Keysight Technologies 8753D Option 011 Network Analyzer

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KEYSIGHT TECHNOLOGIES

Quick Reference Guide

Notices

Manual Part Number

08753-90305

Edition

October 2014

Published by:

Keysight Technologies, Inc.
1400 Fountaingrove Pkwy.
Santa Rosa, CA 95403 USA

Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Quick Reference Guide

HP 8753D Option 011
Network Analyzer

HEWLETT PACKARD

HP Part No. 08753-90305 Supersedes September 1995
Printed in USA July 1997

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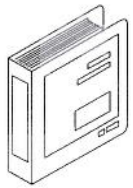
Quick Reference Guide Overview

- Chapter 1, "HP 8753D Option 011 Description," describes features and functions.
- Chapter 2, "Making Measurements," contains some step-by-step procedures for making measurements or using particular functions.
- Chapter 3, "Making Mixer Measurements," contains some step-by-step procedures for making calibrated and error-corrected mixer measurements.
- Chapter 4, "Printing, Plotting, and Saving Measurement Results," contains some instructions for saving to disk or the analyzer internal memory, and printing and plotting displayed measurements.
- Chapter 5, "Optimizing Measurement Results," describes some techniques and functions for achieving the best measurement results.
- Chapter 6, "Application and Operation Concepts," contains explanatory-style information about some applications and analyzer operation.
- Chapter 7, "Specifications and Characteristics," defines some of the performance capabilities of the analyzer.
- Chapter 8, "Menu Maps," shows softkey menu relationships.
- Chapter 9, "Key Definitions," describes all the front panel keys, softkeys, and their corresponding HP-IB commands.
- Chapter 10, "Error Messages," provides some information for interpreting error messages.
- Chapter 11, "Compatible Peripherals," lists measurement and system accessories, and other applicable equipment compatible with the HP 8753D Option 011. Procedures for configuring the peripherals, and an HP-IB programming overview are also included.
- Chapter 12, "Preset State and Memory Allocation," contains a discussion of memory allocation, memory storage, instrument state definitions, and preset conditions.

HP 8753D Option 011 Network Analyzer Documentation Set

The **Installation and Quick Start Guide** familiarizes you with the HP 8753D Option 011 network analyzer's front and rear panels, electrical and environmental operating requirements, as well as procedures for installing, configuring, and verifying the operation of the HP 8753D Option 011.



The **User's Guide** shows how to make measurements, explains commonly-used features, and tells you how to get the most performance from your analyzer.

The **Quick Reference Guide** provides a summary of selected user features.

The **Programmer's Guide** provides programming information including: an HP-IB command reference, an HP-IB programming reference, as well as programming examples.

The **System Verification and Test Guide** provides the system verification and performance tests and the Performance Test Record for your HP 8753D Option 011 network analyzer.

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HP 8753D Option 011 Description

- Combined digital signal processing and microprocessor controls to provide easy operation and measurement improvement.
- Measurement functions selection with front panel keys and softkey menus.
- Direct print or plot output of displayed measurement results, with a time stamp, to a compatible peripheral with a serial, parallel, or HP-IB interface.
- Instrument states storage in internal memory for the following times, or on disk indefinitely.

  Temperature at 70 °C ..... 208 days (0.57 year) characteristically
  Temperature at 40 °C .... 1036 days (2.8 years) characteristically
  Temperature at 25 °C ..... 10 years characteristically

- Automatic sweep time that selects the minimum sweep time for the given IF bandwidth, number of points, averaging mode, frequency range, and sweep type.
- Built-in service diagnostics are available to simplify troubleshooting procedures.
- Performance improvement and flexibility through trace math, data averaging, trace smoothing, electrical delay, and accuracy enhancement.
- Accuracy enhancement methods that range from normalizing data to complete one or two port vector error correction with up to 1601 measurement points, and TRL*/LRM*.
- External source mode capability that allows you to phase lock the analyzer's receiver to an external source.
- Tuned receiver mode.

- Complete reflection and transmission measurements in 50 ohm impedance environments or in 75 ohm environments with appropriate test sets.
- Receiver/source frequency offset mode.
- Power meter calibration.
- Test system automation with the addition of an HP 9000 series 200, 300, or 700 computer.
- External keyboard compatibility.
- LIF/DOS disk formats.
- Integration of a high capacity micro-floppy disk drive.
- Internal automation, using test sequencing.
- A general purpose input/output (GPIO) bus that can control eight output bits and read five input bits through test sequencing.

Front Panel Features

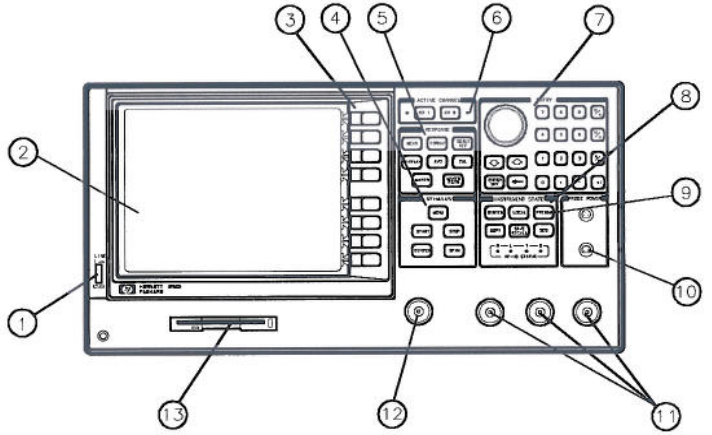

Figure 1-1. HP 8753D Option 011 Front Panel

1. **LINE switch.** This switch controls ac power to the analyzer. 1 is ON, 0 is OFF.

2. **Display.** This shows the measurement data traces, measurement annotation, and softkey labels. The display is divided into specific information areas, illustrated in Figure 1-2.

3. **Softkeys.** These keys provide access to menus that are shown on the display.

4. **STIMULUS function block.** The keys in this block allow you to control the analyzer source's frequency, power, and other stimulus functions.

5. **RESPONSE function block.** The keys in this block allow you to control the measurement and display functions of the active display channel.

6. **ACTIVE CHANNEL keys.** The analyzer has two independent display channels. These keys allow you to select the active

channel. Then any function you enter applies to this active channel.

7. **The ENTRY block.** This block includes the knob, the step ⇧ ⇩ keys, and the number pad. These allow you to enter numerical data and control the markers.

8. **INSTRUMENT STATE function block.** These keys allow you to control channel-independent system functions such as the following:

   - copying, save/recall, and HP-IB controller mode
   - limit testing
   - external source mode
   - tuned receiver mode
   - frequency offset mode
   - test sequence function
   - harmonic measurements (Option 002)
   - time domain transform (Option 010)

   HP-IB STATUS indicators are also included in this block.

9. **PRESET key.** This key returns the instrument to either a known factory preset state, or a user preset state that can be defined.

10. **PROBE POWER connector.** This connector (fused inside the instrument) supplies power to an active probe for in-circuit measurements of ac circuits.

11. **R, A, and B connectors.** These connectors allow you to apply input signals when creating your own test setup.

12. **RF OUT connector.** This connects the RF output signal from the analyzer's internal source to a test set or power splitter.

13. **Disk drive.** This 3.5 inch drive allows you to store and recall instrument states and measurement results for later analysis.

Analyzer Display

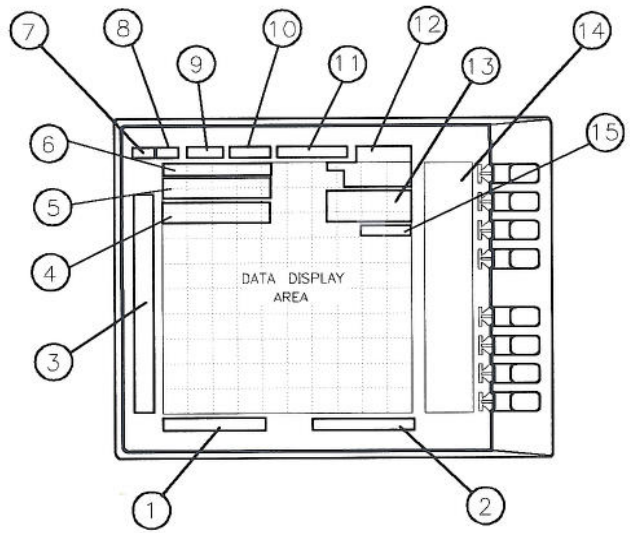

Figure 1-2. Analyzer Display (Single Channel, Cartesian Format)

The analyzer display shows various measurement information:

- The grid where the analyzer plots the measurement data.
- The currently selected measurement parameters.
- The measurement data traces.

1. **Stimulus start value.** This value could be any one of the following:

   - the start frequency of the source in frequency domain measurements
   - the start time in CW mode (0 seconds) or time domain measurements
   - the lower power value in power sweep

   When the stimulus is in center/span mode, the center stimulus value is shown in this space.

2. **Stimulus stop Value.** This value could be any one of the following:

   - The stop frequency of the source in frequency domain measurements.
   - The stop time in time domain measurements or CW sweeps.
   - The upper limit of a power sweep.

   When the stimulus is in center/span mode, the span is shown in this space. The stimulus values can be blanked.

3. **Status Notations.** This area shows the current status of various functions for the active channel.

   The following notations are used:

   Avg = Sweep-to-sweep averaging is on. The averaging count is shown immediately below.

   Cor = Error correction is on.

   C? = Stimulus parameters have changed from the error-corrected state, or interpolated error correction is on.

   C2 = Full two-port error-correction is active when either the power range for each port is different (uncoupled), or the TESTSET HOLD is activated. You can update all the parameters by pressing (MENU) MEASURE RESTART.

   Del = Electrical delay has been added or subtracted, or port extensions are active.

   ext = Waiting for an external trigger.

   Ofs = Frequency offset mode is on.

   Of? = Frequency offset mode error, the IF frequency is not within 10 MHz of expected frequency. LO inaccuracy is the most likely cause.

   Gat = Gating is on (time domain Option 010 only).

   H=2 = Harmonic mode is on, and the second harmonic is being measured (harmonics Option 002 only).

   H=3 = Harmonic mode is on, and the third harmonic is being measured (harmonics Option 002 only).

Hld = Hold sweep.

man = Waiting for manual trigger.

PC = Power meter calibration is on.

PC? = The analyzer's source could not be set to the desired level, following a power meter calibration.

P? = Source power is unleveled at start or stop of sweep.

P↓ = Source power has been automatically set to minimum, due to receiver overload.

Smo = Trace smoothing is on.

tsH = Indicates that the test set hold mode is engaged.

That is, a mode of operation is selected which would cause repeated switching of the step attenuator. This hold mode may be overridden by pressing (MENU).

↑ = Fast sweep indicator. This symbol is displayed in the status notation block when sweep time is less than 1.0 second. When sweep time is greater than 1.0 second, this symbol moves along the displayed trace.

* = Source parameters changed: measured data in doubt until a complete fresh sweep has been taken.

4. **Active Entry Area.** This displays the active function and its current value.

5. **Message Area.** This displays prompts or error messages.

6. **Title.** This is a descriptive alpha-numeric string title that you define and enter through an attached keyboard.

7. **Active Channel.** This is the number of the current active channel, selected with the (CH1) and (CH2) keys. If dual channel is on with an overlaid display, both channel 1 and channel 2 appear in this area.

8. **Measured Input(s).** This shows the S-parameter, input, or ratio of inputs currently measured, as selected using the (MEAS) key. Also indicated in this area is the current display memory status.

9. **Format.** This is the display format that you selected using the (FORMAT) key.

10. **Scale/Div.** This is the scale that you selected using the [SCALE/REF] key, in units appropriate to the current measurement.

11. **Reference Level.** This value is the reference line in Cartesian formats or the outer circle in polar formats, whichever you selected using the [SCALE/REF] key. The reference level is also indicated by a small triangle adjacent to the graticule, at the left for channel 1 and at the right for channel 2.

12. **Marker Values.** These are the values of the active marker, in units appropriate to the current measurement.

13. **Marker Stats, Bandwidth.** These are statistical marker values that the analyzer calculates when you access the menus with the [MARKER FCTN] key.

14. **Softkey Labels.** These menu labels redefine the function of the softkeys that are located to the right of the analyzer display.

15. **Pass Fail.** During limit testing, the result will be annunciated as PASS if the limits are not exceeded, and FAIL if any points exceed the limits.

Rear Panel Features and Connectors

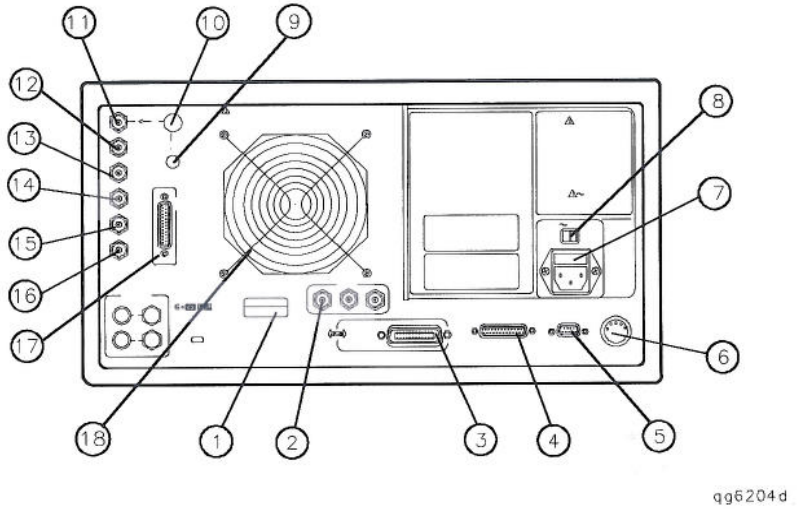

Figure 1-3. HP 8753 Rear Panel

1. **Serial number plate.**

2. **EXTERNAL MONITOR RED, GREEN, BLUE** video output connectors provide analog red, green, and blue video signals which you can use to drive an analog multi-sync external monitor. The monitor must be compatible with the analyzer's 25.5 kHz scan rate and video levels: 1 Vp-p, 0.7 V=white, 0 V=black, sync, sync on green.

3. **HP-IB connector.** This allows you to connect the analyzer to an external controller, compatible peripherals, and other instruments for an automated system.

4. **PARALLEL interface.** This connector allows the analyzer to output to a peripheral with a parallel input. Also included, is a general purpose input/output (GPIO) bus that can control eight output bits and read five input bits through test sequencing.

5. **RS-232 interface.** This connector allows the analyzer to output to a peripheral with an RS-232 (serial) input.

6. **KEYBOARD input (DIN).** This connector allows you to connect an external keyboard. This provides a more convenient means to enter a title for storage files, as well as a substitute for the analyzer's front panel keyboard. The keyboard must be connected to the analyzer before the power is switched on.

7. **Power cord receptacle, with fuse.**

8. **Line voltage selector switch.**

9. **10 MHZ REFERENCE ADJUST. (Option 1D5)**

10. **10 MHZ PRECISION REFERENCE OUTPUT. (Option 1D5)**

11. **EXTERNAL REFERENCE INPUT connector.** This allows for a frequency reference signal input that can phase lock the analyzer to an external frequency standard for increased frequency accuracy.

12. **AUXILIARY INPUT connector.** This allows for a dc or ac voltage input from an external signal source, such as a detector or function generator, which you can then measure, using the S-parameter menu.

13. **EXTERNAL AM connector.** This allows for an external analog signal input that is applied to the ALC circuitry of the analyzer's source. This input analog signal amplitude modulates the RF output signal.

14. **EXTERNAL TRIGGER connector.** This allows connection of an external negative-going TTL-compatible signal that will trigger a measurement sweep. The trigger can be set to external through softkey functions.

15. **TEST SEQUENCE.** Outputs a TTL signal that can be programmed in a test sequence to be high or low, or pulse (10 μseconds) high or low at the end of a sweep for robotic part handler interface.

16. **LIMIT TEST.** Outputs a TTL signal of the limit test results as follows:

    - Pass: TTL high
    - Fail: TTL low

17. **TEST SET INTERCONNECT.** This allows you to connect an HP 8753D Option 011 analyzer to an HP 85046A/B or 85047A S-parameter test set using the interconnect cable supplied with the test set. The S-parameter test set is then fully controlled by the analyzer.

18. **Fan.**

Changes between the HP 8753A/B/C/D

Table 1-1. Comparing the HP 8753 Family of Network Analyzers

Feature	8753A	8753B	8753C	8753D	8753D Opt 011
Fully integrated measurement system (built-in test set)	No	No	No	Yes	No
Test port power range (dBm)	†	†	†	+10 to −85	†
Auto/manual power range selecting	No	No	No	Yes	No
Port power coupling/uncoupling	No	No	No	Yes	No
Internal disk drive	No	No	No	Yes	Yes
Precision frequency reference (Option 1D5)	No	No	No	Yes	Yes
Frequency range - low end	300 kHz	300 kHz	300 kHz	30 kHz	30/300 kHz*
Ext. freq. range to 6 GHz (Option 006)	No	Yes	Yes	Yes	Yes
75Ω system impedance (Option 075)	†	†	†	Yes	†
TRL*/LRM* correction	No	No	No	Yes	Yes
Power meter calibration	No	Yes	Yes	Yes	Yes
Interpolated error correction	No	Yes	Yes	Yes	Yes
Max. Error corrected measurement points	801	1601	1601	1601	1601
Segmented error correction in freq. list mode	No	No	Yes	Yes	Yes
Color CRT	No	No	Yes	Yes	Yes
Test sequencing	No	Yes	Yes	Yes	Yes
Automatic sweep time	No	Yes	Yes	Yes	Yes
External source capability	No	Yes	Yes	Yes	Yes

Table 1-1. Comparing the HP 8753 Family of Network Analyzers (continued)

Feature	8753A	8753B	8753C	8753D	8753D Opt 011
Tuned receiver mode	No	Yes	Yes	Yes	Yes
Printer/plotter buffer	No	Yes	Yes	Yes	Yes
Harmonic measurements (Option 002)	No	Yes	Yes	Yes	Yes
Frequency offset mode (mixer measurements)	No	Yes	Yes	Yes	Yes
dc bias to test device	†	†	†	Yes	†
Interfaces: RS-232, parallel, and DIN keyboard	No	No	No	Yes	Yes
User-defined preset	No	No	No	Yes	Yes
Non-volatile memory	16 Kbytes	16 Kbytes	16 Kbytes	512 Kbytes	512 Kbytes
Dynamic Range					
30 kHz to 3 GHz	100 dB	100 dB	100 dB	110 dB‡	100 dB
3 GHz to 6 GHz	N/A	80 dB	80 dB	105 dB	110 dB
Real time clock	No	No	No	Yes	Yes

* 300 kHz to 3 GHz, without Option 006, or 30 kHz to 6 GHz, with Option 006.

† For this network analyzer, the feature is dependent on the test set being used.

‡ 90 dB from 30 kHz to 50 kHz, 100 dB from 300 kHz to 16 MHz.

2

Making Measurements

Table 2-1. Connector Care Quick Reference

Handling and Storage	
Do	**Do Not**
Keep connectors clean Extend sleeve or connector nut Use plastic end-caps during storage	Touch mating-plane surfaces Set connectors contact-end down
Visual Inspection	
Do	**Do Not**
Inspect all connectors carefully Look for metal particles, scratches, and dents	Use a damaged connector - ever
Connector Cleaning	
Do	**Do Not**
Try compressed air first Use isopropyl alcohol Clean connector threads	Use any abrasives Get liquid into plastic support beads
Gaging Connectors	
Do	**Do Not**
Clean and zero the gage before use Use the correct gage type Use correct end of calibration block Gage all connectors before first use	Use an out-of-spec connector
Making Connections	
Do	**Do Not**
Align connectors carefully Make preliminary connection lightly Turn only the connector nut Use a torque wrench for final connect	Apply bending force to connection Over tighten preliminary connection Twist or screw any connection Tighten past torque wrench "break" point

Basic Measurement Sequence and Example

Basic Measurement Sequence

There are five basic steps when you are making a measurement.

1. Connect the device under test and any required test equipment.
2. Choose the measurement parameters.
3. Perform and apply the appropriate error-correction.
4. Measure the device under test.
5. Output the measurement results.

Basic Measurement Example

This example procedure shows you how to measure the transmission response of a bandpass filter.

Step 1. Connect the device under test and any required test equipment.

1. Make the connections as shown in Figure 2-1.

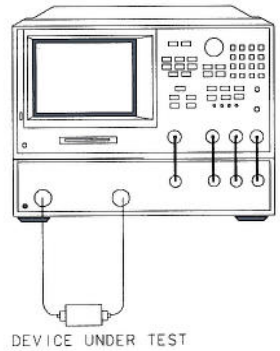

Figure 2-1. Basic Measurement Setup

Step 2. Choose the measurement parameters.

2. Press [PRESET].

   To set preset to "factory preset," press:

   PRESET: FACTORY [PRESET]

   Setting the Frequency Range

3. To set the center frequency to 134 MHz, press:

   [CENTER] [134] [M/μ]

4. To set the span to 30 MHz, press:

   [SPAN] [30] [M/μ]

5. To change the power level to −5 dBm, press:

   [MENU] POWER [-5] [x1]

   Setting the Measurement

6. To change the number of measurement data points to 101, press:

   [MENU] NUMBER OF POINTS [⇩]

7. To select the transmission measurement, press:

   [MEAS] Trans:FWD S21 (B/R)

8. To view the data trace, press:

   [SCALE REF] AUTOSCALE

Step 3. Perform and apply the appropriate error-correction.

9. Refer to the "Optimizing Your Measurement Results" chapter for procedures on correcting measurement errors.

10. To save the instrument state and error-correction in the analyzer internal memory, press:

    [SAVE RECALL] SELECT DISK INTERNAL MEMORY RETURN SAVE STATE

Step 4. Measure the device under test.

11. Replace any standard used for error-correction with the device under test.
12. To measure the insertion loss of the bandpass filter, press:

    (MKR) (134) (M/μ)

Step 5. Output the measurement results.

13. To create a hardcopy of the measurement results, press:

    (COPY) PRINT MONOCHROME (or PLOT)

Using the Display Functions

To View Both Measurement Channels

(DISPLAY) DUAL CHAN ON

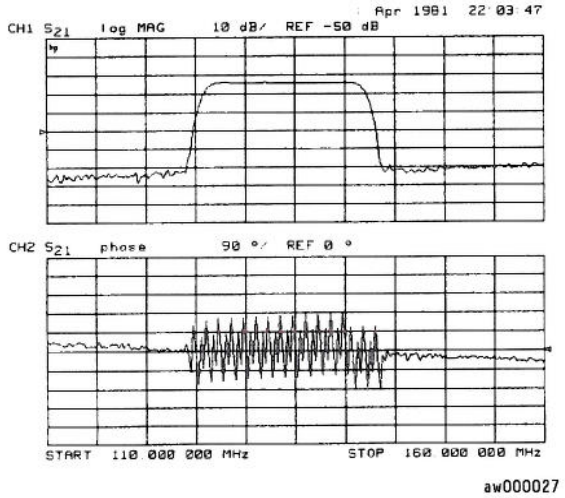

Figure 2-2. Example: Both Channels with Split Display ON

(DISPLAY) DUAL CHAN ON MORE SPLIT DISP OFF

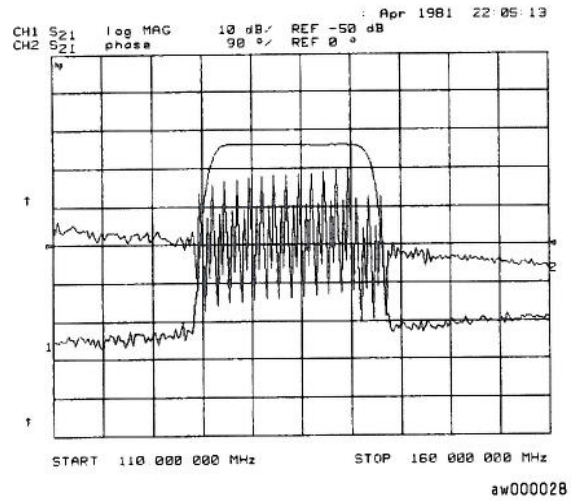

Figure 2-3. Example: Both Channels with Split Display OFF

To Save a Data Trace to the Display Memory

Press (DISPLAY) DATA→MEMORY

To View the Measurement Data and Memory Trace

1. To view a data trace that you have already stored to the active channel memory, press:

   (DISPLAY) MEMORY

2. To view both the memory trace and the current measurement data trace, press:

   (DISPLAY) DATA and MEMORY

To Divide Measurement Data by the Memory Trace

1. You must have already stored a data trace to the active channel memory.
2. Press (DISPLAY) DATA/MEM.

To Subtract the Memory Trace from the/Measurement Data Trace

1. You must have already stored a data trace to the active channel memory.
2. Press (DISPLAY) DATA-MEM.

   The analyzer performs a vector subtraction on the complex data.

To Ratio Measurements in Channel 1 and 2

1. Press (CHAN 1) (MENU) NUMBER OF POINTS.
2. Press (CHAN 2) (MENU) NUMBER OF POINTS.
3. Press (DISPLAY) DUAL CHAN ON MORE D2/D1 TO D2 ON.

To Title the Active Channel Display

1. Press (DISPLAY) MORE TITLE to access the title menu.
2. Press ERASE TITLE and enter the title you want for your measurement display.
   a. Turn the front panel knob to move the arrow pointer to the first character of the title.
   b. Press SELECT LETTER.
   c. Repeat the previous two steps to enter the rest of the characters in your title. You can enter a title that has a maximum of 50 characters.
   d. Press DONE to complete the title entry.

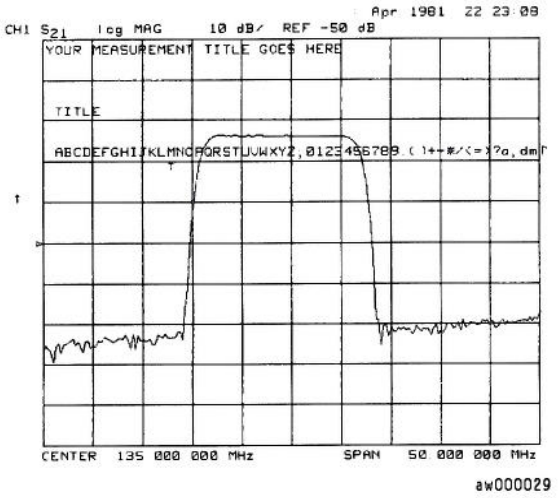

Figure 2-4. Example of a Display Title

To Activate Display Markers

(MARKER) MARKER 1

To Use Delta Markers

1. Press (MARKER) Δ MODE MENU Δ REF=1 to make marker 1 a reference marker.
2. To move marker 1 to any point that you want to reference:
   - turn the front panel knob

   OR

   - enter the frequency value (relative to the reference marker) on the numeric keypad
3. Press MARKER 2 and move marker 2 to any position that you want to measure in reference to marker 1.

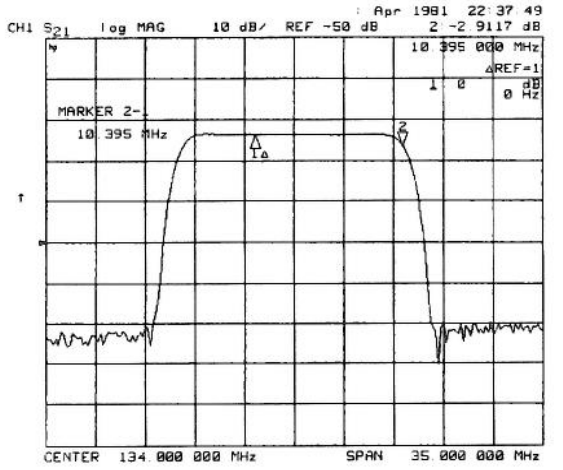

Figure 2-5. Marker 1 as the Reference Marker

To Search for a Specific Amplitude

Searching for the Maximum Amplitude

1. Press (MARKER FCTN) MKR SEARCH.
2. Press SEARCH: MAX.

Searching for the Minimum Amplitude

1. Press (MARKER FCTN) MKR SEARCH to access the marker search menu.
2. Press SEARCH: MIN to move the active marker to the minimum point on the measurement trace.

3

Making Mixer Measurements

Conversion Loss Using the Frequency Offset Mode

Conversion loss is the measure of efficiency of a mixer. It is the ratio of side-band IF power to RF signal power, and is usually expressed in dB. The mixer translates the incoming signal, (RF), to a replica, (IF), displaced in frequency by the local oscillator, (LO). Frequency translation is characterized by a loss in signal amplitude and the generation of additional sidebands. For a given translation, two equal output signals are expected, a lower sideband and an upper sideband.

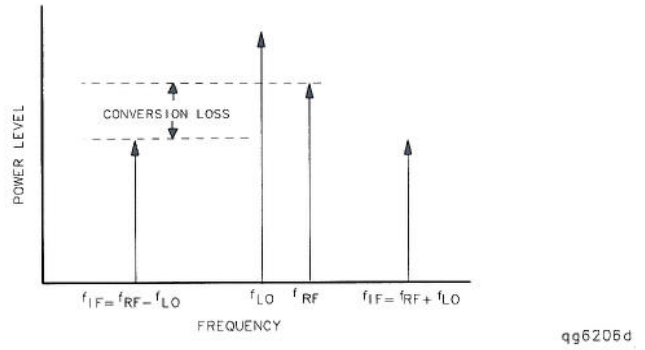

Figure 3-1.
An Example Spectrum of RF, LO, and IF Signals Present in a Conversion Loss Measurement

Swept RF/IF Mixer Measurements

The HP 8753 allows you to make a swept RF/IF conversion loss measurement. You can make this measurement by using the analyzer's frequency offset measurement mode.

Frequency Offset Mode

This mode of operation allows you to offset the analyzer's source by a fixed value, above or below the HP 8753 receiver. For example, this allows you to use a device input frequency range that is different from the receiver input frequency range.

The following procedure describes the swept IF conversion loss measurement of a broadband component mixer.

1. Set the LO source to the desired CW frequency and power level. For this example the LO source is set to the following values:

   CW frequency = 1000 MHz
   power = 13 dBm

2. Initialize the analyzer by pressing [PRESET] on the HP 8753.

3. From the front panel of the HP 8753, set the desired receiver frequency and source output power, by pressing:

   [SYSTEM] INSTRUMENT MODE FREQ OFFS MENU
   FREQ OFFS ON
   START [100] [M/μ]
   STOP [350] [M/μ]
   [MENU]
   POWER [0] [x1]

4. Connect the instruments as shown in Figure 3-2.

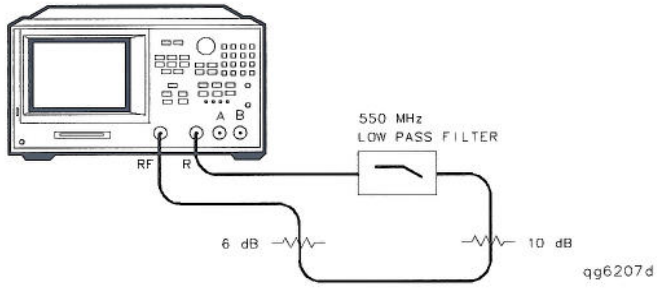

Figure 3-2. Connections for a Conversion Loss Measurement (1 of 2)

5. To view the absolute input power to the HP 8753 R channel, press:

   (MEAS)
   INPUT PORTS R

6. Calibrate the measurement setup:

   (CAL)
   CALIBRATE MENU
   RESPONSE
   THRU
   DONE:RESPONSE

7. Connect the instruments as shown in Figure 3-3.

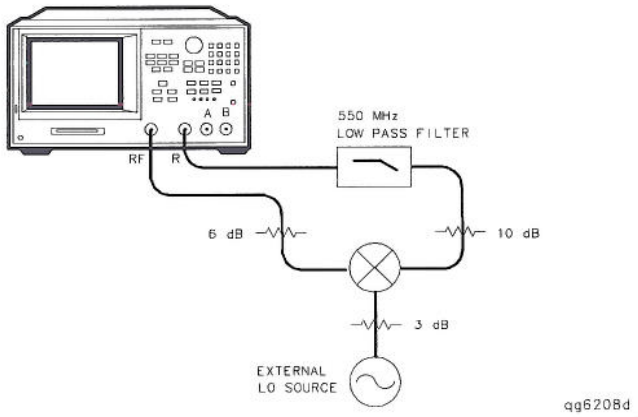

Figure 3-3. Connections for a Conversion Loss Measurement (2 of 2)

8. To set the frequency offset mode LO frequency from the analyzer, press:

   (SYSTEM)
   INSTRUMENT MODE
   FREQ OFFS MENU
   LO MENU
   FREQUENCY:CW (1000) (M/μ)
   POWER:FIXED (13) (x1)
   RETURN

9. To select the converter type and a high-side LO measurement configuration, press:

   DOWN CONVERTER
   RF<LO

   Notice, in this high-side LO, down conversion configuration, the HP 8753 source is actually sweeping backwards, as shown in Figure 3-4. The measurements set-up diagram is shown in Figure 3-5.

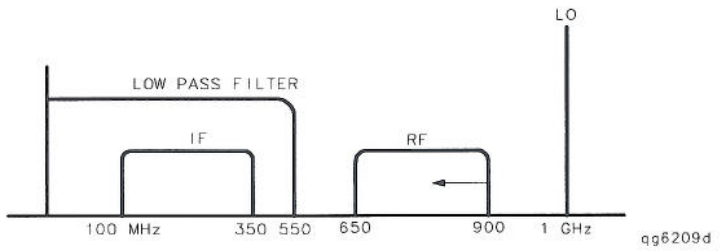

Figure 3-4. Diagram of Measurement Frequencies

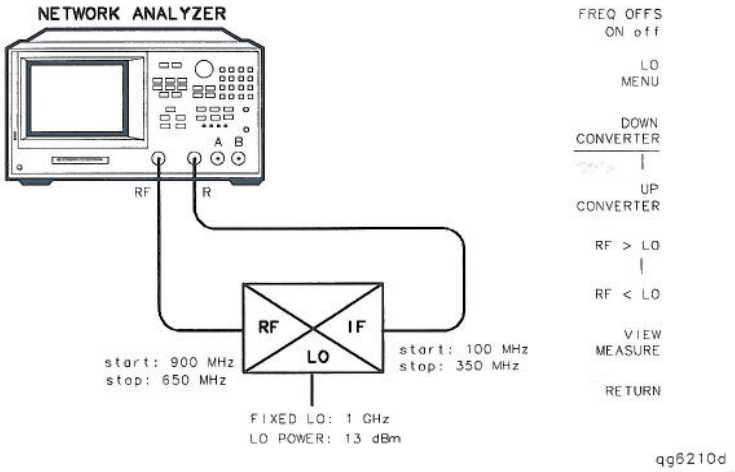

Figure 3-5. Measurement Setup from Display

10. View the conversion loss, shown in Figure 3-6.

    VIEW MEASURE

11. Scale the data for best vertical resolution.

    SCALE REF
    AUTOSCALE

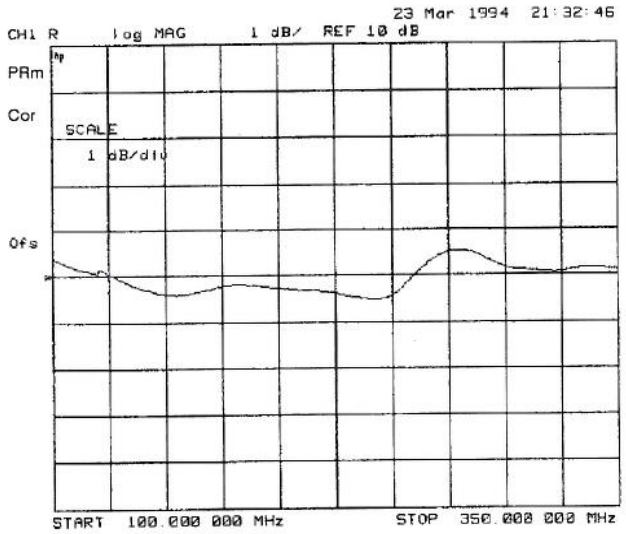

Figure 3-6. Conversion Loss Example Measurement

$$\text{Conversion loss} = \frac{\text{(output power)}}{\text{(input power)}}$$

In this measurement, you set the input power and measure the output power. Figure 3-6 shows the absolute loss through the mixer versus mixer output frequency.

For procedures on removing systematic frequency response errors, and on performing a source power meter calibration, see the "Optimizing Your Measurement Results" chapter in the *HP 8753D Option 011 Network Analyzer User's Guide*.

4

Printing, Plotting, and Saving Measurement Results

Printing or Plotting Your Measurement Results

You can print your measurement results to the following peripherals:

- printers with HP-IB interfaces
- printers with parallel interfaces
- printers with serial interfaces

You can plot your measurement results to the following peripherals:

- HPGL compatible printers with HP-IB interfaces
- HPGL compatible printers with parallel interfaces
- plotters with HP-IB interfaces
- plotters with parallel interfaces
- plotters with serial interfaces

Configuring a Print Function

1. Connect the printer to the interface port.

Printer Interface	Recommended Cables
Parallel	HP 92284A
HP-IB	HP 10833A, 10833B, 10833D
Serial	HP 24542G

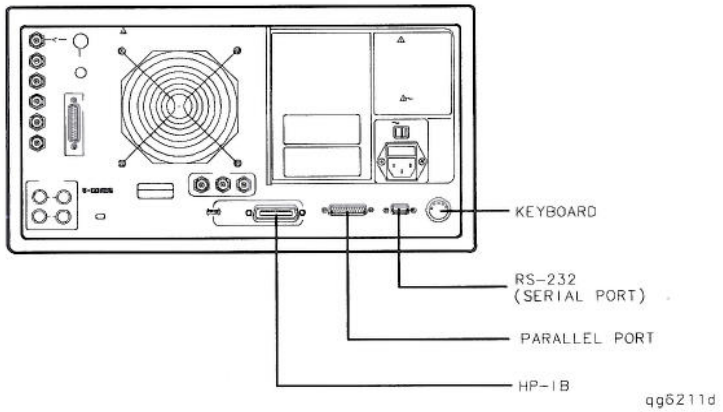

Figure 4-1. Printer Connections to the Analyzer

2. Press (LOCAL) `SET ADDRESSES` `PRINTER PORT` `PRNTR TYPE` until the correct printer choice appears:
   - `ThinkJet` (QuietJet)
   - `DeskJet`
   - `LaserJet`
   - `PaintJet`
   - `Epson-P2` (printers that conform to the ESC/P2 printer control language)
   - `DJ 540` (converts 100 dpi raster information to 300 dpi raster

3. Select one of the following printer interfaces:
   - Choose PRNTR PORT HPIB if your printer has an HP-IB interface, and then configure the print function as follows:
     a. Enter the HP-IB address of the printer, followed by (x1).
     b. Press (LOCAL) and SYSTEM CONTROLLER (if there is no external controller connected to the HP-IB bus) or PASS CONTROL (if there is an external controller connected to the HP-IB bus).
   - Choose PARALLEL if your printer has a parallel (centronics) interface, and then configure the print function as follows:
     - Press (LOCAL) and then select the parallel port interface function, by pressing PARALLEL until the correct function appears:
       - If you choose PARALLEL [COPY], the parallel port is dedicated for normal copy device use (printers or plotters).
       - If you choose PARALLEL [GPIO], the parallel port is dedicated for general purpose I/O, and cannot be used for printing or plotting.
   - Choose SERIAL if your printer has a serial (RS-232) interface, and then configure the print function as follows:
     a. Press PRINTER BAUD RATE and enter the printer's baud rate, followed by (x1).
     b. Select the transmission control method that matches the printer setup, by pressing XMIT CNTRL until the correct method appears:
        - If you choose Xon/Xoff, the handshake method allows the printer to take control.
        - If you choose DTR/DSR, a handshake method takes place in the hardware.

Defining a Print Function

Note The print definition is set to default values whenever the power is cycled. However, you can save the print definition by saving the instrument state.

1. Press (COPY) DEFINE PRINT.
2. Press PRINT: MONOCHROME or PRINT: COLOR
   - Choose PRINT: MONOCHROME if you are using a black and white printer.
   - Choose PRINT: COLOR if you are using a color printer.
3. Press AUTO-FEED until the correct choice (ON or OFF) is high-lighted:
   - Choose AUTO-FEED ON if you want to print one measurement per page.
   - Choose AUTO-FEED OFF if you want to print multiple measurements per page.

If You are Using a Color Printer

1. Press PRINT COLORS.
2. If you want to modify the print colors, select the print element and then choose an available color.

Note You can set all the print elements to black to create a hardcopy in black and white.

Since the media color is white or clear, you could set a print element to white if you do not want that element to appear on your hardcopy.

To Reset the Printing Parameters to Default Values

1. Press (COPY) DEFINE PRINT DEFAULT PRNT SETUP.

Table 4-1. Default Values for Printing Parameters

Printing Parameter	Default
Printer Mode	Monochrome
Auto Feed	ON
Printer Colors	
Channel 1 Data	Magenta
Channel 1 Memory	Green
Channel 2 Data	Blue
Channel 2 Memory	Red
Graticule	Cyan
Warning	Black
Text	Black

Printing One Measurement Per Page

Press (COPY) PRINT: MONOCHROME.

- If you defined the AUTOFEED OFF, press PRINTER FORM FEED after the message COPY OUTPUT COMPLETED appears.

Printing Multiple Measurements Per Page

1. Press (COPY) DEFINE PRINT AUTOFEED until the softkey label appears as AUTOFEED OFF.
2. Press RETURN PRINT: MONOCHROME.
3. Make the next measurement.
4. Press (COPY) PRINT: MONOCHROME.

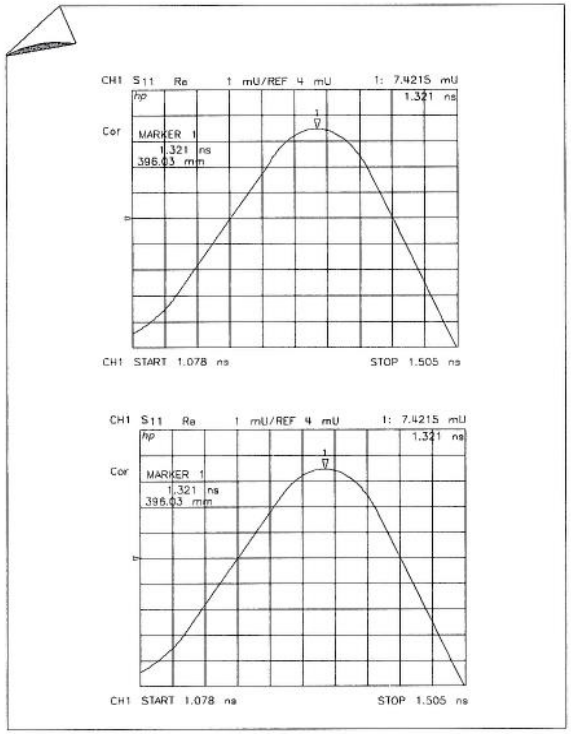

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Figure 4-2. Printing Two Measurements

Table 4-2. Typical Printing Time

Mode	Printing Times (minutes:seconds)				
	PainJet	DeskJet 540	DeskJet 560	DeskJet 1200[1]	LaserJet 4L
Monochrome					
Portrait	0:42	0:23	0:34	0:44	0:33
Landscape	NA	NA	NA	NA	0:47
Color					
Portrait	1:59	0:48	1:46	1:41	NA
Landscape	NA	NA	NA	1:29	NA

1 The DeskJet 1200 was used in fast mode. The print times are slightly faster for dual trace and Smith charts. The times are also not affected by Hold/Continuous sweep mode, and little affected by the number of points.

Table 4-3. Example Printing Conditions and Times

Printer Model	Mode	Speed Setting	# of Points	Print Time min.:sec.
DeskJet 1200C	monochrome	fast	1601	14:6
DeskJet 1200C	monochrome	fast	201	28:6
DeskJet 1200C	color	fast	1601	28:7
DeskJet 560C	monochrome	standard	201	31:7
DeskJet 560C	monochrome	standard	1601	32:6
DeskJet 1200C	monochrome	standard	1601	43:1
DeskJet 1200C	color	standard	1601	1:26
DeskJet 560C	color	standard	201	1:37
DeskJet 560C	color	standard	1601	1:39

Configuring a Plot Function

1. Connect the peripheral to the interface port.

Peripheral Interface	Recommended Cables
Parallel	HP 92284A
HP-IB	HP 10833A, 10833B, 10833D
Serial	HP 24542G

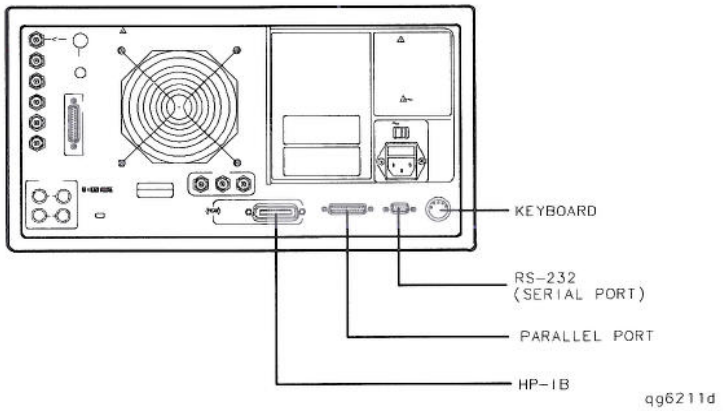

Figure 4-3. Peripheral Connections to the Analyzer

If You are Plotting to an HPGL/2 Compatible Printer

2. Press (LOCAL) SET ADDRESSES PRINTER PORT and then press PRNTR TYPE until the correct printer choice appears:
   - ThinkJet (QuietJet)
   - DeskJet (only DeskJet 1200C)
   - LaserJet (only LaserJet III and IV)
   - PaintJet
   - Epson-P2 (printers that conform to the ESC/P2 printer control language)
3. Configure the analyzer:
   - Choose PRNTR PORT HPIB if your printer has an HP-IB interface, and then configure the print function as follows:
     a. Enter the HP-IB address of the printer (default is 01), followed by (x1).
     b. Press (LOCAL) and SYSTEM CONTROLLER (if there is no external controller connected to the HP-IB bus) or PASS CONTROL (if there is an external controller connected to the HP-IB bus).
   - Choose PARALLEL if your printer has a parallel (centronics) interface, and then configure the print function as follows:
     - Press (LOCAL) and then select the parallel port interface function, by pressing PARALLEL until the correct function appears:
       - If you choose PARALLEL [COPY, the parallel port is dedicated for normal copy device use (printers or plotters).
       - If you choose PARALLEL [GPIO], the parallel port is dedicated for general puprpose I/O, and cannot be used for printing or plotting.
   - Choose SERIAL if your printer has a serial (RS-232) interface, and then configure the print function as follows:
     a. Press PRINTER BAUD RATE and enter the printer's baud rate, followed by (x1).

b. Select the transmission control method that matches the printer setup, by pressing XMIT CNTRL (transmit control – handshaking protocol) until the correct method appears:

- If you choose Xon/Xoff, the handshake method allows the printer to control the data exchange.
- If you choose DTR/DSR, a handshake method takes place in the hardware rather than the firmware or software.

4. Press (LOCAL) SET ADDRESSES PLOTTER PORT and then PLTR TYPE until PLTR TYPE [HPGL PRT] appears.

If You are Plotting to a Pen Plotter

1. Press (LOCAL) SET ADDRESSES PLOTTER PORT and then PLTR TYPE until PLTR TYPE [PLOTTER] appears.
2. Configure the analyzer for one of the following plotter interfaces:

- Choose PLTR PORT HPIB if your plotter has an HP-IB interface, and then configure the plot function as follows:

a. Enter the HP-IB address of the plotter (default is 05), followed by (x1).

b. Press (LOCAL) and SYSTEM CONTROLLER (if there is no external controller connected to the HP-IB bus) or PASS CONTROL (if there is an external controller connected to the HP-IB bus).

- Choose PARALLEL if your plotter has a parallel (centronics) interface, and then configure the plot function as follows:

- Press (LOCAL) and then select the parallel port interface function, by pressing PARALLEL until the correct function appears:
  - If you choose PARALLEL [COPY], the parallel port is dedicated for normal copy device use (printers or plotters).
  - If you choose PARALLEL [GPIO], the parallel port is dedicated for general puprpose I/O, and cannot be used for printing or plotting.

- Choose SERIAL if your plotter has a serial (RS-232) interface, and then configure the plot function as follows:

a. Press PRINTER BAUD RATE and enter the plotter's baud rate, followed by (x1).

b. Select the transmission control method that matches the plotter setup, by pressing XMIT CNTRL (transmit control – handshaking protocol) until the correct method appears:

   - If you choose Xon/Xoff, the handshake method allows the plotter to control the data exchange.
   - If you choose DTR/DSR, a handshake method takes place in the hardware rather than the firmware or software.

If You are Plotting to a Disk Drive

1. Press (LOCAL) SET ADDRESSES PLOTTER PORT DISK.
2. Press (SAVE/RECALL) SELECT DISK and select the disk drive that you will plot to:
   - Choose INTERNAL DISK if you will plot to the analyzer internal disk drive.
   - Choose EXTERNAL DISK if you will plot to a disk drive that is external to the analyzer. Then configure the disk drive as follows:
     a. Press CONFIGURE EXT DISK ADDRESS: DISK and enter the HP-IB address to the disk drive (default is 00) followed by (x1).
     b. Press (LOCAL) DISK UNIT NUMBER and enter the drive where your disk is located, followed by (x1).
     c. If your storage disk is partitioned, press VOLUME NUMBER and enter the volume number where you want to store the instrument state file.

Defining a Plot Function

Note The plot definition is set to default values whenever the power is cycled. However, you can save the plot definition by saving the instrument state.

1. Press (COPY) DEFINE PLOT.
2. Choose which of the following measurement display elements that you want to appear on your plot:
   - Choose PLOT DATA ON for measurement data trace.
   - Choose PLOT MEM ON for displayed memory trace.
   - Choose PLOT GRAT ON for graticule and the reference line.
   - Choose PLOT TEXT ON for displayed text.
   - Choose PLOT MKR ON for displayed markers and marker values.

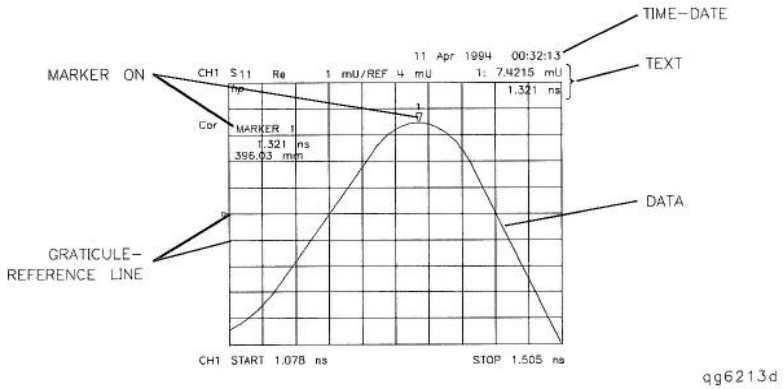

Figure 4-4. Plot Components Available through Definition

3. Press AUTO-FEED

   - Choose AUTO-FEED ON if you want a "page eject" sent to the plotter or HPGL compatible printer after each time you press PLOT.
   - Choose AUTO-FEED OFF if you want multiple plots on the same sheet of paper.

4. Press MORE and select the plot element where you want to change the pen number. The pen number selects the color if you are plotting to an HPGL/2 compatible color printer.

   Press (x1) after each modification.

Table 4-4.
Default Pen Numbers and Corresponding Colors

Pen Number	Color
0	white
1	cyan
2	magenta
3	blue
4	yellow
5	green
6	red
7	black

Table 4-5. Default Pen Numbers for Plot Elements

Corresponding Key	Plot Element	Channel 1 Pen Numbers	Channel 2 Pen Numbers
PEN NUM DATA	Measurement Data Trace	2	3
PEN NUM MEMORY	Displayed Memory Trace	5	6
PEN NUM GRATICULE	Graticule and Reference Line	1	1
PEN NUM TEXT	Displayed Text	7	7
PEN NUM MARKER	Displayed Markers and Values	7	7

Note

You can set all the pen numbers to black for a plot in black and white.

You must define the pen numbers for each measurement channel (channel 1 and channel 2).

5. Press MORE and select each plot element line type that you want to modify.
   - Select LINE TYPE DATA to modify the line type for the data trace. Then enter the new line type, followed by (x1).
   - Select LINE TYPE MEMORY to modify the line type for the memory trace. Then enter the new line type, followed by (x1).

Table 4-6. Default Line Types for Plot Elements

Plot Elements	Channel 1 Line Type Numbers	Channel 2 Line Type Numbers
Data Trace	7	7
Memory Trace	7	7

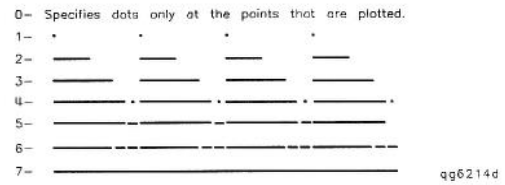

Figure 4-5. Line Types Available

6. Press SCALE PLOT.

   - Choose SCALE PLOT [FULL] if you want the normal scale selection for plotting. This includes space for all display annotations. The display fits within the defined boundaries of P1 and P2 on the plotter.
   - Choose SCALE PLOT [GRAT] if you want the outer limits of the graticule to correspond to the defined P1 and P2 scaling point on the plotter. (Intended for plotting on preprinted rectangular or polar forms.

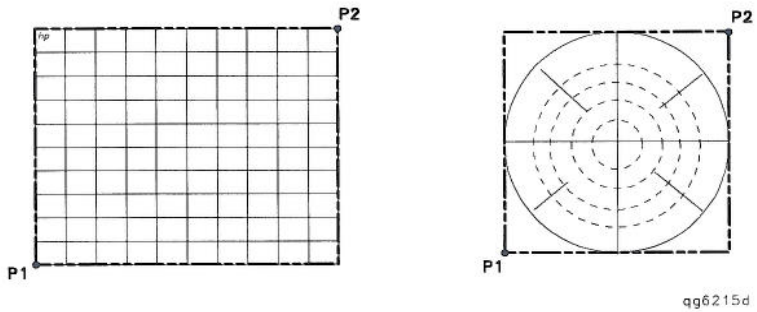

Figure 4-6.
Locations of P1 and P2 in SCALE PLOT [GRAT] Mode

7. Press PLOT SPEED.
   - Choose PLOT SPEED [FAST] for normal plotting.
   - Choose PLOT SPEED [SLOW] for plotting directly on transparencies.

To Reset the Plotting Parameters to Default Values

Press (COPY) DEFINE PLOT MORE MORE DEFAULT PLOT SETUP.

Table 4-7. Plotting Parameter Default Values

Plotting Parameter	Default
Select Quadrant	Full page
Auto Feed	ON
Define Plot	All plot elements on
Plot Scale	Full
Plot Speed	Fast
Line Type	7 (solid line)
Pen Numbers: Channel 1	
Data	2
Memory	5
Graticule	1
Text	7
Marker	7
Pen Numbers: Channel 2	
Data	3
Memory	6
Graticule	1
Text	7
Marker	7

Plotting One Measurement Per Page Using a Pen Plotter

1. Define the plot.
2. Press (COPY) PLOT.
   - If you defined the AUTOFEED OFF, press PLOTTER FORM FEED after the message COPY OUTPUT COMPLETED appears.

Plotting Multiple Measurements Per Page Using a Pen Plotter

1. Define the plot, as explained in "Defining a Plot Function" located earlier in this chapter.
2. Press (COPY) SEL QUAD.
3. Choose the quadrant where you want your displayed measurement to appear on the hardcopy.

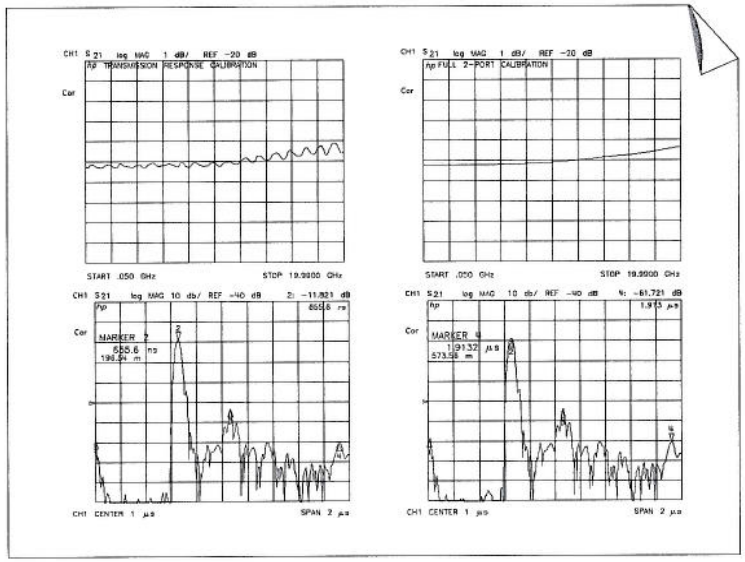

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Figure 4-7. Plot Quadrants

4. Press PLOT.
5. Make the next measurement.
6. Press (COPY) SEL QUAD and choose another quadrant.
7. Repeat the previous three steps until you have captured the results of up to four measurements.

If You are Plotting to an HPGL Compatible Printer

Press (COPY) PLOTTER FORM FEED to print the data the printer has received.

Plotting a Measurement to Disk

The plot files that you generate from the analyzer, contain the HPGL representation of the measurement display. The files will not contain any setup or formfeed commands.

1. Define the plot, as explained in "Defining the Plot Function" located earlier in this chapter.
2. Press (COPY) PLOT.

Aborting a Print or Plot Process

1. Press the (LOCAL) key.
2. If your peripheral is not responding, press (LOCAL) again.

Saving an Instrument State

Places Where You Can Save

- analyzer internal memory
- floppy disk using the analyzer's internal disk drive
- floppy disk using an external disk drive
- IBM compatible personal computer using HP-IB mnemonics

What You Can Save to the Analyzer's Internal Memory

You can save instrument states in the analyzer internal memory, along with the following list of analyzer settings. The default filenames are REG(1-31).

- error-corrections on channels 1 and 2
- displayed memory trace
- print/plot definitions
- measurement setup
  - frequency range
  - number of points
  - sweep time
  - output power
  - sweep type
  - measurement parameter

Note When the ac line power is switched off, the internal non-volatile memory is retained by a battery. The data retention time with the 3 V, 1.2 Ah battery is as follows:

Temperature at 70 °C .....208 days (0.57 year) characteristically
Temperature at 40 °C .....1036 days (2.8 years) characteristically
Temperature at 25 °C ..10 years characteristically

What You Can Save to a Floppy Disk

You can save an instrument state and/or measurement results to a disk. The default filenames are FILEn, where n gets incremented by one each time a file with a default name is added to the directory. The default filenames for data-only files are DATAnDn (DATAn.Dn for DOS), where the first n is incremented by one each time a file with a default name is added to the directory. The second n is the channel where the measurement was made. When you save a file to disk, you can choose to save some or all of the following:

- all settings listed above for internal memory
- active error-correction for the active channel only
- displayed measurement data trace
- displayed user graphics
- data only
- HPGL plots

To Save an Instrument State

1. Press (SAVE/RECALL) SELECT DISK and select one of the storage devices:
   - INTERNAL MEMORY
   - INTERNAL DISK
   - EXTERNAL DISK
2. Press RETURN SAVE STATE.

   The analyzer saves the state in the next available register, if you are saving to internal memory, or saves the state to disk.

Note

If you have saved enough files that you have used all the default names (FILE00 - FILE31 for disk files, or REG1 - REG31 for memory files), you must do one of the following in order to save more states:

- use another disk
- rename an existing file to make a default name available
- re-save a file/register
- delete an existing file/register

To Save Measurement Results

Note Files that contain data-only, and the various save options available under the DEFINE DISK SAVE key, are only valid for disk saves.

The analyzer stores data in arrays along the processing flow of numerical data, from IF detection to display. These arrays are points in the flow path where data is accessible, usually via HP-IB. You can choose from three different arrays which vary in modification flexibility when they are recalled.

Define Save	Modification Flexibility During Recall
Raw Data Array	Most
Data Array	Medium
Format Array	Least

You can also save data-only. This is saved to disk with default filenames DATA00D1 to DATA31D1, for channel 1, or DATA00D2 to DATA31D2, for channel 2. However, these files are not instrument states and cannot be recalled.

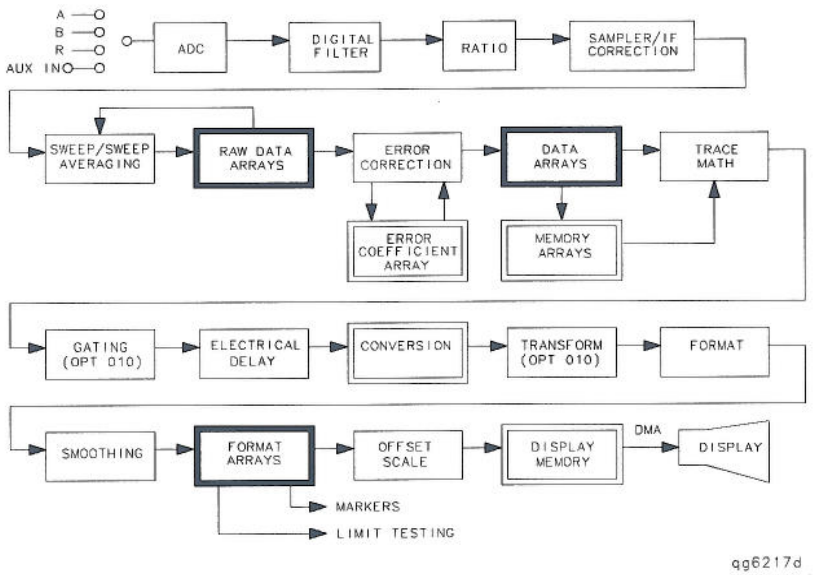


Figure 4-8. Data Processing Flow Diagram

1. Press (SAVE/RECALL) SELECT DISK.
2. Choose one of the following disk drives:
   - INTERNAL DISK
   - EXTERNAL DISK
3. Press RETURN DEFINE DISK-SAVE.
4. Define the save by selecting one of the following choices:
   - DATA ARRAY ON
   - RAW ARRAY ON
   - FORMAT ARRAY ON
   - GRAPHICS ON
   - DATA ONLY ON

5. Choose the type of format you want:
   - Choose SAVE USING BINARY for all applications except CITIfile, S2P, or CAE applications.
   - Choose SAVE USING ASCII for CITIfile, S2P, and CAE applications or when you want to import the information into a spread sheet format.
6. Press RETURN SAVE STATE.

Recalling an Instrument State

1. Press (SAVE/RECALL) SELECT DISK.
2. Choose from the following storage devices:
   - INTERNAL MEMORY
   - INTERNAL DISK
   - EXTERNAL DISK
3. Press the (↓) (↑) keys or the front panel knob to high-light the name of the file that you want to recall.
4. Press RETURN RECALL STATE.

5

Optimizing Measurement Results

Increasing Measurement Accuracy

Connector Repeatability

- inspect the connectors
- clean the connectors
- gauge the connectors
- use correct connection techniques. See Table 2-1 in Chapter 2.

Interconnecting Cables

- inspect for lossy cables
- inspect for damaged cable connectors
- practice good connector care techniques
- minimize cable position changes between error-correction and measurements
- inspect for cables which dramatically change magnitude or phase response when flexing (This may indicate an intermittent problem.)

Temperature Drift

During a measurement calibration, the temperature of the calibration devices must be stable and within 25 ±5 °C.

- use a temperature-controlled environment
- ensure the temperature stability of the calibration devices
- avoid handling the calibration devices unnecessarily during calibration
- ensure the ambient temperature is ±1 °C of measurement error-correction temperature

Frequency Drift

- override the internal crystal with a high-stability external source, frequency standard, or use the internal frequency standard.

Performance Verification

- perform a measurement verification at least once per year

Reference Plane and Port Extensions

Use the port extension feature to compensate for the phase shift of an extended measurement reference plane, due to such additions as cables, adapters, and fixtures, after completing an error-correction procedure (or when there is no active correction).

Press (CAL) MORE PORT EXTENSIONS EXTENSIONS ON. Then enter the delay to the reference plane.

Table 5-1.
Differences between PORT EXTENSIONS and ELECTRICAL DELAY

	PORT EXTENSIONS	ELECTRICAL DELAY
Main Effect	The end of a cable becomes the test port plane for all S-parameter measurements.	Compensates for the electrical length of a cable. Set the cable's electrical length x 1 for transmission. Set the cable's electrical length x 2 for reflection
Measurement Affected	All S-parameters.	Only the currently selected S-parameter.
Electrical Compensation	Intelligently compensates for 1 times or 2 times the cable's electrical delay, depending on which S-parameter is computed.	Only compensates as necessary for the currently selected S-parameter.

Measurement Error-Correction

Conditions Where Error-Correction is Suggested

- Connecting a particular test set or other signal separation hardware.
- Adapting to a different connector type or impedance.
- Connecting a cable between the test device and an analyzer test port.
- Connecting any attenuator or other such device on the input or output of the test device.

Table 5-2.
Purpose and Use of Different Error-Correction Procedures

Correction Procedure	Corresponding Measurement	Errors Corrected	Standard Devices
Response	Transmission or reflection measurement when the highest accuracy is not required.	Frequency response	Thru for transmission, open or short for reflection
Response & isolation	Transmission of high insertion loss devices or reflection of high return loss devices. Not as accurate as 1-port or 2-port correction.	Frequency response plus isolation in transmission or directivity in reflection	Same as response plus isolation standard (load)
S_{11} 1-port	Reflection of any one-port device or well terminated two-port device.	Directivity, source match, frequency response.	Short and open and load
S_{22} 1-port	Reflection of any one-port device or well terminated two-port device.	Directivity, source match, frequency response.	Short and open and load
Full 2-port[1]	Transmission or reflection of highest accuracy for two-port devices.	Directivity, source match, load match, isolation, frequency response, forward and reverse.	Short and open and load and thru (2 loads for isolation)
TRL*/LRM*	Transmission or reflection when highest accuracy is not required. Suitable for calibrating in noncoaxial environments.	Directivity, isolation, frequency response (forward and reverse)	Thru, reflect, line, or line, reflect, match, or thru, reflect, match

1 One-path, 2-port error-correction is a variation of full 2-port that requires reversing the test device between forward and reverse measurements. Since the standard instrument does this with its internal switch if the system includes an S-parameter test set, full 2-port is recommended because it is more convenient and more accurate. If the instrument should be used in a configuration where the incident/reflected signal separation device is external to it, then one-path 2-port would be useful. 1-path, 2-port is most often used with T/R test sets such as the HP 85044A/B and primarily for system verification tests only.

Calibration Standards

- use the correct standard model
- inspect the calibration standards
- clean the calibration standards
- gauge the calibration standards
- use correct connection techniques

Power Meter Measurement Calibration

Table 5-3.
Typical Power Meter Calibration Sweep Speed and Accuracy

Power Desired at Test Port (dBm)	Number of Readings	Sweep Time (seconds)[1]	Typical Accuracy (dB)[2]
+5	1	33	±0.7
	2	64	±0.2
	3	95	±0.1
−15	1	48	±0.7
	2	92	±0.2
	3	123	±0.1
−30	1	194	±0.7
	2	360	±0.2
	3	447	±0.1

1 Sweep speed applies to every sweep in continuous correction mode, and to the first sweep in sample-and-sweep mode. Subsequent sweeps in sample-and-sweep mode will be much faster.

2 The accuracy values were derived by combining the accuracy of the power meter and linearity of the analyzer's internal source, as well as the mismatch uncertainty associated with the power sensor.

Note

Loss of Power Calibration Data

The power correction data will be lost if any of the following circumstances exists.

- If you switch off the analyzer ac power and you haven't saved the correction in an internal register.
- If you change the sweep type (linear, log, list, CW, power) when the power meter correction is activated.
- If you change the frequency when the sweep type is in log or list mode.
- If you press (PRESET) and you haven't saved the correction in an internal register.

Increasing Sweep Speed

To Decrease the Frequency Span

1. To see the band switch points (steps), press:

   (SYSTEM) SERVICE MENU ANALOG BUS ON
   (MEAS) ANALOG IN (29) (x1)
   (FORMAT) MORE REAL
   (SCALE REF) AUTO SCALE

2. Enter the measurement frequency span of the device under test. Autoscale and modify the frequency span as appropriate.

To Set the Auto Sweep Time Mode

- Press (MENU) SWEEP TIME (0) (x1).

To Widen the System Bandwidth

1. Press (AVG) IF BW.
2. Set the IF bandwidth to change the sweep time.

IF BW	Cycle Time (Seconds)[1]	
	Full Span	Narrow Sweep
3700 Hz	.446	.150
3000 Hz	.447	.176
1000 Hz	.511	.312
300 Hz	.944	.980
100 Hz	2.25	2.070
30 Hz	7.57	7.240
10 Hz	21.98	21.600

1 The listed sweep times correspond to an HP 8753D analyzer being set to a preset state for the full span, and 2 GHz to 3 GHz for the narrow span.

To Reduce the Averaging Factor

1. Press (AVG) AVG FACTOR.
2. Enter an averaging factor that is less than the value displayed on the analyzer screen and press (x1).

To Reduce the Number of Measurement Points

1. Press (MENU) NUMBER OF POINTS.
2. Enter a number of points that is less than the value displayed on the analyzer screen and press (x1).

Number of Points	Sweep Time (Seconds)[1]			
	Full Span		Narrow Span	
	LIN	LIST/LOG	LIN	LIST
51	0.35	0.57	0.09	0.25
101	0.39	0.77	0.12	0.43
201	0.43	1.11	0.17	0.78
401	0.49	1.73	0.27	1.33
801	0.69	3.04	0.47	2.64
1601	1.09	5.7	0.87	5.3

1 The listed sweep times correspond to the analyzer being set to a preset state, with a 6 GHz span. A 3 GHz span would have faster sweep times.

To Set the Sweep Type

1. Press (MENU) SWEEP TYPE MENU.
2. Select the sweep type:
   - Select LIN FREQ for the fastest sweep for a given number of fixed points.
   - Select LIST FREQ for the fastest sweep when specific frequency points are of interest.
   - Select LOG FREQ for the fastest sweep when the frequency points of interest are in the lower part of the frequency span selected.

To View a Single Measurement Channel

1. Press (DISPLAY) DUAL CHAN OFF.
2. Press (CHAN 1) and (CHAN 2) to alternately view the two measurement channels.

To Activate Chop Sweep Mode

- Press (CAL) MORE CHOP A and B.

Increasing Dynamic Range

To Increase the Test Port Input Power

Press (MENU) POWER and enter the new source power level, followed by (x1).

Caution **TEST PORT INPUT DAMAGE LEVEL: +20 dBm; +30 dBm with HP 85046A; +30 dBm with HP 85047A.**

To Reduce the Receiver Noise Floor

Change System Bandwidth

Each tenfold reduction in IF (receiver) bandwidth lowers the noise floor by 10 dB.

1. Press (AVG) IF BW.
2. Enter the bandwidth value that you want, followed by (x1).

Change Measurement Averaging

1. Press (AVG) AVERAGING FACTOR.
2. Enter a value followed by (x1).
3. Press AVERAGING ON.

Reducing Trace Noise

Activate Averaging

1. Press (AVG) AVERAGING FACTOR.
2. Enter a value followed by (x1).
3. Press AVERAGING ON.

Change System Bandwidth

1. Press (AVG) IF BW.
2. Enter the IF bandwidth value that you want, followed by (x1).

Reducing Receiver Crosstalk

To set the alternate sweep, press (CAL) MORE ALTERNATE A AND B.

6

Application and Operation Concepts

How the HP 8753D Option 011 Works

Network analyzers measure the reflection and transmission characteristics of devices and networks. A network analyzer test system consists of the following:

- source
- signal-separation devices
- receiver
- display

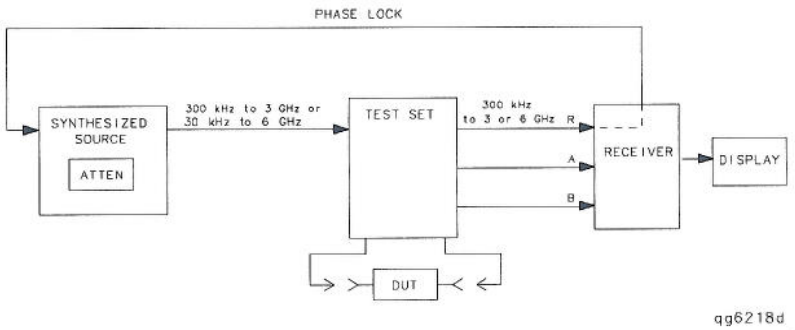


Figure 6-1. Simplified Block Diagram of the Network Analyzer System

Channel power coupling

`CHAN POWER [COUPLED]` toggles between coupled and uncoupled channel power.

Channel stimulus coupling

`COUPLED CH on OFF` toggles the channel coupling of stimulus values.

In the stimulus coupled mode, the following parameters are coupled:

- frequency
- number of points
- source power
- number of groups
- IF bandwidth
- sweep time
- trigger type
- gating parameters
- sweep type
- power meter calibration

Sweep time

Minimum sweep time

The minimum sweep time is dependent on the following measurement parameters:

- the number of points selected
- IF bandwidth
- sweep-to-sweep averaging in dual channel display mode
- error-correction
- type of sweep

In addition to the parameters listed above, the actual **cycle time** of the analyzer is also dependent on the following measurement parameters:

- smoothing
- limit test
- trace math
- marker statistics
- time domain (Option 010 Only)

Use Table 6-1 to determine the minimum cycle time for the listed measurement parameters. The values listed represent the minimum time required for a CW time measurement with averaging off.

Table 6-1. Minimum Cycle Time (in seconds)

Number of Points	IF Bandwidth						
	3700 Hz	3000 Hz	1000 Hz	300 Hz	100 Hz	30 Hz	10 Hz
11	0.0041 s	0.0055 s	0.012 s	0.037 s	0.108 s	0.359 s	1.14 s
51	0.0191 s	0.0255 s	0.060 s	0.172 s	0.504 s	1.660 s	5.30 s
101	0.0379 s	0.0505 s	0.120 s	0.341 s	0.998 s	3.300 s	10.5 s
201	0.0754 s	0.1005 s	0.239 s	0.679 s	1.990 s	6.600 s	20.9 s
401	0.1504 s	0.2005 s	0.476 s	1.355 s	3.960 s	13.10 s	41.7 s
801	0.3004 s	0.4005 s	0.951 s	2.701 s	7.910 s	26.10 s	83.3 s
1601	0.6004 s	0.8005 s	1.901 s	5.411 s	15.80 s	52.20 s	166.5 s

Alternate and Chop Sweep Modes

ALTERNATE A and B measures only one input per frequency sweep, in order to reduce spurious signals. Thus, this mode optimizes the dynamic range for all four S-parameter measurements. This is the default measurement mode.

CHOP A and B measures both inputs A and B during each sweep.

To access the ALTERNATE A and B and CHOP A and B softkeys press (CAL) MORE. Figure 6-2 shows the *alternate* sweep mode

(bold trace) overlaying the *chop* sweep mode in a band-pass filter measurement. Note the difference in the noise levels between the two modes.

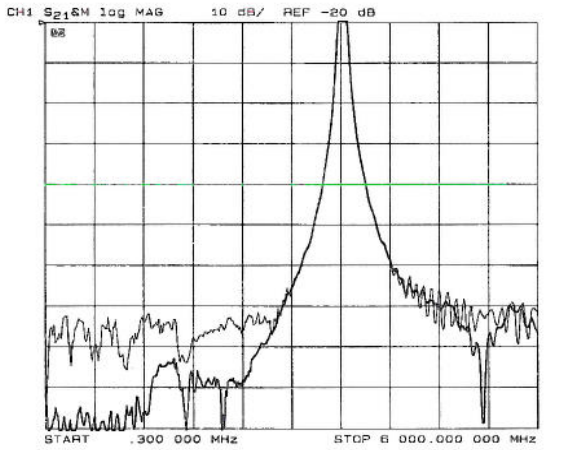


Figure 6-2. Alternate and Chop Sweeps Overlaid

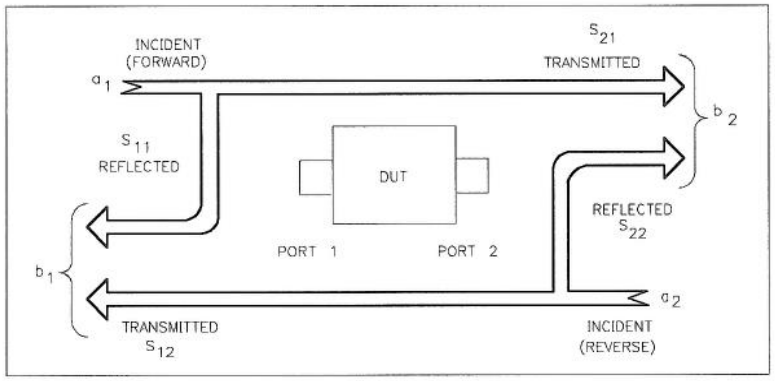
Understanding S-parameters

S-parameters (scattering parameters) are a convention used to characterize the way a device modifies signal flow.

S-parameters are always a ratio of two complex (magnitude and phase) quantities. S-parameter notation identifies these quantities using the numbering convention:

S out in

where the first number (out) refers to the test-device port where the signal is emerging and the second number (in) is the test-device port where the signal is incident. For example, the S-parameter S_{21} identifies the measurement as the complex ratio of the signal emerging at the test device's port 2 to the signal incident at the test device's port 1.



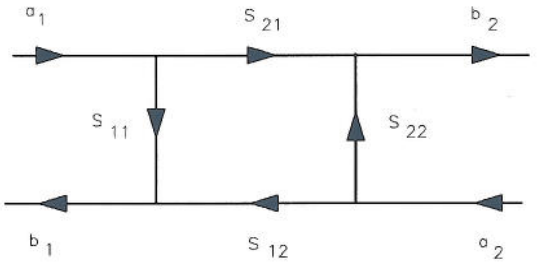


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Figure 6-3. S-Parameters of a Two-Port Device

S-parameters are exactly equivalent to the more common description terms below, requiring only that the measurements be taken with all test device ports properly terminated.

S-Parameter	Definition	Test Set Description	Direction
S_{11}	$\frac{b_1}{a_1}$ $a_2 = 0$	Input reflection coefficient	FWD
S_{21}	$\frac{b_2}{a_1}$ $a_2 = 0$	Forward gain	FWD
S_{12}	$\frac{b_1}{a_2}$ $a_1 = 0$	Reverse gain	REV
S_{22}	$\frac{b_2}{a_2}$ $a_1 = 0$	Output reflection coefficient	REV

What is Measurement Calibration (Error Correction)?

Measurement calibration is an accuracy enhancement procedure that effectively reduces the system errors that cause uncertainty in measuring a test device. It measures known standard devices, and uses the results of these measurements to characterize the system.

What is accuracy enhancement?

A perfect measurement system would have infinite dynamic range, isolation, and directivity characteristics, no impedance mismatches in any part of the test setup, and flat frequency response. In any high frequency measurement there are measurement errors associated with the system that contribute uncertainty to the results. Parts of the measurement setup such as interconnecting cables and signal-separation devices (as well as the analyzer itself) all introduce variations in magnitude and phase that can mask the actual performance of the test device. Vector accuracy enhancement, also known as measurement calibration or error correction, provides the means to simulate a nearly perfect measurement system.

What causes measurement errors?

Network analysis measurement errors can be separated into systematic, random, and drift errors.

Correctable systematic errors are the repeatable errors that the system can measure. These are errors due to mismatch and leakage in the test setup, isolation between the reference and test signal paths, and system frequency response.

The system cannot measure and correct for the non-repeatable random and drift errors. These errors affect both reflection and transmission measurements. Random errors are measurement variations due to noise and connector repeatability. Drift errors include frequency drift, temperature drift, and other physical changes in the test setup between calibration and measurement.

The resulting measurement is the vector sum of the test device response plus all error terms.

Understanding and Using Time Domain (Option 010)

With Option 010, the analyzer can transform frequency domain data to the time domain or time domain data to the frequency domain.

The analyzer has three frequency-to-time transform modes:

Time domain bandpass mode is designed to measure band-limited devices and is the easiest mode to use. This mode simulates the time domain response to an impulse input.

Time domain low pass step mode simulates the time domain response to a step input. As in a traditional TDR measurement, the distance to the discontinuity in the test device, and the type of discontinuity (resistive, capacitive, inductive) can be determined.

Time domain low pass impulse mode simulates the time domain response to an impulse input (like the bandpass mode). Both low pass modes yield better time domain resolution for a given frequency span than does the bandpass mode. In addition, using the low pass modes you can determine the type of discontinuity.

Time domain low pass

This mode is used to simulate a traditional time domain reflectometry (TDR) measurement. It provides information to determine the type of discontinuity (resistive, capacitive, or inductive) that is present.

Table 6-2.
Minimum Frequency Ranges for Time Domain Low Pass

Number of Points	Minimum Frequency Range
3	30 kHz to 0.09 MHz
11	30 kHz to 0.33 MHz
26	30 kHz to 0.78 MHz
51	30 kHz to 1.53 MHz
101	30 kHz to 3.03 MHz
201	30 kHz to 6.03 MHz
401	30 kHz to 12.03 MHz
801	30 kHz to 24.03 MHz
1601	30 kHz to 48.03 MHz

Time domain concepts

Windowing

- **Finite impulse width (or rise time).** Finite impulse width limits the ability to resolve between two closely spaced responses. The effects of the finite impulse width cannot be improved without increasing the frequency span of the measurement (see Table 6-3).

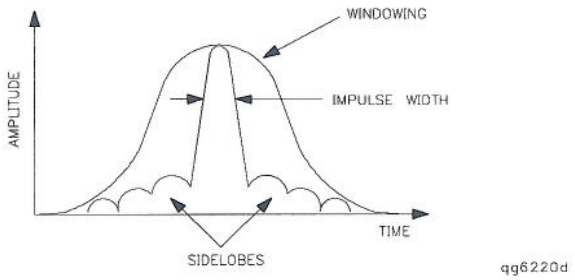

Figure 6-4. Impulse Width, Sidelobes, and Windowing

- **Sidelobes.** The impulse sidelobes limit the dynamic range of the time domain measurement by hiding low-level responses within the sidelobes of higher level responses. The effects of sidelobes can be improved by windowing (see Table 6-3).

To select a window, press (SYSTEM) TRANSFORM MENU WINDOW. A menu is presented that allows the selection of three window types (see Table 6-3).

Table 6-3.
Impulse Width, Sidelobe Level, and Windowing Values

Window Type	Impulse Sidelobe Level	Low Pass Impulse Width (50%)	Step Sidelobe Level	Step Rise Time (10 - 90%)
Minimum	−13 dB	0.60/Freq Span	−21 dB	0.45/Freq Span
Normal	−44 dB	0.98/Freq Span	−60 dB	0.99/Freq Span
Maximum	−75 dB	1.39/Freq Span	−70 dB	1.48/Freq Span

NOTE: The bandpass mode simulates an impulse stimulus. Bandpass impulse width is twice that of low pass impulse width. The bandpass impulse sidelobe levels are the same as low pass impulse sidelobe levels.

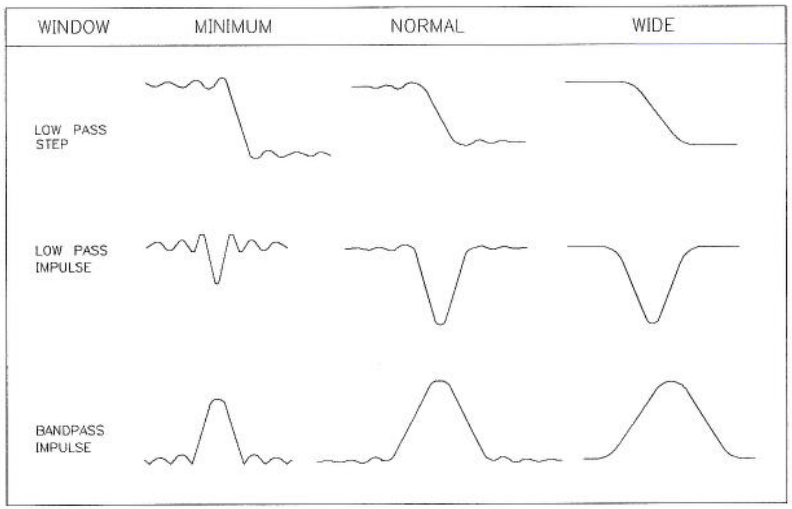

Figure 6-5.
The Effects of Windowing on the Time Domain Responses of a Short Circuit

Range

In the time domain, range is defined as the length in time that a measurement can be made without encountering a repetition of the response, called aliasing. A time domain response repeats at regular intervals because the frequency domain data is taken at discrete frequency points, rather than continuously over the frequency band.

Measurement range is equal to $1/\Delta F$ (ΔF is the spacing between frequency data points).

Measurement range = (number of points − 1)/frequency span (Hz).

```
Example:
Measurement=201 points
              1 MHz to 2.001 GHz
      Range=1/ΔF or (number of points−1)/frequency span
           =1/(10x106) or (201−1)/(2x109)
           =100x10¯ seconds
Electrical length=range x the speed of light (3x10 m/s)
                 =(100x10¯9 s) x (3x10 m/s)
                 =30 meters
```

Gating

Gating provides the flexibility of selectively removing time domain responses. The remaining time domain responses can then be transformed back to the frequency domain.

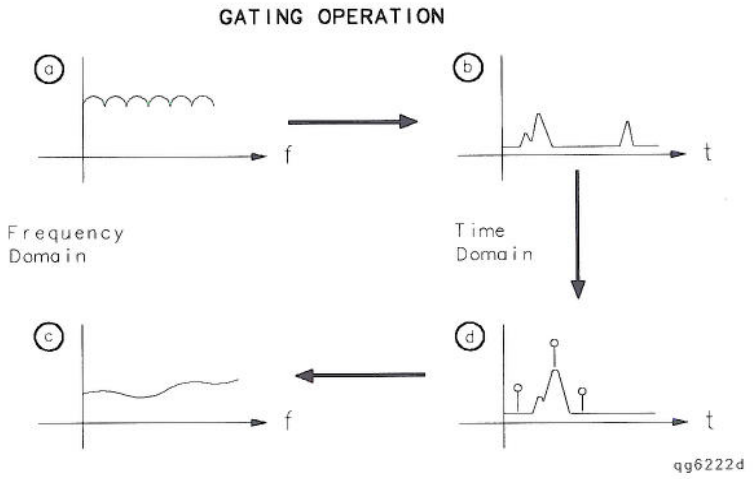

Figure 6-6. Sequence of Steps in Gating Operation

Selecting gate shape. The four gate shapes available are listed in Table 6-4. Each gate has a different passband flatness, cutoff rate, and sidelobe levels.

Table 6-4. Gate Characteristics

Gate Shape	Passband Ripple	Sidelobe Levels	Cutoff Ti me	Minimum Gate Span
Gate Span Minimum	±0.10 dB	−48 dB	1.4/Freq Span	2.8/Freq Span
Normal	±0.01 dB	−68 dB	2.8/Freq Span	5.6/Freq Span
Wide	±0.01 dB	−57 dB	4.4/Freq Span	8.8/Freq Span
Maximum	±0.01 dB	−70 dB	12.7/Freq Span	25.4/Freq Span

Amplifier Testing

Amplifier parameters

The HP 8753D Option 011 allows you to measure the transmission and reflection characteristics of many amplifiers and active devices.

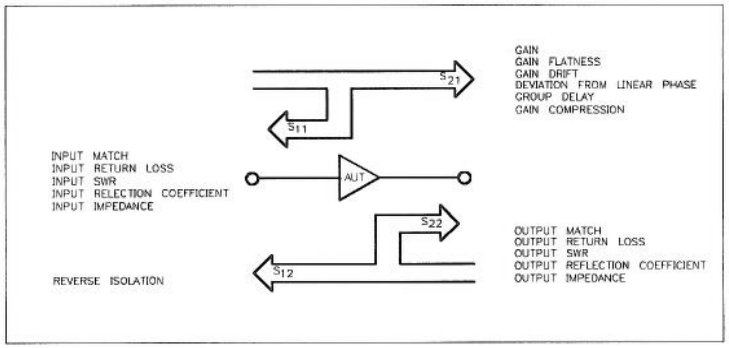

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Figure 6-7. Amplifier Parameters

Mixer Testing

Mixer parameters that you can measure

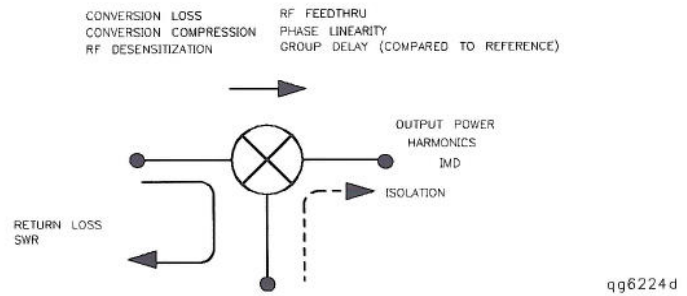


Figure 6-8. Mixer Parameters

- Transmission characteristics include conversion loss, conversion compression, RF desensitization, group delay, and RF feedthru.
- Reflection characteristics include return loss, SWR and complex impedance.
- Characteristics of the signal at the output port include the output power, the spurious or harmonic content of the signal, and intermodulation distortion.
- Other parameters of concern are isolation terms, including LO to RF isolation and LO to IF isolation.

Up-conversion and down-conversion definition

When you choose between RF < LO and RF > LO in the frequency offset menus, the analyzer determines which direction the internal source must sweep in order to achieve the requested IF frequency.

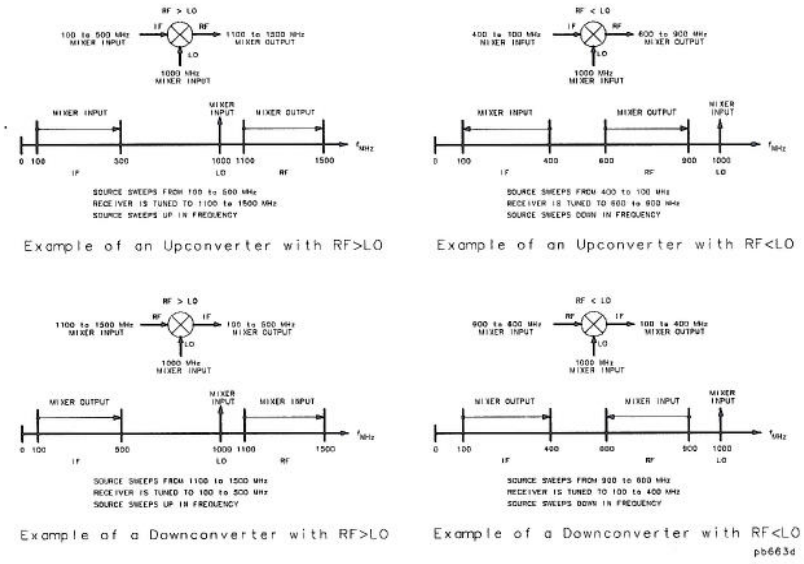


Figure 6-9. Examples of Up Converters and Down Converters

7

Specifications and Characteristics

HP 8753D Option 011 Network Analyzer Specifications

Table 1. Instrument Specifications
(1 of 2)

SOURCE		
Description	**Specification**	**Code**
FREQUENCY CHARACTERISTICS		
Range		
without Option 006	300 kHz to 3 GHz	S-1*
with Option 006	30 kHz to 6 GHz	S-1*
Accuracy (at 25 °C ±5 °C)	±10 ppm	S-1*
Stability		
0 °C to 55 °C	±7.5 ppm	T
per year	±3 ppm	T
Resolution	1 Hz	S-3
OUTPUT POWER CHARACTERISTICS		
Range		
without Option 006	−5 to +20 dBm	S-1*
with Option 006	−5 to +18 dBm	S-1*
Resolution	0.05 dB	S-3
Level Accuracy (at +10 dBm output level) (at 25 °C ± 5 °C)†	±1.0 dB	S-1*
Linearity (at 25 °C ±5 °C)†		
−5 to +15 dBm§	±0.25 dB (relative to +10 dBm output level)	S-1
+15 to +20 dBm‡	±0.5 dB (relative to +10 dBm output level)	S-1
Impedance	50 Ω nominal	

* Explicitly tested as part of an on-site verification performed by Hewlett-Packard.
† Typical 30 kHz to 300 kHz
‡ +13 to +18 dBm for Option 006
§ −5 to +13 dBm for Option 006

Table 1. Instrument Specifications
(2 of 2)

RECEIVER		
Description	**Specification**	**Code**
CHARACTERISTICS		
Dynamic Range (10 Hz IF Bandwidth)		
A, B		
30 kHz to 50 kHz	90 dB	T
50 kHz to 300 kHz	100 dB	T
300 kHz to 3 GHz*	110 dB	S-1
3 GHz to 6 GHz	105 dB	S-1
R		
30 kHz to 300 kHz	30 dB	T
300 kHz to 3 GHz	35 dB	S-1
3 GHz to 6 GHz	30 dB	S-1
Maximum Input Level	0 dBm	S-1
Damage Level	+20 dBm or > 25 Vdc	T
Minimum R Level		
(required for source operation)		
300 kHz to 3 GHz	−35 dBm	S-1
3 GHz to 6 GHz	−30 dBm	S-1

* 100 dB, 300 kHz to 16 MHz, due to fixed spurs.

Front Panel Connectors

Connector Type ..... Type N, female

Impedance ..... 50 ohms (nominal)

Connector Center Pin Protrusion ..... 0.201 to 0.207 in.

Environmental Characteristics

Operating Conditions

Operating Temperature ..... 0 °C to 55 °C

Error-Corrected Temperature Range ..... ±1 °C of calibration temperature

Humidity ..... 5% to 95% at 40 °C (non-condensing)

Altitude ..... 0 to 4500 meters (15,000 feet)

Non-Operating Storage Conditions

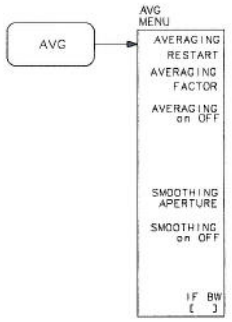
Temperature ..... −40 °C to +70 °C

Humidity ..... 0 to 90% relative at +65 °C (non-condensing)

Altitude ..... 0 to 15,240 meters (50,000 feet)

8

Menu Maps



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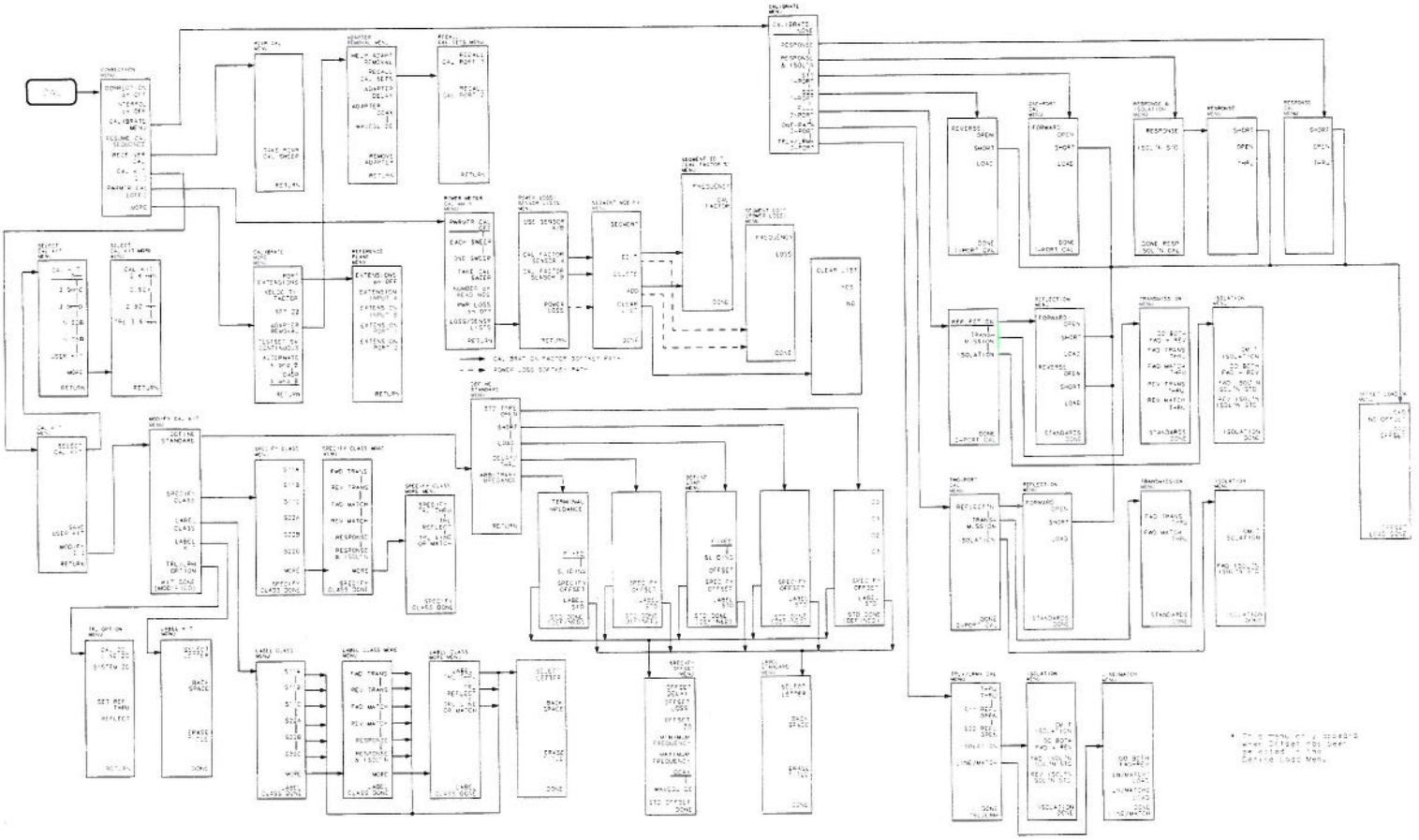
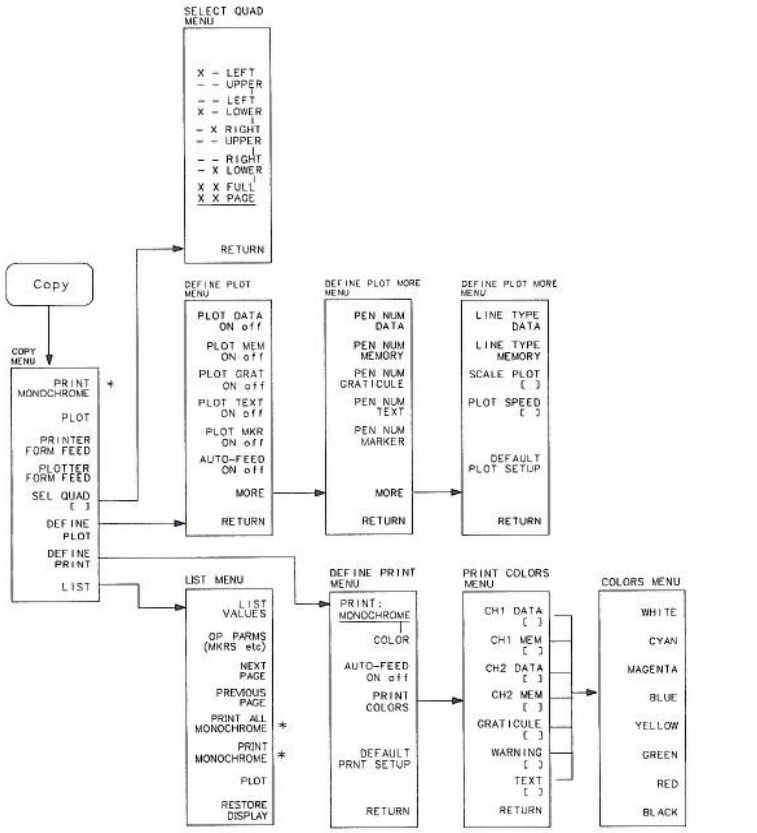


CAL KEY MENUS



* THIS KEY LABEL CHANGES BETWEEN PRINT MONOCHROME AND PRINT COLOR, DEPENDING ON THE SETTING OF THE PRINT: MONOCHROME/COLOR KEY SELECTION IN THE DEFINE PRINT MENU.

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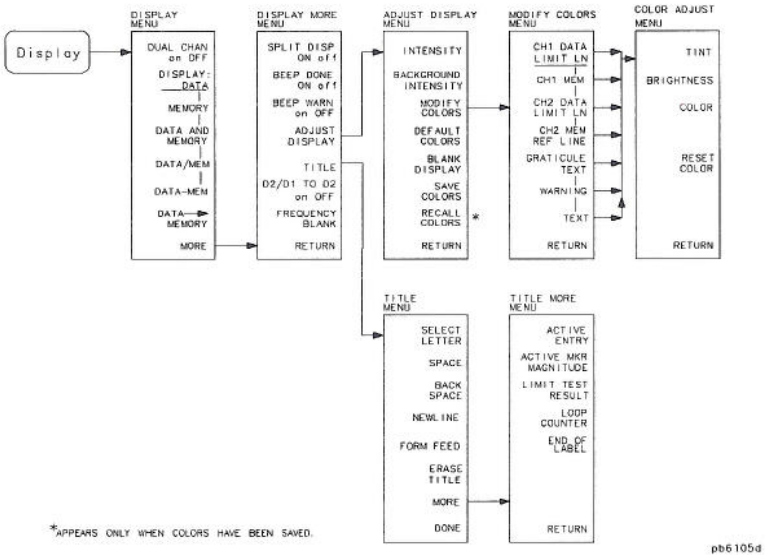
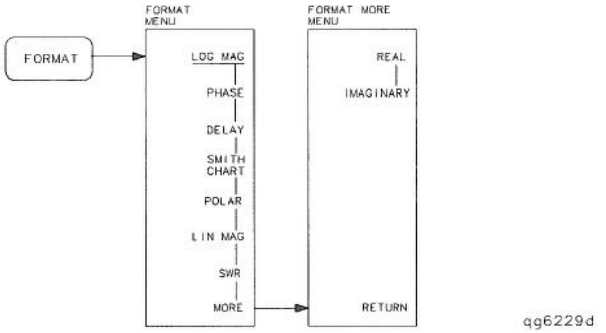
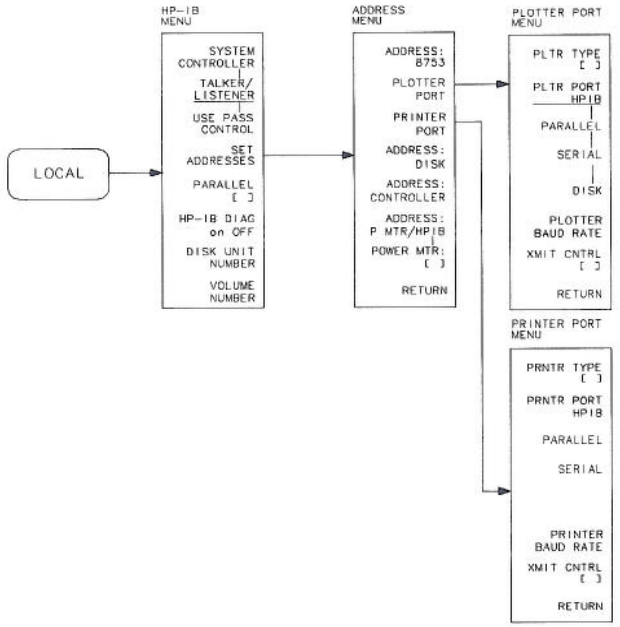
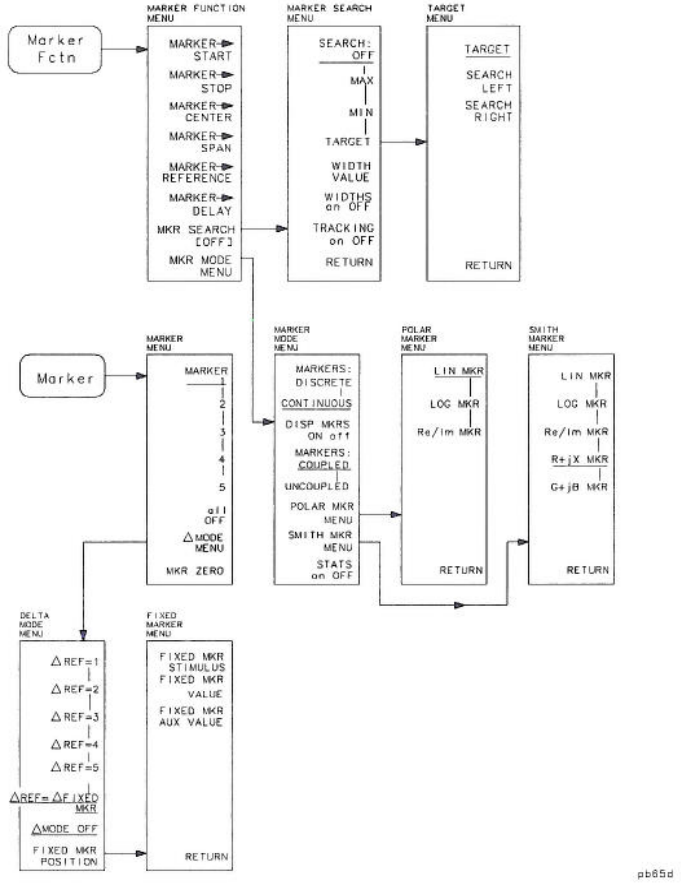
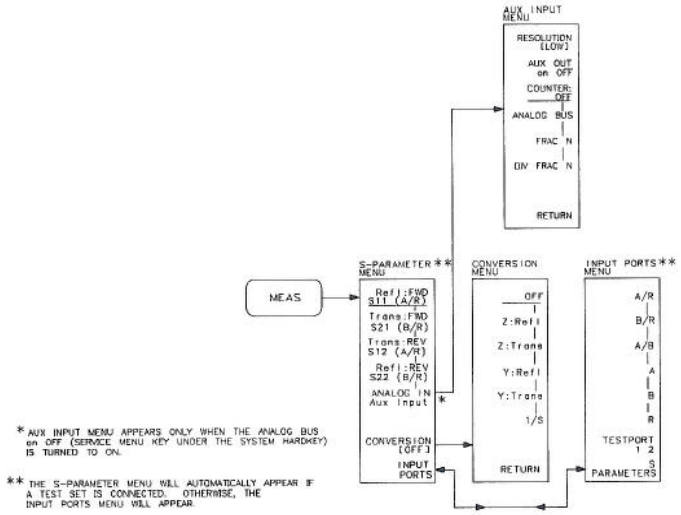

Display
DISPLAY MENU
DUAL CHAN on OFF
DISPLAY: DATA | MEMORY | DATA AND MEMORY | DATA/MEM | DATA-MEM | DATA→MEMORY
MORE
DISPLAY MORE MENU
SPLIT DISP ON off
BEEP DONE ON off
BEEP WARN on OFF
ADJUST DISPLAY
TITLE
D2/D1 TO D2 on OFF
FREQUENCY BLANK
RETURN
ADJUST DISPLAY MENU
INTENSITY
BACKGROUND INTENSITY
MODIFY COLORS
DEFAULT COLORS
BLANK DISPLAY
SAVE COLORS
RECALL COLORS *
RETURN
MODIFY COLORS MENU
CH1 DATA LIMIT LN | CH1 MEM
CH2 DATA LIMIT LN | CH2 MEM REF LINE
GRATICULE TEXT
WARNING | TEXT
RETURN
COLOR ADJUST MENU
TINT
BRIGHTNESS
COLOR
RESET COLOR
RETURN
TITLE MENU
SELECT LETTER
SPACE
BACK SPACE
NEW LINE
FORM FEED
ERASE TITLE
MORE
DONE
TITLE MORE MENU
ACTIVE ENTRY
ACTIVE MKR MAGNITUDE
LIMIT TEST RESULT
LOOP COUNTER
END OF LABEL
RETURN
*APPEARS ONLY WHEN COLORS HAVE BEEN SAVED.
pb6105d

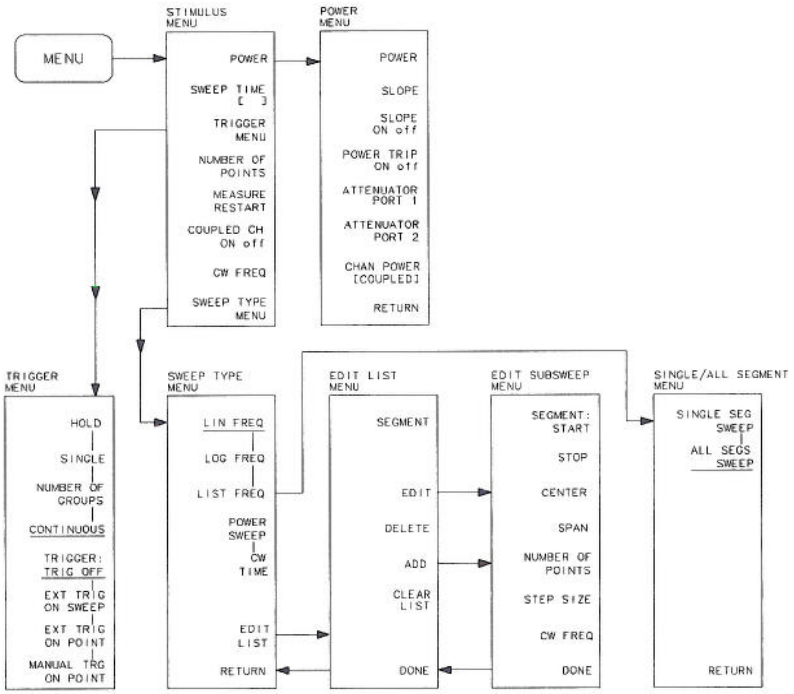

FORMAT
FORMAT MENU
LOG MAG | PHASE | DELAY | SMITH CHART | POLAR | LIN MAG | SWR | MORE
FORMAT MORE MENU
REAL | IMAGINARY
RETURN
qg6229d


HP-IB MENU
SYSTEM CONTROLLER
TALKER/ LISTENER
USE PASS CONTROL
SET ADDRESSES
PARALLEL [ ]
HP-IB DIAG on OFF
DISK UNIT NUMBER
VOLUME NUMBER
LOCAL
ADDRESS MENU
ADDRESS: 8753
PLOTTER PORT
PRINTER PORT
ADDRESS: DISK
ADDRESS: CONTROLLER
ADDRESS: P MTR/HPIB
POWER MTR: [ ]
RETURN
PLOTTER PORT MENU
PLTR TYPE [ ]
PLTR PORT HPIB
PARALLEL
SERIAL
DISK
PLOTTER BAUD RATE
XMIT CNTRL [ ]
RETURN
PRINTER PORT MENU
PRNTR TYPE [ ]
PRNTR PORT HPIB
PARALLEL
SERIAL
PRINTER BAUD RATE
XMIT CNTRL [ ]
RETURN

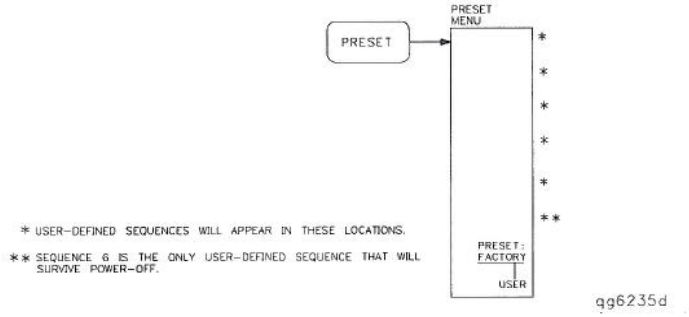
qg6230d


Marker Fctn
MARKER FUNCTION MENU
MARKER→ START
MARKER→ STOP
MARKER→ CENTER
MARKER→ SPAN
MARKER→ REFERENCE
MARKER→ DELAY
MKR SEARCH [OFF]
MKR MODE MENU
MARKER SEARCH MENU
SEARCH: OFF
MAX
MIN
TARGET
WIDTH VALUE
WIDTHS on OFF
TRACKING on OFF
RETURN
TARGET MENU
TARGET
SEARCH LEFT
SEARCH RIGHT
RETURN
Marker
MARKER MENU
MARKER 1 2 3 4 5
all OFF
ΔMODE MENU
MKR ZERO
MARKER MODE MENU
MARKERS: DISCRETE
CONTINUOUS
DISP MKRS ON off
MARKERS: COUPLED
UNCOUPLED
POLAR MKR MENU
SMITH MKR MENU
STATS on OFF
POLAR MARKER MENU
LIN MKR
LOG MKR
Re/Im MKR
RETURN
SMITH MARKER MENU
LIN MKR
LOG MKR
Re/Im MKR
R+jX MKR
G+jB MKR
RETURN
DELTA MODE MENU
ΔREF=1
ΔREF=2
ΔREF=3
ΔREF=4
ΔREF=5
ΔREF=ΔFIXED MKR
ΔMODE OFF
FIXED MKR POSITION
FIXED MARKER MENU
FIXED MKR STIMULUS
FIXED MKR VALUE
FIXED MKR AUX VALUE
RETURN
pb85d

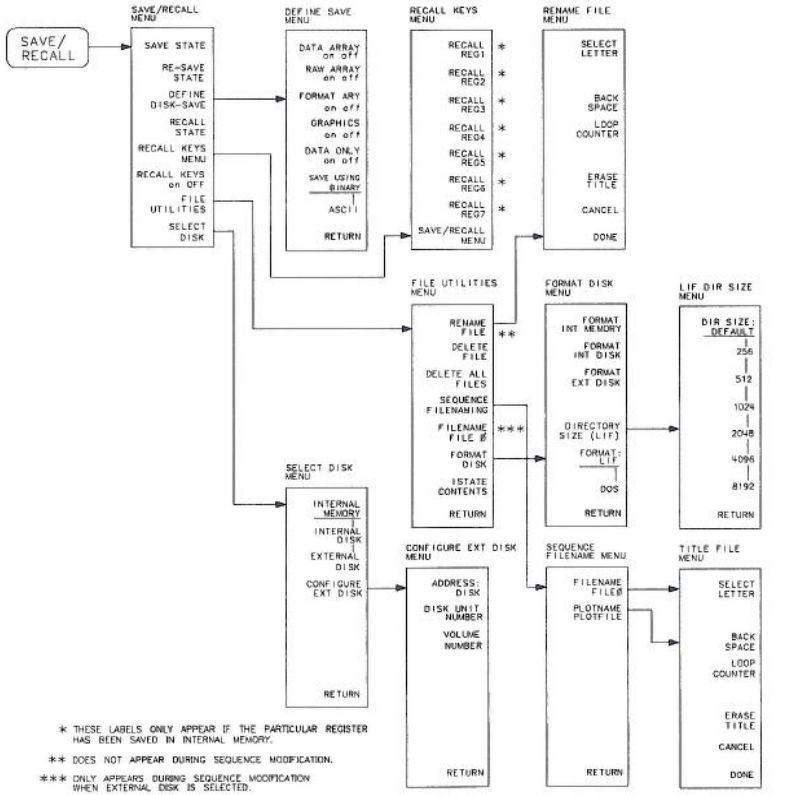

AUX INPUT MENU
RESOLUTION [LOW]
AUX OUT on OFF
COUNTER: OFF
ANALOG BUS
FRAC N
DIV FRAC N
RETURN
MEAS
S-PARAMETER** MENU
Refl:FWD S11 (A/R)
Trans:FWD S21 (B/R)
Trans:REV S12 (A/R)
Refl:REV S22 (B/R)
ANALOG IN Aux Input
CONVERSION [OFF]
INPUT PORTS
CONVERSION MENU
OFF
Z:Refl
Z:Trans
Y:Refl
Y:Trans
1/S
RETURN
INPUT PORTS** MENU
A/R
B/R
A/B
A
B
R
TESTPORT 1 2
S PARAMETERS
*
* AUX INPUT MENU APPEARS ONLY WHEN THE ANALOG BUS on OFF (SERVICE MENU KEY UNDER THE SYSTEM HARDKEY) IS TURNED TO ON.
** THE S-PARAMETER MENU WILL AUTOMATICALLY APPEAR IF A TEST SET IS CONNECTED. OTHERWISE, THE INPUT PORTS MENU WILL APPEAR.
pg5286d

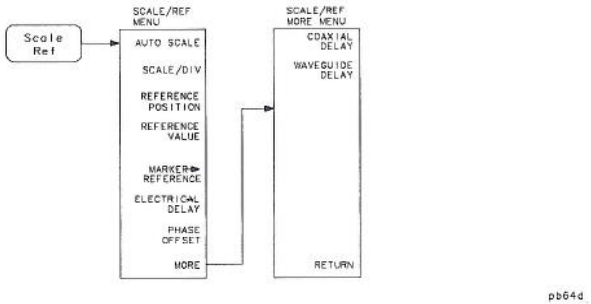


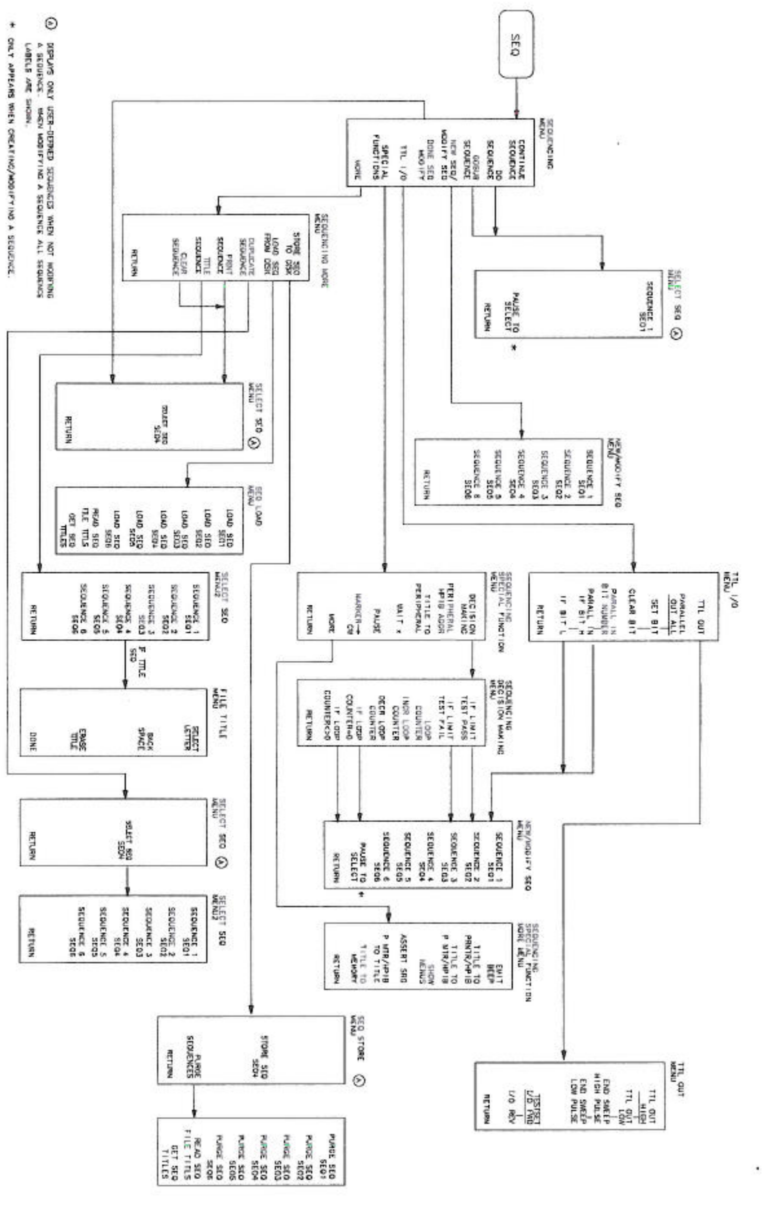
qg6234d



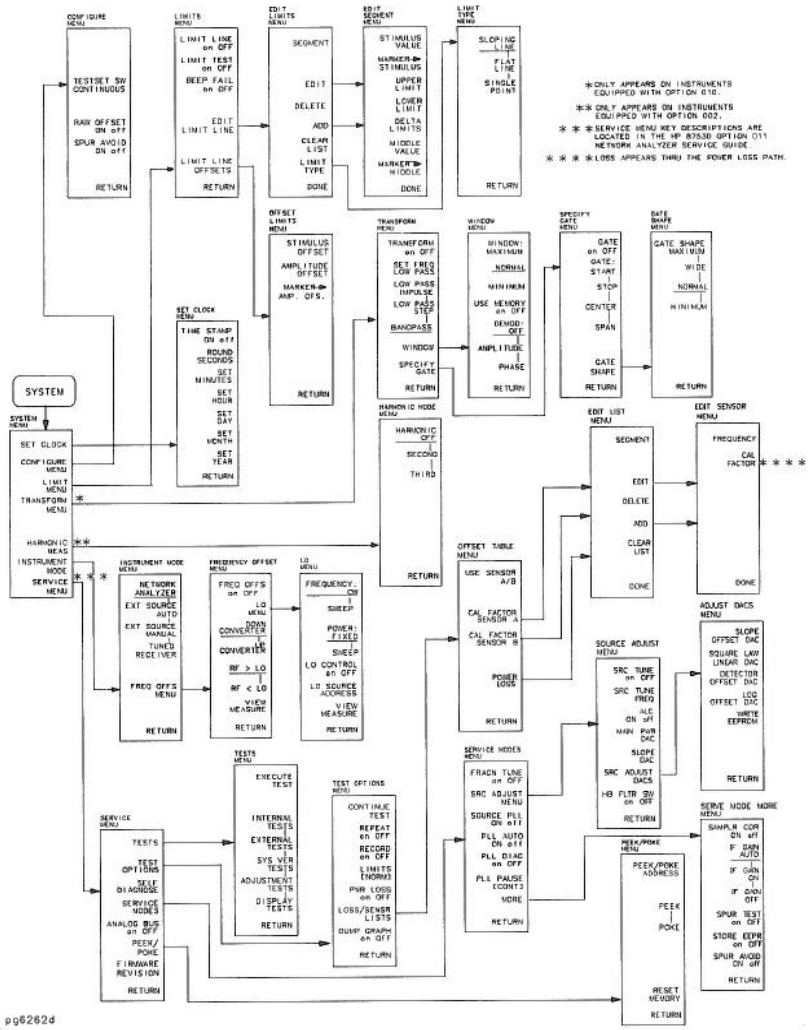
qg6235d


SAVE/ RECALL
SAVE/RECALL MENU
SAVE STATE
RE-SAVE STATE
DEFINE DISK-SAVE
RECALL STATE
RECALL KEYS MENU
RECALL KEYS on off
FILE UTILITIES
SELECT DISK
DEFINE SAVE MENU
DATA ARRAY on off
RAW ARRAY on off
FORMAT ARY on off
GRAPHICS on off
DATA ONLY on off
SAVE USING BINARY
ASCII
RETURN
RECALL KEYS MENU
RECALL REG1 *
RECALL REG2 *
RECALL REG3 *
RECALL REG4 *
RECALL REG5 *
RECALL REG6 *
RECALL REG7 *
SAVE/RECALL MENU
RENAME FILE MENU
SELECT LETTER
BACK SPACE
LOOP COUNTER
ERASE TITLE
CANCEL
DONE
FILE UTILITIES MENU
RENAME FILE **
DELETE FILE
DELETE ALL FILES
SEQUENCE FILENAMING
FILENAME FILE # ***
FORMAT DISK
ISTATE CONTENTS
RETURN
FORMAT DISK MENU
FORMAT INT MEMORY
FORMAT INT DISK
FORMAT EXT DISK
DIRECTORY SIZE (LIF)
FORMAT: LIF
DOS
RETURN
LIF DIR SIZE MENU
DIR SIZE: DEFAULT
256
512
1024
2048
4096
8192
RETURN
SELECT DISK MENU
INTERNAL MEMORY
INTERNAL DISK
EXTERNAL DISK
CONFIGURE EXT DISK
RETURN
CONFIGURE EXT DISK MENU
ADDRESS: DISK
DISK UNIT NUMBER
VOLUME NUMBER
RETURN
SEQUENCE FILENAME MENU
FILENAME FILE0
PLOTNAME PLOTFILE
RETURN
TITLE FILE MENU
SELECT LETTER
BACK SPACE
LOOP COUNTER
ERASE TITLE
CANCEL
DONE
* THESE LABELS ONLY APPEAR IF THE PARTICULAR REGISTER HAS BEEN SAVED IN INTERNAL MEMORY.
** DOES NOT APPEAR DURING SEQUENCE MODIFICATION.
*** ONLY APPEARS DURING SEQUENCE MODIFICATION WHEN EXTERNAL DISK IS SELECTED.
pg6260d


Scale Ref
SCALE/REF MENU
AUTO SCALE
SCALE/DIV
REFERENCE POSITION
REFERENCE VALUE
MARKER→ REFERENCE
ELECTRICAL DELAY
PHASE OFFSET
MORE
SCALE/REF MORE MENU
COAXIAL DELAY
WAVEGUIDE DELAY
RETURN
pb64d



SEQUENCE MENU MAP


SYSTEM
SYSTEM MENU
SET CLOCK
CONFIGURE MENU
LIMIT MENU
TRANSFORM MENU
HARMONIC MEAS
INSTRUMENT MODE
SERVICE MENU
CONFIGURE MENU
TESTSET SW CONTINUOUS
RAW OFFSET ON off
SPUR AVOID ON off
RETURN
LIMITS MENU
LIMIT LINE on OFF
LIMIT TEST on OFF
BEEP FAIL on OFF
EDIT LIMIT LINE
LIMIT LINE OFFSETS
RETURN
EDIT LIMITS MENU
SEGMENT
EDIT
DELETE
ADD
CLEAR LIST
LIMIT TYPE
DONE
EDIT SEGMENT MENU
STIMULUS VALUE
MARKER→ STIMULUS
UPPER LIMIT
LOWER LIMIT
DELTA LIMITS
MIDDLE VALUE
MARKER→ MIDDLE
DONE
LIMIT TYPE MENU
SLOPING LINE
FLAT LINE
SINGLE POINT
RETURN
* ONLY APPEARS ON INSTRUMENTS EQUIPPED WITH OPTION 010.
** ONLY APPEARS ON INSTRUMENTS EQUIPPED WITH OPTION 002.
*** SERVICE MENU KEY DESCRIPTIONS ARE LOCATED IN THE HP 87530 OPTION 011 NETWORK ANALYZER SERVICE GUIDE.
**** LOSS APPEARS THRU THE POWER LOSS PATH.
SET CLOCK MENU
TIME STAMP ON off
ROUND SECONDS
SET MINUTES
SET HOUR
SET DAY
SET MONTH
SET YEAR
RETURN
OFFSET LIMITS MENU
STIMULUS OFFSET
AMPLITUDE OFFSET
MARKER→ AMP. OFS.
RETURN
TRANSFORM MENU
TRANSFORM on OFF
SET FREQ LOW PASS
LOW PASS IMPULSE
LOW PASS STEP
BANDPASS
WINDOW
SPECIFY GATE
RETURN
WINDOW MENU
WINDOW: MAXIMUM
NORMAL
MINIMUM
USE MEMORY on OFF
DEMOD: OFF
AMPLITUDE
PHASE
RETURN
SPECIFY GATE MENU
GATE on OFF
GATE: START
STOP
CENTER
SPAN
GATE SHAPE
RETURN
GATE SHAPE MENU
GATE SHAPE MAXIMUM
WIDE
NORMAL
MINIMUM
RETURN
HARMONIC MODE MENU
HARMONIC OFF
SECOND
THIRD
RETURN
EDIT LIST MENU
SEGMENT
EDIT
DELETE
ADD
CLEAR LIST
DONE
EDIT SENSOR MENU
FREQUENCY
CAL FACTOR ****
DONE
INSTRUMENT MODE MENU
NETWORK ANALYZER
EXT SOURCE AUTO
EXT SOURCE MANUAL
TUNED RECEIVER
FREQ OFFS MENU
RETURN
FREQUENCY OFFSET MENU
FREQ OFFS on OFF
LO MENU
DOWN CONVERTER
UP CONVERTER
RF > LO
RF < LO
VIEW MEASURE
RETURN
LO MENU
FREQUENCY, CW
SWEEP
POWER: FIXED
SWEEP
LO CONTROL on OFF
LO SOURCE ADDRESS
VIEW MEASURE
RETURN
OFFSET TABLE MENU
USE SENSOR A/B
CAL FACTOR SENSOR A
CAL FACTOR SENSOR B
POWER LOSS
RETURN
SOURCE ADJUST MENU
SRC TUNE on OFF
SRC TUNE FREQ
ALC ON off
MAIN PWR DAC
SLOPE DAC
SRC ADJUST DACS
HB FLTR SW on OFF
RETURN
ADJUST DACS MENU
SLOPE
OFFSET DAC
SQUARE LAW
LINEAR DAC
DETECTOR OFFSET DAC
LOG OFFSET DAC
WRITE EEPROM
RETURN
SERVICE MENU
TESTS
TEST OPTIONS
SELF DIAGNOSE
SERVICE MODES
ANALOG BUS on OFF
PEEK/POKE
FIRMWARE REVISION
RETURN
TESTS MENU
EXECUTE TEST
INTERNAL TESTS
EXTERNAL TESTS
SYS VER TESTS
ADJUSTMENT TESTS
DISPLAY TESTS
RETURN
TEST OPTIONS MENU
CONTINUE TEST
REPEAT on OFF
RECORD on OFF
LIMITS ENDING
PWR LOSS on OFF
LOSS/SENSR LISTS
DUMP GRAPH on OFF
RETURN
SERVICE MODES MENU
FRACN TUNE on OFF
SRC ADJUST MENU
SOURCE PLL on off
PLL AUTO ON off
PLL DIAG on OFF
PLL PAUSE (CONT)
MORE
RETURN
SERVE MODE MORE MENU
SAMPLR COR on off
IF GAIN AUTO
IF GAIN ON
IF GAIN OFF
SPUR TEST on OFF
STORE EEPR on OFF
SPUR AVOID ON off
RETURN
PEEK/POKE MENU
PEEK/POKE ADDRESS
PEEK
POKE
RESET MEMORY
RETURN
pg6262d

9

Key Definitions

Softkey Locations

The following table lists the softkeys alphabetically, and the corresponding front-panel access key.

Table 9-1. Softkey Locations

Softkey	Front-Panel Access Key
Δ MODE MENU	MARKER
Δ MODE OFF	MARKER
Δ REF = 1	MARKER
Δ REF = 2	MARKER
Δ REF = 3	MARKER
Δ REF = 4	MARKER
Δ REF = 5	MARKER
Δ REF = Δ FIXED MKR	MARKER
1/S	MEAS
A	MEAS
A/B	MEAS
A/R	MEAS
ACTIVE ENTRY	DISPLAY
ACTIVE MRK MAGNITUDE	DISPLAY
ADAPTER:COAX	CAL
ADAPTER:WAVEGUIDE	CAL
ADAPTER DELAY	CAL
ADAPTER REMOVAL	CAL
ADDRESS: 8753	LOCAL
ADDRESS: CONTROLLER	LOCAL
ADDRESS: DISK	LOCAL
ADDRESS: DISK	SAVE/RECALL
ADDRESS: P MTR/HPIB	LOCAL
ADJUST DISPLAY	DISPLAY
ALL OFF	MARKER

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
ALL SEGS SWEEP	MENU
ALTERNATE A and B	CAL
AMPLITUDE	SYSTEM
AMPLITUDE OFFSET	SYSTEM
ANALOG IN Aux Input	MEAS
ARBITRARY IMPEDANCE	CAL
ASCII	SAVE RECALL
ASSERT SRQ	SEQ
ATTENUATOR PORT 1	MENU
ATTENUATOR PORT 2	MENU
AUTO FEED on OFF	COPY
AUTO SCALE	SCALE REF
AVERAGING FACTOR	AVG
AVERAGING on OFF	AVG
AVERAGING RESTART	AVG
B	MEAS
B/R	MEAS
BACKGROUND INTENSITY	DISPLAY
BANDPASS	SYSTEM
BEEP DONE ON off	DISPLAY
BEEP FAIL on OFF	SYSTEM
BEEP WARN on OFF	DISPLAY
BLANK DISPLAY	DISPLAY
BRIGHTNESS	DISPLAY

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
C0	CAL
C1	CAL
C2	CAL
C3	CAL
CAL FACTOR	CAL
CAL FACTOR SENSOR A	CAL
CAL FACTOR SENSOR B	CAL
CAL KIT [ ]	CAL
CAL KIT: 2.4mm	CAL
CAL KIT: 2.92*	CAL
CAL KIT: 2.92mm	CAL
CAL KIT: 3.5mmC	CAL
CAL KIT: 3.5mmD	CAL
CAL KIT: TRL 3.5mm	CAL
CAL KIT: 7mm	CAL
CAL KIT: N 50Ω	CAL
CAL KIT: N 75Ω	CAL
CAL KIT: USER KIT	CAL
CAL ZO: LINE ZO	CAL
CAL ZO: SYSTEM ZO	CAL
CALIBRATE MENU	CAL
CALIBRATE: NONE	CAL
CH1 DATA [ ]	COPY
CH1 DATA LIMIT LN	DISPLAY

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
CH1 MEM	DISPLAY
CH1 MEM [ ]	COPY
CH2 DATA [ ]	COPY
CH2 DATA LIMIT LN	DISPLAY
CH2 MEM [ ]	COPY
CH2 MEM REF LINE	DISPLAY
CHAN PWR [COUPLED]	MENU
CHAN PWR [UNCOUPLED]	MENU
CHOP A and B	CAL
CLEAR BIT	SEQ
CLEAR LIST	MENU
CLEAR SEQUENCE	SEQ
COAX	CAL
COAXIAL DELAY	SCALE REF
COLOR	DISPLAY
CONFIGURE EXTERNAL DISK	SAVE/RECALL
CONTINUE SEQUENCE	SEQ
CONTINUOUS	MENU
CONVERSION [ ]	MEAS
CORRECTION on OFF	CAL
COUPLED CH on OFF	MENU
CW FREQ	MENU
CW TIME	MENU
D2/D1 to D2 on OFF	DISPLAY

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
DATA and MEMORY	DISPLAY
DATA ARRAY on OFF	SAVE RECALL
DATA/MEM	DISPLAY
DATA - MEM	DISPLAY
DATA -> MEMORY	DISPLAY
DATA ONLY on OFF	SAVE RECALL
DECISION MAKING	SEQ
DECR LOOP COUNTER	SEQ
DEFAULT COLORS	DISPLAY
DEFAULT PLOT SETUP	COPY
DEFAULT PRINT SETUP	COPY
DEFINE DISK-SAVE	SAVE/RECALL
DEFINE PLOT	COPY
DEFINE PRINT	COPY
DEFINE STANDARD	CAL
DELAY	FORMAT
DELAY/THRU	CAL
DELETE ALL FILES	SAVE/RECALL
DELETE FILE	SAVE/RECALL
DELTA LIMITS	SYSTEM
DEMOD: AMPLITUDE	SYSTEM
DEMOD: OFF	SYSTEM
DEMOD: PHASE	SYSTEM
DIRECTORY SIZE (LIF)	SAVE RECALL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
DISK UNIT NUMBER	LOCAL
DISK UNIT NUMBER	SAVE/RECALL
DISPLAY: DATA	DISPLAY
DISP MKRS ON off	MARKER
DO BOTH FWD + REV	CAL
DO SEQUENCE	SEQ
DONE 1-PORT CAL	CAL
DONE 2-PORT CAL	CAL
DONE RESPONSE	CAL
DONE RESP ISOL'N CAL	CAL
DONE SEQ MODIFY	SEQ
DONE TRL/LRM	CAL
DOWN CONVERTER	SYSTEM
DUAL CHAN on OFF	DISPLAY
DUMP GRAPH on OFF	SYSTEM
DUPLICATE SEQUENCE	SEQ
EACH SWEEP	CAL
EDIT LIMIT LINE	SYSTEM
EDIT LIST	MENU
ELECTRICAL DELAY	SCALE REF
EMIT BEEP	SEQ
END OF LABEL	DISPLAY
END SWEEP HIGH PULSE	SEQ
END SWEEP LOW PULSE	SEQ

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
ERASE TITLE	CAL
ERASE TITLE	DISPLAY
ERASE TITLE	SAVE RECALL
EXT SOURCE AUTO	SYSTEM
EXT SOURCE MANUAL	SYSTEM
EXT TRIG ON POINT	MENU
EXT TRIG ON SWEEP	MENU
EXTENSION INPUT A	CAL
EXTENSION INPUT B	CAL
EXTENSION PORT 1	CAL
EXTENSION PORT 2	CAL
EXTENSIONS on OFF	CAL
EXTERNAL DISK	SAVE/RECALL
FILENAME	SAVE/RECALL
FILENAME FILE0	SAVE/RECALL
FILETITLE FILE0	SAVE/RECALL
FILE UTILITES	SAVE/RECALL
FIXED	CAL
FIXED MKR AUX VALUE	MARKER
FIXED MKR POSITION	MARKER
FIXED MKR STIMULUS	MARKER
FIXED MKR VALUE	MARKER
FLAT LINE	SYSTEM
FORM FEED	DISPLAY

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
FORMAT ARY on OFF	SAVE/RECALL
FORMAT DISK	SAVE/RECALL
FORMAT: DOS	SAVE/RECALL
FORMAT: LIF	SAVE/RECALL
FORMAT EXT DISK	SAVE/RECALL
FORMAT INT DISK	SAVE/RECALL
FORMAT INT MEMORY	SAVE/RECALL
FREQ OFFS MENU	SYSTEM
FREQ OFFS on OFF	SYSTEM
FREQUENCY	CAL
FREQUENCY BLANK	DISPLAY
FREQUENCY: CW	SYSTEM
FREQUENCY: SWEEP	SYSTEM
FULL 2-PORT	CAL
FULL PAGE	COPY
FWD ISOL'N ISOL'N STD	CAL
FWD MATCH	CAL
FWD MATCH THRU	CAL
FWD TRANS	CAL
FWD TRANS THRU	CAL
G+jB MKR	MARKER
GATE: CENTER	SYSTEM
GATE: SPAN	SYSTEM
GATE: START	SYSTEM

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
GATE: STOP	SYSTEM
GATE on OFF	SYSTEM
GATE SHAPE	SYSTEM
GATE SHAPE MAXIMUM	SYSTEM
GATE SHAPE MINIMUM	SYSTEM
GATE SHAPE NORMAL	SYSTEM
GOSUB SEQUENCE	SEQ
GRAPHICS on OFF	SAVE RECALL
GRATICULE [ ]	COPY
GRATICULE TEXT	DISPLAY
HARMONIC MEAS	SYSTEM
HARMONIC OFF	SYSTEM
HARMONIC SECOND	SYSTEM
HARMONIC THIRD	SYSTEM
HELP ADAPT REMOVAL	CAL
HOLD	MENU
HP-IB DIAG on off	LOCAL
IF BW [ ]	AVG
IF LIMIT TEST FAIL	SEQ
IF LIMIT TEST PASS	SEQ
IF LOOP COUNTER = 0	SEQ
IF LOOP < > COUNTER 0	SEQ
IMAGINARY	FORMAT
INCR LOOP COUNTER	SEQ
INIT DISK? YES	SAVE/RECALL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
INITIALIZE DISK	SAVE/RECALL
INPUT PORTS	MEAS
INSTRUMENT MODE	SYSTEM
INTENSITY	DISPLAY
INTERNAL DISK	SAVE/RECALL
INTERNAL MEMORY	SAVE/RECALL
INTERPOL on OFF	CAL
ISOLATION	CAL
ISOLATION DONE	CAL
ISOL'N STD	CAL
ISTATE CONTENTS	SAVE/RECALL
KIT DONE (MODIFIED)	CAL
LABEL CLASS	CAL
LABEL CLASS DONE	CAL
LABEL KIT	CAL
LABEL STD	CAL
LEFT LOWER	COPY
LEFT UPPER	COPY
LIMIT LINE OFFSETS	SYSTEM
LIMIT LINE on OFF	SYSTEM
LIMIT MENU	SYSTEM
LIMIT TEST on OFF	SYSTEM
LIMIT TEST RESULT	DISPLAY
LIMIT TYPE	SYSTEM
LIN FREQ	MENU

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
LIN MAG	FORMAT
LIN MKR	MARKER
LIST FREQ	MENU
LINE/MATCH	CAL
LINE TYPE DATA	COPY
LINE TYPE MEMORY	COPY
LIST	COPY
LN/MATCH 1	CAL
LN/MATCH 2	CAL
LO CONTROL on OFF	SYSTEM
LO MENU	SYSTEM
LO SOURCE ADDRESS	SYSTEM
LOAD	CAL
LOAD NO OFFSET	CAL
LOAD OFFSET	CAL
LOAD SEQ FROM DISK	SEQ
LOG FREQ	MENU
LOG MAG	FORMAT
LOG MKR	MARKER
LOOP COUNTER	SEQ
LOOP COUNTER	DISPLAY
LOSS	CAL
LOSS/SENSR LISTS	CAL
LOWER LIMIT	SYSTEM

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
LOW PASS IMPULSE	SYSTEM
LOW PASS STEP	SYSTEM
MANUAL TRG ON POINT	MENU
MARKER -> AMP. OFS.	SYSTEM
MARKER -> CENTER	MARKER FCTN
MARKER -> CW	SEQ
MARKER -> DELAY	MARKER FCTN
MARKER -> DELAY	SCALE REF
MARKER -> MIDDLE	SYSTEM
MARKER -> REFERENCE	MARKER FCTN
MARKER -> REFERENCE	SCALE REF
MARKER -> SPAN	MARKER FCTN
MARKER -> START	MARKER FCTN
MARKER -> STIMULUS	SYSTEM
MARKER -> STOP	MARKER FCTN
MARKER 1	MARKER
MARKER 2	MARKER
MARKER 3	MARKER
MARKER 4	MARKER
MARKER 5	MARKER
MARKER all OFF	MARKER
MARKER MODE MENU	MARKER
MARKERS: CONTINUOUS	MARKER
MARKERS: COUPLED	MARKER

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
MARKERS: DISCRETE	MARKER
MARKERS: UNCOUPLED	MARKER
MAX	MARKER FCTN
MAXIMUM FREQUENCY	CAL
MEASURE RESTART	MENU
MEMORY	DISPLAY
MIDDLE VALUE	SYSTEM
MIN	MARKER FCTN
MINIMUM	SYSTEM
MINIMUM FREQUENCY	CAL
MKR SEARCH [ ]	MARKER FCTN
MKR ZERO	MARKER
MODIFY [ ]	CAL
MODIFY COLORS	DISPLAY
NETWORK ANALYZER	SYSTEM
NEW SEQ/MODIFY SEQ	SEQ
NEWLINE	DISPLAY
NEXT PAGE	COPY
NORMAL	SYSTEM
NUMBER OF GROUPS	MENU
NUMBER OF POINTS	MENU
NUMBER OF READINGS	CAL
OFFSET	CAL
OFFSET DELAY	CAL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
OFFSET LOADS DONE	CAL
OFFSET LOSS	CAL
OFFSET Z0	CAL
OMIT ISOLATION	CAL
ONE-PATH 2-PORT	CAL
ONE SWEEP	CAL
OPEN	CAL
OP PARMS (MKRS etc)	COPY
P MTR/HPIB TO TITLE	SEQ
PAGE	COPY
PARALL IN BIT NUMBER	SEQ
PARALL IN IF BIT H	SEQ
PARALL IN IF BIT L	SEQ
PARALLEL	LOCAL
PARALLEL [ ]	LOCAL
PARALLEL OUT ALL	SEQ
PAUSE TO SELECT	SEQ
PEN NUM DATA	COPY
PEN NUM GRATICULE	COPY
PEN NUM MARKER	COPY
PEN NUM MEMORY	COPY
PEN NUM TEXT	COPY
PERIPHERAL HPIB ADDR	SEQ
PHASE	FORMAT

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
PHASE	SYSTEM
PHASE OFFSET	SCALE REF
PLOT	COPY
PLOT DATA ON off	COPY
PLOT GRAT ON off	COPY
PLOT MEM ON off	COPY
PLOT MKR ON off	COPY
PLOTNAME PLOTFILE	SAVE/RECALL
PLOT SPEED [ ]	COPY
PLOT SPEED [ ]	COPY
PLOT TEXT ON off	COPY
PLOTTER BAUD RATE	LOCAL
PLOTTER FORM FEED	COPY
PLOTTER PORT	LOCAL
PLTR PORT: DISK	LOCAL
PLTR PORT: HPIB	LOCAL
PLTR PORT: PARALLEL	LOCAL
PLTR PORT: SERIAL	LOCAL
PLTR TYPE [ ]	LOCAL
POLAR	FORMAT
POLAR MKR MENU	MARKER
PORT EXTENSIONS	CAL
POWER	MENU
POWER: FIXED	SYSTEM

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
POWER: SWEEP	SYSTEM
POWER LOSS	CAL
POWER MTR [ ]	LOCAL
POWER SWEEP	MENU
POWER TRIP OFF on	MENU
PRESET: FACTORY	PRESET
PRESET: USER	PRESET
PREVIOUS PAGE	COPY
PRINT: COLOR	COPY
PRINT COLORS	COPY
PRINT: MONOCHROME	COPY
PRINT MONOCHROME	COPY
PRINT SEQUENCE	SEQ
PRINTER BAUD RATE	LOCAL
PRINTER FORM FEED	COPY
PRINTER PORT	LOCAL
PRNTR PORT: HPIB	LOCAL
PRNTR PORT: PARALLEL	LOCAL
PRNTR PORT: SERIAL	LOCAL
PRNTR TYPE [ ]	LOCAL
PWR LOSS on OFF	CAL
PWR RANGE AUTO man	CAL
PWRMTR CAL [ ]	CAL
PWRMTR CAL [OFF]	CAL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
R	MEAS
R+jX MKR	MARKER
RAW ARRAY on OFF	SAVE/RECALL
RAW OFFSET ON Off	SYSTEM
Re/Im MKR	MARKER
REAL	FORMAT
RECALL CAL PORT 1	Cal
RECALL CAL PORT 2	Cal
RECALL CAL SETS	Cal
RECALL COLORS	DISPLAY
RECALL KEYS MENU	SAVE/RECALL
RECALL KEYS on OFF	SAVE/RECALL
RECALL REG1	SAVE/RECALL
RECALL REG2	SAVE/RECALL
RECALL REG3	SAVE/RECALL
RECALL REG4	SAVE/RECALL
RECALL REG5	SAVE/RECALL
RECALL REG6	SAVE/RECALL
RECALL REG7	SAVE/RECALL
RECALL STATE	SAVE/RECALL
RECEIVER CAL	CAL
REFERENCE POSITION	SCALE REF
REFERENCE VALUE	SCALE REF
Refl: FWD S11 (A/R)	MEAS

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
Refl: REV S22 (B/R)	MEAS
REFLECT AND LINE	CAL
REFLECTION	CAL
REMOVE ADAPTER	CAL
RENAME FILE	SAVE/RECALL
RE-SAVE STATE	SAVE/RECALL
RESET COLOR	DISPLAY
RESPONSE	CAL
RESPONSE & ISOL'N	CAL
RESUME CAL SEQUENCE	CAL
REV ISOL'N ISOL'N STD	CAL
REV MATCH	CAL
REV MATCH THRU	CAL
REV TRANS	CAL
REV TRANS THRU	CAL
RF > LO	SYSTEM
RF < LO	SYSTEM
RIGHT LOWER	COPY
RIGHT UPPER	COPY
ROUND SECONDS	SYSTEM
S PARAMETERS	MEAS
S11 1-PORT	CAL
S11A	CAL
S11B	CAL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
S11C	CAL
S11 REFL OPEN	CAL
S22 1-PORT	CAL
S22A	CAL
S22B	CAL
S22C	CAL
S22 REFL OPEN	CAL
SAMPLR COR ON off	SYSTEM
SAVE COLORS	DISPLAY
SAVE USER KIT	CAL
SAVE USING ASCII	SAVE/RECALL
SAVE USING BINARY	SAVE/RECALL
SCALE/DIV	SCALE REF
SCALE PLOT [ ]	COPY
SEARCH LEFT	MARKER FCTN
SEARCH RIGHT	MARKER FCTN
SEARCH: MAX	MARKER FCTN
SEARCH: MIN	MARKER FCTN
SEARCH: OFF	MARKER FCTN
SECOND	SYSTEM
SEGMENT	CAL
SEGMENT	SYSTEM
SEGMENT: CENTER	MENU
SEGMENT: SPAN	MENU

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
SEGMENT: START	MENU
SEGMENT: STOP	MENU
SEL QUAD [ ]	COPY
SELECT DISK	SAVE/RECALL
SEQUENCE 1 SEQ1	SEQ
SEQUENCE 2 SEQ2	SEQ
SEQUENCE 3 SEQ3	SEQ
SEQUENCE 4 SEQ4	SEQ
SEQUENCE 5 SEQ5	SEQ
SEQUENCE 6 SEQ6	SEQ
SEQUENCE FILENAMING	Save/Recall
SET ADDRESSES	LOCAL
SET BIT	SEQ
SET CLOCK	SYSTEM
SET DAY	SYSTEM
SET FREQ LOW PASS	SYSTEM
SET HOUR	SYSTEM
SET MINUTES	SYSTEM
SET MONTH	SYSTEM
SET REF: THRU	SYSTEM
SET REF: REFLECT	SYSTEM
SET YEAR	SYSTEM
SET Z0	CAL
SHORT	CAL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
SINGLE	MENU
SINGLE POINT	SYSTEM
SINGLE SEG SWEEP	MENU
SLIDING	CAL
SLOPE	MENU
SLOPE on OFF	MENU
SLOPING LINE	SYSTEM
SMITH CHART	FORMAT
SMITH MKR MENU	MARKER
SMOOTHING APERTURE	AVG
SMOOTHING on OFF	AVG
SPECIAL FUNCTIONS	SEQ
SPAN	MENU
SPAN	SYSTEM
SPECIFY CLASS	CAL
SPECIFY GATE	SYSTEM
SPECIFY OFFSET	CAL
SPLIT DISP on OFF	DISPLAY
SPUR AVOID On Off	SYSTEM
STANDARDS DONE	CAL
STATS on OFF	MARKER FCTN
STD DONE (MODIFIED)	CAL
STD OFFSET DONE	CAL
STD TYPE:	CAL
STEP SIZE	MENU

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
STIMULUS VALUE	SYSTEM
STIMULUS OFFSET	SYSTEM
STORE SEQ TO DISK	SEQ
SWEEP	SYSTEM
SWEEP TIME [ ]	MENU
SWEEP TYPE MENU	MENU
SWR	FORMAT
SYSTEM CONTROLLER	LOCAL
TAKE CAL SWEEP	CAL
TAKE RCVR CAL SWEEP	CAL
TALKER/LISTENER	LOCAL
TARGET	MARKER FCTN
TERMINAL IMPEDANCE	CAL
TEST PORT 1 2	MEAS
TESTSET I/O FWD	SEQ
TESTSET I/O REV	SEQ
TESTSET SWP CONTINUOUS	CAL SYSTEM
TEXT	DISPLAY
TEXT [ ]	COPY
THIRD	SYSTEM
THRU	CAL
THRU THRU	CAL
TIME STAMP ON off	SYSTEM
TINT	DISPLAY
TITLE	DISPLAY

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
TITLE SEQUENCE	SEQ
TITLE TO MEMORY	SEQ
TITLE TO P MTR/HPIB	SEQ
TITLE TO PERIPHERAL	SEQ
TITLE TO PRINTER/HPIB	SEQ
TRACKING on OFF	MARKER FCTN
TRANS DONE	CAL
TRANS: FWD S21 (B/R)	MEAS
TRANS: REV S12 (B/R)	MEAS
TRANSFORM MENU	SYSTEM
TRANSFORM on OFF	SYSTEM
TRANSMISSION	CAL
TRIGGER MENU	MENU
TRIGGER: TRIG OFF	MENU
TRL*/LRM* 2-PORT	CAL
TRL/LRM OPTION	CAL
TTL I/O	SEQ
TTL OUT HIGH	SEQ
TTL OUT LOW	SEQ
TUNED RECEIVER	SYSTEM
UNCOUPLED	MARKER
UP CONVERTER	SYSTEM
UPPER LIMIT	SYSTEM
USE MEMORY on OFF	SYSTEM
USE PASS CONTROL	LOCAL

Table 9-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
USER	PRESET
USER KIT	CAL
USE SENSOR A / B	CAL
VELOCITY FACTOR	CAL
VIEW MEASURE	SYSTEM
VOLUME NUMBER	LOCAL
VOLUME NUMBER	SAVE/RECALL
WAIT x	SEQ
WARNING	DISPLAY
WARNING [ ]	COPY
WAVEGUIDE	CAL
WAVEGUIDE DELAY	SCALE REF
WIDE	SYSTEM
WIDTH VALUE	MARKER FCTN
WIDTHS on OFF	MARKER FCTN
WINDOW	SYSTEM
WINDOW: MAXIMUM	SYSTEM
WINDOW: MINIMUM	SYSTEM
WINDOW: NORMAL	SYSTEM
XMIT CNTRL [ ]	LOCAL
Y: Refl	MEAS
Y: Trans	MEAS
Z: Refl	MEAS
Z: Trans	MEAS

10

Error Messages

Error Messages in Alphabetical Order

This chapter contains an alphabetical listing of all error messages to help you interpret any error messages that may be displayed on the analyzer, or transmitted by the instrument over HP-IB:

ABORTING COPY OUTPUT

Information Message	This message is displayed briefly if you have pressed (LOCAL) to abort a copy operation. If the message is not subsequently replaced by error message number 25, PRINT ABORTED, the copy device may be hung. Press (LOCAL) once more to exit the copy process and verify the status of the copy device.

ADDITIONAL STANDARDS NEEDED

Error Number 68	Error correction for the selected calibration class cannot be computed until you have measured all the necessary standards.

ADDRESSED TO TALK WITH NOTHING TO SAY

Error Number 31: You have sent a read command to the analyzer (such as ENTER 716) without first requesting data with an appropriate output command (such as OUTPDATA).

ALL REGISTERS HAVE BEEN USED

Error Number 200: You have used all of the available registers; you can store no more instrument states even though you may still have sufficient memory.

ASCII: MISSING 'BEGIN' STATEMENT

Error Number 193: The citifile you just downloaded over the HP-IB or via disk was not properly organized. The analyzer is unable to read the "BEGIN" statement.

ASCII: MISSING 'CITIFILE' STATEMENT

Error Number 194: The citifile you just downloaded over the HP-IB or via disk was not properly organized. The analyzer is unable to read the "CITIFILE" statement.

ASCII: MISSING 'DATA' STATEMENT

Error Number 195: The citifile you just downloaded over the HP-IB or via disk was not properly organized. The analyzer is unable to read the "DATA" statement.

ASCII: MISSING 'VAR' STATEMENT

Error Number 196: The citifile you just downloaded over the HP-IB or via disk was not properly organized. The analyzer is unable to read the "VAR" statement.

AVERAGING INVALID ON NON-RATIO MEASURE

Error Number 13: You cannot use sweep-to-sweep averaging on single-input measurements.

BAD FREQ FOR HARMONIC OR FREQ OFFSET

Error Number 181: You turned on time domain or recalled a calibration that resulted in start and stop frequencies that are beyond the allowable limits.

BATTERY FAILED. STATE MEMORY CLEARED

Error Number 183: The battery protection of the non-volatile CMOS memory has failed. Replace the battery.

BATTERY LOW! STORE SAVE REGS TO DISK

Error Number 184: The battery protection of the non-volatile CMOS memory is in danger of failing. If this occurs, all of the instrument state registers stored in CMOS memory will be lost. Save these states to a disk.

BLOCK INPUT ERROR

Error Number 34: The analyzer did not receive a complete data transmission. Clear by pressing the [LOCAL] key or aborting the I/O process at the controller.

BLOCK INPUT LENGTH ERROR

Error Number 35 — The length of the header received by the analyzer did not agree with the size of the internal array block.

CALIBRATION ABORTED

Error Number 74 — You have changed the active channel during a calibration so the calibration in progress was terminated.

CALIBRATION REQUIRED

Error Number 63 — A calibration set could not be found that matched the current stimulus state or measurement parameter.

CANNOT FORMAT DOS DISKS ON THIS DRIVE

Error Number 185 — You have attempted to initialize a floppy disk to DOS format on an external disk drive that does not support writing to all 80 tracks of the double density and high density disks.

CANNOT MODIFY FACTORY PRESET

Error Number 199 — You have attempted to rename, delete, or otherwise alter the factory preset state.

CANNOT READ/WRITE HFS FILE SYSTEM

Error Number 203: The disk is being accessed by the analyzer and is found to contain an HFS (hierarchical file system). The analyzer does not support HFS.

CAN'T CHANGE-ANOTHER CONTROLLER ON BUS

Error Number 37: You must remove the active controller from the bus or the controller must relinquish the bus before the analyzer can assume the system controller mode.

CAN'T STORE/LOAD SEQUENCE, INSUFFICIENT MEMORY

Error Number 127: Your sequence transfer to or from a disk could not be completed due to insufficient memory.

CH1 (CH2) TARGET VALUE NOT FOUND

Error Number 159: Your target value for the marker search function does not exist on the current data trace.

CONTINUOUS SWITCHING NOT ALLOWED

Error Number 10: Your current measurement requires the attenuator to switch between channel 1 and channel 2 power ranges.

COPY: device not responding; copy aborted

Error Number 170: The printer or plotter is not accepting data. Verify that the copy device is ready.

COPY OUTPUT COMPLETED

Information Message: The analyzer has completed outputting data to the printer or plotter.

CORRECTION AND DOMAIN RESET

Error Number 65: When you change the frequency range, sweep type, or number of points, error-correction and time domain are automatically turned off.

CORRECTION CONSTANTS NOT STORED

Error Number 3: A store operation to the EEPROM was not successful. You must change the position of the jumper on the A9 CPU assembly.

CORRECTION TURNED OFF

Error Number 66: Critical parameters in your current instrument state do not match the parameters for the calibration set.

CURRENT PARAMETER NOT IN CAL SET

Error Number 64: Correction is not valid for your selected measurement parameter.

D2/D1 INVALID WITH SINGLE CHANNEL

Error Number 130: You can only make a D2/D1 measurement if both channels are on.

D2/D1 INVALID. CH1 CH2 NUM PTS DIFFERENT

Error Number 152: You can only make a D2/D1 measurement if both channels have the same number of points.

DEADLOCK

Error Number 111: A fatal firmware error occurred before instrument preset completed. Call your local HP Sales and Service office.

DEMODULATION NOT VALID

Error Number 17: Demodulation is only valid for the CW time mode.

DEVICE: not on, not connect, wrong addrs

Error Number 119: The device at the peripheral address cannot be accessed by the analyzer.

DIRECTORY FULL

Error Number 188: There is no room left in the directory to add files. Either delete files or get a new disk.

DISK HARDWARE PROBLEM

Error Number 39: The disk drive is not responding correctly. Refer to the disk drive operating manual.

DISK IS WRITE PROTECTED

Error Number 48	The store operation cannot write to a write-protected disk. Slide the write-protect tab over the write-protect opening in order to write data on the disk.

DISK MEDIUM NOT INITIALIZED

Error Number 40	You must initialize the disk before it can be used.

DISK MESSAGE LENGTH ERROR

Error Number 190	The analyzer and the external disk drive aren't communicating properly.

DISK: not on, not connected, wrong addrs

Error Number 38	The disk cannot be accessed by the analyzer. Verify power, HP-IB connection, and address.

DISK READ/WRITE ERROR

Error Number 189	There may be a problem with your disk. Try a new floppy disk.

DISK WEAR - REPLACE DISK SOON

Error Number 49	Cumulative use of the disk is approaching the maximum.

DOMAIN RESET

Error Number 67

Time domain calculations were reset due to a change in the frequency range, sweep type, or number of points. Perform a new time domain transform on the new state.

DOS NAME LIMITED TO 8 CHARS + 3 CHAR EXTENSION

Error Number 180

A DOS file name must meet the following criteria:

- minimum of 1 character
- first character must be alpha; the remainder must be alphanumeric or underscore
- format is `filename.ext`
  - maximum of 8 characters in the filename
  - maximum of 3 characters in the extension field
  - a dot separates the filename from the extension field (the dot is not part of the name on the disk)

DUPLICATING TO THIS SEQUENCE NOT ALLOWED

Error Number 125

A sequence cannot be duplicated to itself.

EXCEEDED 7 STANDARDS PER CLASS

Error Number 72

When modifying calibration kits, you can define a maximum of seven standards for any class.

EXTERNAL SOURCE MODE REQUIRES CW TIME

Error Number 148: An external source can only be phase locked and measured in the CW time sweep mode.

EXT SOURCE NOT READY FOR TRIGGER

Error Number 191: There is a hardware problem with the HP 8625A external source.

EXT SRC: NOT ON/CONNECTED OR WRONG ADDR

Error Number 162: The analyzer is unable to communicate with the external source.

FILE NOT COMPATIBLE WITH INSTRUMENT

Information Message: You cannot recall user graphics that had been saved on an earlier model of analyzer with a monochrome display (HP 8753A/B). These files cannot be used with the HP 8753D.

FILE NOT FOUND

Error Number 192: The requested file was not found on the current disk medium.

FILE NOT FOUND OR WRONG TYPE

Error Number 197: During a resave operation, either the file was not found or the type of file was not an instrument state file.

FIRST CHARACTER MUST BE A LETTER

Error Number 42	The first character of a disk file title or an internal save register title must be an alpha character.

FORMAT NOT VALID FOR MEASUREMENT

Error Number 75	Conversion measurements (Z or Y reflection and transmission) are not valid with smith chart and SWR formats.

FORMATTING DATA

Information Message	The list information is being processed for a list data output.

FREQ OFFSET ONLY VALID IN NETWORK ANALYZER MODE

Error Number 140	You can only make frequency offset measurements in the network analyzer mode.

FUNCTION NOT VALID

Error Number 14	The function you requested is incompatible with the current instrument state.

FUNCTION NOT VALID DURING MOD SEQUENCE

Error Number 131	You cannot perform sequencing operations while a sequence is being modified.

FUNCTION NOT VALID FOR INTERNAL MEMORY

Error Number 201 — The function you selected only works with disk files.

FUNCTION ONLY VALID DURING MOD SEQUENCE

Error Number 164 — You can only use the GOSUB SEQUENCE capability when you are building a sequence.

HPIB COPY IN PROGRESS, ABORT WITH LOCAL

Error Number 169 — An HP-IB copy was already in progress when you requested the HP-IB for another function.

ILLEGAL UNIT OR VOLUME NUMBER

Error Number 46 — The disk unit or volume number set in the analyzer is not valid.

INIT DISK removes all data from disk

Information Message — Continuing with the initialize operation will *destroy* any data currently on the disk.

INITIALIZATION FAILED

Error Number 47 — The disk initialization failed, probably because the disk is damaged.

INSTRUMENT STATE MEMORY CLEARED

Error Number 56 — All instrument state registers have been cleared from memory along with any saved calibration data, memory traces, and calibration kit definitions.

INSUFFICIENT MEMORY

Error Number 51 — Your last front panel or HP-IB request could not be implemented due to insufficient memory space.

INSUFFICIENT MEMORY FOR PRINT/PLOT

Error Number 168 — There is not enough memory available for the print or plot function. Increase the available memory by changing or eliminating a memory-intensive operation such as reducing the number of points in the sweep.

INVALID KEY

Error Number 2 — You pressed an undefined softkey.

LIST MODE OFF: INVALID WITH LO FREQ

Error Number 182 — List mode has been turned off in the frequency offset mode because it is incompatible with your selected LO frequency.

LIST TABLE EMPTY

Error Number 9	The frequency list is empty. To implement list frequency mode, add segments to the list table.

LOG SWEEP REQUIRES 2 OCTAVE MINIMUM SPAN

Error Number 150	A logarithmic sweep is only valid if the stop frequency is greater than four times the start frequency.

LOW PASS: FREQ LIMITS CHANGED

Information Message	The frequency domain data points must be harmonically related from dc to the stop frequency. That is, stop = n × start, where n = number of points. If this condition is not true when a low pass mode (step or impulse) is selected and transform is turned on, the analyzer resets the start and stop frequencies. The stop frequency is set close to the entered stop frequency, and the start frequency is set equal to stop/n.

LOW PASS MODE NOT ALLOWED

Error Number 18	You must set the number of points to 801 or less when you are in low pass time domain mode.

MEMORY FOR CURRENT SEQUENCE IS FULL

Error Number 132	All the memory in the sequence you are modifying is filled with instrument commands.

MORE SLIDES NEEDED

Error Number 71: When you use a sliding load (in a user-defined calibration kit), you must set at least three slide positions to complete the calibration.

NO CALIBRATION CURRENTLY IN PROGRESS

Error Number 69: The RESUME CAL SEQUENCE softkey is not valid unless a calibration is already in progress. Start a new calibration.

NO DISK MEDIUM IN DRIVE

Error Number 41: You have no disk in the current disk unit.

NO FAIL FOUND

Service Error Number 114: The self-diagnose function of the instrument operates on an internal test failure. At this time, no failure has been detected.

NO FILE(S) FOUND ON DISK

Error Number 45: No files of the type created by an analyzer store operation were found on the disk.

NO IF FOUND: CHECK R INPUT LEVEL

Error Number 5: The first IF signal was not detected during pretune. Check the R input connection.

NO LIMIT LINES DISPLAYED

Error Number 144: You can turn limit lines on but they cannot be displayed on polar or Smith chart display formats.

NO MARKER DELTA -SPAN NOT SET

Error Number 15: You must turn the delta marker mode on, with at least two markers displayed, in order to use the MARKER -> SPAN softkey function.

NO MEMORY AVAILABLE FOR INTERPOLATION

Error Number 123: You cannot perform interpolated error-correction due to insufficient memory.

NO MEMORY AVAILABLE FOR SEQUENCING

Error Number 126: You cannot modify the sequence due to insufficient memory.

NO PHASE LOCK: CHECK R INPUT LEVEL

Error Number 7: The first IF signal was detected at pretune, but phase lock could not be acquired.

NO SPACE FOR NEW CAL. CLEAR REGISTERS

Error Number 70: You cannot store a calibration set due to insufficient memory. You can free more memory by clearing a saved instrument state from an internal register.

NOT ALLOWED DURING POWER METER CAL

Error Number 198 — When the analyzer is performing a power meter calibration, the HP-IB bus is unavailable for other functions such as printing or plotting.

NOT ENOUGH SPACE ON DISK FOR STORE

Error Number 44 — The store operation will overflow the available disk space. Insert a new disk.

NO VALID MEMORY TRACE

Error Number 54 — If you are going to display or otherwise use a memory trace, you must first store a data trace to memory.

NO VALID STATE IN REGISTER

Error Number 55 — You have requested the analyzer, over HP-IB (or by sequencing), to load an instrument state from an *empty* internal register.

ONLY LETTERS AND NUMBERS ARE ALLOWED

Error Number 43 — You can only use alpha-numeric characters (and underscores) in disk file titles or internal save register titles. Other symbols are not allowed, except for the "underscore" symbol.

OPTIONAL FUNCTION; NOT INSTALLED

Error Number 1	The function you requested requires a capability provided by an option that is not currently installed in the analyzer.

OVERLOAD ON INPUT A, POWER REDUCED

Error Number 58	See error number 57.

OVERLOAD ON INPUT B, POWER REDUCED

Error Number 59	See error number 57.

OVERLOAD ON INPUT R, POWER REDUCED

Error Number 57	You have exceeded approximately +3 dBm at one of the input ports. The RF output power is automatically turned off. Set to a lower power, and press POWER TRIP on OFF.

PARALLEL PORT NOT AVAILABLE FOR GPIO

Error Number 165	You have defined the parallel port as COPY for sequencing in the HP-IB menu. To access the parallel port for general purpose I/O (GPIO), set the selection to [GPIO].

PARALLEL PORT NOT AVAILABLE FOR COPY

Error Number 167

You have defined the parallel port as general purpose I/O (GPIO) for sequencing found under the [LOCAL] key. To access the parallel port for copy, set the selection to PARALLEL [COPY].

PHASE LOCK CAL FAILED

Error Number 4

A phase lock calibration was initiated and the first IF detected, but a problem prevented the calibration from completing successfully.

This message may appear if you connect a mixer between the RF output and R input before turning on frequency offset mode.

PHASE LOCK LOST

Error Number 8

Phase lock was acquired but then lost.

PLOT ABORTED

Error Number 27

When you press the [LOCAL] key, the analyzer aborts the plot in progress.

PLOTTER: not on, not connect, wrong addrs

Error Number 26

The plotter does not respond to control. Verify power, HP-IB connection, and address.

PLOTTER NOT READY-PINCH WHEELS UP

Error Number 28

The plotter pinch wheels clamp the paper in place.

POSSIBLE FALSE LOCK

Error Number 6

Phase lock has been achieved, but the source may be phase locked to the wrong harmonic of the synthesizer.

POWER UNLEVELED

Error Number 179	There is either a hardware failure in the source or you have attempted to set the power level too high.

POW MET INVALID

Error Number 116	The power meter indicates an out-of-range condition. Check the test setup.

POW MET NOT SETTLED

Error Number 118	Sequential power meter readings are not consistent. Verify that the equipment is set up correctly. If so, preset the instrument and restart the operation.

POW MET: not on, not connected, wrong addrs

Error Number 117	The power meter cannot be accessed by the analyzer. Verify that the power meter address and model number set in the analyzer match the address and model number of the actual power meter.

POWER SUPPLY HOT!

Error Number 21	The temperature sensors on the A8 post-regulator assembly have detected an over-temperature condition.

POWER SUPPLY SHUT DOWN!

Error Number 22: One or more supplies on the A8 post-regulator assembly have been shut down due to an over-current, over-voltage, or under-voltage condition.

`PRESS [MENU], SELECT CW (IF) FREQ, THEN SWEPT LO`

Error Number 161: When you are sweeping the RF and LO, the IF must be fixed.

`PRINT ABORTED`

Error Number 25: When you press the (LOCAL) key, the analyzer aborts output to the printer.

`print color not supported with EPSON`

Error Number 178: You have defined the printer type as EPSON-P2, which is not supported with this printer.

`PRINTER: busy`

Error Number 176: The parallel port printer is not accepting data.

`PRINTER: error`

Error Number 175: The parallel port printer is malfunctioning. The analyzer cannot complete the copy function.

PRINTER: not connected

Error Number 173 — There is no printer connected to the parallel port.

PRINTER: not handshaking

Error Number 177 — The printer at the parallel port is not responding.

PRINTER: not on line

Error Number 172 — The printer at the parallel port is not set on line.

PRINTER: not on, not connected, wrong addrs

Error Number 24 — The printer does not respond to control. Verify power, HP-IB connection, and address.

PRINTER: paper error

Error Number 171 — There is a paper-related problem with the parallel port printer such as a paper jam or out-of-paper condition.

PRINTER: power off

Error Number 174 — The power to the printer at the parallel port is off.

PRINT/PLOT IN PROGRESS, ABORT WITH LOCAL

Error Number 166 — A print or plot is in progress and you attempted a second print or plot.

PROBE POWER SHUT DOWN!

Error Number 23 — The analyzer biasing supplies to the HP 85024A external probe are shut down due to excessive current.

PROCESSING DISPLAY LIST

Information Message — The display information is being processed for a screen print to a copy device.

REQUESTED DATA NOT CURRENTLY AVAILABLE

Error Number 30 — The analyzer does not currently contain the data you have requested.

SAVE FAILED, INSUFFICIENT MEMORY

Error Number 151 — You cannot store an instrument state in an internal register due to insufficient memory. Increase the available memory by clearing one or more save/recall registers and pressing (PRESET), or by storing files to a disk.

SELECTED SEQUENCE IS EMPTY

Error Number 124 — The sequence you attempted to run does not contain instrument commands.

SELF TEST #n FAILED

Service Error Number 112 — Internal test #n has failed. The analyzer reports the first failure detected.

SEQUENCE ABORTED

Error Number 157 — The sequence running was stopped prematurely when you pressed the [LOCAL] key.

SEQUENCE MAY HAVE CHANGED, CAN'T CONTINUE

Error Number 153 — When you pause a sequence, you cannot continue it if you have modified it. You must start the sequence again.

SLIDES ABORTED (MEMORY REALLOCATION)

Error Number 73 — You cannot perform sliding load measurements due to insufficient memory. Reduce memory usage by clearing save/recall registers, then repeat the sliding load measurements.

SOURCE PARAMETERS CHANGED

Error Number 61

Some of the stimulus parameters of the instrument state have been changed, because you have turned correction on. The instrument state was updated to match the stimulus parameters of the calibration state. Or, you have turned on harmonic mode or frequency offset and the present frequency range cannot be used with one of these modes.

SOURCE POWER TRIPPED, RESET UNDER POWER MENU

Information Message

You have exceeded the maximum power level at one of the inputs and power has been automatically reduced. Reset the power and then toggle the POWER TRIP on OFF softkey.

STARTING COPY SPOOLER

Information Message

The analyzer is beginning to output data from the spool buffer to the copy device.

STOP/CW FREQ + OFFSET MUST BE < 3 GHz

Error Number 141

The output frequency of the mixer cannot violate the minimum/maximum frequency of the analyzer.

SWEEP MODE CHANGED TO CW TIME SWEEP

Error Number 187

If you select external source auto or manual instrument mode and you do not also select CW mode, the analyzer is automatically switched to CW.

SWEEP TIME INCREASED

Error Number 11: You have made instrument changes that cause the analyzer sweep time to be automatically increased. Some parameter changes that cause an increase in sweep time are narrower IF bandwidth, an increase in the number of points, and a change in sweep type.

SWEEP TIME TOO FAST

Error Number 12: The fractional-N and digital IF circuits have lost synchronization.

SWEEP TRIGGER SET TO HOLD

Information Message: The instrument is in a hold state and is no longer sweeping.

SWEEP TYPE CHANGED TO LINEAR SWEEP

Error Number 145: If you have the frequency list mode active when you change the instrument mode to harmonic measurements, and the list frequencies do not fall in the allowable frequency range of these modes, the list mode automatically is turned off.

SYNTAX ERROR

Error Number 33: You have improperly formatted an HP-IB command.

SYST CTRL OR PASS CTRL IN LOCAL MENU

Error Number 36: The analyzer is in talker/listener mode. In this mode, the analyzer cannot control a peripheral device on the bus. Use the local menu to change to system controller or pass control mode.

SYSTEM IS NOT IN REMOTE

Error Number 52: The analyzer is in local mode and will not respond to HP-IB commands.

TEST ABORTED

Error Number 113: You have prematurely stopped a service test.

THIS LIST FREQ INVALID IN HARM/3 GHZ RNG

Error Number 133: You have set frequencies in the list that are outside of the allowable frequency range for harmonic measurements, or are greater than 3 GHz on instruments without option 006. Reduce the frequency range of the list.

TOO MANY NESTED SEQUENCES. SEQ ABORTED

Error Number 164: You can only nest sequences to a maximum level of six. The sequence will abort if you nest more than six.

TOO MANY SEGMENTS OR POINTS

Error Number 50: You can have a maximum of 30 segments or 1632 points in frequency list mode. In power meter calibrations, you can have a maximum of 12 segments for power sensor cal factors and power loss functions.

TRANSFORM, GATE NOT ALLOWED

Error Number 16: You can perform a time domain transformation only in linear and CW sweep types.

TROUBLE! CHECK SETUP AND START OVER

Service Error Number 115: Your equipment setup for the adjustment procedure in progress is not correct.

WAITING FOR CLEAN SWEEP

Information Message: In single sweep mode, the instrument ensures that all changes to the instrument state, if any, have been implemented before taking the sweep.

WAITING FOR DISK

Information Message: This message is displayed between the start and finish of a read or write operation to a disk.

WAITING FOR HP-IB CONTROL

Information Message: You have instructed the analyzer to use pass control (USEPASC). If the message remains, the system controller is not relinquishing the bus.

WRITE ATTEMPTED WITHOUT SELECTING INPUT TYPE

Error Number 32

You have sent the data header "#A" to the analyzer with no preceding input command (such as INPUDATA). The instrument did not know what type of data to receive.

WRONG DISK FORMAT, INITIALIZE DISK

Error Number 77

You have attempted to store, load, or read file titles, but your disk format does not conform to the Logical Interchange Format (LIF).

11

Compatible Peripherals

Measurement Accessories Available

Calibration Kits

- HP 85031B 7-mm Calibration Kit
- HP 85032B 50-ohm Type-N Calibration Kit
- HP 85033D 3.5-mm Calibration Kit
- HP 85033C 3.5-mm Calibration Kit
- HP 85036B 75-ohm Type-N Calibration Kit
- HP 85039A 75-ohm Type-F Calibration Kit

Verification Kit

- HP 85029B 7 mm Verification Kit

Test Port Return Cables

- HP 11857D 7-mm Test Port Return Cable Set
- HP 11857B 75-ohm Type-N Test Port Return Cable Set

Adapter Kits

- HP 11852B 50 to 75-ohm Minimum Loss Pad
- HP 11853A 50-ohm Type-N Adapter Kit
- HP 11854A 50-ohm BNC Adapter Kit
- HP 11855A 75-ohm Type-N Adapter Kit
- HP 11856A 75-ohm BNC Adapter Kit

System Accessories Available

Plotters and Printers

- HP 7440A ColorPro Eight-Pen Color Graphics Plotter
- HP 7470A Two-Pen Graphics Plotter
- HP 7475A Six-Pen Graphics Plotter
- HP 7550A/B High-Speed Eight-Pen Graphics Plotter
- HP Deskjet 1200C (can also be used to plot)
- HP Deskjet 500
- HP C2170A, Deskjet 520
- HP Deskjet 500C
- HP Deskjet 540
- HP Deskjet 550C
- HP C2168A, Deskjet 560C
- All LaserJets (LaserJet III and IV can also be used to plot)
- HP C2621A DeskJet Portable InkJet
- PaintJet 3630A PaintJet Color Graphics Printer

HP-IB Cables

- HP 10833A HP-IB Cable, 1.0-m (3.3 ft.)
- HP 10833B HP-IB Cable, 2.0-m (6.6 ft.)
- HP 10833D HP-IB Cable, 0.5-m (1.6 ft.)

Interface Cables

- HP C2912B Centronics (Parallel) Interface Cable, 3.0 m (9.9 ft.)
- HP C2913A RS-232C Interface Cable, 1.2-m (3.9 ft.)
- HP C2914A Serial Interface Cable, 1.2-m (3.9 ft.)
- HP 24542G Serial Interface Cable, 3-m (9.9 ft.)
- HP 24542D Parallel Interface Cable, 2-m (6 ft.)
- HP 92284A Parallel Interface Cable, 2-m (6 ft.)

Keyboards

- HP C1405A Option ABA keyboard with the HP part number C1405-60015 adapter
- PC-AT-compatible keyboards with a standard DIN connector
- keyboards with a mini-DIN connector and the HP part number C1405-60015 adapter

External Monitor Requirements

- 60-Hz vertical refresh rate
- 25.5-kHz horizontal refresh rate
- RGB with synchronization on green
- 75-ohm video input impedance
- video amplitude 1 Vp-p (0.7 V = white, 0 V = black, −0.3 V = synchronization)

Connecting and Configuring Peripherals

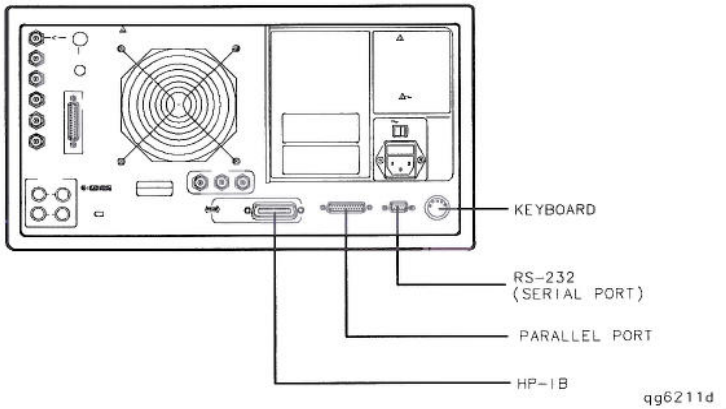


Figure 11-1. Printer Connections to the Analyzer

Configuring Peripherals with HP-IB Interface

- Press (LOCAL) SET ADDRESSES.

Table 11-1. Default Addresses for HP-IB Peripherals

Peripheral	Default HP-IB Address
Printer	01
Plotter	05
Power Meter	13
Disk Drive	00
Computer Controller	21

HP-IB Bus Structure

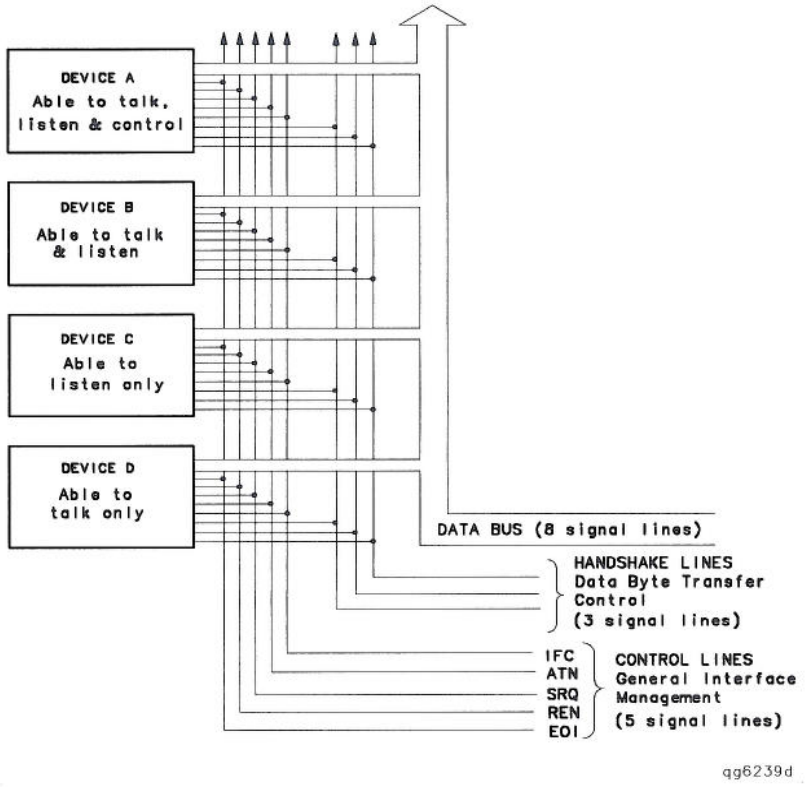


Figure 11-2. HP-IB Structure

HP-IB Requirements

Number of Interconnected Devices	15 maximum.
Interconnection Path/Maximum Cable Length	20 meters maximum or 2 meters per device whichever is less.
Message Transfer Scheme	Byte serial/bit parallel asynchronous data transfer using a 3-line handshake system.
Data Rate	Maximum of 1 megabyte per second over limited distances with tri-state drivers. Actual data rate depends on the transfer rate of the slowest device involved.
Address Capability	Primary addresses: 31 talk, 31 listen. A maximum of 1 talker and 14 listeners at one time.
Multiple Controller Capability	In systems with more than one controller (like the analyzer system), only one can be active at a time.

Analyzer HP-IB Capabilities

As defined by the IEEE 488.1 standard, the analyzer has the following capabilities:

SH1	Full source handshake capability.
AH1	Full acceptor handshake capability.
T6	Can be a basic talker, answers serial poll, unaddresses if MLA is issued.
TE0	No extended talker capabilities.
L4	Acts as a basic listener and unaddresses if MTA is issued.
SR1	Can issue service requests.
RL1	Will do remote, local, and local lockout.
PP0	Does not respond to parallel poll.
DC1	Device clear capability.
DT1	Will respond to device trigger in hold mode.
C1, C2, C3	No controller capabilities in talker/listener mode. System controller mode can be selected under the LOCAL menu.
C10	Pass control capability in pass control mode.
E2	Tri-state drivers.

12

Preset State and Memory Allocation

Types of Memory and Data Storage

Volatile Memory

This is dynamic read/write memory, of approximately 2 Mbytes, that contains all of the parameters that make up the *current* instrument state.

Volatile memory is cleared upon a power cycle of the instrument and, except as noted, upon instrument preset.

Non-Volatile Memory

This is CMOS read/write memory that is protected by a battery to provide storage of data when line power to the instrument is turned off.

Non-volatile memory consists of a block of user-allocated memory and a block of fixed memory.

Table 12-1.
Memory Requirements of Calibration and Memory Trace Arrays

Variable	Data Length (Bytes)	Approximate Totals (Bytes)			
		401 pts	801 pts	1601 pts	
		1 chan		1 chan	2 chans
Calibration Arrays					
Response	N x 6 + 52	2.5 k	5 k	10 k	19 k
Response and Isolation	N x 6 x 2 + 52	5 k	10 k	19 k	38 k
1-Port	N x 6 x 3 + 52	7 k	14 k	29 k	58 k
2-Port	N x 6 x 12 + 52	29 k	58 k	115 k	230 k
Interpolated Cal	Same as above in addition to regular cal				
Power Meter Cal*	(N† x 2 x number of channels‡) +208	1 k	1.8 k	3.4 k	6.6 k
Measurement Data					
Memory Trace Array*	N x 6 + 52	2.5 k	4.9 k	9.7 k	19 k
Instrument State#		3 k	3 k	3 k	3 k

N = number of points
* This variable is allocated once per active channel.
† The number of points that was set at the time the cal was turned on.
‡ If the channels are coupled, this number is always 1. If the channels are uncoupled, this number refers to the number of channels that have power meter cal on.
This value may change with different firmware revisions.

Conserving Memory

- two-port error correction
- interpolated error correction
- 1601 measurement points
- using time domain
- saving data arrays and graphics with the instrument state

Preset State

Table 12-2. Preset Conditions

Preset Conditions	Preset Value
Analyzer Mode	
Analyzer Mode	Network Analyzer Mode
Frequency Offset	Off
Operation	
Offset Value	0
Harmonic Operation	Off
Stimulus Conditions	
Sweep Type	Linear Frequency
Display Mode	Start/Stop
Trigger Type	Continuous
External Trigger	Off
Sweep Time	100 ms, Auto Mode
Start Frequency	30 kHz
Frequency Span (std.)	2999.97 MHz
Frequency Span (Opt. 006)	5999.97 MHz
Start Time	0
Time Span	100 ms
CW Frequency	1000 MHz
Source Power	0 dBm
Power Slope	0 dB/GHz; Off

Preset Conditions	Preset Value
Start Power	−15.0 dBm
Power Span	25 dB
Coupled Power	On
Source Power	On
Coupled Channels	On
Coupled Port Power	On
Power Range	Auto; Range 0
Number of Points	201
Frequency List	
Frequency List	Empty
Edit Mode	Start/Stop
	Number of Points
Response Conditions	
Parameter	Channel 1: S11;
	Channel 2: S21
Conversion	Off
Format	Log Magnitude (all inputs)
Display	Data

Table 12-2. Preset Conditions (continued)

Preset Conditions	Preset Value
Color Selections	Same as before PRESET
Dual Channel	Off
Active Channel	Channel 1
Frequency Blank	Disabled
Split Display	On
Intensity	If set to > 15%, PRESET has no effect. If set to < 15% PRESET increases intensity to 15%.
Beeper: Done	On
Beeper: Warning	Off
D2/D1 to D2	Off
Title	Channel 1 = [hp] Channel 2 = Empty
IF Bandwidth	3000 Hz
IF Averaging Factor	16; Off
Smoothing Aperture	1% SPAN; Off
Phase Offset	0 Degrees
Electrical Delay	0 ns
Scale/Division	10 dB/Division
Calibration	
Correction	Off

Preset Conditions	Preset Value
Calibration Type	None
Calibration Kit	7 mm
System Z0	50 Ohms
Velocity Factor	1
Extensions	Off
Port 1	0 s
Port 2	0 s
Input A	0 s
Input B	0 s
Chop A and B	On
Power Meter Calibration	Off
Number of Readings	1
Power Loss Correction	Off
Sensor A/B	A
Interpolated Error Correction	Off
Markers (coupled)	
Markers 1, 2, 3, 4, 5	1 GHz; All Markers Off
Last Active Marker	1
Reference Marker	None
Marker Mode	Continuous
Display Markers	On
Delta Marker Mode	Off

Table 12-2. Preset Conditions (continued)

Preset Conditions	Preset Value
Coupling	On
Marker Search	Off
Marker Target Value	−3 dB
Marker Width Value	−3 dB; Off
Marker Tracking	Off
Marker Stimulus Offset	0 Hz
Marker Value Offset	0 dB
Marker Aux Offset (Phase)	0 Degrees
Marker Statistics	Off
Polar Marker	Lin Mkr
Smith Marker	R+jX Mkr
Limit Lines	
Limit Lines	Off
Limit Testing	Off
Limit List	Empty
Edit Mode	Upper/Lower Limits
Stimulus Offset	0 Hz
Amplitude Offset	0 dB
Limit Type	Sloping Line
Beep Fail	Off

Preset Conditions	Preset Value
Time Domain	
Transform	Off
Transform Type	Bandpass
Start Transform	−20 nanoseconds
Transform Span	40 nanoseconds
Gating	Off
Gate Shape	Normal
Gate Start	−10 nanoseconds
Gate Span	20 nanoseconds
Demodulation	Off
Window	Normal
Use Memory	Off
System Parameters	
HP-IB Addresses	Last Active State
HP-IB Mode	Last Active State
Focus	Last Active State
Clock Time Stamp	On
Preset: Factory/User	Last Selected State
Copy Configuration	
Parallel Port	Last Active State
Plotter Type	Last Active State
Plotter Port	Last Active State

Table 12-2. Preset Conditions (continued)

Preset Conditions	Preset Value
Plotter Baud Rate	Last Active State
Plotter Handshake	Last Active State
HP-IB Address	Last Active State
Printer Type	Last Active State
Printer Port	Last Active State
Printer Baud Rate	Last Active State
Printer Handshake	Last Active State
Printer HP-IB Address	Last Active State
Disk Save Configuration (Define Store)	
Data Array	Off
Raw Data Array	Off
Formatted Data Array	Off
Graphics	Off
Data Only	Off
Directory Size	Default[1]
Save Using	Binary
Select Disk	Internal Memory
Disk Format	LIF

Preset Conditions	Preset Value
Sequencing[2]	
Loop Counter	0
TTL OUT	High
Service Modes	
HP-IB Diagnostic	Off
Source Phase Lock	Loop On
Sampler Correction	On
Spur Avoidance	On
Aux Input Resolution	Low
Analog Bus Node	11 (Aux Input)
Plot	
Plot Data	On
Plot Memory	On
Plot Graticule	On
Plot Text	On
Plot Marker	On
Autofeed	On
Plot Quadrant	Full Page
Scale Plot	Full
Plot Speed	Fast

1 The directory size is calculated as 0.013% of the floppy disk size (which is ≈256) or 0.005% of the hard disk size.

2 Pressing preset turns off sequencing modify (edit) mode and stops any running sequence.

Table 12-2. Preset Conditions (continued)

Preset Conditions	Preset Value
Pen Number:	
Ch1 Data	2
Ch2 Data	3
Ch1 Memory	5
Ch2 Memory	6
Ch1 Graticule	1
Ch2 Graticule	1
Ch1 Text	7
Ch2 Text	7
Ch1 Marker	7
Ch2 Marker	7
Line Type:	
Ch1 Data	7
Ch2 Data	7
Ch1 Memory	7
Ch2 Memory	7
Print	
Printer Mode	Last Active State
Auto-Feed	On
Printer Colors	
CH1 Data	Magenta
CH1 Mem	Green
CH2 Data	Blue
CH2 Mem	Red
Graticule	Cyan
Warning	Black
Text	Black

Table 12-2. Preset Conditions

Format Table	Scale	Reference	
		Position	Value
Log Magnitude (dB)	10.0	5.0	0.0
Phase (degree)	90.0	5.0	0.0
Group Delay (ns)	10.0	5.0	0.0
Smith Chart	1.00	–	1.0
Polar	1.00	–	1.0
Linear Magnitude	0.1	0.0	0.0
Real	0.2	5.0	0.0
Imaginary	0.2	5.0	0.0
SWR	1.00	0.0	1.0

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