Quick Reference Guide

HP 8752C Network Analyzer

HP Part No. 08752-90138
Printed in USA August 1994

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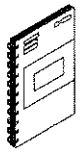
Quick Reference Guide Overview

- **Chapter 1**, "**HP 8752C Descriptions**" describes analyzer features and functions.
- **Chapter 2**, "**Making Measurements**" contains step-by-step procedures for making a basic measurement, and using the display and marker functions.
- **Chapter 3**, "**Printing, Plotting, or Saving Measurement Results**" contains procedures for saving to disk or the analyzer memory, and printing or plotting displayed measurements.
- **Chapter 4**, "**Optimizing Measurement Results**" describes some techniques and functions for achieving the best measurement results.
- **Chapter 5**, "**Application and Operation Concepts**" contains information about some of the applications and analyzer operation.
- **Chapter 6**, "**Specifications and Measurement Uncertainties**" contains information on the analyzer's dynamic range and 7 mm test port performance capabilities.
- **Chapter 7**, "**Menu Maps**" contains the menus related to all the front panel keys.
- **Chapter 8**, "**Key Definitions**" contains a cross reference that shows softkeys and the corresponding front panel key.
- **Chapter 9**, "**Error Messages**" contains a table of all the possible error messages.
- **Chapter 10**, "**Compatible Peripherals**" contains lists of equipment that is compatible with the analyzer. Some HP-IB information is also included.
- **Chapter 11**, "**Preset State and Memory Allocation**" contains information on the analyzer internal memory and the analyzer parameters that correspond to a preset state.

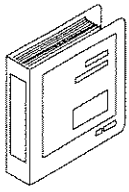
For additional information refer to:

- *HP 8752C Network Analyzer Installation and Quick Start Guide*
- *HP 8752C Network Analyzer User's Guide*
- *HP 8752C Network Analyzer Programmer's Guide*

HP 8752C Network Analyzer Documentation Set

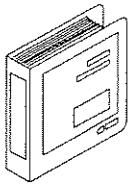


The **Installation and Quick Start Guide** familiarizes you with the HP 8752C network analyzer's front and rear panels, electrical and environmental operating requirements, as well as procedures for installing, configuring, and verifying the operation of the HP 8752C.

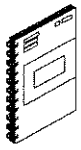


The **User's Guide** shows how to make measurements, explains commonly-used features, and tells you how to get the most performance from your analyzer.

The **Quick Reference Guide** provides a summary of all available 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 8752C network analyzer.

1

HP 8752C Description and Options

Analyzer 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 to a compatible peripheral.
- Storage of instrument states, and any corresponding error-corrections, in analyzer internal memory for the following times, or on floppy disk indefinitely.

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

- 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 that simplify troubleshooting procedures.
- Performance improvement and flexibility through trace math, data averaging, trace smoothing, electrical delay, and accuracy enhancement.
- Accuracy enhancement (error-correction) methods that range from normalizing data to one-port vector error correction with up to 1601 measurement points. (Vector error-correction reduces the effects of system directivity, frequency response, source match, and crosstalk.)
- Reflection and transmission measurements in either 50 or 75 ohm impedance environments.

- Test system automation with the addition of a personal computer with an HP-IB card, or an HP 9000 series 200 or 300 computer. This allows all of the analyzer's measurement capabilities to be programmed over the Hewlett-Packard Interface Bus (HP-IB). (Refer to the "Compatible Peripherals" chapter or the *HP 8752C Network Analyzer Programming Guide*.)
- LIF/DOS disk format for saving states and measurement data to an external disk drive.
- Internal automation, using test sequencing to program analyzer measurements and control other devices without an external controller.
- TTL lines on the test set connector that can control four output bits (0, 1, 2, 3) and read one input bits through test sequencing.

Front Panel Features

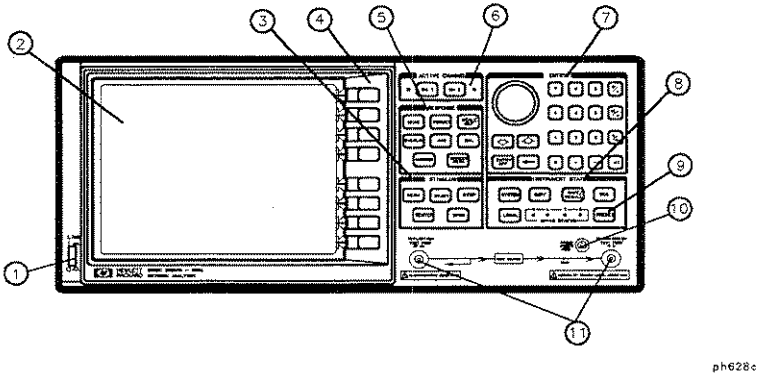


Figure 1-1. HP 8752C Front Panel

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

4. **Softkeys.** These keys provide access to menu selections that are shown on the display.

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.

   You can use the numeric keypad to select digits, decimal points, and a minus sign for numerical entries. You must also select a units terminator to complete value inputs.

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
   - test sequence function
   - 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. Refer to the "Preset State and Memory Allocation" chapter for a complete listing of the instrument preset condition.

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

11. **REFLECTION TEST PORT and TRANSMISSION TEST PORT.** The reflection test port outputs a signal from the source and receives input signals from a device, during a reflection measurement. The transmission port receives input signals from a device, during a transmission measurement.

Analyzer Display

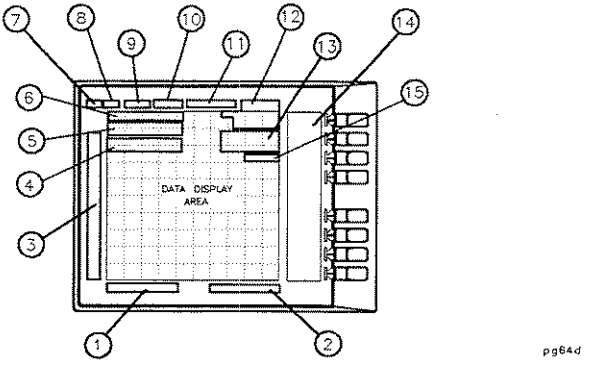


Figure 1-2. Analyzer Display (Single Channel, Cartesian Format)

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, as described under "FREQUENCY BLANK Key" in the "Key Definitions" chapter.

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 (See "AVG Key" in the "Key Definitions" chapter.)

   Cor = Error-correction is on. (For error-correction procedures, refer to the "Optimizing Measurement Results" chapter. For error correction theory, refer to the "Application and Operation Concepts" chapter.)

   C? = Stimulus parameters have changed from the error-corrected state, or interpolated error-correction is on. (For error-correction procedures, refer to the "Optimizing Measurement Results" chapter. For error-correction theory, refer to the "Application and Operation Concepts" chapter.)

   Del = Electrical delay has been added or subtracted, or port extensions are active. (See the "Application and Operation Concepts" chapter and "SCALE REF Key" in the "Key Definitions" chapter.)

   ext = Waiting for an external trigger.

   Gat = Gating is on (time domain option 010 only). (For time domain measurement procedures, refer to the "Making Measurements" chapter. For time domain theory, refer to the "Application and Operation Concepts" chapter.

Hld = Hold sweep. (See HOLD in the "Key Definitions" chapter.)

man = Waiting for manual trigger.

P? = Source power is unleveled at start or stop of sweep. (Refer to the *HP 8752C Network Analyzer Service Guide* for troubleshooting.)

P↓ = Source power has been automatically set to minimum, due to receiver overload. (See POWER in the "Key Definitions" chapter.)

PRm = Power range is in manual mode (option 004 only).

Smo = Trace smoothing is on. (See "AVG" in the "Key Definitions" chapter.)

↑ = 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 as described in the "Printing, Plotting, and Saving Measurement Results" chapter.

7. **Active Channel.** This is the number of the current active channel, selected with the CH 1 and CH 2 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 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. Refer to "Using Analyzer Display Markers" in the "Making Measurements" chapter.

13. **Marker Stats, Bandwidth.** These are statistical marker values that the analyzer calculates when you access the menus with the MKR FCTN key. (Refer to "Using Analyzer Display Markers" in the "Making Measurements" chapter.)

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

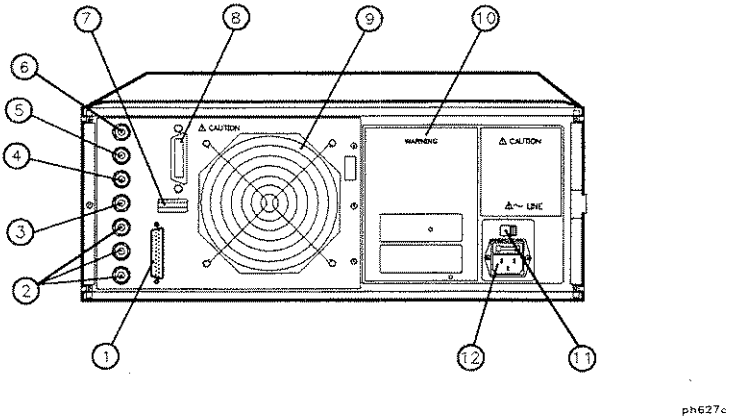


Figure 1-3. HP 8752C Rear Panel

1. **TEST SET INTERCONNECT.** The HP 8752 cannot be used with external test sets. However, with an adapter, you can use signal levels for sequencing. Refer to the "Application and Operation Concepts" chapter for information on applying the test set interconnect.

2. **EXTERNAL MONITOR: BLUE, GREEN, and RED.** Blue, green, and red video output connectors provide analog blue, green, and red video signals which you can use to drive an analog multi-sync 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, −0.3 V sync, sync on green.

3. **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. (Refer to the "Key Definitions" chapter.)

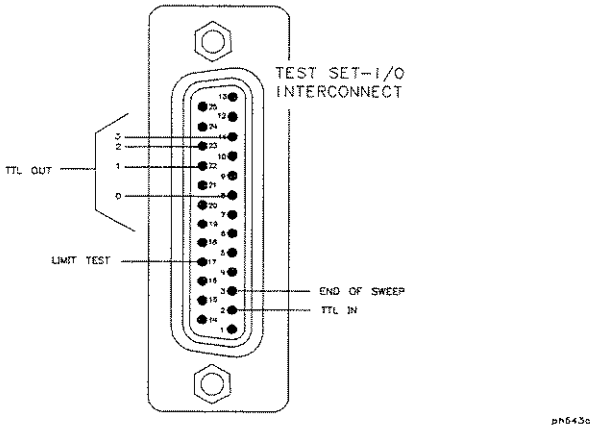


Figure 1-4. Test Set Interconnect Pin-Out

4. **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.

5. **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. (You can also use this connector as an analog output in service routines, as described in the service manual.)

6. **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.

   The analyzer automatically enables the external frequency reference feature when a signal is connected to this input. When the signal is removed, the analyzer automatically switches back to its internal frequency reference.

7. **Serial number plate.**

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

Peripherals" chapter in this document for HP-IB information, limitations, and configurations.

9. **Fan.** This fan provides forced-air cooling for the analyzer.

10. **Safety warnings.**

11. **Line voltage selector switch.** For more information refer to the *HP 8752C Network Analyzer Installation and Quick Start Guide*.

12. **Power cord receptacle, with fuse.** For information on replacing the fuse, refer to the *HP 8752C Network Analyzer Installation and Quick Start Guide* or the *HP 8752C Network Analyzer Service Guide*.

Changes between the HP 8752A/B/C

Table 1-1.
Comparing the HP 8752 Family of Network Analyzers

Feature	HP 8752A	HP 8752B	HP 8752C
Test port power range (dBm)			
standard	−20 to +5	−20 to +5	−20 to +5
option 004			−85 to +10
Auto/manual power range selecting	No	No	Yes
Extended frequency range to 6 GHz (option 006)	No	No	Yes
75Ω system impedance (option 075)	No	Yes	Yes
Test sequencing subroutines	No	No	Yes
Non-volatile memory	16 kbytes	16 kbytes	512 kbytes
Faster processor clock rate	No	No	Yes
Non-volatile memory			
Correction data in non-volatile memory	No	No	Yes
Maximum number of internal registers	5	5	32
User-defined preset	No	No	Yes
Formats for external disk	LIF	LIF	LIF or DOS

2

Making Measurements

Table 2-1. Connector Care Quick Reference

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

2 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.

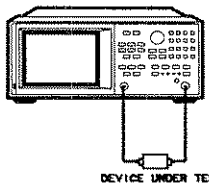


Figure 2-1. Basic Measurement Setup

Step 2. Choose the measurement parameters.

2. Press (PRESET)

   If the preset is set to "user 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)

Note You could also press the (START) and (STOP) keys and enter the frequency range limits as start frequency and stop frequency values.

Setting the Source Power

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

   (MENU) POWER (-5) (x1)

Note If your analyzer has option 004 installed, you could also press POWER RANGE MAN POWER RANGES and select one of the power ranges, keeping the power setting within the defined range.

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) TRANSMISSN

8. To view the data trace, press:

   (SCALE REF) AUTO SCALE

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 additional error-correction in the analyzer internal memory, press:

    (SAVE/RECALL) 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:

    MRK 134 M/μ

Step 5. Output the measurement results.

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

    COPY PRINT (or PLOT)

    Refer to the "Printing, Plotting, and Saving Measurement Results" for procedures on how to define a print, plot, or save. For information on configuring a peripheral, refer to the "Compatible Peripherals" chapter.

To View Both Measurement Channels

Press: DISPLAY DUAL CHAN ON SPLIT DISP

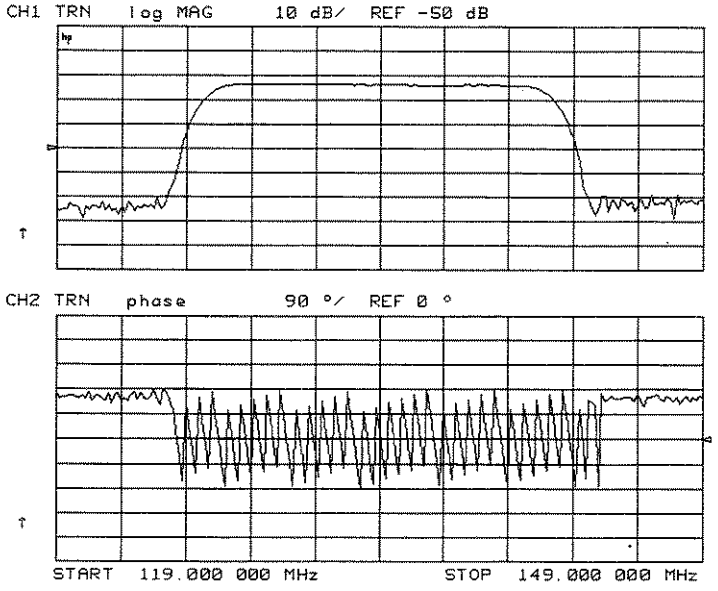


Figure 2-2. Example of Viewing Both Channels with a Split Display

Press:MORE SPLIT DISP OFF

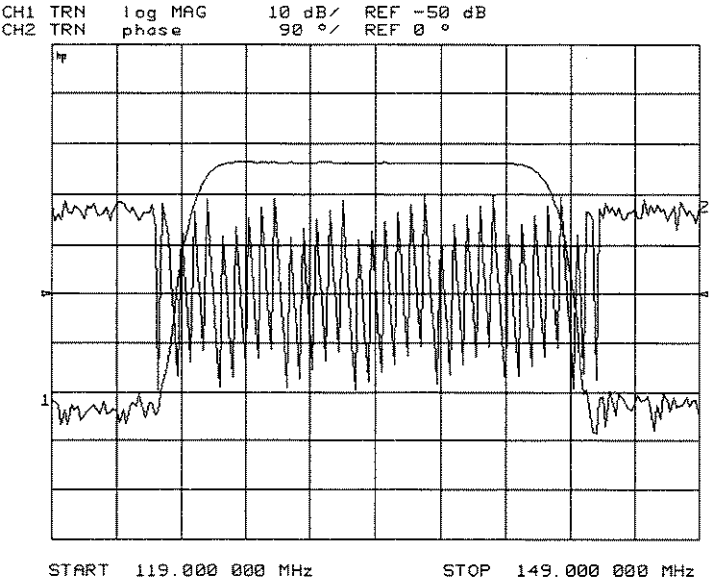


Figure 2-3.
Example of Viewing Both Channels with a Single Graticule

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, as described in "To Save a Data Trace to the Display 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

To Ratio Measurements in Channel 1 and 2

1. Press (CH 1) (MENU) NUMBER OF POINTS
2. Press (CH 2) (MENU) NUMBER OF POINTS and enter the same value that you observed for the channel 1 setting.
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.

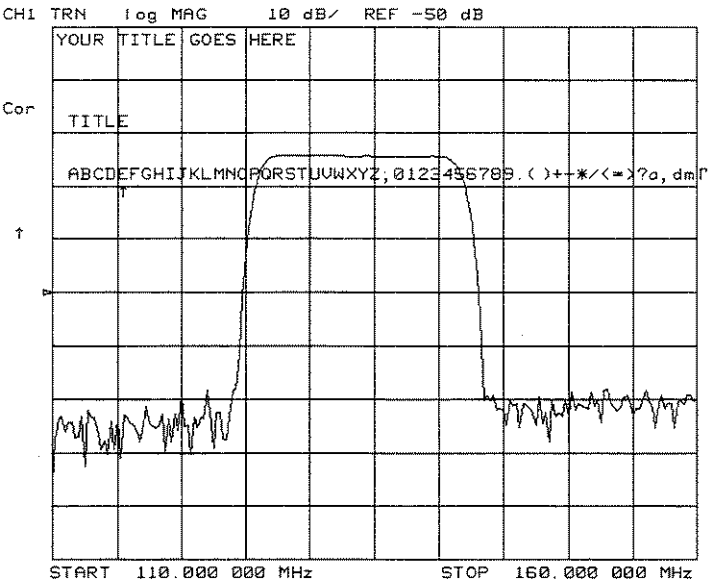


Figure 2-4. Example of a Display Title

To Activate Display Markers

Press: (MRK) MARKER 1

To switch on the corresponding marker and make it the active marker, press:

MARKER 2, MARKER 3, or MARKER 4

To switch off all of the markers, press:

all OFF

To Use Delta Markers

1. Press (MRK) 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:
3. Press MARKER 2 and move marker 2 to any position that you want to measure in reference to marker 1.

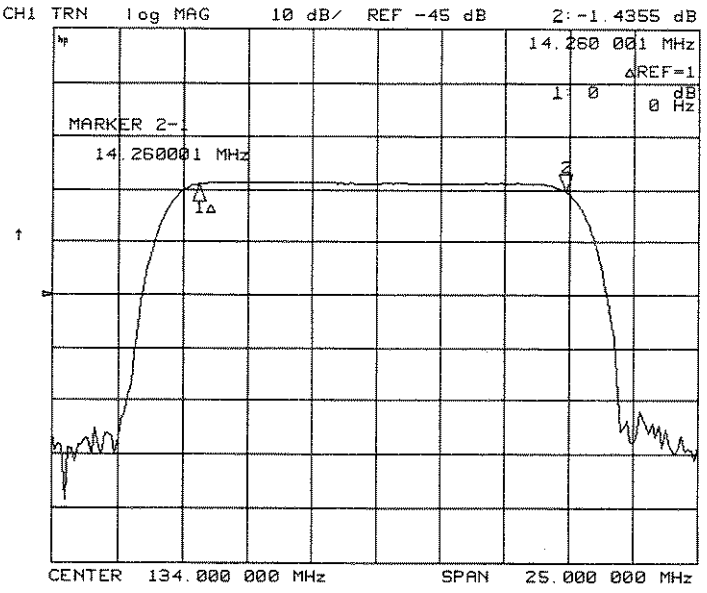


Figure 2-5. Marker 1 as the Reference Marker

To Couple and Uncouple Display Markers

1. Press (MRK) MARKER MODE MENU

   - Choose MARKERS: COUPLED if you want the analyzer to couple the marker stimulus values for the two display channels.
   - Choose MARKERS: UNCOUPLED if you want the analyzer to uncouple the marker stimulus values for the two display channels. This allows you to control the marker stimulus values independently for each channel.

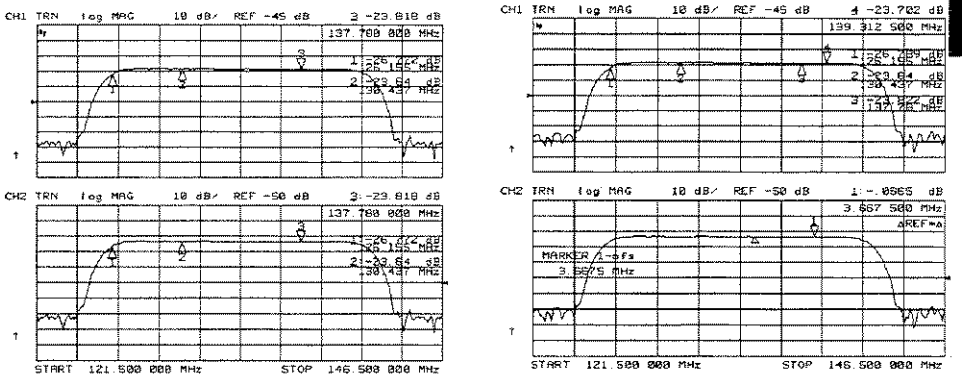


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Figure 2-6. Example of Coupled and Uncoupled Markers

Searching for the Maximum Amplitude

Press (MRK FCTN) MKR SEARCH

SEARCH: MAX

Searching for the Minimum Amplitude

Press (MRK FCTN) MKR SEARCH SEARCH: MIN

3

Printing, Plotting, and Saving Measurement Results

Printing or Plotting Your Measurement Results

Configuring a Print Function

1. Connect the printer to the interface port.
2. If the printer has a parallel interface, connect the HP-IB to parallel adapter to the end of the HP-IB cable. The adapter has the following part numbers:
   - HP ITEL-45CHVU: U.S. and Canada
   - HP ITEL-45CHVE: International

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

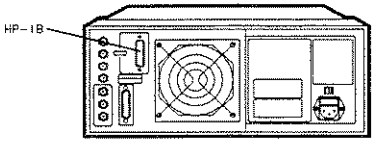

Figure 3-1. Printer Connections to the Analyzer

3. Press (LOCAL) and select one of the following:
   - Choose SYSTEM CONTROLLER if there is no external controller connected to the HP-IB bus.
   - Choose PASS CONTROL if there is an external controller is connected to the HP-IB bus.

4. Press SET ADDRESSES PRINTER PORT.
5. Press 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)
6. Press PRNTR PORT HP-IB and enter the HP-IB address of the printer, if the default address (01) is incorrect. Follow the address entry by pressing (x1).

Defining a Print Function

1. Press (COPY) DEFINE PRINT
2. Press PRINT
   - Choose PRINT: MONOCHROME if you are using a black and white printer, or you want just black and white from a color 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.

To Reset the Printing Parameters to Default Values

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

Table 3-1. 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

Configuring a Plot Function

1. Connect the peripheral to the interface port.
2. If the peripheral has a parallel interface, connect the HP-IB to parallel interface adapter to the end of the HP-IB cable. The adapter has the following part numbers:
   - HP ITEL-45CHVU: U.S. & Canada
   - HP ITEL-45CHVE: international

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

3. Press (LOCAL) and select one of the following:
   - Choose SYSTEM CONTROLLER if there is no external controller connected to the HP-IB bus.
   - Choose PASS CONTROL if there is an external controller connected to the HP-IB bus.

If You are Plotting to an HPGL/2 Compatible Printer

1. Press (LOCAL) SET ADDRESSES PRINTER PORT.
2. 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. Press PRINTER ADDRESS and enter the HP-IB address, if the default address (01) is incorrect. Follow the entry by pressing (x1).
4. Press PLTR TYPE until HPGL PRTI appears on the softkey label.

If You are Plotting to a Pen Plotter

1. Press (LOCAL) SET ADDRESSES PLOTTER PORT.
2. Press PLTR TYPE until [PLOTTER] appears on the softkey label.
3. Press PLTR PORT HP-IB and enter the HP-IB address, if the default address (05) is incorrect. Follow the entry by pressing (x1).

If You are Plotting to an External Disk Drive

1. Press (LOCAL) DISK UNIT NUMBER and enter the drive where your disk is located, followed by (x1).
2. If your storage disk is partitioned, press VOLUME NUMBER and enter the volume number where you want to store the instrument state file.
3. Press SET ADDRESSES ADDRESS: DISK.
4. Enter the HP-IB address of the disk drive, if the default address (00) is incorrect. Follow the entry by pressing (x1).
5. Press PLOTTER PORT DISK.

Defining a Plot Function

1. Press (COPY) DEFINE PLOT
2. Choose display elements:
   - Choose PLOT DATA ON if you want the measurement data trace to appear on your plot.
   - Choose PLOT MEM ON if you want the displayed memory trace to appear on your plot.
   - Choose PLOT GRAT ON if you want the graticule and the reference line to appear on your plot.
   - Choose PLOT TEXT ON if you want all of the displayed text to appear on your plot. (This does not include the marker values or softkey labels.)

- Choose PLOT MKR ON if you want the displayed markers, and marker values, to appear on your plot.

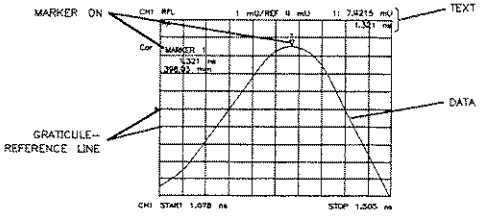

Figure 3-2. Plot Components Available through Definition

3. Press AUTO-FEED until the correct choice is high-lighted:
   - 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.

   Press (x1) after each modification.

Table 3-2.
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 3-3. 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

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.
   - Select LINE TYPE MEMORY to modify the line type for the memory trace.

Table 3-4. 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

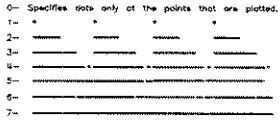

Figure 3-3. Line Types Available

6. Press SCALE PLOT until the selection appears that you want.
   - Choose SCALE PLOT [FULL] if you want the normal scale selection for plotting.
   - 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.

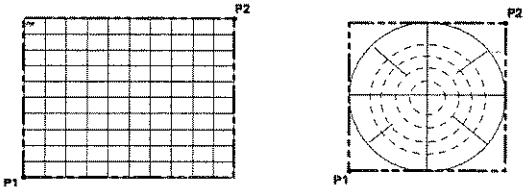

Figure 3-4.

7. Press PLOT SPEED until the plot speed appears that you want.
   - Choose PLOT SPEED [FAST] for normal plotting.
   - Choose PLOT SPEED [SLOW] for plotting directly on transparencies: the slower speed provides a more consistent line width.

To Reset the Plotting Parameters to Default Values

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

Table 3-5. 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

Aborting a Print or Plot Process

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

3

Saving an Instrument State

Places Where You Can Save

- analyzer internal memory
- floppy disk using an external disk drive

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)
Temperature at 40 °C .... 1036 days (2.8 years)
Temperature at 25 °C ..... 10 years typical

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. Connect an external disk drive to the analyzer's HP-IB connector, and configure as follows:

   a. Press (LOCAL) DISK UNIT NUMBER and enter the drive where your disk is located, followed by (x1).

   b. If your storage disk is partitioned, press VOLUME NUMBER and enter the volume number where you want to store the instrument state file.

   c. Press SET ADDRESSES ADDRESS: DISK.

   d. Enter the HP-IB address of the peripheral, if the default address is incorrect (default = 00). Follow the entry by pressing (x1).

   e. Press (LOCAL) and select one of the following:

   - Choose SYSTEM CONTROLLER to allow the analyzer to control peripherals directly.
   - Choose TALKER/LISTENER to allow the computer controller to be involved in all peripheral access operations.
   - Choose PASS CONTROL to allow yourself to control the analyzer over HP-IB and also allows the analyzer to take or pass control.

2. Press (SAVE/RECALL) SELECT DISK and select one of the storage devices:

   - INTERNAL MEMORY
   - EXTERNAL DISK

3. Press RETURN SAVE STATE.

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 an external 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. However, you can save memory traces to internal memory. The analyzer internal memory can only store instrument states and memory traces.

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 the following arrays:

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 DATA0D1 to DATA9D1, for channel 1, or DATA0D2 to DATA9D2, for channel 2. However, these files are not instrument states and cannot be recalled.

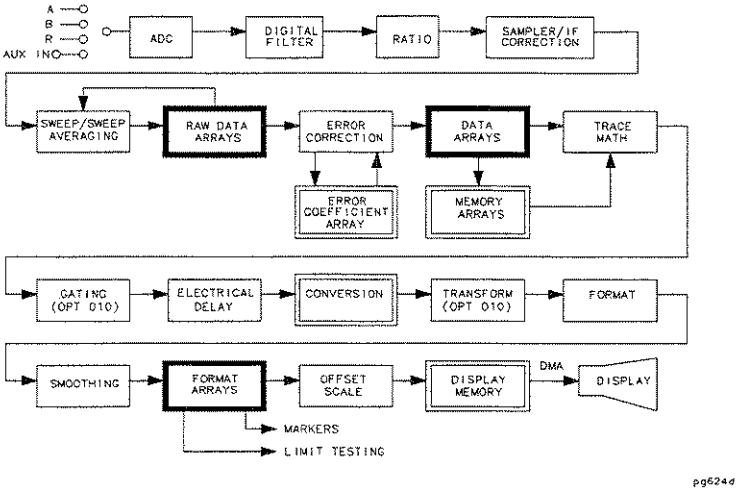

Figure 3-5. Data Processing Flow Diagram

1. If you want to title the displayed measurement, refer to "Titling the Displayed Measurement," located in the "Printing, Plotting, and Saving Measurement Results" in the *HP 8752C Network Analyzer User's Guide*.
2. Press (SAVE/RECALL) SELECT 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 or CAE applications.
   - Choose SAVE USING ASCII for CITIFILE 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
   - EXTERNAL DISK
3. Press the (⇩) repeatedly until the name of the file that you want to recall is high-lighted.
4. Press RETURN RECALL STATE.

4

Optimizing Measurement Results

Increasing Measurement Accuracy

Connector Repeatability

- inspect the connectors
- clean the connectors
- gauge the connectors
- use correct connection techniques (see Chapter 2, Table 2-1)

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

Temperature Drift

During an error-correction procedure, 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 standard devices unnecessarily during error-correction
- ensure the ambient temperature is ±1° of error-correction temperature

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).

You can activate a port extension by pressing (CAL) MORE PORT EXTENSIONS EXTENSIONS ON. Then enter the delay to the reference plane.

4

Table 4-1.
Differences between Port Extensions and Electrical Delay

	PORT EXTENSIONS	ELECTRICAL DELAY
Main Effect	The end of a cable becomes the test port plane.	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
Measurements Affected	All measurements.	Only the currently selected measurement.
Electrical Compensation	Intelligently compensates for 1 times or 2 times the cable's electrical delay, depending on which measurement type is computed.	Only compensates as necessary for the currently selected measurement type.

Measurement Error-Correction

Conditions Where Error-Correction is Suggested

- You are adapting to a different connector type or impedance.
- You are connecting a cable between the test device and an analyzer test port.
- You are connecting any attenuator or other such device on the input or output of the test device.

Table 4-2.
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[1]	Transmission of high insertion loss devices or reflection of high return loss devices. Not as accurate as 1-port correction for reflection measurements.	Frequency response plus isolation in transmission or directivity in reflection	Same as response plus isolation standard (load)
Reflection 1-port	Reflection of any one-port device or well terminated two-port device.	Directivity, source match, frequency response.	Short and open and load

1 This is the most accurate correction offered for transmission.

Calibration Standards

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

Clarifying Type-N Connector Sex

4 When you are performing error-correction for a system that has type-N test port connectors, the softkey menus label the sex of the test port connector - *not* the calibration standard connector. For example, the label SHORT (F) refers to the short that will be connected to the *female* test port.

Increasing Sweep Speed

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.

Set the Auto Sweep Time Mode

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

Widen the System Bandwidth

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

IF BW	Sweep Time (Seconds)[1]	
	Full Span	Narrow Sweep
3000 Hz	0.44	0.18
1000 Hz	0.5	0.33
300 Hz	0.95	0.76
100 Hz	2.24	2.07
30 Hz	7.75	7.14
10 Hz	21.93	21.52

1 The listed sweep times correspond to the analyzer being set to a preset state for the full span (300 kHz to 6 GHz), and 900 MHz to 1 GHz for the narrow span.

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).

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.

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.

View a Single Measurement Channel

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

Activate Chop Sweep Mode

- Press (CAL) MORE CHOP RFL/TRN.

Increasing Dynamic Range

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

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

To Activate Averaging

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

4

Change System Bandwidth

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

Reducing Receiver Crosstalk

Set the alternate sweep, press (CAL) MORE ALTERNATE REFL/TRN.

5

Application and Operation Concepts

How the HP 8752C 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

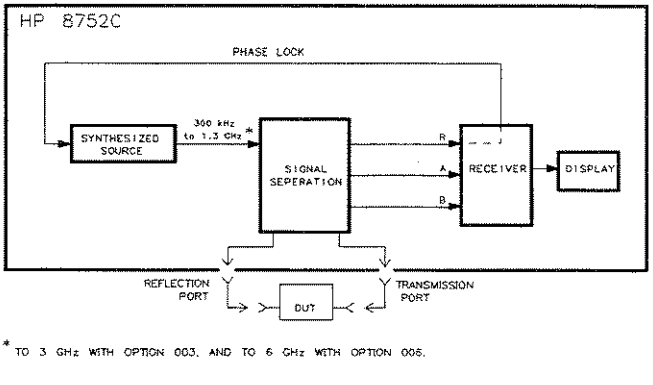

Figure 5-1. Simplified Block Diagram of the Network Analyzer System

The built-in synthesized source

Understanding the power ranges (option 004)

The built-in synthesized source contains a programmable step attenuator that allows you to directly and accurately set power levels in eight different power ranges. Each range has a total span of 25 dB. The eight ranges cover the instrument's full operating range from +10 dBm to −85 dBm (see Figure 5-2). A power range can be selected either manually or automatically.

Automatic mode

If you select PWR RANGE AUTO, you can enter any power level within the total operating range of the instrument and the source attenuator will automatically switch to the corresponding range.

5

Each range overlaps its adjacent ranges by 15 dB, therefore, certain power levels are designated to cause the attenuator to switch to the next range so that optimum (leveled) performance is maintained. These transition points exist at −10 dB from the top of a range and at +5 dB from the bottom of a range. This leaves 10 dB of operating range. By turning the RPG knob with TEST PORT POWER being the active function, you can hear the attenuator switch as these transitions occur (see Figure 5-2).

Manual mode

If you select PWR RANGE MAN, you must first manually select the power range that corresponds to the power level you want to use. This is accomplished by pressing the POWER RANGES softkey and then selecting one of the eight available ranges. In this mode, you will not be able to use the step keys, RPG, or keypad entry to select power levels outside the range limits. This feature is necessary to maintain accuracy once a measurement calibration is turned on.

When a calibration is completed and turned on, the power range selection is switched from auto to manual mode, and PRm appears on the display.

Note

A measurement calibration is valid *only* for the power level at which it was performed; but you can change the power within a range and still maintain nearly full accuracy.

If you decide to switch power ranges, the calibration is no longer valid and specified accuracy is forfeited. However, the analyzer leaves the correction *on* even though it's invalid.

The annotation C? will be displayed whenever you change the power after calibration.

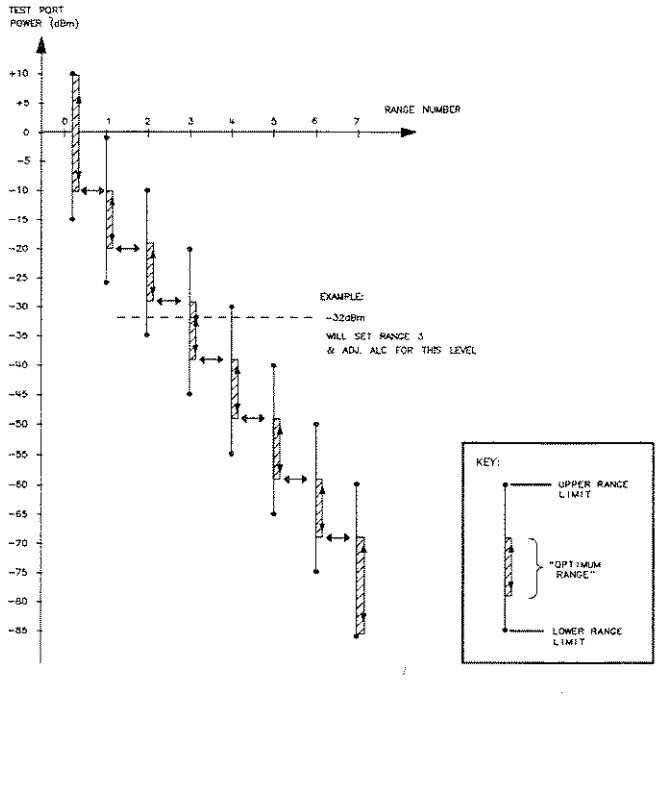

Figure 5-2. Power Range Transitions in the Automatic Mode

Channel coupling

CHAN POWER [COUPLED] toggles between coupled and uncoupled channel power. By uncoupling the channel powers, you effectively have two separate sources. With the channel power coupled, the power level is the same on each channel. With the channel power uncoupled, you can set different power levels for each channel. For the channel power to be uncoupled, the other channel stimulus functions must also be uncoupled (COUPLED CH on OFF).

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
- power slope
- IF bandwidth
- sweep time
- trigger type
- gating parameters
- sweep type

5

Minimum sweep time

The minimum sweep time is dependent on several factors.

- the number of points selected
- IF bandwidth
- sweep-to-sweep averaging in dual channel display mode
- smoothing
- limit test
- error correction
- trace math
- marker statistics
- time domain
- type of sweep

Table 5-1. Minimum Sweep Time (in seconds)

Number of Points	IF Bandwidth			
	3000 Hz	1000 Hz	300 Hz	10 Hz
11	0.0055 sec.	0.012 sec.	0.037 sec.	1.14 sec.
51	0.0255 sec.	0.060 sec.	0.172 sec.	5.30 sec.
101	0.0505 sec.	0.120 sec.	0.341 sec.	10.5 sec.
201	0.1005 sec.	0.239 sec.	0.679 sec.	20.9 sec.
401	0.2005 sec.	0.476 sec.	1.355 sec.	41.7 sec.
801	0.4005 sec.	0.951 sec.	2.701 sec.	83.3 sec.
1601	0.8005 sec.	1.901 sec.	5.411 sec.	166.5 sec.

Interpolated error correction

The interpolated error correction feature will function with the following sweep types:

- linear frequency
- power sweep
- CW time

Alternate and Chop Sweep Modes

CHOP REFL/TRN (the preset mode) measures both inputs A and B during each sweep.

ALTERNATE REFL/TRN measures only one input per frequency sweep, in order to reduce spurious signals. Thus, this mode optimizes the dynamic range for both reflection and transmission measurements.

To access the ALTERNATE REFL/TRN and CHOP REFL/TRN softkeys press (CAL) MORE.

What is Measurement Calibration?

Measurement calibration is an accuracy enhancement procedure that effectively removes 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.

5

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.

Limit lines and limit testing

Limits can be defined independently for the two channels, up to 18 segments for each channel.

Limit testing compares the measured data with the defined limits, and provides pass or fail information for each measured data point.

The limit test bit is output to the I/O test set interconnect on the rear panel of the instrument. The I/O control adapter (HP part number 08752-60020) gives you access to this line via a female SMB connector.

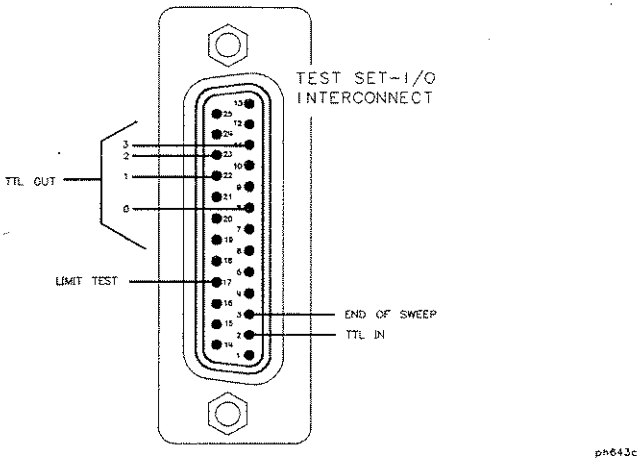

Figure 5-3. Pin Locations on IO Interconnect

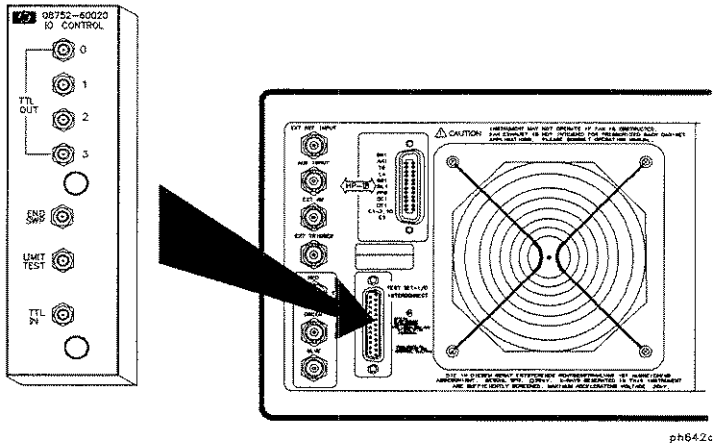

Figure 5-4. IO Control Adapter

5

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.

However, these modes have certain limitations that are defined in "Time domain low pass" of this section.

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 5-2.
Minimum Frequency Ranges for Time Domain Low Pass

Number of Points	Minimum Frequency Range
3	300 kHz to 0.90 MHz
11	300 kHz to 3.30 MHz
26	300 kHz to 7.80 MHz
51	300 kHz to 15.3 MHz
101	300 kHz to 30.3 MHz
201	300 kHz to 60.3 MHz
401	300 kHz to 120.3 MHz
801	300 kHz to 240.3 MHz
1601	300 kHz to 480.3 MHz

Time domain concepts

Masking

Masking occurs when a discontinuity (fault) closest to the reference plane affects the response of each subsequent discontinuity. This happens because the energy reflected from the first discontinuity never reaches subsequent discontinuities.

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 5-3).

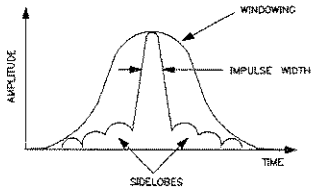

Figure 5-5. Impulse Width, Sidelobes, and Windowing

- **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 5-3).

To select a window, press (SYSTEM) TRANSFORM MENU WINDOW. A menu is presented that allows the selection of three window types (see Table 5-3).

5

Table 5-3.
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.

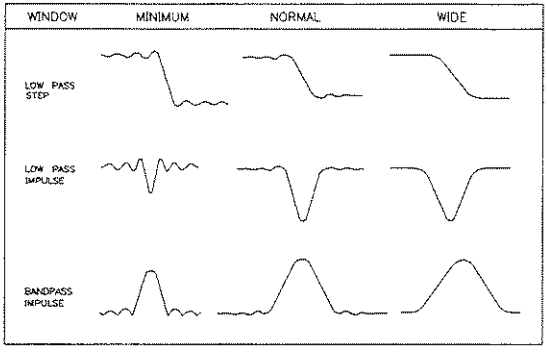

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Figure 5-6.
The Effects of Windowing on the Time Domain Responses of a Short Circuit

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.

Resolution

Response resolution. Time domain response resolution is defined as the ability to resolve two closely-spaced responses, or a measure of how close two responses can be to each other and still be distinguished from each other.

Range resolution. Time domain range resolution is defined as the ability to locate a single response in time.

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 5-7a shows the frequency response of an electrical airline and termination. Figure 5-7b shows the response in the time domain.

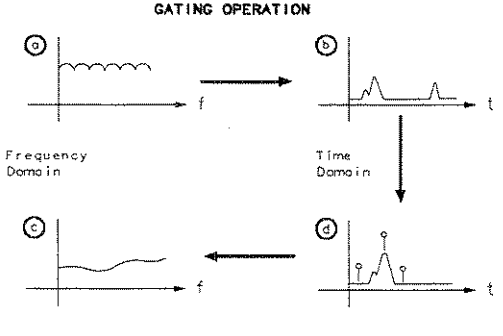


Figure 5-7.

Selecting gate shape. The four gate shapes available are listed in Table 5-4. Each gate has a different passband flatness, cutoff rate, and sidelobe levels.

Table 5-4. 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

What is Test Sequencing?

- Limited decision-making functions increase the versatility of the test sequences you create by allowing you to jump from one sequence to another.
- A GOSUB SEQUENCE function that allows you to call other sequences as sub-routines.
- You can create, title, save, and execute up to six sequences.
- You can save your sequences to a disk using an external disk drive.
- You can use the I/O interconnect to read a TTL input bit in a decision making function, and send four TTL output bits to control a peripheral.

Amplifier Testing

Amplifier parameters

The HP 8752C allows you to measure the transmission and reflection characteristics of many amplifiers and active devices.

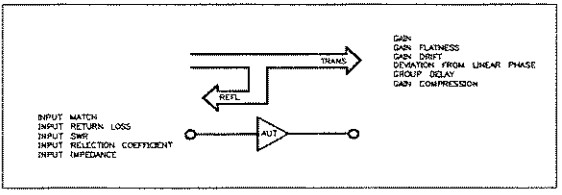


Figure 5-8. Amplifier Parameters

6

Specifications and Measurement Uncertainties

Dynamic Range

The specifications described in the table below apply to transmission measurements using 10 Hz IF BW and error-correction. Dynamic range is limited by the maximum test port power and the receiver's noise floor.

Table 6-1. HP 8752C Dynamic Range

Frequency Range	Dynamic Range
300 kHz to 1.3 GHz	110 dB*†
1.3 GHz to 3 GHz	110 dB†
3 GHz to 6 GHz	105 dB

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

† 105 dB, option 075

HP 8752C Network Analyzer Specifications

HP 8752C (50Ω) with Type-N Test Ports

The following specifications describe the system performance of the HP 8752C network analyzer. The system hardware includes the following:

Options: 006

Calibration kit: ..... HP 85032B

Cables: ..... HP part number 8120-4781 (included with HP 8752C)

Measurement Port Characteristics

The following tables describe the measurement port characteristics for both corrected and uncorrected HP 8752C network analyzers.

Table 6-2.
Measurement Port Characteristics (Corrected)* for 50 Ohm Type-N Test Ports

	Frequency Range		
	300 kHz to 1.3 GHz	1.3 GHz to 3 GHz	3 GHz to 6 GHz
Directivity	50 dB	47 dB	40 dB
Source match (Reflection)	42 dB	36 dB	31 dB
Reflection tracking	±0.009 dB	±0.019 dB	±0.070 dB
Source match (Transmission)	23 dB	20 dB	16 dB
Load match	23 dB†	20 dB	20 dB
Transmission tracking	±0.043 dB‡	±0.086 dB	±0.172 dB

* These characteristics apply for an environmental temperature of 25 ± 5 °C, with less than 1 °C deviation from the calibration temperature.

† 14 dB, 300 kHz to 10 MHz, for option 006

‡ 0.13 dB, 300 kHz to 10 MHz, option 006

Table 6-3.
Measurement Port Characteristics (Uncorrected)* for 50 Ohm Type-N Test Ports

	Frequency Range		
	300 kHz to 1.3 GHz	1.3 GHz to 3 GHz	3 GHz to 6 GHz
Directivity	40 dB†	35 dB	30 dB
Source match (Reflection)	30 dB	25 dB	20 dB
Reflection tracking	±0.2 dB	±0.3 dB	±0.4 dB
Source match (Transmission)	23 dB	20 dB	16 dB
Load match	23 dB‡	20 dB	20 dB
Transmission tracking	±0.2 dB	±0.3 dB	±0.4 dB
Crosstalk	100 dB	100 dB	90 dB

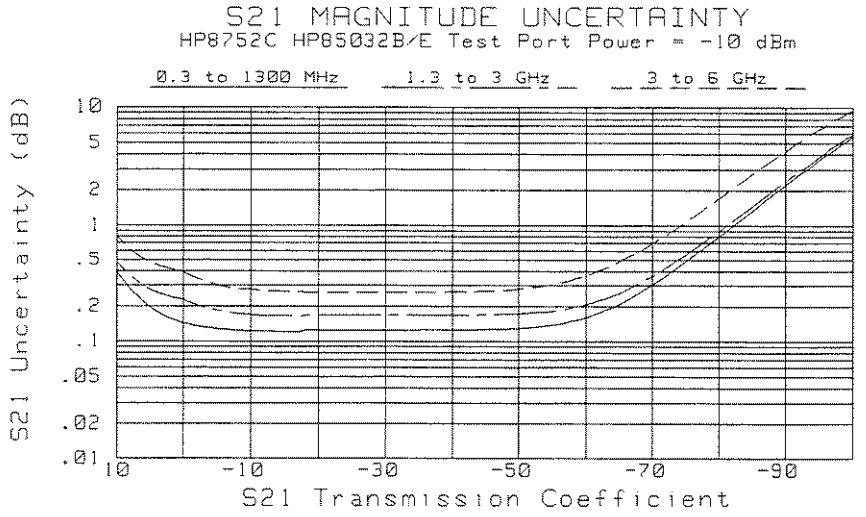
* Applies at 25 ±5 °C

† 30 dB, 300 kHz to 10 MHz

‡ 14 dB, 300 kHz to 10 MHz, for option 006

Transmission Measurement Uncertainties

The graphs shown for transmission measurements assume a well-matched device (S_{11}=S_{22}=0).



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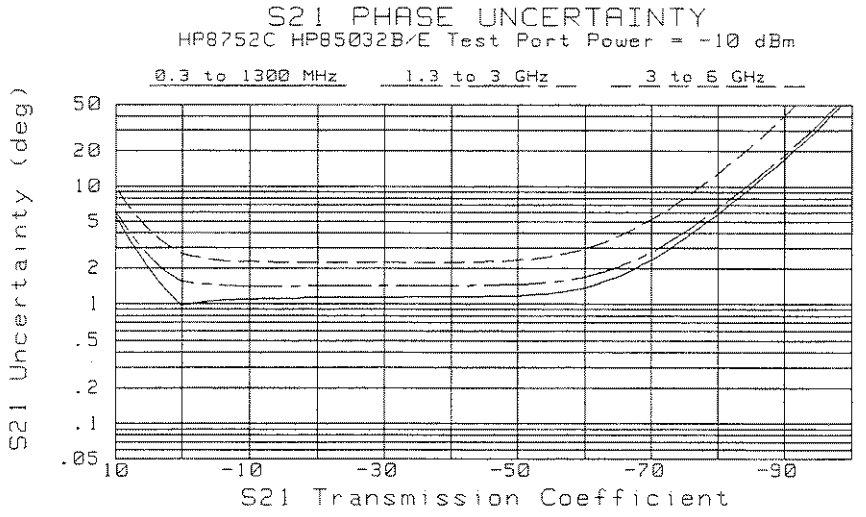
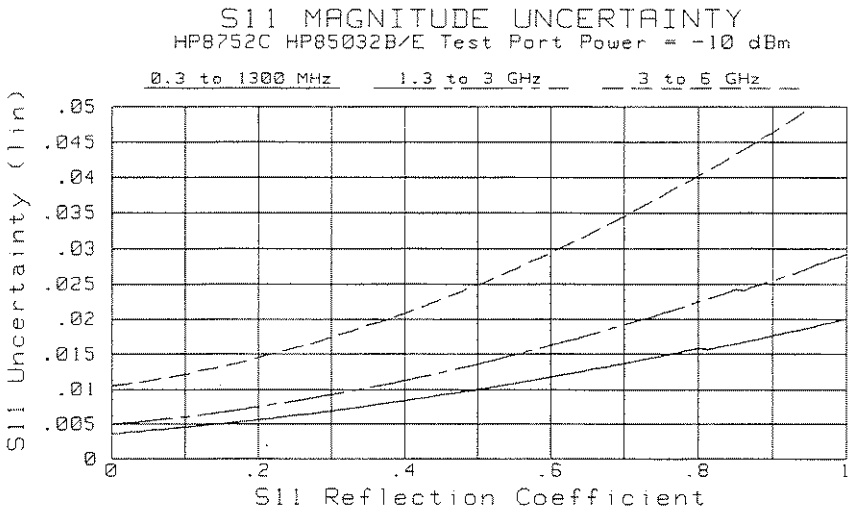
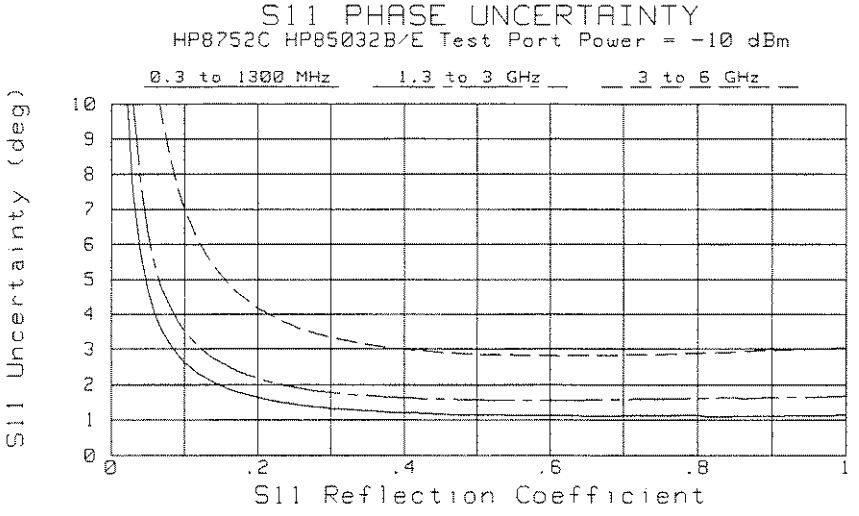


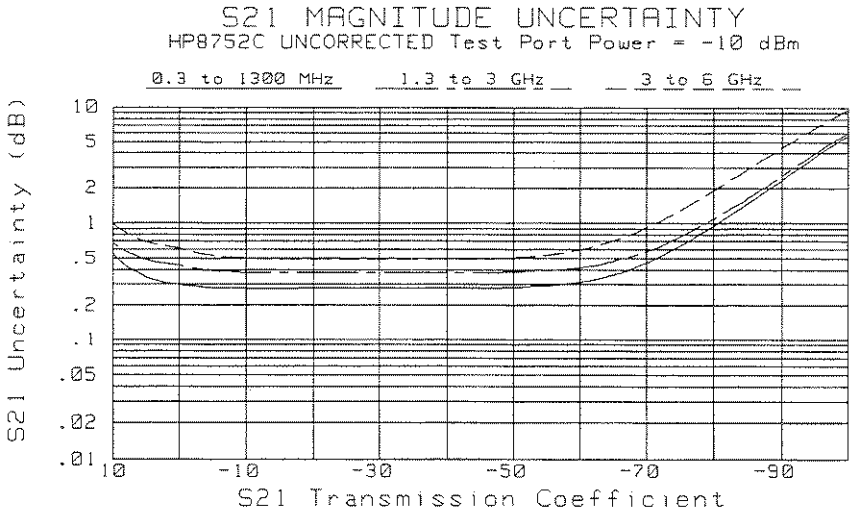
Reflection Measurement Uncertainties

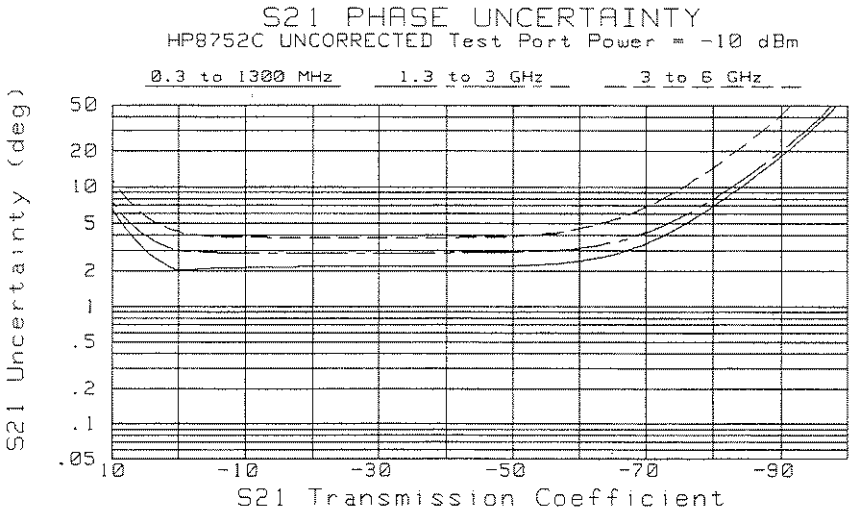




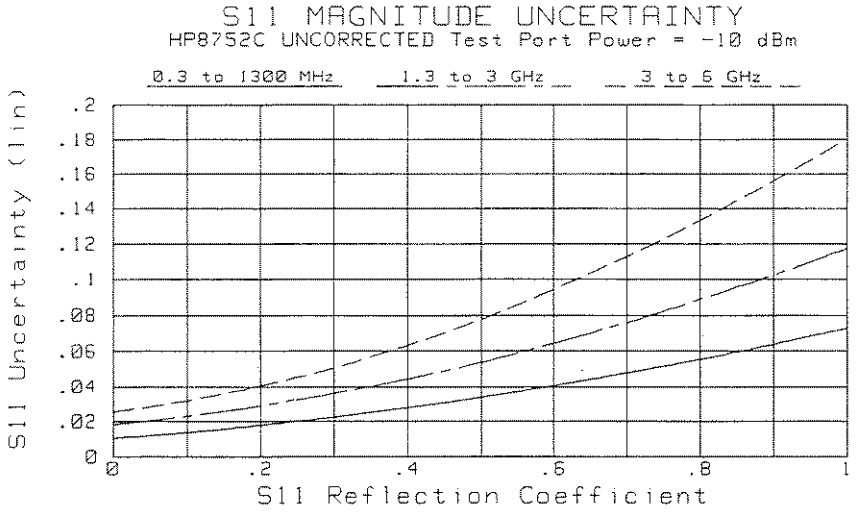
Transmission Measurement Uncertainties

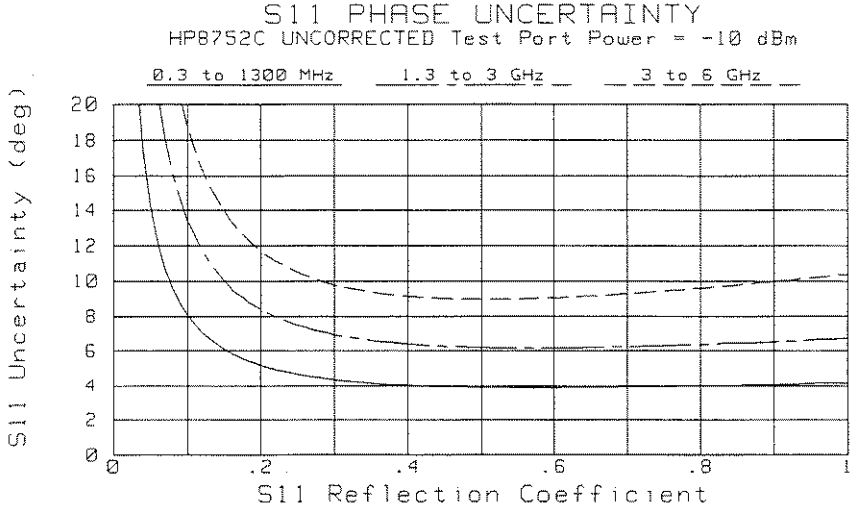
The graphs shown for transmission measurements assume a well-matched device (S_{11}=S_{22}=0).





Reflection Measurement Uncertainties





Front Panel Connectors

Connector Type ..... type-N

Impedance ..... 50 ohms (nominal)

..... 75 ohms (option 075)

Connector Center Pin Protrusion ..... 0.204 to 0.207 in.

Environmental Characteristics

Operating Conditions

Operating Temperature ..... 0 ° 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)

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Non-Operating Storage Conditions

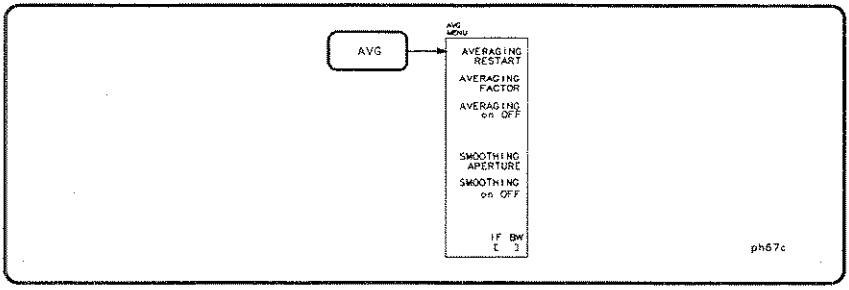
Temperature ..... −40 °C to +70 °C

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

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

7

Menu Maps



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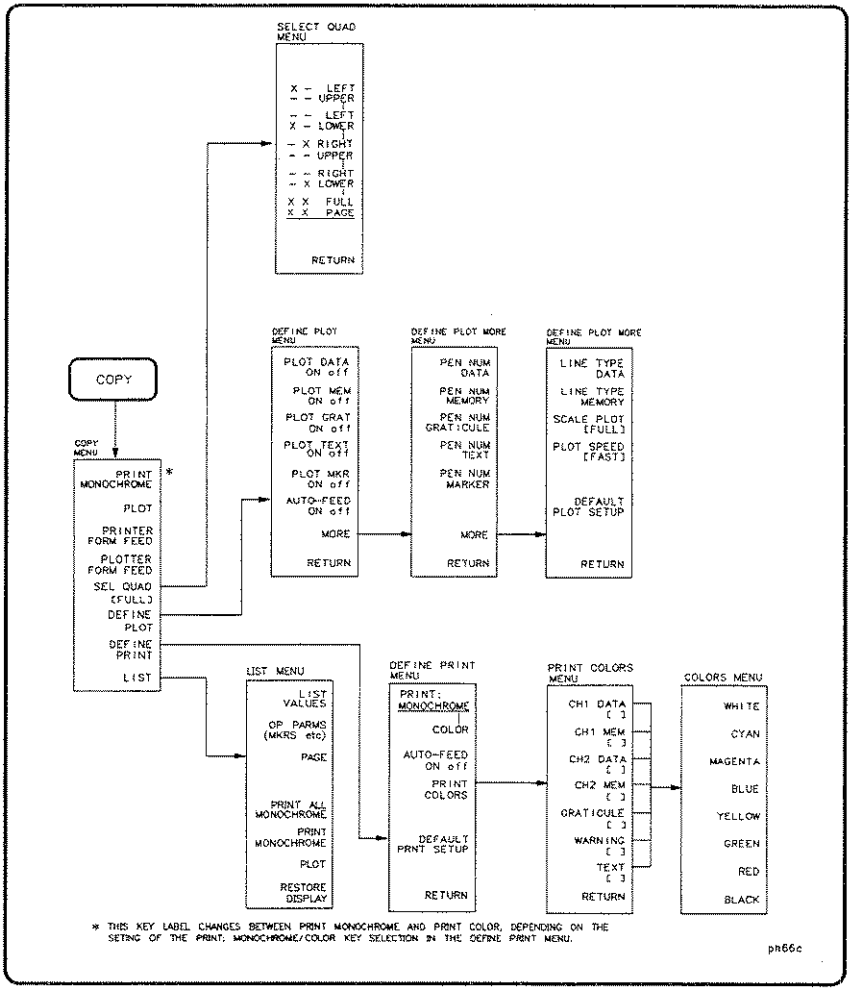

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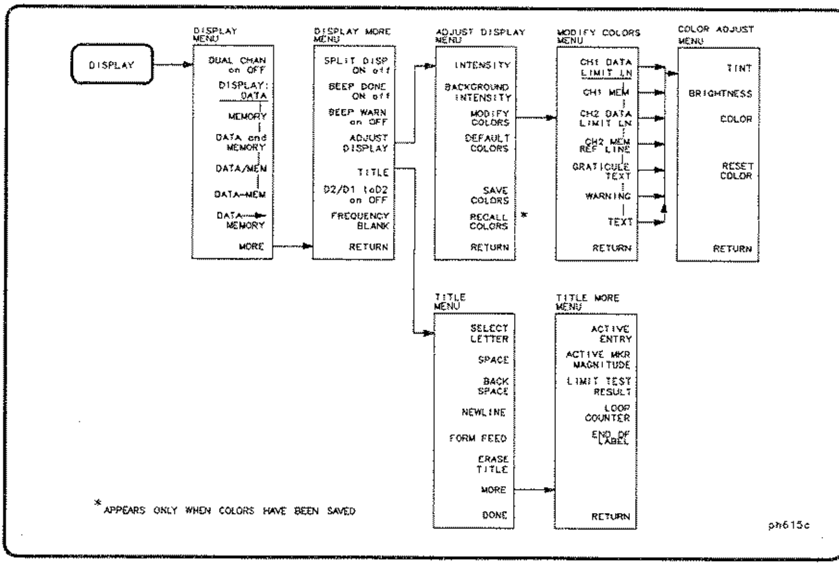

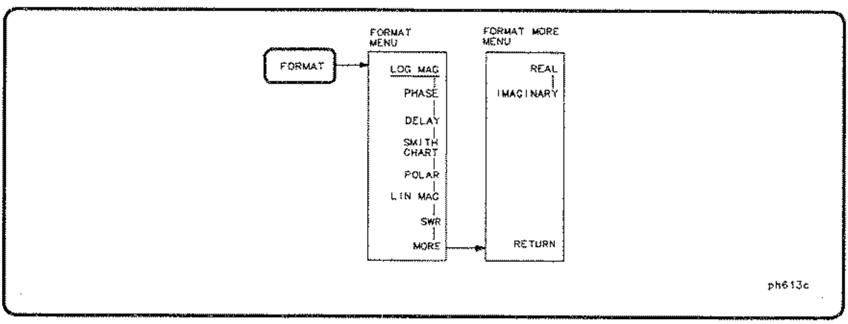

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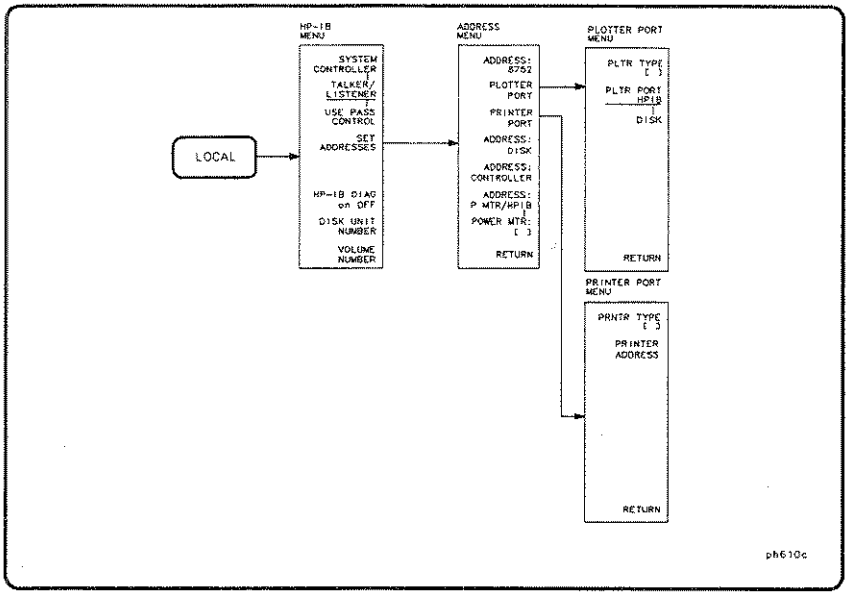

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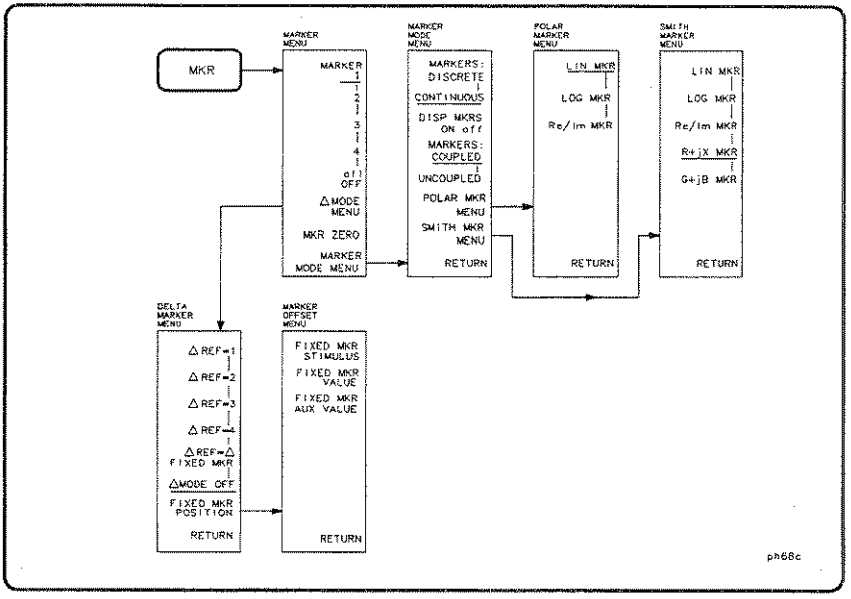

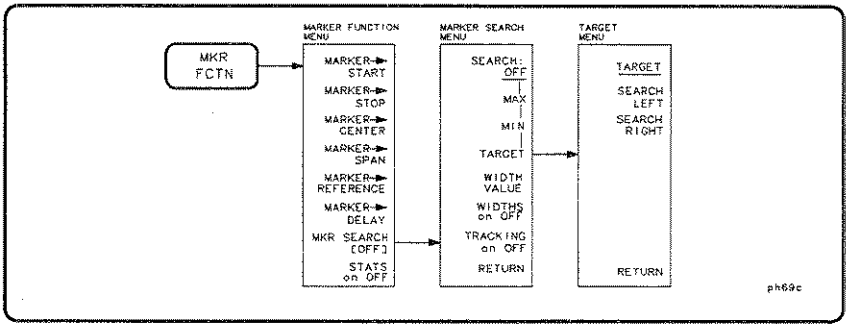

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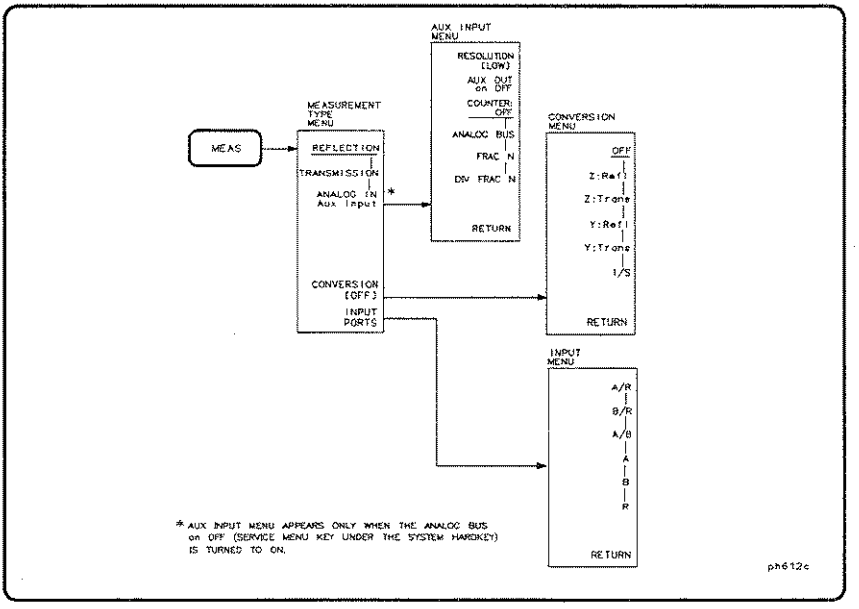

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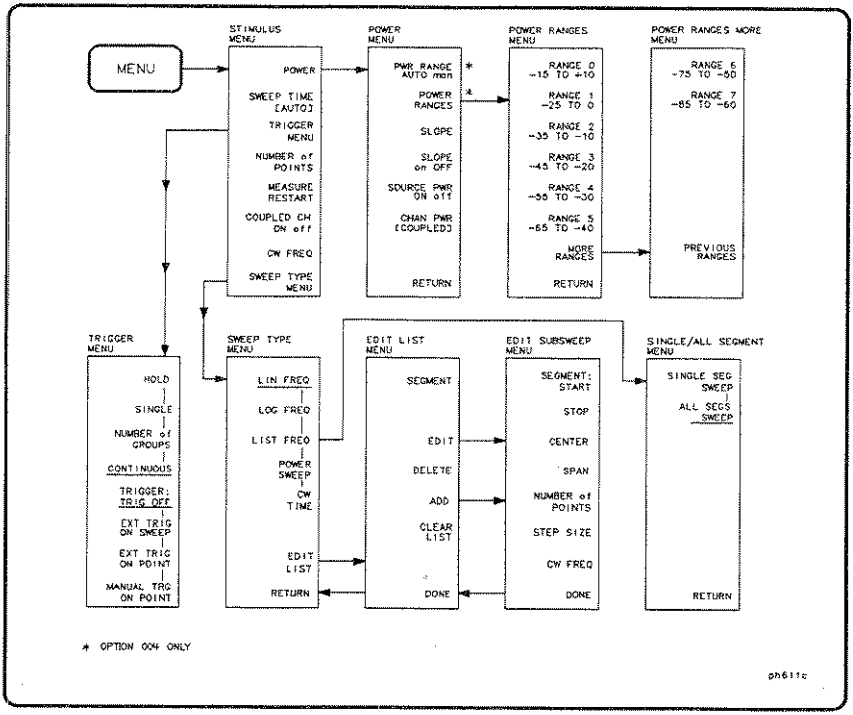

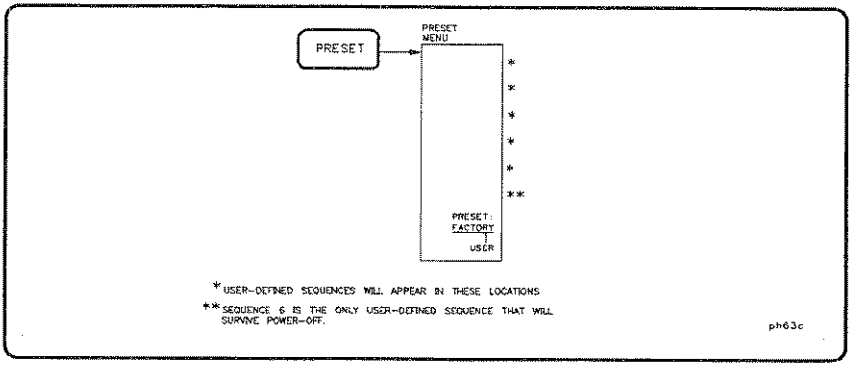

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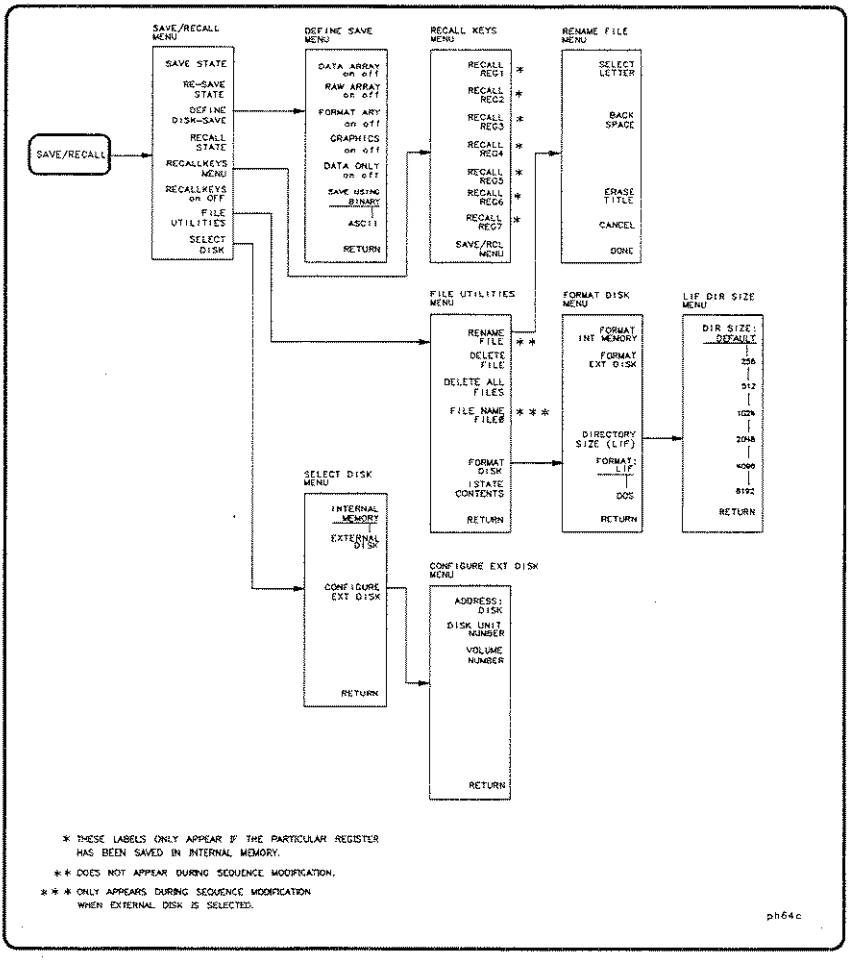

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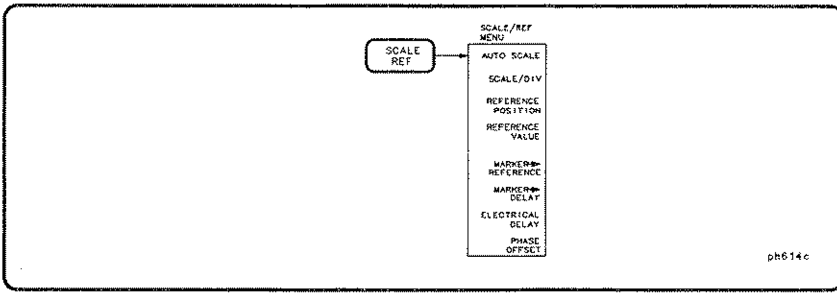

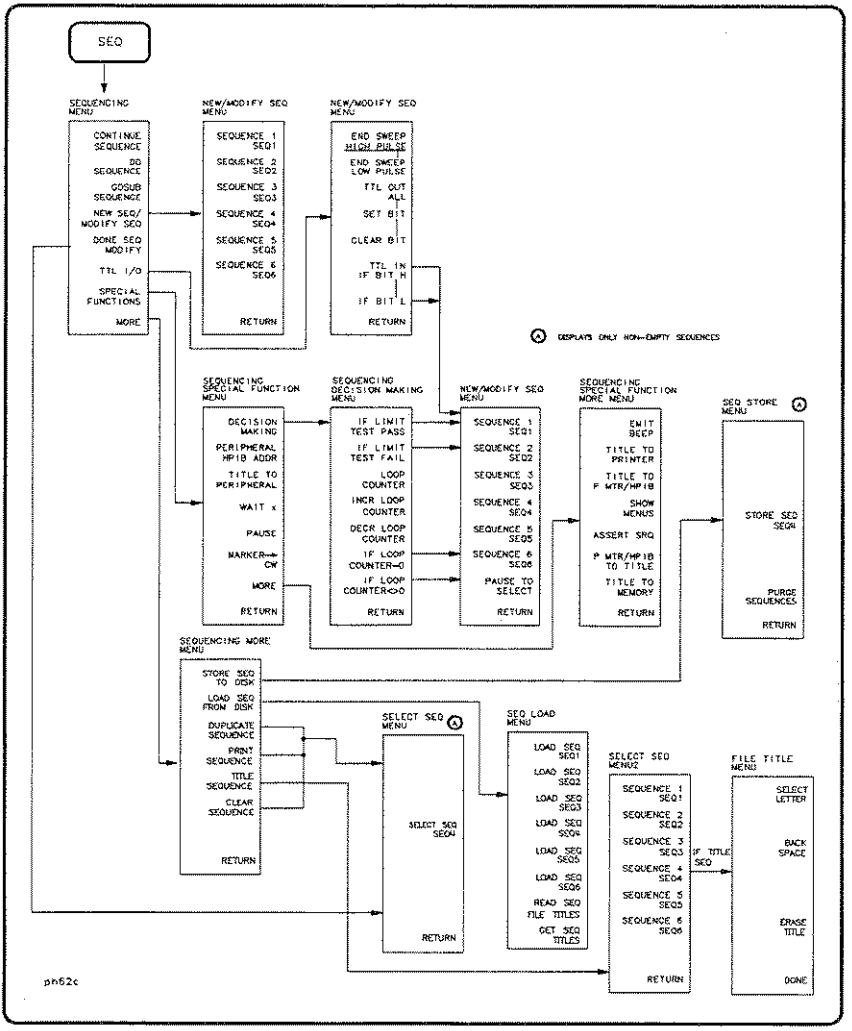

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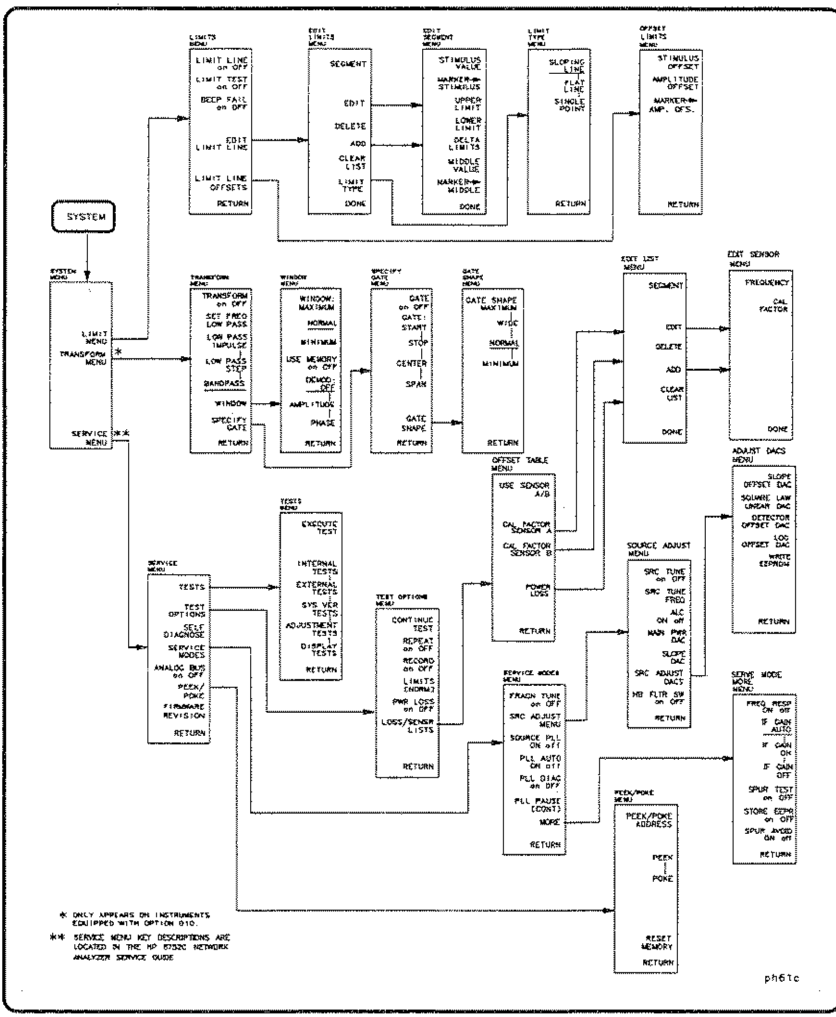

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8

Key Definitions

Softkey Locations

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

Table 8-1. Softkey Locations

Softkey	Front-Panel Access Key
Δ MODE MENU	MRK
Δ MODE OFF	MRK
Δ REF = 1	MRK
Δ REF = 2	MRK
Δ REF = 3	MRK
Δ REF = 4	MRK
Δ REF = Δ FIXED MKR	MRK
1/S	MEAS
A	MEAS
A/B	MEAS
A/R	MEAS
ACTIVE ENTRY	DISPLAY
ACTIVE MRK MAGNITUDE	DISPLAY
ADD	MENU
ADDRESS: 8752	LOCAL
ADDRESS: CONTROLLER	LOCAL
ADDRESS: DISK	LOCAL
ADDRESS: DISK	SAVE/RECALL
ADDRESS: P MTR/HPIB	LOCAL
ADJUST DISPLAY	DISPLAY
ALL SEGS SWEEP	MENU
ALTERNATE REFL/TRN	CAL
AMPLITUDE OFFSET	SYSTEM
ANALOG IN Aux Input	MEAS
ASCII	SAVE RECALL
ASSERT SRQ	SEQ

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Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
AUTO FEED on OFF	COPY
AUTO SCALE	SCALE REF
AUX OUT on OFF	MEAS
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
BRIGHTNESS	DISPLAY
C0	CAL
C1	CAL
C2	CAL
C3	CAL
CAL KIT [ ]	CAL
CAL KIT: 3.5mmC	CAL
CAL KIT: 3.5mmD	CAL
CAL KIT: 7mm	CAL
CAL KIT: N 50Ω	CAL
CAL KIT: N 75Ω	CAL
CAL KIT: USER KIT	CAL
CALIBRATE MENU	CAL

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
CALIBRATE: NONE	CAL
CENTER	MENU
CENTER	SYSTEM
CH1 DATA [ ]	COPY
CH1 DATA LIMIT LN	DISPLAY
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 RFL/TRN	CAL
CLEAR BIT	SEQ
CLEAR LIST	MENU
CLEAR SEQUENCE	SEQ
COAX	CAL
COLOR	DISPLAY
CONFIGURE EXT DISK	SAVE/RECALL
CONTINUE SEQUENCE	SEQ
CONTINUOUS	MENU
CONVERSION [ ]	MEAS
CORRECTION on OFF	CAL
COUNTER: ANALOG BUS	MEAS
COUNTER: DIV FRAC N	MEAS

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Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
COUNTER: FRAC N	MEAS
COUNTER: OFF	MEAS
COUPLED CH on OFF	MENU
CW FREQ	MENU
CW TIME	MENU
D2/D1 to D2 on OFF	DISPLAY
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
DELETE FILE	SAVE/RECALL
DELTA LIMITS	SYSTEM
DEMOD: AMPLITUDE	SYSTEM
DEMOD: OFF	SYSTEM

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
DEMOD: PHASE	SYSTEM
DIRECTORY SIZE (LIF)	SAVE RECALL
DISK UNIT NUMBER	LOCAL
DISK UNIT NUMBER	SAVE/RECALL
DISP MKRS ON off	MRK
DISPLAY: DATA	DISPLAY
DO SEQUENCE	SEQ
DONE 1-PORT CAL	CAL
DONE: OPENS	CAL
DONE: RESPONSE	CAL
DONE: SHORTS	CAL
DONE RESP ISOL'N CAL	CAL
DONE SEQ MODIFY	SEQ
DUAL CHAN on OFF	DISPLAY
DUPLICATE SEQUENCE	SEQ
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
ERASE TITLE	CAL
ERASE TITLE	DISPLAY
ERASE TITLE	SAVE RECALL
EXT TRIG ON POINT	MENU

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
EXT TRIG ON SWEEP	MENU
EXTENSION INPUT A	CAL
EXTENSION INPUT B	CAL
EXTENSION REFL PORT	CAL
EXTENSION TRANS PORT	CAL
EXTENSIONS on OFF	CAL
EXTERNAL DISK	SAVE/RECALL
FILE NAME FILE0	SAVE/RECALL
FIXED	CAL
FIXED MKR AUX VALUE	MRK
FIXED MKR POSITION	MRK
FIXED MKR STIMULUS	MRK
FIXED MKR VALUE	MRK
FLAT LINE	SYSTEM
FORM FEED	DISPLAY
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 MEMORY	SAVE/RECALL
FORWARD: LOAD	CAL
FORWARD: OPENS	CAL
FORWARD: SHORTS	CAL
FREQUENCY	CAL
FREQUENCY BLANK	DISPLAY

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
FULL PAGE	COPY
FWD MATCH	CAL
FWD TRANS	CAL
G+jB MKR	MRK
GATE: CENTER	SYSTEM
GATE: SPAN	SYSTEM
GATE: START	SYSTEM
GATE: STOP	SYSTEM
GATE on OFF	SYSTEM
GATE SHAPE	SYSTEM
GATE SHAPE MAXIMUM	SYSTEM
GATE SHAPE MINIMUM	SYSTEM
GATE SHAPE NORMAL	SYSTEM
GATE SHAPE WIDE	SYSTEM
GOSUB SEQUENCE	SEQ
GRAPHICS on OFF	SAVE RECALL
GRATICULE [ ]	COPY
GRATICULE TEXT	DISPLAY
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

8

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
INCR LOOP COUNTER	SEQ
INPUT PORTS	MEAS
INTENSITY	DISPLAY
INTERNAL MEMORY	SAVE/RECALL
INTERPOL on OFF	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
LIN MAG	FORMAT
LIN MKR	MRK
LINE TYPE DATA	COPY
LINE TYPE MEMORY	COPY
LIST	COPY

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
LIST FREQ	MENU
LOAD SEQ FROM DISK	SEQ
LOG FREQ	MENU
LOG MAG	FORMAT
LOG MKR	MRK
LOOP COUNTER	SEQ
LOOP COUNTER	DISPLAY
LOWER LIMIT	SYSTEM
LOW PASS IMPULSE	SYSTEM
LOW PASS STEP	SYSTEM
MANUAL TRG ON POINT	MENU
MARKER -> AMP. OFS.	SYSTEM
MARKER -> CENTER	MRK FCTN
MARKER -> CW	SEQ
MARKER -> DELAY	MRK FCTN
MARKER -> DELAY	SCALE REF
MARKER -> MIDDLE	SYSTEM
MARKER -> REFERENCE	MRK FCTN
MARKER -> REFERENCE	SCALE REF
MARKER -> SPAN	MRK FCTN
MARKER -> START	MRK FCTN
MARKER -> STIMULUS	SYSTEM
MARKER -> STOP	MRK FCTN
MARKER 1	MRK
MARKER 2	MRK
MARKER 3	MRK

8

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
MARKER 4	MRK
MARKER all OFF	MRK
MARKER MODE MENU	MRK
MARKERS: CONTINUOUS	MRK
MARKERS: COUPLED	MRK
MARKERS: DISCRETE	MRK
MARKERS: UNCOUPLED	MRK
MAXIMUM FREQUENCY	CAL
MEASURE RESTART	MENU
MEMORY	DISPLAY
MIDDLE VALUE	SYSTEM
MINIMUM FREQUENCY	CAL
MKR SEARCH [ ]	MRK FCTN
MKR ZERO	MRK
MODIFY [ ]	CAL
MODIFY COLORS	DISPLAY
NEW SEQ/MODIFY SEQ	SEQ
NEWLINE	DISPLAY
NORMAL	SYSTEM
NUMBER OF GROUPS	MENU
NUMBER OF POINTS	MENU
OFFSET DELAY	CAL
OFFSET LOSS	CAL
OFFSET Z0	CAL
OP PARMS (MKRS etc)	COPY
OPEN (F)	CAL

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
OPEN (M)	CAL
P MTR/HPIB TO TITLE	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
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
PLOT SPEED [ ]	COPY
PLOT TEXT ON off	COPY
PLOTTER FORM FEED	COPY
PLOTTER PORT	LOCAL
PLTR PORT: DISK	LOCAL
PLTR PORT: HPIB	LOCAL
PLTR TYPE [PLOTTER]	LOCAL
PLTR TYPE [HPGL PRT]	LOCAL
POLAR	FORMAT
POLAR MKR MENU	MRK

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Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
PORT EXTENSIONS	CAL
POWER	MENU
POWER MTR [436A]	LOCAL
POWER MTR [437B/438A]	LOCAL
POWER RANGES	MENU
POWER SWEEP	MENU
PRESET: FACTORY	PRESET
PRESET: USER	PRESET
PRINT: COLOR	COPY
PRINT: MONOCHROME	COPY
PRINT COLORS	COPY
PRINT MONOCHROME	COPY
PRINT SEQUENCE	SEQ
PRINTER ADDRESS	LOCAL
PRINTER FORM FEED	COPY
PRINTER PORT	LOCAL
PRNTR TYPE [ ]	LOCAL
PWR RANGE AUTO man	MENU
R	MEAS
R+jX MKR	MRK
RANGE 0 -15 TO +10	MENU
RANGE 1 -25 TO 0	MENU
RANGE 2 -35 TO -10	MENU
RANGE 3 -45 TO -20	MENU
RANGE 4 -55 TO -30	MENU
RANGE 5 -65 TO -40	MENU

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
RANGE 6 -75 TO -50	MENU
RANGE 7 -85 TO -60	MENU
RAW ARRAY on OFF	SAVE/RECALL
Re/Im MKR	MRK
REAL	FORMAT
RECALL KEYS on OFF	SAVE/RECALL
RECALL COLORS	DISPLAY
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
REFERENCE POSITION	SCALE REF
REFERENCE VALUE	SCALE REF
REFLECTION 1-PORT	CAL
RE-SAVE STATE	SAVE/RECALL
RESET COLOR	DISPLAY
RESOLUTION [ ]	MEAS
RESPONSE	CAL
RESPONSE & ISOL'N	CAL
RESTORE DISPLAY	COPY
RESUME CAL SEQUENCE	CAL
REV MATCH	CAL

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
REV TRANS	CAL
RIGHT LOWER	COPY
RIGHT UPPER	COPY
S11A RE FW MTCH	CAL
S11B LN FW MTCH	CAL
S11C LN FW TRAN	CAL
S22A RE RV MTCH	CAL
S22B LN RV MTCH	CAL
S22C LN RV TRAN	CAL
SAVE COLORS	DISPLAY
SAVE USER KIT	CAL
SAVE USING BINARY	SAVE/RECALL
SCALE/DIV	SCALE REF
SCALE PLOT [FULL]	COPY
SCALE PLOT [GRAT]	COPY
SEARCH LEFT	MRK FCTN
SEARCH RIGHT	MRK FCTN
SEARCH: MAX	MRK FCTN
SEARCH: MIN	MRK FCTN
SEARCH: OFF	MRK FCTN
SEGMENT	CAL
SEGMENT	SYSTEM
SEGMENT: CENTER	MENU
SEGMENT: SPAN	MENU
SEGMENT: START	MENU
SEGMENT: STOP	MENU

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Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
SEL QUAD [ ]	COPY
SELECT LETTER	DISPLAY
SEQUENCE 1 SEQ1	SEQ
SEQUENCE 2 SEQ2	SEQ
SEQUENCE 3 SEQ3	SEQ
SEQUENCE 4 SEQ4	SEQ
SEQUENCE 5 SEQ5	SEQ
SEQUENCE 6 SEQ6	SEQ
SET ADDRESSES	LOCAL
SET BIT	SEQ
SET FREQ LOW PASS	SYSTEM
SET Z0	CAL
SHORT (F)	CAL
SHORT (M)	CAL
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	MRK
SMOOTHING APERTURE	AVG
SMOOTHING on OFF	AVG
SOURCE PWR ON off	MENU

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Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
SPECIAL FUNCTIONS	SEQ
SPECIFY CLASS	CAL
SPECIFY GATE	SYSTEM
SPECIFY OFFSET	CAL
SPLIT DISP on OFF	DISPLAY
STATS on OFF	MRK FCTN
STD DONE (MODIFIED)	CAL
STD OFFSET DONE	CAL
STD TYPE: ARBITRARY IMPEDANCE	CAL
STD TYPE: DELAY/THRU	CAL
STD TYPE: LOAD	CAL
STD TYPE: OPEN	CAL
STD TYPE: SHORT	CAL
STEP SIZE	MENU
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
TALKER/LISTENER	LOCAL
TARGET	MRK FCTN
TERMINAL IMPEDANCE	CAL
TEXT	DISPLAY

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
TEXT [ ]	COPY
THRU	CAL
TINT	DISPLAY
TITLE	DISPLAY
TITLE SEQUENCE	SEQ
TITLE TO MEMORY	SEQ
TITLE TO P MTR/HPIB	SEQ
TITLE TO PERIPHERAL	SEQ
TITLE TO PRINTER	SEQ
TRACKING on OFF	MRK FCTN
TRANSFORM MENU	SYSTEM
TRANSFORM on OFF	SYSTEM
TRIGGER MENU	MENU
TRIGGER: TRIG OFF	MENU
TTL I/O	SEQ
TTL IN IF BIT H	SEQ
TTL IN IF BIT L	SEQ
TTL OUT ALL	SEQ
UPPER LIMIT	SYSTEM
USE MEMORY on OFF	SYSTEM
USE PASS CONTROL	LOCAL
VELOCITY FACTOR	CAL
VOLUME NUMBER	LOCAL
VOLUME NUMBER	SAVE/RECALL
WAIT x	SEQ
WARNING	DISPLAY

Table 8-1. Softkey Locations (continued)

Softkey	Front-Panel Access Key
WARNING [ ]	COPY
WAVEGUIDE	CAL
WIDTH VALUE	MRK FCTN
WIDTHS on OFF	MRK FCTN
WINDOW	SYSTEM
WINDOW: MAXIMUM	SYSTEM
WINDOW: MINIMUM	SYSTEM
WINDOW: NORMAL	SYSTEM
Y: Refl	MEAS
Y: Trans	MEAS
Z: Refl	MEAS
Z: Trans	MEAS

9

Error Messages

Error Messages in Numerical Order

Refer to the alphabetical listing for explanations and suggestions for solving the problems.

Error Number	Error
1	OPTIONAL FUNCTION; NOT INSTALLED
2	INVALID KEY
3	CORRECTION CONSTANTS NOT STORED
4	PHASE LOCK CAL FAILED
5	NO IF FOUND: CHECK R INPUT LEVEL
6	POSSIBLE FALSE LOCK
7	NO PHASE LOCK: CHECK R INPUT LEVEL
8	PHASE LOCK LOST
9	LIST TABLE EMPTY
10	CONTINUOUS SWITCHING NOT ALLOWED
11	SWEEP TIME INCREASED
12	SWEEP TIME TOO FAST
13	AVERAGING INVALID ON NON-RATIO MEASURE
14	FUNCTION NOT VALID
15	NO MARKER DELTA - SPAN NOT SET
16	TRANSFORM, GATE NOT ALLOWED
17	DEMODULATION NOT VALID
18	LOW PASS MODE NOT ALLOWED
21	POWER SUPPLY HOT!
22	POWER SUPPLY SHUT DOWN!
23	PROBE POWER SHUT DOWN!
24	PRINTER: not on, not connect, wrong addrs
25	PRINT ABORTED
26	PLOTTER: not on, not connect, wrong addrs
27	PLOT ABORTED
28	PLOTTER NOT READY-PINCH WHEELS UP
30	REQUESTED DATA NOT CURRENTLY AVAILABLE
31	ADDRESSED TO TALK WITH NOTHING TO SAY

Error Number	Error
32	WRITE ATTEMPTED WITHOUT SELECTING INPUT TYPE
33	SYNTAX ERROR
34	BLOCK INPUT ERROR
35	BLOCK INPUT LENGTH ERROR
36	SYST CTRL OR PASS CTRL IN LOCAL MENU
37	CAN'T CHANGE-ANOTHER CONTROLLER ON BUS
38	DISK: not on, not connected, wrong addrs
39	DISK HARDWARE PROBLEM
40	DISK MEDIUM NOT INITIALIZED
41	NO DISK MEDIUM IN DRIVE
42	FIRST CHARACTER MUST BE A LETTER
43	ONLY LETTERS AND NUMBERS ARE ALLOWED
44	NOT ENOUGH SPACE ON DISK FOR STORE
45	NO FILE(S) FOUND ON DISK
46	ILLEGAL UNIT OR VOLUME NUMBER
47	INITIALIZATION FAILED
48	DISK IS WRITE PROTECTED
49	DISK WEAR-REPLACE DISK SOON
50	TOO MANY SEGMENTS OR POINTS
51	INSUFFICIENT MEMORY
52	SYSTEM IS NOT IN REMOTE
54	NO VALID MEMORY TRACE
55	NO VALID STATE IN REGISTER
56	INSTRUMENT STATE MEMORY CLEARED
57	OVERLOAD ON INPUT R, POWER REDUCED
58	OVERLOAD ON REFL PORT, POWER REDUCED
59	OVERLOAD ON TRANS PORT, POWER REDUCED

Error Number	Error
61	SOURCE PARAMETERS CHANGED
63	CALIBRATION REQUIRED
64	CURRENT PARAMETER NOT IN CAL SET
65	CORRECTION AND DOMAIN RESET
66	CORRECTION TURNED OFF
67	DOMAIN RESET
68	ADDITIONAL STANDARDS NEEDED
69	NO CALIBRATION CURRENTLY IN PROGRESS
70	NO SPACE FOR NEW CAL \ CLEAR REGISTERS
71	MORE SLIDES NEEDED
72	EXCEEDED 7 STANDARDS PER CLASS
73	SLIDES ABORTED (MEMORY REALLOCATION)
74	CALIBRATION ABORTED
75	FORMAT NOT VALID FOR MEASUREMENT
77	WRONG DISK FORMAT, INITIALIZE DISK
111	DEADLOCK
112	SELF TEST #n FAILED
113	TEST ABORTED
114	NO FAIL FOUND
115	TROUBLE! CHECK SETUP AND START OVER
116	POW MET INVALID
117	POW MET: not on, not connected, wrong addrs
118	POW MET NOT SETTLED
119	DEVICE: not on, not connect, wrong addrs
123	NO MEMORY AVAILABLE FOR INTERPOLATION
124	SELECTED SEQUENCE IS EMPTY
125	DUPLICATING TO THIS SEQUENCE NOT ALLOWED
126	NO MEMORY AVAILABLE FOR SEQUENCING

Error Number	Error
127	CAN'T STORE/LOAD SEQUENCE, INSUFFICIENT MEMORY
130	D2/D1 INVALID WITH SINGLE CHANNEL
131	FUNCTION NOT VALID DURING MOD SEQUENCE
132	MEMORY FOR CURRENT SEQUENCE IS FULL
133	THIS LIST FREQ INVALID IN HARM/3 GHZ RNG
144	NO LIMIT LINES DISPLAYED
150	LOG SWEEP REQUIRES 2 OCTAVE MINIMUM SPAN
151	SAVE FAILED \ INSUFFICIENT MEMORY
152	D2/D1 INVALID \ CH1 CH2 NUM PTS DIFFERENT
153	SEQUENCE MAY HAVE CHANGED, CAN'T CONTINUE
157	SEQUENCE ABORTED
159	CH1 (CH2) TARGET VALUE NOT FOUND
163	FUNCTION ONLY VALID DURING MOD SEQUENCE
164	TOO MANY NESTED SEQUENCES
166	PRINT/PLOT IN PROGRESS, ABORT WITH LOCAL
168	INSUFFICIENT MEMORY FOR PRINT/PLOT
169	HPIB COPY IN PROGRESS, ABORT WITH LOCAL
170	COPY:device not responding; copy aborted
178	print color not supported with EPSON
179	POWER UNLEVELED
180	DOS NAME LIMITED TO 8 CHARS + 3 CHAR EXTENSION
183	BATTERY FAILED. STATE MEMORY CLEARED
184	BATTERY LOW! STORE SAVE REGS TO DISK
185	CANNOT FORMAT DOS DISKS ON THIS DRIVE
188	DIRECTORY FULL
189	DISK READ/WRITE ERROR

Error Number	Error
190	DISK MESSAGE LENGTH ERROR
192	FILE NOT FOUND
193	ASCII: MISSING 'BEGIN' statement
194	ASCII: MISSING 'CITIFILE' statement
195	ASCII: MISSING 'DATA' statement
196	ASCII: MISSING 'VAR' statement
197	FILE NOT FOUND OR WRONG TYPE
199	CANNOT MODIFY FACTORY PRESET
200	ALL REGISTERS HAVE BEEN USED
201	FUNCTION NOT VALID FOR INTERNAL MEMORY
202	FEATURE NOT AVAILABLE

10

Compatible Peripherals

Measurement Accessories Available

Calibration Kits

- 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

Test Port Return Cables

- HP Part Number 8120-4781 50 Ohm Type-N
- HP Part Number 8120-2408 75 Ohm Type-N (includes 2 male connectors)
- HP Part Number 8120-2409 75 Ohm Type-N (includes 1 male and 1 female connector)

Adapter Kits

HP 11852B 50 to 75 Ohm Minimum Loss Pad.

- HP 11853A 50 Ohm Type-N Adapter Kit
- HP 11854A 50 Ohm Type-N to 50 Ohm BNC Adapter Kit
- HP 11855A 75 Ohm Type-N Adapter Kit
- HP 11856A 75 Ohm Type-N to 75 Ohm BNC Adapter Kit
- HP 11878A 50 Ohm Type-N to 3.5 mm 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
- Deskjet 1200C (can also be used to plot)
- DeskJet 500
- HP C2170A, DeskJet 520
- DeskJet 500C
- DeskJet 550C
- HP C2168A, DeskJet 560C
- All LaserJets (LaserJet III and IV can also be used to plot)
- HP C2621A, DeskJet 310 Portable InkJet
- HP 3630A, PaintJet Color Graphics Printer

Printer Interface Adapter

The analyzer can support parallel peripherals by using one of the listed adapters. The adapters convert HP-IB to Centronics parallel interface for connecting to printers.

- HP ITEL-45CHVU (U.S. and Canada version)
- HP ITEL-45CHVE (International version)

I/O Control Adapter

The I/O control adapter (HP part number 08752-60020) is helpful for connecting to peripherals. The adapter fits into the analyzer's test set connector and makes the following connections available through SMA connectors:

- four TTL output lines
- one TTL input line
- end-of-sweep output
- limit test pass/fail output

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.)

HP-IB Bus Structure

Control Lines

IFC - Interface Clear

ATN - Attention

SRQ - Service Request

REN - Remote Enable

EOI - End or Identify

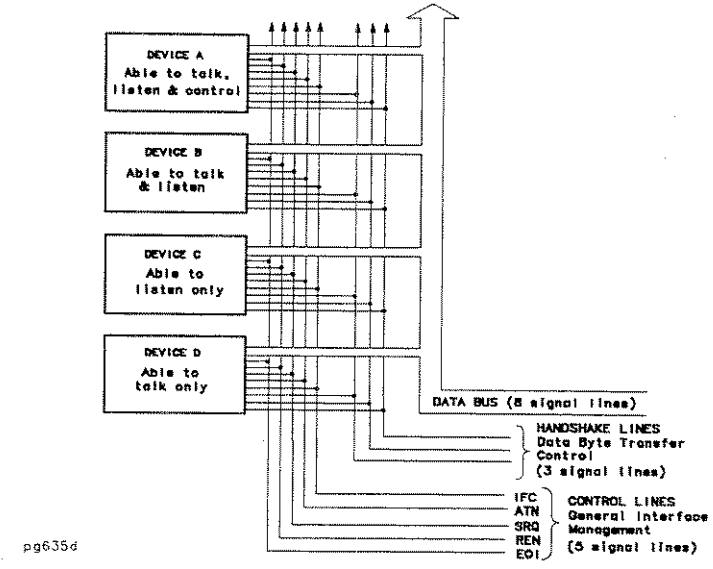

Figure 10-1. HP-IB Structure

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. The active controller can pass control to another controller, but only the system controller can assume unconditional control. Only one system controller is allowed. The system controller is hard-wired to assume bus control after a power failure.

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.

11

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. An instrument state consists of all the stimulus and response parameters that set up the analyzer to make a specific measurement.

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 11-1.
Memory Requirements of Calibration and Memory 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
Reflection 1-Port	N x 6 x 3 + 52	7 k	14 k	29 k	58 k
Interpolated Cal	Same as above in addition to regular cal				
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.
# This value may change with different firmware revisions.

External Disk

You can use an external disk for storage of instrument states, calibration data, measurement data, and plot files.

A disk file created by the analyzer appends a suffix to the file name.

Table 11-2. Suffix Character Definitions

Char 1	Definition	Char 2	Definition
I	Instrument State		
G	Graphics	1	Display Graphics
		0	Graphics Index
D	Error Corrected Data	1	Channel 1
		2	Channel 2
R	Raw Data	1 to 4	Channel 1, raw arrays 1 to 4
		5 to 8	Channel 2, raw arrays 5 to 8
F	Formatted Data	1	Channel 1
		2	Channel 2
C	Cal	K	Cal Kit
1	Cal Data, Channel 1	0	Stimulus State
		1 to 9	Coefficients 1 to 9
		A	Coefficient 10
		B	Coefficient 11
		C	Coefficient 12
2	Cal Data, Channel 2	0 to C	same as Channel 1
M	Memory Trace Data	1	Channel 1
		2	Channel 2

Preset State

When the [PRESET] key is pressed, the analyzer reverts to a known state called the factory preset state.

You also can configure an instrument state and define it as your user preset state:

1. Set the instrument state to your desired preset conditions.
2. Save the state (save/recall menu).
3. Rename that register to "UPRESET".
4. Press [PRESET].

Table 11-3. Preset Conditions

Preset Conditions	Preset Value
Stimulus Conditions	
Sweep Type	Linear Frequency
Display Mode	Start/Stop
Trigger Type	Continuous
External Trigger	Off
Sweep Time	100 ms, Auto Mode
Sweep Time (Option 006)	175 ms, Auto Mode
Start Frequency	300 kHz
Stop Frequency	1300 MHz
Stop Frequency (Option 003)	3 GHz
Stop Frequency (Option 006)	6 GHz
Start Time	0
Time Span	100 ms
CW Frequency	1000 MHz
Test Port Power	−10 dBm
Power Slope	0 dB/GHz; Off
Start Power	−20 dBm
Start Power (Option 004)	−15 dBm
Power Span	25 dB
Coupled Power	On
Source Power	On
Coupled Channels	On
Power Range (Option 004)	Auto; Range 1
Number of Points	201

Table 11-3. Preset Conditions (continued)

Preset Conditions	Preset Value
Frequency List	
Frequency List	Empty
Edit Mode	Start/Stop, Number of Pts.
Response Conditions	
Parameter	Channel 1: Reflection
	Channel 2: Transmission
Conversion	Off
Format	Log Magnitude (all inputs)
Display	Data
Color Selections	Same as before (PRESET)
Dual Channel	Off
Active Channel	Channel 1
Frequency Blank	Disabled
Split Display	On
Intensity	If set to $\geq$ 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

Table 11-3. Preset Conditions (continued)

Preset Conditions	Preset Value
Smoothing Aperture	1% SPAN; Off
Phase Offset	0 Degrees
Electrical Delay	0 s
Scale/Division	10 dB/Division
Calibration	
Correction	Off
Calibration Type	None
Calibration Kit	Type-N 50Ω
Calibration Kit (Option 075)	Type-N 75Ω
Alternate RFL & TRN	Off
System Z0	50 Ohms
System Z0 (Option 075)	75 Ohms
Chop RFL & TRN	On
Interpolated Error Cor.	Off
Markers (coupled)	
Markers 1, 2, 3, 4	1 GHz; All Markers Off
Last Active Marker	1
Reference Marker	None
Marker Mode	Continuous
Display Markers	On
Delta Marker Mode	Off
Coupling	On
Marker Search	Off

Table 11-3. Preset Conditions (continued)

Preset Conditions	Preset Value
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
Time Domain	
Transform	Off
Transform Type	Bandpass
Start Transform	−20 nanoseconds
Transform Span	40 nanoseconds

Table 11-3. Preset Conditions (continued)

Preset Conditions	Preset Value
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
Intensity	Last Active State
Preset: Factory/User	Last Selected State
Disk Save Configuration (Define Store)	
Corrected 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

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.

Table 11-3. Preset Conditions (continued)

Preset Conditions	Preset Value
Sequencing[1]	
Loop Counter	0
End Sweep	High Pulse
TTL Out All	Last Active State
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
Plot Quadrant	Full Page
Scale Plot	Full
Plot Speed	Fast
Pen Number:	
Ch1 Data	2

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

Table 11-3. Preset Conditions (continued)

Preset Conditions	Preset Value
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
Auto-feed	On
Print	
Print Type	Last Active State
Auto-feed	On
Print Colors:	
Ch1 Data	Magenta
Ch2 Data	Green
Ch1 Memory	Blue
Ch2 Memory	Red
Graticule	Cyan
Warning	Black
Text	Black

Preset Conditions - Format Table

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