;"LIMCLEL"
360   FOR I=1 TO Numb
370     OUTPUT Hp8751;"LIMSADD"
380     OUTPUT Hp8751;"LIMS ";Table(I,1)
```

```
390     OUTPUT Hp8751;"LIMU ";Table(I,2)
400     OUTPUT Hp8751;"LIML ";Table(I,3)
410     OUTPUT Hp8751;"LIMSDON"
420   NEXT I
430   !
440   OUTPUT Hp8751;"LIMEDONE"
450   OUTPUT Hp8751;"LIMILINEON"
460   OUTPUT Hp8751;"LIMITESTON"
470   DEALLOCATE Table(*)
480   STOP
490   !
500 Loadlimit:  !
510   INPUT "Enter stimulus value (Hz)",Table(I,1)
520   INPUT "Enter upper limit value (dB)",Table(I,2)
530   INPUT "Enter lower limit value (dB)",Table(I,3)
540   PRINT TABXY(0,I+1);I;TAB(11);Table(I,1);TAB(27);Table(I,2);TAB(42);
Table(I,3)
550   RETURN
560   END
```

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

Line 160	Finds out how many limits to expect.
Line 170	Creates a table to hold the limits. It will contain the stimulus value (frequency), the upper limit value, and the lower limit value.
Lines 190 through 210	Clears the screen and prints the table header.
Lines 230 through 250	Reads in each segment.
Lines 270 through 320	Edits the table until editing is no longer needed.
Line 340	Begins editing the limit line table.
Line 350	Deletes any existing limits.
Lines 360 through 420	Enters the segment values.
Line 440	Closes the table.
Line 450	Displays the limits.
Line 460	Activates the limit testing.
Lines 500 through 550	Enters a segment.

Storing and Recalling Instrument Status

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

Coordinating disk storage

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

```
10    !
20    ! Storing Instrument States
30    !
40    DIM Err$[50]
50    Hp8751=717
60    ABORT 7
70    CLEAR Hp8751
80    !
90    OUTPUT Hp8751;"PRES"
100   OUTPUT Hp8751;"CHAN1; S21; LOGM"
110   INPUT "Enter center frequency (Hz)",F_cent
120   INPUT "Enter frequency span (Hz)",F_span
130   OUTPUT Hp8751;"CENT ";F_cent
140   OUTPUT Hp8751;"SPAN ";F_span
150   !
160   INPUT "File name? (up to 8 char.)",Name$
170   OUTPUT Hp8751;"SAVDSTA """;Name$;""";"
180   OUTPUT Hp8751;"*OPC?"
190   ENTER Hp8751;Dum
200   OUTPUT Hp8751;"OUTPERRO?"
210   ENTER Hp8751;Err,Err$
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"";"
320   OUTPUT Hp8751;"*OPC?"
330   ENTER Hp8751;Dum
340   DISP "Done."
350   END
```

Figure 2-15. Sample Program: Storing Instrument States

Line 160 Gets the name of the file to create.

Line 170 Saves 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	Waits for completion of the saving.
Lines 200 and 210	Examines whether an error occurred or not.
Lines 220 through 280	If an error is detected, prints the error number and the error message. If an error is not detected, prompts the user to continue the program.
Line 310	Adds the extension to the file name and recalls the file.

Reading Calibration Data

This example demonstrates how to read measurement calibration data out of the HP 8751A, and how to put it back into 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 is 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 format 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.

A computer can also store calibration coefficients in the HP 8751A. To do this, declare the type of calibration data about to 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 mnemonic SAVC, and have the HP 8751A take a sweep.

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

```
10    !
20    ! Reading calibration data
30    !
40    OPTION BASE 1
50    DIM Head$[6]
60    Hp8751=717
70    ABORT 7
80    CLEAR Hp8751
90    !
100   INPUT "Connect THRU and press [Return] to do cal.",Dum$
110   GOSUB Setup
120   GOSUB Cal
130   OUTPUT Hp8751;"SAVC"
140   OUTPUT Hp8751;"POIN?"
150   ENTER Hp8751;Nop
160   ALLOCATE Dat(Nop,2)
170   !
180   INPUT "Press [Return] to transmit cal data.",Dum$
190   ASSIGN @Dt TO Hp8751;FORMAT OFF
200   OUTPUT Hp8751;"FORM3"
210   OUTPUT Hp8751;"OUTPCALC01?"
220   ENTER @Dt USING "#,8A";A$
230   ENTER @Dt;Dat(*)
240   ENTER @Dt USING "#,1A";B$
250   INPUT "Transmit done. Disconnect THRU and press [Return].",Dum$
```

```
260   !
270   GOSUB Setup
280   GOSUB Cal
290   OUTPUT Hp8751;"SAVC"
300   !
310   INPUT "Press [Return] to retransmit cal data.",Dum$
320   V$=VAL$(Nop*2*8)
330   Numv=LEN(V$)
340   Head$="000000"
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 ";
400   OUTPUT Hp8751;"#6"&Head$
410   OUTPUT @Dt;Dat(*),END
420   OUTPUT Hp8751;"SAVC"
430   !
440   ASSIGN @Dt TO *
450   DEALLOCATE Dat(*)
460   DISP "Retransmit completed. Connect DUT."
470   OUTPUT Hp8751;"CONT"
480   STOP
490   !
500 Setup:  !
510   F_cent=7.0E+7
520   F_span=2.0E+5
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:  !
610   OUTPUT Hp8751;"CALIRESP"
620   OUTPUT Hp8751;"CLES"
630   OUTPUT Hp8751;"STANC"
640   REPEAT
650     OUTPUT Hp8751;"ESB?"
660     ENTER Hp8751;Stat
670   UNTIL BIT(Stat,0)
680   WAIT .001
690   OUTPUT Hp8751;"RESPDONE"
700   RETURN
710   END
```

Figure 2-16. Reading calibration data

Line 50 Declares the dimension part of the file header.

Line 110	Presets and sets up the HP 8751A, then holds the trigger.
Line 120	Performs the response calibration.
Line 130	Re-draws the trace with the calibration data.
Line 210	Requests outputting the calibration data.
Line 220	Enters the file header.
Line 230	Enters the calibration data.
Line 240	Enters the file terminator.
Line 280	Performs the calibration to set the correction ON.
Line 320	Calculates the number of bytes transferred, and represents it in the string format.
Line 330	Counts the number of characters in the string which contains the number of bytes transferred.
Line 340	Enters 0 to all the arrays of the header as the initial value.
Line 350 through 370	Places 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	Transmits 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 the computer can control the HP 8751A and how the computer can pass 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$[50]
50    Hp8751=717
60    !
70    OUTPUT Hp8751;"*CLS"
80    OUTPUT Hp8751;"*ESE 2"
90    !
100   OUTPUT Hp8751;"PRINALL"
110   REPEAT
120     Stat=SPOLL(Hp8751)
130   UNTIL BIT(Stat,5)
140   !
150   PASS CONTROL Hp8751
160   DISP "Printing."
170   REPEAT
180     STATUS 7,6;Hpib
```

```
190   UNTIL BIT(Hpib,6)
200   DISP "Done."
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	Clears the status reporting system.
Line 80	Enables the Request Active Control bit in the event status register.
Line 100	Requests printing.
Lines 110 through 130	Waits until the HP 8751A requests control.
Line 150	Passes active control to the HP 8751A.
Line 170 through 190	Waits until the print is finished and the control is returned.
Line 220 through 240	If an error occurred, prints 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 the disk drive connected to the computer.

```
10    !
20    ! Transferring Disk Data Files
30    !
40    OPTION BASE 1
50    INTEGER Nop
60    DIM Sw$(7)[8],Numseg(7)
70    DATA "Raw",8,"Cal",24,"Data",2,"Mem",2,"Unform",2,"Trace",2,
"Tracemem",2
80    !
90    INPUT "File name (with extension)?",File$
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$(J);I
250       GOSUB Dataseg
260       PRINT
270     NEXT I
280     PRINT
290     IF J<>Numdat THEN INPUT "Press [Return] to read next data.",Dum$
300   NEXT J
310   ASSIGN @Path TO *
320   STOP
330   !
340 Datasw:  !
350   ENTER @Path USING "B,#";Sw
360   IF Sw THEN
```

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

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

Lines 50 and 60	Sets up the data of possible data groups.
Line 90	Gets the file name to load. The file name must be included the extension: "_D".
Line 100	Defines an I/O path which points to the chosen file.
Line 110	Enters bytes of internal use only.
Line 120 through 170	Reads the data switches and examine the data contained.
Line 190	Enters bytes of internal use only.
Line 220 through 300	Enters a data group.
Line 230 through 270	Enters a data segment.
Line 310	Closes the I/O path.
Lines 340 through 420	Reads a data switch.
Lines 440 through 520	Enters a data segment.
Line 450	Enters the number of data bytes which follow.
Line 460	Enters bytes of internal use only.
Lines 470 through 500	Reads the data.
Line 510	Enters 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 queue.

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 computers can in turn be set up to generate an interrupt on the 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 00001000 in binary representation. That means that whenever an error is put into the error queue and bit 3 gets 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 01000010 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.

```
10    !
20    ! Generating Interrupts
30    !
40    Hp8751=717
50    !
60    OUTPUT Hp8751;"*CLS"
```

```
70    OUTPUT Hp8751;"*ESE 32"
80    OUTPUT Hp8751;"*SRE 32"
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?"
240   ENTER Hp8751;Err,Err$
250   PRINT Err,Err$
260   !
270   ENABLE INTR 7
280   RETURN
290   END
```

Figure 2-19. Sample Program: Generating Interrupts

Line 60	Clears the status reporting system.
Line 70	Enables bit 5 of the event status register.
Line 80	Enables bit 5 of the status byte so that an SRQ will generated on a syntax error.
Line 100	Tells the computer where to branch it gets the interrupt.
Line 110	Tells 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 did it. A branch to `Err_report` will disable the interrupt, so the return from `Err_report` re-enable it.
Line 130 and 140	Does nothing loop.
Line 180	Clears the SRQ bit of the status byte.
Lines 190 and 200	Reads the register to clear the bit.
Lines 230 through 250	Instructs the HP 8751A to output the error number and the error message, and print them.

3

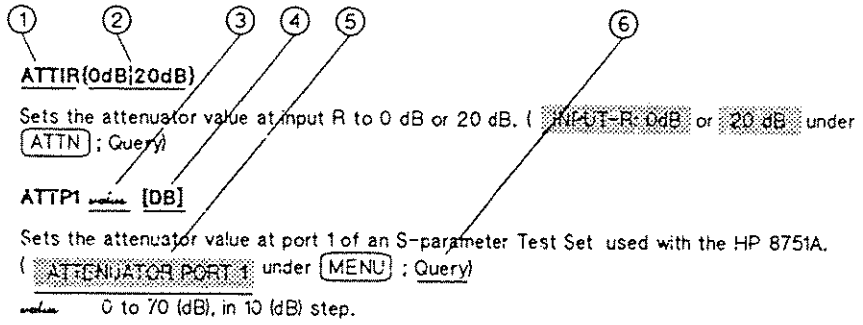
HP-IB Programming Reference

This chapter provides a reference for the 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 detail of the service related functions.

Notation



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 Softkey or hardkey 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 followings is acceptable.

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

Query Commands

All instrument function 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 the of 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 appendages (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 Convention

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 L high frequency. (Under SERVICE MENU under SYSTEM; Query)

ACTLLFRE

Sets the active L low frequency. (Under SERVICE MENU under SYSTEM; Query)

ACTLNORM

Sets the active 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.

AR

Calculates and displays the complex ratio of input A to input R. (A/R under MEAS; Query)

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 (dB), in 10 (dB) 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 (dB), in 10 (dB) step.

AUTO

Selects the scale/div value automatically to fit the trace data to the display. (AUTO SCALE under SCALE REF)

AVERFACT *value*

Sets the averaging factor. (AVERAGING FACTOR under AVG; Query)

value 1 to 999.

AVER{ON|OFF}

Sets the averaging function on or off for the active channel. (`AVERAGING on off` under AVG; Query)

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 1000 (x 10^{-15} F).

C1 *value*

Enters the constant term of the open circuit capacitor model value, C_1. (C1 under CAL)

value 0 to 1000 (x 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 1000 (x 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 NONE, RESP, RAI, S111, S221, FUL2, or ONE2

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 APC7, N50, N75, or USED.

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 (Hz) to 500 (MHz), or
−50 (dBm) to +15 (dBm) (Power sweep only).

suffix Refer to "Suffix".

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 the 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 the display element to change color: the HP Instrument BASIC text. (IBASIC under DISPLAY) (Option 002 only)

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 1.0E-18 (F) to 1.0E+9 (F).

CONPCS *value* [F]

Displays or changes parameter value Cs for the selected conjugate matching circuit. (Cs under DISPLAY; Query)

value 1.0E-18 (F) to 1.0E+9 (F).

CONPLP *value* [H]

Displays or changes parameter value Lp for the selected conjugate matching circuit. (Lp under DISPLAY; Query)

value 1.0E-18 (H) to 1.0E+9 (H).

CONPLS *value* [H]

Displays or changes parameter value Ls for the selected conjugate matching circuit. (PARAMETER:Ls under DISPLAY; Query)

value 1.0E-18 (H) to 1.0E+9 (H).

CONPDISP{ON|OFF}

Displays or does not displays 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 conversion setting of the measured data, impedance or admittance. (Query)

parameter OFF, ZREF, ZTRA, YREF, YTRA, or ONEDS

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)

CWFREQ *value* [*suffix*]

Sets the frequency for power sweep. (CWFREQ under MENU; Query)

value 5 (Hz) to 500 (MHz).

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 standard 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 testing off. (Under SERVICE MENU under SYSTEM; Query)

DESTON

Sets destructive testing on. (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 ALLI, HIHB, or ALLB

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)

DISL{1|2}

Selects the 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 DATA, MEMO, DATM, DDM, or DMM

DISPDATA

Displays a trace of the measured data. (DISPLAY: DATA under [DISPLAY]; Query)

DISPDATM

Displays traces of both the measured data and the memory data. (DATA and MEMORY under [DISPLAY]; Query)

DISPDDM

Displays the trace of the results of the measured data divided by the memory data. (DATA/MEM under [DISPLAY]; Query)

DISPDMM

Displays the trace of the results of the measured data subtracted by the memory data. (DATA-MEM under [DISPLAY]; Query)

DISPMEMO

Displays a trace of the memory data. (MEMORY under [DISPLAY]; Query)

DONE

Completes the measurement of the selected standard class calibration. (DONE: OPENS, DONE: SHORTS, or DONE:LOADS under [CAL])

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 (s) to 10 (s).

ESB?

Outputs the event status register B value.

ESNB *value*

Specifies the bits of event status register B.

value 0 to 32767 ($=2^{15}-1$).

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 OFF, ONSWEE, ONPOIN, or MAN.

EXTTOFF

Sets the internal measurement trigger mode (external trigger off). (TRIGGER: TRIG OFF under (MENU); Query)

EXTTON

Sets the external measurement trigger mode on. When triggered, one measurement sweep is executed. (EXT. TRIG ON SWEEP under (MENU); Query)

EXTTPOIN

Sets the external measurement trigger mode 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.

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 LOGM, PHAS, DELA, SMIC, POLA, LINM, SWR, REAL, IMAG, EXPP, INVSCHAR, LOGMP, or LOGMD

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)

FREQ

Erases the frequency annotation on the display. Preset to turn on. (FREQUENCY BLANK under DISPLAY; Query)

FORM2

Sets the IEEE 32-bit floating point format to transfer the trace data via HP-IB.

FORM3

Sets the IEEE 64-bit floating point format to transfer the trace data via HP-IB.

FORM4

Sets the ASCII transfer format to transfer the trace data via HP-IB.

FORM5

Sets the PC-DOS format to transfer the trace data via HP-IB.

FULP

Selects the full page plot. (FULL PAGE under COPY; Query)

FWDI

Selects forward isolation class for the calibration. (FWD ISOL'N ISOL'N STD under CAL)

FWDM

Selects forward match for the calibration. (FWD. MATCH THRU under CAL)

FWDT

Selects forward transmission for the calibration. (FWD. TRANS. THRU under CAL)

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 (Hz), 20 (Hz), 200 (Hz), 1000 (Hz), or 4000 (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.

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*

Retransmits 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 hardkey 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 during modifying the calibration kit. (FWD. MATCH or LABEL: FWD. TRANS. under CAL)

string Up to ten characters long.

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 long.

LABEREV{M|T} *string*

Defines the label for reverse match or reverse transmission class during modifying the calibration kit. (REV.MATCH or REV.TRANS. under CAL)

string Up to ten characters long.

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 long.

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 long.

LABK *string*

Defines the calibration kit label when modifying the calibration kit. (LABEL KIT under CAL)

string Up to ten characters long.

LABS *string*

Defines the calibration standard label when modifying the calibration kit. (LABEL STD under CAL)

string Up to ten characters long.

LEFL

Sets the plot quadrant to left lower. (LEFT LOWER under COPY; Query)

LEFU

Sets the plot quadrant to left upper. (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 5.0E+5 (dB) (Log mag format),

0 to 5.0E+5 (deg) (Phase and Expanded phase formats),

0 to 5.0E+5 (s) (Delay format),

0 to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

0 to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

0 to 5.0E+5 (SWR format).

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 −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase format),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−5.0E+5 to 5.0E+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 −500 (MHz) to 500 (MHz) (Frequency sweep), or

−50 (dBm) 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 −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−5.0E+5 to 5.0E+5 (SWR format).

suffix Refer to "Suffix".

LIMM *value* [*suffix*]

Sets the middle value of delta limits. (MIDDLE VALUE under SYSTEM; Query)

value −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith Chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−5.0E+5 to 5.0E+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 (Hz) to 500 (MHz) (Frequency sweep), or

−50 (dBm) 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 −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−5.0E+5 to 5.0E+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 one point. (MANUAL TRG ON POINT under MENU; 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 (Hz) to 500 (MHz) (Frequency sweep), or
−50 (dBm) 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 −5.0E+6 (ohm) to 5.0E+6 (ohm) (Smith chart and Inv. Smith chart formats), or

−5.0E+6 (deg) to 5.0E+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 −5000 (MHz) to 5000 (MHz) (Frequency sweep), or

−99999 (dBm) to 99999 (dBm) (Power sweep).

suffix Refer to "Suffix".

MARKFVAL *value* [*suffix*]

Sets the fixed marker position value offset. (FIXED MKR VALUE under MKR; Query)

value −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−5.0E+5 to 5.0E+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 to 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 for searching 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 AR, BR, AB, A, B, R, S11, S12, S21, S22, BDC, or BDCR.

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 (s) 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 1.0E+19 (Ω/s).

OFSZ *value* [ohm]

Specifies the characteristic impedance of the coaxial cable offset. (OFFSET Z0 under CAL)

value 0.1 (ohm) to 5.0E+6 (ohm).

OMII

Omits the correction for isolation of a 2-port calibration. (OMIT ISOLATION under CAL)

OPEP

Lists the key parameters for both channel 1 and 2 on the display. (OPERATING PARAMETERS under COPY)

OSE *value*

Enables the operational status register.

value 0 to 32767.

OSR?

Outputs the operational status register value.

OUT8IO *value*

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

value 0 to 32767.

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: ASCII No., "string").

OUTPFAIP?

Outputs the detailed information of the limit test at the failed point (Data format: stimulus, result, upper limit, lower limit).

OUTPFBUS?

Outputs the FBUS data. (Under SERVICE MENU under (SYSTEM))

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 maker 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)

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)

OUTPMWID?

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

OUTPRAW{1-4}?

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

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

OUTPTMEMP? *value*

Outputs the memory 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 (MHz) to 5000 (MHz) (Frequency sweep), or

−500 (dBm) 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 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−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 (deg) 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 DONLY, DGRAT, or ALL.

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 polar format. (POLAR under FORMAT; Query)

POLM *parameter*

Selects the polar marker. (Query)

parameter LOG, LIN, or RI.

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 (s) 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 (s) 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 (s) 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 (s) 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 (s) to 10 (s).

POWDAUTO

Sets the power DAC to auto. (Under SERVICE MENU under SYSTEM)

POWDMAN

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 4095.

POWE *value* [dBm]

Sets the source output level. (POWER under MENU; Query)

value −50 (dBm) 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 state. (PRESET)

PRINALL

Copies the measurement display to the printer according to plotting options. (PRINT under COPY)

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)

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 LEFU, LEFL, RIGU, RIGL, or FULP.

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 (dB) to 500 (dB) (Log mag format),

−5.0E+6 (deg) to 5.0E+6 (deg) (Phase or Expanded phase formats),

−0.5 (s) to 0.5 (s) (Delay format),

1.0E-11 (Units) to 500 (Units) (Smith chart, Inv. Smith chart, or Polar formats),

−5.0E+6 (Units) to 5.0E+6 (Units) (Lin man, Real, or Imaginary formats), or

−5.0E+6 to 5.0E+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 class for the calibration. (REV ISOL'N ISOL'N STD under CAL)

REVM

Selects the reverse match class for the calibration. (REV. MATCH THRU under CAL)

REVT

Selects the reverse transmission class for the 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)

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)

REVI

Selects the reverse isolation class for the calibration. (REV ISOL'N ISOL'N STD under CAL)

REVM

Selects the reverse match class for the calibration. (REV. MATCH THRU under CAL)

REVT

Selects the reverse transmission class for the 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)

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. (`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 arrays.

SAVCA{ON|OFF}

Sets the calibration coefficients arrays to be saved or not. (`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)

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.

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 division of the graticule. (SCALE/DIV under SCALE REF; Query)

value 0.001 (dB/div) to 500 (dB/div) (Log mag format),

0.01 (deg/div) to 500 (deg/div) (Phase format),

1.0E-11 (deg) to 10000 (deg) (Expanded phase format),

1.0E-14 (s/div) to 10 (s/div) (Delay format),

1.0E-11 (Units FS) to 10000 (Units FS) (Smith chart, Inv. Smith chart, and Polar format),

1.0E-11 (Units/div) to 10000 (Units/div) (Lin mag, Real, and Imaginary formats), or

1.0E-11 to 10000 (/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 the list sweep. (DELETE under MENU)

SDON

Completes editing a segment of the list sweep. (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 OFF, MAX, MIN, TARG, MEAN, LMAX, LMIN, or PPEAK.

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 −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary format), or

−5.0E+5 to 5.0E+5 (SWR format).

suffix Refer to "Suffix".

SEDI *value*

Determines a segment of the list sweep to be modified. (SEGMENT under MENU; Query)

value 1 to 31.

SELC *parameter*

Selects the conjugate matching circuit type. (Query)

parameter LSLP, LSCP, CSLP, CSCP, LPLS, LPCS, CPLS, or CPCS

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

Execute 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 (ohm) to 5.0E+6 (ohm).

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	LIN, LOG, RI, RX, or GB.

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 499.999995 MHz.

suffix Hz or MHz.

SPECFWDM *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the forward match (THRU) calibration. (FWD.MATCH under CAL)

A, *B*, *C*, *D*, 1 to 8.
E, *F*, *G*

SPECFWDT *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the forward transmission (THRU) calibration. (FWD.TRANS. under CAL)

A, *B*, *C*, *D*, 1 to 8.
E, *F*, *G*

SPECRESI *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the response and isolation calibration. (RESPONSE & ISOL'N under CAL)

A, *B*, *C*, *D*, 1 to 8.
E, *F*, *G*

SPECRESP *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the response calibration. (RESPONSE under CAL)

A, *B*, *C*, *D*, 1 to 8.
E, *F*, *G*

SPECREVM *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the reverse match (THRU) calibration. (REV.MATCH under CAL)

A, *B*, *C*, *D*, 1 to 8.
E, *F*, *G*

SPECREVT *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the reverse transmission (THRU) calibration. (REV.TRANS. under CAL)

A, *B*, *C*, *D*, 1 to 8.
E, *F*, *G*

SPECS11A *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the first class required for an S_{11} 1-port calibration. (SPECIFY: S11A under CAL)

A, *B*, *C*, *D*, *E*, *F*, *G* 1 to 8.

SPECS11B *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the second class required for an S_{11} 1-port calibration. (S11B under CAL)

A, *B*, *C*, *D*, *E*, *F*, *G* 1 to 8.

SPECS11C *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the third class required for an S_{11} 1-port calibration. (S11C under CAL)

A, *B*, *C*, *D*, *E*, *F*, *G* 1 to 8.

SPECS22A *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the first class required for an S_{22} 1-port calibration. (SPECIFY: S22A under CAL)

A, *B*, *C*, *D*, *E*, *F*, *G* 1 to 8.

SPECS22B *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the second class required for an S_{22} 1-port calibration. (S22B under CAL)

A, *B*, *C*, *D*, *E*, *F*, *G* 1 to 8.

SPECS22C *A*[,*B*[,*C*[,*D*[,*E*[,*F*[,*G*]]]]]]

Enters the standard numbers for the third class required for an S_{22} 1-port calibration. (S22C under CAL)

A, *B*, *C*, *D*, *E*, *F*, *G* 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 (Hz) to 500 (MHz) (Frequency sweep), or
−50 (dBm) 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 OPEN, SHOR, LOAD, DELA, or ARBI.

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)

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 (Hz) to 500 (MHz).

−50 (dBm) to +15 (dBm).

suffix Refer to "Suffix".

STPSIZE *value* [*suffix*]

Specifies the frequency step for the list sweep. (STEP SIZE under MENU; Query)

value 0 to 499.999995 (MHz).

suffix Hz or MHz.

SVCO

Saves the modified color set. (SAVE COLORS under DISPLAY)

SWET *value* [s]

Sets the sweep time manually. (SWEEP TIME under MENU; Query)

value 6.0E-4 (s) to 86400 (s).

SWETAUTO

Sets the sweep time automatically. (SWEEP TIME AUTO under MENU; Query)

SWPT *parameter*

Selects the sweep type. (Query)

parameter LINF, LOGF, LIST, or POWE

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 10000 (ohm).

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 chosen attribute. (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 the cutoff point on the trace within the current cutoff points. (SEARCH IN under MKR FCTN)

WIDSOUT

Searches 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 −5.0E+5 (dB) to 5.0E+5 (dB) (Log mag format),

−5.0E+5 (deg) to 5.0E+5 (deg) (Phase and Expanded phase formats),

−5.0E+5 (s) to 5.0E+5 (s) (Delay format),

−5.0E+5 (ohm) to 5.0E+5 (ohm) (Smith chart and Inv. Smith chart formats),

−5.0E+5 (Units) to 5.0E+5 (Units) (Polar, Lin mag, Real, and Imaginary formats), or

−5.0E+5 to 5.0E+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 control of the HP-IB 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 the 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 commands of the HP 8751A according to the 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 *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	

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 Z0

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 ZO

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	RESPONSE & ISOL'N
value,*value*, ...	
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

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

Recall Menu

RECD *string*	RECALL FILE

Service Function

TEST *value*
EXET
TESC
DESTON
DESTOFF
SELD
FIRR?
RECCON
RECCOFF
SOUCON
SOUCOFF
DCBUS *value*
FBUS *value*
FNVNORM

FNVOPEN
FNDAUTO
FNDMANU
FNDVALU *value*
STEONORM
STEOOPEN
STEODAUT
STEODMAN
STEODVAL *value*
REOPNORM
REOPOPEN
FIRLPNOR
FIRLPOPE
MIXLPNOR
MIXLPTES
POWDAUTO
POWDMANU
POWDVALU *value*
POWLANOR
POWLAOPE
ACTLNORM
ACTLHFRE
ACTLLFRE
FIRLANOR
FIRLAOPE
CHAIRANG
IFRCH?
IFRAUTO
IFRX1
IFRX8X1
IFRX1X8
IFRX64
OUTPFBUS?
OUTPTESS? *value*
EXTRLOCK?

Commands Which Don't Have Equivalent Softkey Labels

INP8IO
OUT8IO *value*
OUTPINP8IO
MARKBUCK *value*
PSOFT{ON|OFF}
KEY *value*
INPUDATA *value*
INPUFORM *value*
INPUUFORM *value*
INPURAW1 *value*
INPURAW2 *value*
INPURAW3 *value*
INPURAW4 *value*
INPUCALC{01-12} *value*
INPUCALK *value*
FORM2
FORM3
FORM4
FORM5
OUTPCALC{01-12}?
OUTPCALK?
OUTPSTIM?
OUTPDATA?
OUTPDATAP? *value*
OUTPERRO?
OUTPFORM?
OUTPFORMP? *value*
OUTPLIMF?
OUTPFAIP?
OUTPLIML?
OUTPLIMM?
OUTPMARK?
OUTPMEMO?
OUTPMEMOP? *value*
OUTPTMEM?
OUTPTMEMP? *value*
OUTPIFORM?
OUTPITMEM?
OUTPRFORM?
OUTPRTMEM?
OUTPIRFORM?
OUTPIRTMEM?
OUTPUFORM?
OUTPMSTA?
OUTPMWID?
OUTPRAW1?
OUTPRAW2?
OUTPRAW3?

OUTPRAW4?
OUTPTITL?
ESB?
ESNB *value*
OSR?
OSE *value*
TESS?
CLES
SAVC

IEEE 488.2 Common Commands

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

B

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.

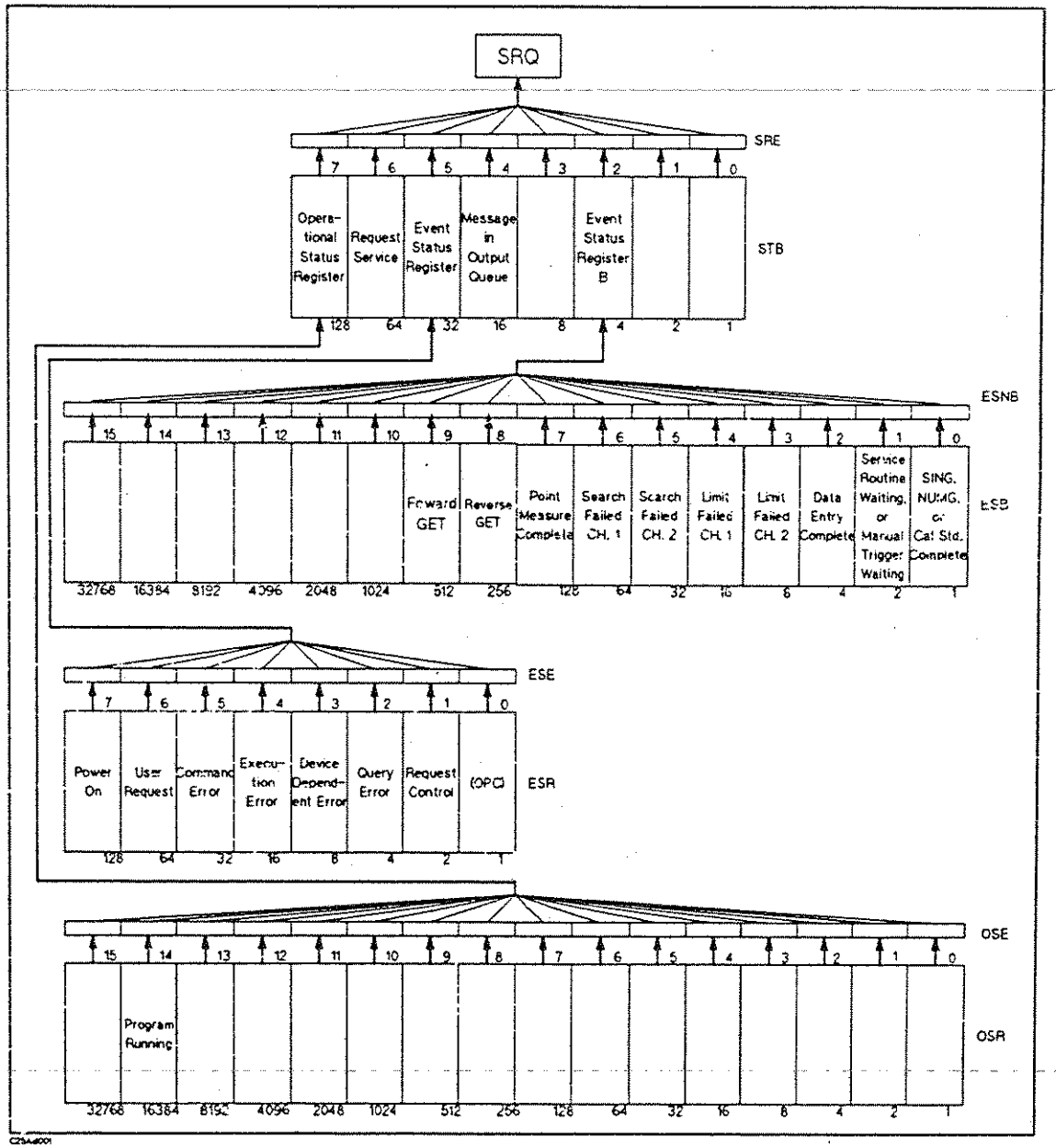


Figure B-1. Status Reporting Structure

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.
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.

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

Bit	Name	Description
0	Sweep or group 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.

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

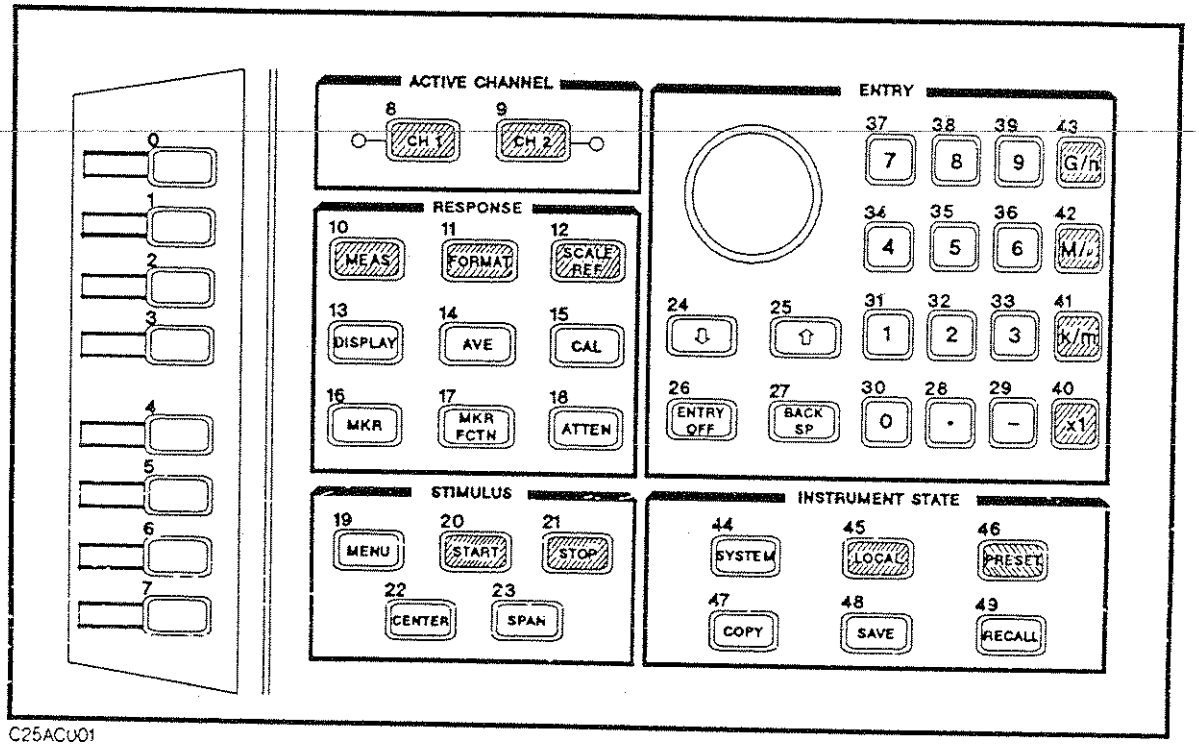
In the case of the manual trigger on point mode, HP 8751A accepts the next trigger while current measurement is in progress (up to the number of points). Use bit 1 and bit 7 correctly to synchronize measurement and external triggering. For example, 1) wait until bit 1 is set, 2) trigger, and 3) wait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

Key Codes

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



C25ACU01

Figure C-1. Key Codes

D

Calibration Types and Standard Classes, and Calibration Arrays

Table D-1 lists which standard classs 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.

Error Messages

This section lists the error messages that may be 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

159 +12V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

160 +15V(A) OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

157 +18V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

161 +22V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

162 +65V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

156 −12.6V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

155 −15V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

192 1st IF OFFSET OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

190 1st LOCAL AMP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

186 1st LOCAL MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

149 A1 CPU EXT BUS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

141 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. Power off and cool down the instrument for approximately 10 minutes. If this message is displayed again, contact your nearest Hewlett-Packard office.

165 Ach +5V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

173 Ach A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

166 Ach A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

170 Ach RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

176 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 on.

143 BACKUP RAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

167 Bch −5.2V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

174 Bch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

168 Bch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

171 Bch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

177 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 change of the active channel or 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*.

60 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.

−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).

136 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, 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.

97 DC OVERLOAD ON INPUT A

96 DC OVERLOAD ON INPUT B

98 DC OVERLOAD ON INPUT R

The DC voltage at one of the three receiver inputs approaches a DC damage level. Refer to "Instrument Specifications" in the *General Information* section for the DC damage level.

−255 DIRECTORY FULL

A legal program command could not be executed because the media directory was full.

142 DRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

144 EEPROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

182 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.

158 FAN POWER OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

153 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.

191 FN FREQ TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

181 FN PRETUNE-DAC/MONITOR FAILURE

Severe error. Contact your nearest Hewlett-Packard office.

61 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.

147 FPC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

−105 GET not allowed

GET is not allowed inside a program message.

150 GSP I/F TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

154 HPIB CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

146 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.

104 INVALID FILE NAME

HP-IB only. The file name for the RECALL, PURGE, or RE-SAVE function must have a extension, "_A", "_D", or "_S". 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.

152 KEY CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

66 LIST TABLE EMPTY OR INSUFFICIENT TABLE

The frequency list is empty. To implement list frequency mode, add segments to the list table. Refer to "Stimulus Function Block" in the *Reference Manual*.

80 LOCAL MAX NOT FOUND

The maximum peak whose sharpness is defined by the peak define function cannot be found.

81 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 should be 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; for example, there is no room on the disk.

−258 MEDIA PROTECTED

A legal program command could not be executed because the media was protected; for example, the write-protect tab on a disk was present.

−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 improper number of parameters received.

178 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.*

111 NO DATA TRACE DISPLAYED

The SCALE FOR [DATA] is selected while the data trace is not displayed.

76 NO DATA TRACE

The MARKER ON [DATA] is selected while the data trace is not displayed.

105 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.

82 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.*

79 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.*

78 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.*

112 NO MEMORY TRACE DISPLAYED

The SCALE FOR [MEMORY] is selected while the memory trace is not displayed.

77 NO MEMORY TRACE

The MARKER ON [MEMORY] is selected while the memory trace is not displayed.

117 NO VALID Ach ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

118 NO VALID Bch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

122 NO VALID DC FULL SCALE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

125 NO VALID FN PRETUNE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

123 NO VALID HF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

124 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*.

121 NO VALID RATIO A/B CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

119 NO VALID RATIO A/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

120 NO VALID RATIO B/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

116 NO VALID Rch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

126 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 >32k).

94 OVERLOAD ON INPUT A, POWER REDUCED

93 OVERLOAD ON INPUT B, POWER REDUCED

95 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 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.

180 POOR PRETUNE TRACKING

Severe error. Contact your nearest Hewlett-Packard office.

185 PGWER 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) is 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.

145 RATE TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

163 Rch +5V(D)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

172 Rch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

164 Rch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

169 Rch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

148 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 the power down.

103 RECALL ERROR: INSTR STATE PRESET

A serious error, for example corrupted data, is detected on recalling file, and this forced the analyzer to be preset.

184 RF AMP FLATNESS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

187 RF MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

193 RF OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

189 RF POWER LEVEL ALC(HF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

188 RF POWER LEVEL ALC(LF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

102 SAVE ERROR

A serious error, for example physically damaged disk surface, is detected on saving file.

175 SOURCE ATTENUATOR OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

183 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.

67 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 data transfer format is FORM 2, FORM 3 or FORM 5, or number 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).

179 VCO MISADJUSTED, RETRY THIS TEST

Severe error. Contact your nearest Hewlett-Packard office.

151 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. Power off and cool down the instrument 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 the power down.

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.

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 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 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 number 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*.

60 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.

61 FORMAT NOT VALID FOR MEASUREMENT

The conversion function except the 1/S mode is not valid for the Smith, Inverse Smith, and SWR formats.

66 LIST TABLE EMPTY OR INSUFFICIENT TABLE

The frequency list is empty. To implement list frequency mode, add segments to the list table. Refer to "Stimulus Function Block" in the *Reference Manual*.

67 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.

76 NO DATA TRACE

The MARKER ON [DATA] is selected while the data trace is not displayed.

77 NO MEMORY TRACE

The MARKER ON [MEMORY] is selected while the memory trace is not displayed.

78 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*.

79 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*.

80 LOCAL MAX NOT FOUND

The maximum peak whose sharpness is defined by the peak define function cannot be found.

81 LOCAL MIN NOT FOUND

The minimum peak whose sharpness is defined by the peak define function cannot be found.

82 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*.

93 OVERLOAD ON INPUT B, POWER REDUCED

94 OVERLOAD ON INPUT A, POWER REDUCED

95 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*.

96 DC OVERLOAD ON INPUT B

97 DC OVERLOAD ON INPUT A

98 DC OVERLOAD ON INPUT R

The DC voltage at one of the three receiver inputs approaches a DC damage level. Refer to "Instrument Specifications" in the *General Information* section for the DC damage level.

102 SAVE ERROR

A serious error, for example physically damaged disk surface, is detected on saving file.

103 RECALL ERROR: INSTR STATE PRESET

A serious error, for example corrupted data, is detected on recalling file, and this forced the analyzer to be preset.

104 INVALID FILE NAME

HP-IB only. The file name for the RECALL, PURGE, or RE-SAVE function must have a extension, "_A", "_D", or "_S". Refer to "Saving and Recalling Instrument States and Data" in the *Reference Manual* for more information.

105 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.

111 NO DATA TRACE DISPLAYED

The SCALE FOR [DATA] is selected while the data trace is not displayed.

112 NO MEMORY TRACE DISPLAYED

The SCALE FOR [MEMORY] is selected while the memory trace is not displayed.

116 NO VALID Rch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

117 NO VALID Ach ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

118 NO VALID Bch ABS MAG CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

119 NO VALID RATIO A/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

120 NO VALID RATIO B/R CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

121 NO VALID RATIO A/B CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

122 NO VALID DC FULL SCALE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

123 NO VALID HF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

124 NO VALID LF PWR LIN CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

125 NO VALID FN PRETUNE CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

126 NO VALID STEP OSC CORRECTION CONSTANTS

Severe error. Contact your nearest Hewlett-Packard office.

136 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*.

141 A1 ROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

142 DRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

143 BACKUP RAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

144 EEPROM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

145 RATE TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

146 INTR TIMER TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

147 FPC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

148 REALTIME CLOCK TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

149 A1 CPU EXT BUS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

150 GSP I/F TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

151 VRAM TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

152 KEY CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

153 FDC CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

154 HPIB CHIP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

155 −15V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

156 −12.6V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

157 +18V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

158 FAN POWER OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

159 +12V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

160 +15V(A) OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

161 +22V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

162 +65V OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

163 Rch +5V(D)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

164 Rch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

165 Ach +5V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

166 Ach A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

167 Bch −5.2V(A)/2 OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

168 Bch A/D REF VOLTAGE OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

169 Rch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

170 Ach RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

171 Bch RECEIVER FUNCTIONALLY POOR

Severe error. Contact your nearest Hewlett-Packard office.

172 Rch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

173 Ach A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

174 Bch A/D LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

175 SOURCE ATTENUATOR OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

176 Ach/Rch IF GAIN OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

177 Bch/Rch IF GAIN OUT OF SPEC

Severe error. Contact your nearest Hewlett-Packard office.

178 MIXER LINEARITY POOR

Severe error. Contact your nearest Hewlett-Packard office.

179 VCO MISADJUSTED, RETRY THIS TEST

Severe error. Contact your nearest Hewlett-Packard office.

180 POOR PRETUNE TRACKING

Severe error. Contact your nearest Hewlett-Packard office.

181 FN PRETUNE-DAC/MONITOR FAILURE

Severe error. Contact your nearest Hewlett-Packard office.

182 EEPROM WRITE FAILED

Severe error. Contact your nearest Hewlett-Packard office.

183 STEP OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

184 RF AMP FLATNESS TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

185 POWER LINEARITY TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

186 1st LOCAL MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

187 RF MIXER LOCAL PORT ALC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

188 RF POWER LEVEL ALC(LF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

189 RF POWER LEVEL ALC(HF) TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

190 1st LOCAL AMP TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

191 FN FREQ TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

192 1st IF OFFSET OSC TEST FAILED

Severe error. Contact your nearest Hewlett-Packard office.

193 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) is 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 write-protect tab on a disk was present.

−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; for example, there is no room on the disk.

−253 CORRUPT MEDIA

A legal program command could not be executed because of corrupt media; for example, 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 should be 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 data transfer format is FORM 2, FORM 3 or FORM 5, or number of data is grater 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 >32k).

−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 improper number of parameters 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.