Quick Reference Guide

HP 8753E Network Analyzer
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Regulatory Information

The regulatory information is in the User’s *Guide* supplied with the analyzer.

Safety, Warranty, and Assistance

Refer to the User’s Guide for information on safety, warranty, and assistance.
The Installation and Quick Start Guide familiarizes you with the HP 8763E/Option 011 network analyzer's front and rear panels, electrical and environmental operating requirements, as well as procedures for installing, configuring, and verifying the operation of the analyzer.

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

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

The HP-IB Programming and Command Reference Guide provides programming information for operation of the network analyzer under HP-IB control.

The HP BASIC Programming Examples Guide provides a tutorial introduction using BASIC programming examples to demonstrate the remote operation of the network analyzer.

The System Verification and Test Guide provides the system verification and performance tests and the Performance Test Record for your HP 8763E/Option 011 network analyzer.
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Caution

Do not mistake the line switch for the disk eject button. See the figure below. If the line switch is mistakenly pushed, the instrument will be turned off, losing all settings and data that have not been saved.

Figure 1-l shows the location of the following front panel features and key function blocks. These features are described in more detail later in this chapter.

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

4. Disk eject button.

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

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

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

8. ACTIVE CHANNEL keys. These keys activate one of the four measurement channels. Once activated, a channel can then be configured for making measurements.

   The analyzer has four display channels. \( \text{Chan 1} \) activates channel 1 or 3, and \( \text{Chan 2} \) activates channel 2 or 4. Refer to “Using Display Functions” in Chapter 2 for information on enabling channels 3 and 4 and making them active.

9. The ENTRY block. This block includes the knob, the step \( \uparrow \downarrow \) 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.

   The backspace key \( \leftarrow \) has two independent functions:

   - Modifies entries and test sequences.
   - Turns off the softkey menu and, if more than one marker is active, the marker information is displayed in the softkey area.

   Refer to “Markers and the Backspace Key” in Chapter 2.
10. **INSTRUMENT STATE function block.** These keys allow you to control channel-independent system functions such as the following:

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

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

11. **[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.

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

13. **R CHANNEL connectors.** These connectors allow you to apply an input signal to the analyzer’s R channel, for frequency offset mode.

14. **PORT 1 and PORT 2.** These ports output a signal from the source and receive input signals from a device under test. PORT 1 allows you to measure $S_{12}$ and $S_{11}$. PORT 2 allows you to measure $S_{21}$ and $S_{22}$. 


Analyzer Display

![Analyzer Display Diagram]

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.

Figure 1-2 illustrates the locations of the different information labels described below. In addition to the single-channel display shown in Figure 1-2, multiple graticule and channel displays are available, as described in “Using Display Functions” in Chapter 2.

When multiple channels are superimposed or displayed in separate graticules, information is arranged as follows:

- Channel(s) displayed and measurement parameter(s) are at the top of each graticule.
- Stimulus frequency information is at the bottom of each graticule.
- Marker information (when selected) is on the right side of each graticule.
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.
   (For CW time and power sweep measurements, the CW frequency is displayed centered between the start and stop times or power values.)

3. **Status Notations.** This area shows the current status of various functions for the active channel.
   The following notations are used:
   - **Avg** = Sweep-to-sweep averaging is on. The averaging count is shown immediately below.
   - **Cor** = Error correction is on. (For error-correction procedures, refer to Chapter 5, “Optimizing Measurement Results.”)
**C? =** Stimulus parameters have changed from the error-corrected state, or interpolated error correction is on. (For error-correction procedures, refer to Chapter 5, “Optimizing Measurement Results.”)

**C2 =** Full two-port error-correction is active and either the power range for each port is different (uncoupled), or the TESTS E T SW H O L D is activated. The annotation occurs because the analyzer does not switch between the test ports every sweep under these conditions. The measurement stays on the active port after an initial cycling between the ports. (The active port is determined by the selected measurement parameter.) You can update all the parameters by pressing [Menu] MEASURE RESTART, or [Meas] key.

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

**ext =** Waiting for an external trigger.

**Ofs =** Frequency offset mode is on.

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

**Gat =** Gating is on (tune domain Option 010 only). (For time domain measurement procedures, refer to Chapter 2, “Making Measurements.”)

**H=2 =** Harmonic mode is on, and the second harmonic is being measured (harmonics Option 002 only). (See “Analyzer Options Available” later in this chapter.)
Harmonic mode is on, and the third harmonic is being measured (harmonics Option 002 only). (See “Analyzer Options Available” later in this chapter.)

Hold sweep.

Waiting for manual trigger.

Power meter calibration is on. (For power meter calibration procedures, refer to Chapter 5, “Optimizing Measurement Results.”)

The analyzer’s source could not be set to the desired level, following a power meter calibration. (For power meter calibration procedures, refer to Chapter 5, “Optimizing Measurement Results.”)

Source power is unlevelled at start or stop of sweep. (Refer to the HP 8753E Network Analyzer Service Guide for troubleshooting.)

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

Power range is in manual mode.

Trace smoothing is on.

Indicates that the test set hold mode is engaged. That is, a mode of operation is selected which would cause repeated switching of the step attenuator. This hold mode may be overridden.

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

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

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

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

6. **Title.** This is a descriptive alpha-numeric string title that you define and enter through an attached keyboard or as described in Chapter 4, “Printing, Plotting, and Saving Measurement Results.”
7. Channel. This is the channel selected with the (Chan 1) and (Chan 2) keys. For multiple, superimposed channel displays, more than one channel will be shown.

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

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

10. Scale/Div. This is the scale that you selected using the (Scale Ref) key, in units appropriate to the current measurement.

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

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 Chapter 2, “Making Measurements.”)

13. Marker Stats, Bandwidth. These are statistical marker values that the analyzer calculates when you access the menus with the (Marker Fctn) key. (Refer to “Using Analyzer Display Markers” in Chapter 2, “Making Measurements.”)

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 87533 Rear Panel

Figure 1-3 illustrates the features and connectors of the rear panel, described below. Requirements for input signals to the rear panel connectors are provided in Chapter 7 of the User's Guide.

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

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

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

4. **KEYBOARD** input (mini-DIN). This connector allows you to connect an external keyboard. This provides a more convenient means to enter a title for storage files, as well as substitute for the analyzer's front panel keyboard.

5. **Power cord receptacle, with fuse.** For information on replacing the fuse, refer to the *HP 8753E Network Analyzer Installation and Quick Start Guide* or the *HP 8753E Network Analyzer Service Guide.*
6. Line voltage selector switch. For more information, refer to the HP 87533 Network Analyzer Installation and Quick Start Guide.

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

8. **10 MHz PRECISION REFERENCE OUTPUT.** (Option 1D5)

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

10. **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.

11. **AUXILIARY INPUT connector.** This allows for a dc or ac voltage input from an external signal source, such as a detector or function generator, which you can then measure using the S-parameter menu. (You can also use this connector as an analog output in service routines, as described in the service manual.)

12. **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.

13. **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.

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

15. **LIMIT TEST.** This outputs a TTL signal of the limit test results as follows:

    - **Pass:** TTL high
    - **Fail:** TTL low

16. **MEASURE RESTART.** This allows the connection of an optional foot switch. Using the foot switch will duplicate the key sequence [Meas] MEASURE RESTART.
17. TEST SET INTERCONNECT. This allows you to connect an HP 87533 Option 011 analyzer to an HP 85046A/B or 85047A S-parameter test set using the interconnect cable supplied with the test set. The S-parameter test set is then fully controlled by the analyzer.

18. BIAS INPUTS AND BUSSES. These connectors bias devices connected to port 1 and port 2. The fuses (1 A, 125 V) protect the port 1 and port 2 bias lines.

19. Serial number plate. The serial number of the instrument is located on this plate.

20. EXTERNAL MONITOR: VGA. VGA output connector provides analog red, green, and blue video signals which can drive a VGA monitor.
## Making Measurements

### Table 2-1. Connector Care Quick Reference

<table>
<thead>
<tr>
<th>Handling and Storage</th>
<th>Do</th>
<th>Do Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep connectors clean</td>
<td></td>
<td>Touch mating-plane surfaces</td>
</tr>
<tr>
<td>Extend sleeve or connector nut</td>
<td></td>
<td>Set connectors contact-end down</td>
</tr>
<tr>
<td>Use plastic end-caps during storage</td>
<td></td>
<td>Set connectors contact-end down</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visual Inspection</th>
<th>Do</th>
<th>Do Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect all connectors carefully</td>
<td></td>
<td>Use a damaged connector - ever</td>
</tr>
<tr>
<td>Look for particles, scratches, and dents</td>
<td></td>
<td>Use a damaged connector - ever</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector Cleaning</th>
<th>Do</th>
<th>Do Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try compressed air first</td>
<td></td>
<td>Use any abrasives</td>
</tr>
<tr>
<td>Use isopropyl alcohol</td>
<td></td>
<td>Get liquid into plastic support beads</td>
</tr>
<tr>
<td>Clean connector threads</td>
<td></td>
<td>Get liquid into plastic support beads</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gaging Connectors</th>
<th>Do</th>
<th>Do Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and zero the gage before use</td>
<td></td>
<td>Use an out-of-spec connector</td>
</tr>
<tr>
<td>Use the correct gage type</td>
<td></td>
<td>Use an out-of-spec connector</td>
</tr>
<tr>
<td>Use correct end of calibration block</td>
<td></td>
<td>Use an out-of-spec connector</td>
</tr>
<tr>
<td>Gage all connectors before first use</td>
<td></td>
<td>Use an out-of-spec connector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Making Connections</th>
<th>Do</th>
<th>Do Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Align connectors carefully</td>
<td></td>
<td>Apply bending force to connection</td>
</tr>
<tr>
<td>Make preliminary connection lightly</td>
<td></td>
<td>Over tighten preliminary connection</td>
</tr>
<tr>
<td>Turn only the connector nut</td>
<td></td>
<td>Twist or screw any connection</td>
</tr>
<tr>
<td>Use a torque wrench for final connect</td>
<td></td>
<td>Tighten wrench past “break” point</td>
</tr>
</tbody>
</table>

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Making Measurements 2-1
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
In the following example, a magnitude and insertion phase response measurement is made.

Step 1. Connect the device under test and any required test equipment.
1. Make the connections as shown in Figure 2-1.

![Network Analyzer with Device Under Test](image)

Figure 2-1. Basic Measurement Setup

Step 2. Choose the measurement parameters.
2. Press **Preset** \textbf{PRESET: FACTORY}.

Setting the Frequency Range
3. 'lb set the center frequency to 134 MHz, press:

\begin{center}
Center 134 MHz
\end{center}

2-2 Making Measurements
4. "lb set the span to 30 MHz, press:

   **Span 30 MHz**

   Setting the Source Power

5. "lb change the power level to -5 dBm, press:

   **Menu POWER -5 dBm**

   Setting the Measurement

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

   **Menu NUMBER OF POINTS 101**

7. "lb select the transmission measurement, press:

   ** Measurement: FWD S21 (BxR)**

8. "lb 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.

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

    **Save Recall SELECT DISK INTERNAL MEMORY RETURN SAVE STATE**

   Step 4. Measure the device under test.

11. Replace any standard used for error-correction with the device under test.

12. "lb measure the insertion loss of the bandpass filter, press:

    **Marker 134 MHz**

   Step 5. Output the measurement results.

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

    **Copy PRINT (or PLOT)**

   Making Measurements 2-3
Using the Display Functions

To View Four Channels Simultaneously

**Note**  
A full two-port calibration must be active before enabling auxiliary channels 3 or 4. Refer to Chapter 5, “Optimizing Measurement Results” in the User's Guide for a description of a full two-port error correction.

1. Press \( \text{Chan 1} \) \( \text{Display} \) \( \text{DUAL:QUAD P} \).
2. Put channel 1 in the upper graticule and channel 2 in the lower graticule:
   
   Set \( \text{DUAL CHAN} \) on \( \text{OFF} \) to \( \text{ON} \).
3. Enable auxiliary channel 3:
   
   Set \( \text{AUX CHAN} \) on \( \text{OFF} \) to \( \text{ON} \).
4. Enable auxiliary channel 4:
   
   Press \( \text{Chan 2} \) and set \( \text{AUX CHAN} \) on \( \text{OFF} \) to \( \text{ON} \).
5. Create a four-graticule display:
   
   Set \( \text{SPLIT DISP= 1X=2X=4X to 4X} \).

See Figure 2-2 for the resulting display. This is the default channel orientation, where channel 1 is the upper left graticule, channel 2 is the upper right graticule, channel 3 is the lower left graticule, and channel 4 is the lower right graticule.
Description of the Auxiliary Channels

- Channels 1 and 2 are the primary channels.
- Channel 3 is the auxiliary channel for channel 1.
- Channel 4 is the auxiliary channel for channel 2.
- The auxiliary channels can be independently configured from each other and the primary channels in all variables except stimulus; an auxiliary channel always has the same stimulus values as its primary channel.

The default measurement parameter for each channel is:

- Channel 1; S11
- Channel 2; S21
- Channel 3; S12
- Channel 4; S22

Figure 2-2. Four Parameter Display
Quick Four-Parameter Display

A quick way to set up a four-parameter display once a full two-port calibration is active is to use one of the options in the menu.

After a full two-port calibration has been performed or recalled from a previously saved instrument state:

1. Press Display.
2. Press DUAL I QUAD SETUP.
3. Press 4 PARAM DISPLAYS.
4. Press SETUP F.

To Make an Auxiliary Channel Active:

- Chan 1 activates channels 1 and 3, and Chan 2 activates channels 2 and 4.

The following steps illustrate how the measurement channel LEDs work. From step 5 in “View Four Channels Simultaneously”:

1. Press Chan 2.

   The LED adjacent to Chan 2 is flashing. This indicates that channel 4 is active and may be configured.

2. Press Chan 1. The LED adjacent to Chan 1 is constantly lit. This indicates that channel 1 is active.

3. Press Chan 1 again. The LED is flashing, indicating that channel 3 is active and may be configured.

Once active, a channel’s markers, limit lines, format, and other variables can be applied and changed. Also, the active entry and stimulus values will change to the color of the active channel.
To Save a Data Trace to the Display Memory

Press \textit{Display} \textit{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:
   \textit{Display} \textit{MEMORY}

2. To view both the memory trace and the current measurement data trace, press:
   \textit{Display} \textit{DATA} and \textit{MEMORY}
To Divide Measurement Data by the Memory Trace
1. You must have already stored a data trace to the active channel memory.
2. Press **Display** DATA/MEM.

To Subtract the Memory Trace from the Measurement Data Trace
1. You must have already stored a data trace to the active channel memory.
2. Press **Display** DATA/MEM.

To Ratio Measurements in Channel 1 and 2
1. Press **Display** Number of measurements.
2. Press **Display** Number of measurements. Enter the same value that you observed for the channel 1 setting.
3. Press **Display** MORE and set D2/D1 TO D2 on OFF to ON.

To Title the Active Channel Display
1. Press **Display** MORE TITLE to access the title menu.
2. Press **Display** TITLE and enter the title you want for your measurement display. Use an external keyboard or the analyzer front panel.

2-8 Making Measurements
Using Markers

To Activate Display Markers

Press \textit{MARKER}. 

Delta Markers and Statistics

1. Press \textit{MARKER 1 REF= 1 to make marker 1 a reference marker.}
2. Move marker 1 to any point that you want to reference.
3. Press \textit{MARKER 2} and move marker 2 to any position that you want to measure in reference to marker 1.

Figure 2-3. Marker 1 as the Reference Marker
4. Press (Marker) MKR MODE MENU STATS ON to calculate and display the statistics of the measurement data between the active marker and the delta reference marker.

![Figure 2-4. Example Statistics of Measurement Data](image)

**Search for a Specific Amplitude**

Searching for the Maximum Amplitude

1. Press (Marker) SEARCH.
2. Press SEARCH; MAX.

Searching for the Minimum Amplitude

1. Press (Marker) SEARCH.
2. Press SEARCH; MIN.
Markers and the Backspace Key

Besides modifying entries and test sequences, the backspace key has a second function; it toggles the softkey display on and off and, if more than one marker is active, moves the marker information off of the graticules and into the softkey area. This function makes data traces and marker information easier to view.

To Move Marker Information off of the Graticules

1. Activate markers 1 through 5:

Press MARK 1 through MARK 5

The display will appear similar to Figure 2-5.

Figure 2-5. Markers before Pressing the Backspace Key
2. Press \( \leftarrow \).

The display will appear similar to Figure 2-6. Notice that the marker information has moved off of channels' 2 and 4 graticules and into the softkey display area.

![Figure 2-6. Markers after Pressing the Backspace Key](image)

To Move Marker Information back onto the Graticules

3. Press \( \leftarrow \).

Notice that the marker information moves back onto the graticules and that the softkey menu is restored as shown in Figure 2-6. The softkey menu is also restored when a softkey or hardkey is pressed. The hardkey must be one which opens a menu, such as [Format] or [System].
Testing A Device with Limit Lines

Creating Flat Limit Lines

In this example procedure, the following flat limit line values are set:

Frequency Range: 127 MHz to 140 MHz, Power Range: -27 dB to -21 dB
Frequency Range: 100 MHz to 123 MHz, Power Range: -200 dB to -65 dB
Frequency Range: 146 MHz to 160 MHz, Power Range: -200 dB to -65 dB

Note: The minimum value for measured data is -200 dB.

1. To access the limits menu and activate the limit lines, press:
   System LIMIT MENU LIMIT LINE ON EDIT LIMIT LINE CLEAR LIST YES
2. To create a new limit line, press:
   ADD
   The analyzer generates a new segment that appears on the center of the display.
3. To specify the limit’s stimulus value, test limits (upper and lower), and the limit type, press:
   STIMULUS VALUE 127 M/μ
   UPPER LIMIT -21 x1
   LOWER LIMIT -27 x1
   DONE
   Note: You could also set the upper and lower limits by using the MIDDLE VALUE and DELTA LIMITS keys. To use these keys for the entry, press:
   MIDDLE VALUE -24 x1
   DELTA LIMITS 3 x1
   This would correspond to a test specification of -24 ±3 dB.
4. To define the limit as a flat line, press:
   LIMIT TYPE FLAT LINE TURN
5. Ib terminate the flat line segment by establishing a single point limit, press:

ADD
STIMULUS VALUE [140 M/μ]
DONE
LIMIT TYPE SINGLE POINT RETURN

Figure 2-7 shows the flat limit lines that you have just created with the following parameters:

- stimulus from 127 MHz to 140 MHz
- upper limit of -21 dB
- lower limit of -27 dB

![Figure 2-7. Example Flat Limit Line](image)

6. Ib create a limit line that tests the low side of the filter, press:

ADD
STIMULUS VALUE [100 M/μ]
UPPER LIMIT -65 x1
LOWER LIMIT -200 x1
DONE
LIMIT TYPE FLAT LINERETURN
ADD
STIMULUS VALUE [123 M/μ]
DONE
LIMIT TYPE SINGLE POINT RETURN

2-14 Making Measurements
7. To create a limit line that tests the high side of the bandpass filter, press:

```
ADD
STIMULUS VALUE (146) M/μ
UPPER LIMIT -65 (x1)
LOWER LIMIT -200 (x1)
DONE
LIMIT TYPE FLAT LINE RETURN
ADD
STIMULUS VALUE (160) M/μ
DONE
LIMIT TYPE SINGLE POINT RETURN
```

Figure 2-8. Example Flat Limit Lines
Creating a Sloping Limit Line

This example procedure shows you how to make limits that test the shape factor of a SAW Elter. The following limits are set:

- **Frequency Range**: 123 MHz to 125 MHz, Power Range: -65 dB to -26 dB
- **Frequency Range**: 144 MHz to 146 MHz, Power Range: -26 dB to -65 dB

1. To access the limits menu and activate the limit lines, press:

   ![System](image1) LIMIT MENU LIMIT LINE ON EDIT LIMIT LINE CLEAR LIST YES

2. To establish the start frequency and limits for a sloping limit line that tests the low side of the filter, press:

   ![ADD](image2)
   STIMULUS VALUE 123 (M/μ)
   UPPER LIMIT -65 (x1)
   LOWER LIMIT -200 (x1)
   DONE
   LIMIT TYPE SLOPING L I HE RETURN

3. To terminate the lines and create a sloping limit line, press:

   ![ADD](image3)
   STIMULUS VALUE 123 (M/μ)
   UPPER LIMIT -26 (x1)
   LOWER LIMIT -200 (x1)
   DONE
   LIMIT TYPE SINGLE POINT RETURN

---

2-16 Making Measurements
4. To establish the start frequency and limits for a sloping limit line that tests the high side of the Elter, press:

```
ADD
STIMULUS VALUE 144 M/µ
UPPER LIMIT -26 x1
LOWER LIMIT -200 x1
DONE
LIMIT TYPE SLOPING LINE RETURN
```

5. To terminate the lines and create a sloping limit line, press:

```
ADD
STIMULUS VALUE 146 M/µ
UPPER LIMIT -65 x1
LOWER LIMIT -200 x1
DONE
LIMIT TYPE SINGLE POINT RETURN
```

You could use this type of limit to test the shape factor of a filter.

![Figure 2-9. Sloping Limit Lines](image)

Figure 2-9. Sloping Limit Lines
Creating Single Point Limits

In this example procedure, the following limits are set:

- from -23 dB to -28.5 dB at 141 MHz
- from -23 dB to -28.5 dB at 126.5 MHz

1. To access the limits menu and activate the limit lines, press:

   ![LIMIT MENU LIMIT LINE ON EDIT LIMIT LINE CLEAR LIST YES]

2. To designate a single point limit line, as shown in Figure 2-10, you must define two pointers:

   - downward pointing, indicating the upper test limit
   - upward pointing, indicating the lower test limit

   Press:

   ```
   ADD
   STIMULUS VALUE 141 m/μ
   UPPER LIMIT -23 x1
   LOWER LIMIT -28.5 x1
   DONE
   LIMIT TYPE SINGLE POINT
   RETURN
   ADD
   STIMULUS VALUE 126.5 m/μ
   UPPER LIMIT -23 x1
   LOWER LIMIT -28.5 x1
   DONE
   LIMIT TYPE SINGLE POINT
   RETURN
   ```

2-18 Making Measurements
Figure 2-10. Example Single Point Limit Lines
**Editing Limit Segments**

This example shows you how to edit the upper limit of a limit line.

1. lb access the limits menu and activate the limit lines, press:

   ![System LIMIT MENU LIMIT LINE ON EDIT LIMIT LINE]

2. lb move the pointer symbol (> on the analyzer display to the segment you wish to modify, press:

   SEGMENT ↑ or ↓ repeatedly
   OR
   SEGMENT and enter the segment number followed by (x1).

3. To change the upper limit (for example, -20) of a limit line, press:

   EDIT UPPER LIMIT -20 x1 DONE

**Deleting Limit Segments**

1. lb access the limits menu and activate the limit lines, press:

   ![System LIMIT MENU LIMIT LINE ON EDIT LIMIT LINE]

2. lb move the pointer symbol (> on the analyzer display to the segment you wish to delete, press:

   SEGMENT ↑ or ↓ repeatedly
   OR
   SEGMENT and enter the segment number followed by (x1).

3. lb delete the segment that you have selected with the pointer symbol, press:

   DELETE

---

2-20 Making Measurements
Running a Limit Test

1. lb access the limits menu and activate the limit lines, press:

   ![System LIMIT MENU LIMIT LINE ON EDIT LIMIT LINE]

Reviewing the Limit Line Segments

The limit table data that you have previously entered is shown on the analyzer display.

2. lb verify that each segment in your limits table is correct, review the entries by pressing:

   ![SEGMENT](Prev) and (Next)

3. lb modify an incorrect entry, refer to the “Editing Limit Segments” procedure, located earlier in this section.

Activating the Limit Test

4. lb activate the limit test and the beep fail indicator, press:

   ![System LIMIT MENU LIMIT TEST ON BEEP FAIL N]

Note

Selecting the beep fail indicator BEEP FAIL ON is optional and will add approximately 50 ms of sweep cycle time. Because the limit test will still work if the limits lines are off, selecting LIMIT LINE ON is also optional.

The limit test results appear on the right side on the analyzer display. The analyzer indicates whether the filter passes or fails the defined limit test:

- The message FAIL will appear on the right side of the display if the limit test fails.
- The analyzer beeps if the limit test fails and if BEEP FAIL ON has been selected.
- The analyzer alternates a red trace where the measurement trace is out of limits.
- A TTL signal on the rear panel BNC connector “LIMIT TEST” provides a pass/fail (5 V/0 V) indication of the limit test results.
Measuring Gain Compression

Gain compression occurs when the input power of an amplifier is increased to a level that reduces the gain of the amplifier and causes a nonlinear increase in output power. The point at which the gain is reduced by 1 dB is called the 1 dB compression point. The gain compression will vary with frequency, so it is necessary to end the worst case point of gain compression in the frequency band.

Once that point is identified, you can perform a power sweep of that CW frequency to measure the input power at which the 1 dB compression occurs and the absolute power out (in dBm) at compression. The following steps provide detailed instruction on how to apply various features of the analyzer to accomplish these measurements.

![Diagram of Gain Compression](image)

**Figure 2-11. Diagram of Gain Compression**

1. Set up the stimulus and response parameters for your amplifier under test. To reduce the effect of noise on the trace, press:

   ![Avg IF BW 1000 Hz]

2. Perform the desired error correction procedure. Refer to Chapter 5, “Optimizing Measurement Results,” for instructions on how to make a measurement correction.

3. Hook up the amplifier under test.

4. To produce a normalized trace that represents gain compression, perform either step 5 or step 6. (Step 5 uses trace math and step 6 uses uncoupled channels and the display function D1/D2 to D2 ON.)

5. Press ![Display] DATA MEMORY DATA MEM to produce a normalized trace.

2-22 Making Measurements
6. To produce a normalized trace, perform the following steps:
   a. Press (SET DIAL) and set DUAL CHAN on OFF to ON to view channels 1 and 2 simultaneously.
   b. 'lb uncouple the channel stimulus so that the channel power will be uncoupled, press:
      Menu COUPLED CH OFF
      This will allow you to separately increase the power for channel 2 and channel 1, so that you can observe the gain compression on channel 2 while channel 1 remains unchanged.
   c. 'lb display the ratio of channel 2 data to channel 1 data on the channel 2 display, press:
      Chan2 DISPLAY MORE and set D2/D1 to D2 on OFF to ON. This produces a trace that represents gain compression only.

7. Press (Marker) on the marker at approximately mid-span.

8. Press (Scale Ref) SCALE/DIV 1 to change the scale to 1 dB per division.

9. Press (Menu) POWER.

10. Increase the power until you observe approximately 1 dB of compression on channel 2, using the step keys or the front panel knob.

11. 'lb locate the worst case point on the trace, press:
      (Marker Fctn) MKR SEARCH MIN

Making Measurements 2-23
Figure 2-12. Gain Compression using Linear Sweep and D2/D1 + D 2 ON

12. If COUPL ED CH OFF was selected, recouple the channel stimulus by pressing:

[Menu] COUPL ED CH ON

13. To place the marker exactly on a measurement point, press:

Marker Fctn MARKER MODE MENU MARKERS: DISCRETE

14. To set the CW frequency before going into the power sweep mode, press:

[Seq] SPECIAL FUNCTIONS MARKER → CW

15. Press [Menu] SWEEP TYPE MENU POWER SWEEP.

16. Enter the start and stop power levels for the sweep.

Now channel 1 is displaying a gain compression curve. (Do not pay attention to channel 2 at this time.)

2-24 Making Measurements
17. To maintain the calibration for the CW frequency, press:

Cal INTERPOL ON CORRECTION ON

18. Press SETUP Display DUAL QUAD s e t DUAL CHAN on OFF to ON.

19. If D2/D1 to D2 ON was selected, press MORE D2/D1 to D2 OFF.

20. Press Meas INPUT PORTS B.

Now channel 2 displays absolute output power (in dBi) as a function of power input.

21. Press Scale Ref SCALE DIV 10 x1 to change the scale of channel 2 to 10 dB per division.

22. Press Chan1 1 x1 to change the scale of channel 1 to 1 dB per division.

Note A receiver calibration will improve the accuracy of this measurement. Refer to Chapter 5, “Optimizing Measurement Results.”

23. Press Marker MARKER MODE MENU MARKERS: COUPLED.

24. To find the 1 dB compression point on channel 1, press:

Marker Fctn MKR SEARCH SEARCH: MAX
Marker MKR ZERO
Marker Fctn MKR SEARCH: TARGET -1 x1

Notice that the marker on channel 2 tracked the marker on channel 1.

25. Press Mark2 (Marker) MKR MODE MARKERS: UNCOUPLED.

26. To take the channel 2 marker out of the A mode so that it reads the absolute output power of the amplifier (in dBm), press:

Marker A MODE UNA MODE F

Making Measurements 2-25
Figure 2-13. Gain Compression using Power Sweep
Measurements using the Swept List Mode

**Stepped List Mode**

In this mode, the source steps to each defined frequency point, stopping while data is taken. This mode eliminates IF delay and allows frequency segments to overlap. However, the sweep time can be substantially slower than for a continuous sweep with the same number of points.

**Swept List Mode**

This mode takes data while sweeping through the defined frequency segments, increasing throughput by up to 6 times over a stepped sweep. In addition, this mode allows the test port power and IF bandwidth to be set independently for each segment that is defined. The frequency segments in this mode cannot overlap.

The ability to completely customize the frequency sweep while using swept list mode is useful when setting up a measurement for a device with high dynamic range, like a filter. The following measurement of a filter illustrates the advantages of using the swept list mode.

**Note**

Primary channels 1 and 2 can be set up independently from each other with different frequency lists (stepped or swept). Press [Menu] and set COUPLED CH ON of f to OFF to uncouple the primary channels from each other. You can then create an independent frequency list for each primary channel.

Due to the permanent stimulus coupling between primary and auxiliary channels, channel 3 and 4 will have the same frequency lists as channels 1 and 2 respectively.
Connect the Device Under Test

1. Connect the equipment as shown in the following illustration:

![Figure 2-14. Swept List Measurement Setup](image)

2. Set the following measurement parameters:

<table>
<thead>
<tr>
<th>Meas</th>
<th>Trans</th>
<th>FWD</th>
<th>S21 (B or R)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Center</th>
<th>900</th>
<th>M/μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>500</td>
<td>M/μ</td>
</tr>
</tbody>
</table>
Observe the Characteristics of the Filter

Generally, the pass band of a filter exhibits low loss. A relatively low incident power may be needed to avoid overdriving the next stage of the DUT (if that stage contains an amplifier) or the network analyzer receiver.

Conversely, the stop band of a filter generally exhibits high isolation. To measure this characteristic, the dynamic range of the system will have to be maximized. This can be done by increasing the incident power and narrowing the IF bandwidth.

Figure 2-15. Characteristics of a Filter
Choose the Measurement Parameters

1. Decide the frequency ranges of the segments that will cover the stop bands and pass band of the filter. For this example, the following ranges will be used:

   - Lower stop band ................. 650 to 880 MHz
   - Pass band ........................ 880 to 920 MHz
   - Upper stop band .................. 920 to 1150 MHz

2. To set up the swept list measurement, press

   (Menu) SWEEP TYPE MENU EDIT LIST

Set Up the Lower Stop Band Parameters

3. To set up the segment for the lower stop band, press

   ADD
   START 650 M/μ
   STOP 880 M/μ
   NUMBER of POINTS 51 x1

4. To maximize the dynamic range in the stop band (increasing the incident power and narrowing the IF bandwidth), press

   MORE
   LIST POWER ON off SEGMENT POWER 10 x1
   LIST IF BW ON off SEGMENT IF BW 1000 x1
   RETURN DONE

Set Up the Pass Band Parameters

5. To set up the segment for the pass band, press

   ADD
   CENTER 900 M/μ
   SPAN 40 M/μ
   STEP SIZE 2 M/μ

6. To specify a lower power level for the pass band, press

   MORE
   SEGMENT POWER -10 x1
   SEGMENT IF BW 3700 x1
   RETURN DONE

2.30 Making Measurements
Set Up the Upper Stop Band Parameters

7. "lb set up the segment for the upper stop band, press

\[
\text{ADD} \\
\text{START [920 M/µ]} \\
\text{STOP [1150 M/µ]} \\
\text{NUMBER of POINTS [51] x1}
\]

8. "lb maximize the dynamic range in the stop band (increasing the incident power and narrowing the IF bandwidth), press

\[
\text{MORE} \\
\text{SEGMENT POWER [10] x1} \\
\text{SEGMENT IF BW [300] x1} \\
\text{RETURN DONE}
\]

9. Press DONE LIST FREQ [SWEEP].

Calibrate and Measure

1. Remove the DUT and connect a thru between the test ports.

2. Perform a full two-port calibration. Refer to Chapter 5, “Optimizing Measurement Results.”

3. With the thru connected, set the scale to autoscale to observe the benefits of using swept list mode.
   - The segments used to measure the stop bands have less noise, thus maximizing dynamic range within the stop band frequencies.
   - The segment used to measure the pass band has been set up for faster sweep speed with more measurement points.
4. Reconnect the filter and adjust the scale to compare results with the first filter measurement that used a linear sweep.

- In Figure 2-18, notice that the noise level has decreased over 10 dB, confirming that the noise reduction techniques in the stop bands were successful.

- In Figure 2-18, notice that the stop band noise in the third segment is slightly lower than in the first segment. This is due to the narrower IF bandwidth of the third segment (300 Hz).
Figure 2-17.
Filter Measurement using Linear Sweep
(Power: 0 dBm/IF BW: 3700 Hz)
Figure 2-18. Filter Measurement using Swept List Mode
Making Mixer Measurements

Measurement Considerations

To ensure successful mixer measurements, the following measurement challenges must be taken into consideration:

- Mixer Considerations
  - Minimizing Source and Load Mismatches
  - Reducing the Effect of Spurious Responses
  - Eliminating Unwanted Mixing and Leakage Signals

- Analyzer Operation
  - How RF and IF Are Defined
  - Frequency Offset Mode Operation
  - Differences Between Internal and External R Channel Inputs
  - Power Meter Calibration

Minimizing Source and Load Mismatches

When characterizing linear devices, you can use vector accuracy enhancement to mathematically remove all systematic errors, including source and load mismatches, from your measurement. This is not possible when the device you are characterizing is a mixer operating over multiple frequency ranges. Therefore, source and load mismatches are not corrected for and will add to overall measurement uncertainty.

You should place attenuators at all of the test ports to reduce the measurement errors associated with the interaction between mixer port matches and system port matches. To avoid overdriving the receiver, you should give extra care to selecting the attenuator located at the mixer’s IF port. For best results, you should choose the attenuator value so that the power incident on the analyzer R channel input is less than -10 dBm and greater than -35 dBm.
Reducing the Effect of Spurious Responses
By choosing test frequencies (frequency list mode), you can reduce the effect of spurious responses on measurements by avoiding frequencies that produce IF signal path distortion.

Eliminating Unwanted Mixing and Leakage Signals
By placing filters between the mixer's IF port and the receiver's input port, you can eliminate unwanted mixing and leakage signals from entering the analyzer's receiver. Filtering is required in both fixed and broadband measurements. Therefore, when configuring broad-band (swept) measurements, you may need to trade some measurement bandwidth for the ability to more selectively filter signals entering the analyzer receiver.

How RF and IF Are Defined
In standard mixer measurements, the input of the mixer is always connected to the analyzer's RF source, and the output of the mixer always produces the IF frequencies that are received by the analyzer's receiver.

However, the ports labeled RF and IF on most mixers are not consistently connected to the analyzer's source and receiver ports, respectively. These mixer ports are switched, depending on whether a down converter or an up converter measurement is being performed.

It is important to keep in mind that in the setup diagrams of the frequency offset mode, the analyzer's source and receiver ports are labeled according to the mixer port that they are connected to.

- In a down converter measurement where the **DOWN CONVERTER** softkey is selected, the notation on the analyzer's setup diagram indicates that the analyzer's source frequency is labeled RF, connecting to the mixer RF port, and the analyzer's receiver frequency is labeled IF, connecting to the mixer IF port.

Because the RF frequency can be greater or less than the set LO frequency in this type of measurement, you can select either $RF > LO$ or $RF < LO$. 

---

3-2 Making Mixer Measurements
In an up converter measurement where the UP CONVERTER softkey is selected, the notation on the setup diagram indicates that the analyzer's source frequency is labeled IF, connecting to the mixer IF port, and the analyzer's receiver frequency is labeled RF, connecting to the mixer RF port.

Because the RF frequency will always be greater than the set LO frequency in this type of measurement, you must select only RF > LO.
**Frequency Offset Mode Operation**

Frequency offset measurements do not begin until all of the frequency offset mode parameters are set. These include the following:

- Start and Stop IF Frequencies
- LO frequency
- Up Converter / Down Converter
- RF > LO / RF < LO

The LO frequency for frequency offset mode must be set to the same value as the external LO source. The offset frequency between the analyzer source and receiver will be set to this value.

When frequency offset mode operation begins, the receiver locks onto the entered IF signal frequencies and then offsets the source frequency required to produce the IF. Therefore, since it is the analyzer receiver that controls the source, it is only necessary to set the start and stop frequencies from the receiver.

**Differences Between Internal and External R Channel Inputs**

Due to internal losses in the analyzer's test set, the power measured internally at the R channel is 16 dB lower than that of the source. To compensate for these losses, the traces associated with the R channel have been offset 16 dB higher. As a result, power measured directly at the R channel via the R CHANNEL IN port will appear to be 16 dB higher than its actual value. If power meter calibration is not used, this offset in power must be accounted for with a receiver calibration before performing measurements.
Power Meter Calibration

Mixer transmission measurements are generally configured as follows:

\[
\text{measured output power (Watts)} / \text{set input power (Watts)}
\]

OR

\[
\text{measured output power (dBm)} - \text{set input power (dBm)}
\]

For this reason, the set input power must be accurately controlled in order to ensure measurement accuracy.

Higher measurement accuracy may be obtained through the use of power meter calibration. You can use power meter calibration to correct for power offsets, losses, and flatness variations occurring between the analyzer source and the input to the mixer under test.
Conversion Loss using the Frequency Offset Mode

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

![Figure 3-3. An Example Spectrum of RF, LO, and IF Signals Present in a Conversion Loss Measurement](image)

The analyzer allows you to make a swept RF/IF conversion loss measurement holding the LO frequency fixed. You can make this measurement by using the analyzer’s frequency offset measurement mode. This mode of operation allows you to offset the analyzer’s source by a fixed value, above or below the analyzer’s receiver. That is, this allows you to use a device input frequency range that is different from the receiver input frequency range.

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

1. Set the LO source to the desired CW frequency and power level.
   
   CW frequency = 1000 MHz  
   Power = 13 dBm
2. Set the desired source power to the value which will provide -10 dBm or less to the R channel input. Press:

```
(Menu)
POWER PWR RANGE MAN 0 x1
```

3. Calibrate and zero the power meter.

4. Connect the measurement equipment as shown in Figure 3-4.

**Caution**  
To prevent connector damage, use an adapter (BP part number 1250-1462) as a connector saver for R CHANNEL IN.

---

![Figure 3-4. Connections for R Channel and Source Calibration](image)

---

5. From the front panel of the BP 87533, set the desired receiver frequency and source output power by pressing:

```
(System) INSTRUMENT MODE FREQ OFFS MENU
Start (100) (M/J)
Stop (250) (M/J)
FREQ OFFS ON
(Menu) POWER 0 x1
```

6. To view the measurement trace, press:

```
(Menu) INPUT PORTSR
```

7. Select the BP 87533 as the system controller:

```
(Local)
SYSTEM CONTROLLER
```
8. Set the power meter's address:

```
SET ADDRESSES
ADDRESS: P MTR/HP 1B (##) 2
```

9. Select the appropriate power meter by pressing `POWER MTR E` until the correct model number is displayed (HP 436A or HP 438A/437).

10. Press `CAL PWRMTR CAL LOSS/SENSR LI STS` then `CAL FACTOR SENSOR A` and enter the correction factors as listed on the power sensor. Press `ADDRE QUENCY XX M/H` then `CAL FACTOR (XX) A DONE` for each correction factor. When finished, press `DONE`.

11. To perform a one sweep power meter calibration over the IF frequency range at 0 dBm, press:

```
(Cal)
PWRMTR=CAL
ONE SWEEP
0 A
TAKE CAL SWEEP
```

12. To calibrate the R channel over the IF range, press:

```
(Cal) RECEIVER=CAL
TAKE RCVR CAL SWEEP
```

Once completed, the display should read 0 dBm.

---

3-8 Making Mixer Measurements
13. Make the connections as shown in Figure 3-5 for the one-sweep power meter calibration over the RF range.

14. Ib set the frequency offset mode LO frequency from the analyzer, press:

   ![System menu](image)

   **System**
   INSTRUMENT MODE
   FREQ OFFS MENU
   LO MENU
   FREQUENCY: CW 1000 M/Hz

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

   RETURN
   DOWN: CONVERTER
   RF<LO

---

Figure 3-5.
Connections for a One-Sweep Power Meter Calibration for Mixer Measurements
16. To view the measurement trace, press:

```
VIEW MEASURE
```

17. To perform a one-sweep power meter calibration over the RF frequency range, press:

```
Cal PWRMTR CAL ONE SWEEP 0 x1 TAKE CAL SWEEP
```

**Note**  
_Do not_ reduce the number of points to perform this power meter calibration. Reducing the number of points will turn off the receiver calibration.

The analyzer is now displaying the conversion loss of the mixer calibrated with power meter accuracy.

---

3-10 Making Mixer Measurements
18. To view the conversion loss in the best vertical resolution, press:

![Scale Ref] AUTOSCALE

**Figure 3-7. Conversion Loss Example Measurement**

*Conversion loss/gain = output power − input power*
High Dynamic Range Swept RF/IF Conversion Loss

The analyzer has a 35 dB dynamic range limitation on measurements made directly with its R (phaselock) channel. For this reason, the measurement of high dynamic range mixing devices (such as mixers with built in amplification and filtering) with greater than 35 dB dynamic range must be made on either the analyzer's A or B channel, with a reference mixer providing input to the analyzer's R-channel for phaselock.

This example describes the swept IF conversion loss measurement of a mixer and filter. The output filtering demonstrates the analyzer's ability to make high dynamic range measurements.

To avoid the complexity of performing a separate power meter calibration over the RF frequency range while the mixer under test and reference mixer are operating, a broad band power meter calibration is used. The broad band calibration covers the entire range of IF and RF frequencies.

1. Set the following analyzer parameters:

   ![Analyzer Parameters]

2. Calibrate and zero the power meter.

3. Connect the measurement equipment as shown in Figure 3-8.

Caution

To prevent connector damage, use an adapter (HP part number 1250-1462) as a connector saver for R CHANNEL IN.
4. Connect the measurement equipment as shown in Figure 3-9.

5. Set the following analyzer parameters:

Start 100 M/μ
Stop 1 G/n
6. lb calibrate the B channel over the IF range, press:

\[ \text{Meas} \quad \text{INPUT PORTS B} \]
\[ \text{Cal} \quad \text{RECEIVER CAL TAKE RCVR CAL SWEEP} \]

Once completed, the analyzer should display 0 \( \text{dBm} \).

7. Make the connections shown in Figure 3-10.

8. Set the LO source to the desired CW frequency and power level. For this example the values are as follows:
   - CW frequency = 1500 MHz
   - source power = 13 dBm

![Figure 3-10. Connections for a High Dynamic Range Swept IF Conversion Loss Measurement](image-url)
9. ‘lb set the frequency offset mode LO frequency, press:

```
 System \Instrument\Mode\Freq\Offs\Menu
 LO Menu Frequency: CW (1500 MHz)
```

10. ‘lb select the converter type and low-side LO measurement configuration, press:

```
RETURN
Down-Converting RF>LO Freq>Offs<On
```

In this low-side LO, down converter measurement, the analyzer’s source frequency range will be offset higher than the receiver frequency range. The source frequency range can be determined from the following equation:

receiver frequency range (100 to 1000 MHz) + LO frequency (1500 MHz) = 1.6-2.5 GHz

11. ‘lb view the conversion loss in the best vertical resolution, press:

```
VIEW MEASURE
```

Figure 3-11. Example of Swept IF Conversion Loss Measurement
Conversion Compression using the Frequency Offset Mode

Conversion compression is a measure of the maximum RF input signal level, where the mixer provides linear operation. The conversion loss is the ratio of the IF output level to the RF input level. This value remains constant over a specified input power range. When the input power level exceeds a certain maximum, the constant ratio between IF and RF power levels will begin to change. The point at which the ratio has decreased 1 dB is called the 1 dB compression point. See Figure 3-12.

Figure 3-12.
Conversion Loss and Output Power as a Function of Input Power Level Example

Notice that the IF output power increases linearly with the increasing RF signal, until mixer compression begins and the mixer saturates.

The following example uses a ratio of mixer output to input power and a marker search function to locate a mixer’s 1 dB compression point.

1. Set the LO source to the desired CW frequency and power level.
   
   CW frequency = 600 MHz
   Rower = 13 dBm

2. Initialize the analyzer by pressing [Preset].

3-16 Making Mixer Measurements
3. To set the desired CW frequency and power sweep range, press:

```
Menu
Sweep Type Menu Power Sweep Return
CW Freq
800 M/Hz
Power Pwr Range Man
Power Ranges Range 0
Start -10 x1
Stop 10 x1
```

4. Make the connections, as shown in Figure 3-13.

**Caution**

To prevent connector damage, use an adapter (HP part number 1250-1462) as a connector saver for R CHANNEL IN.

Figure 3-13.
Connections for the First Portion of Conversion Compression Measurement

5. To view the absolute input power to the analyzer's R-channel, press:

```
Meas Input Ports R
```
6. 'lb store a trace of the receiver power versus the source power into memory and view data/memory, press:

```
Display
DATA → MEMORY
DATA/MEM
```

This removes the loss between the output of the mixer and the input to the receiver, and provides a linear power sweep for use in subsequent measurements.

7. Make the connections as shown in Figure 3-14.

---

**Caution**

'lb prevent connector damage, use an adapter (HP part number 1250-1462) as a connector saver for R CHANNEL IN.

---

![Figure 3-14. Connections for the Second Portion of Conversion Compression Measurement](image)

8. 'lb set the frequency offset mode LO frequency, press:

```
System
INSTRUMENT MODE FREQ OFFSET MENU
LO OFFSET FREQUENCY: CH 600 M/Hz
```

---

3-18 Making Mixer Measurements
9. To select the converter type, press:

RETURN
UP CONVERTER

10. To select a low-side LO measurement configuration, press:

RF>LO
FREQ OFFS ON

In this low-side LO, up converter measurement, the analyzer source frequency is offset lower than the receiver frequency. The analyzer source frequency can be determined from the following equation:

receiver frequency (800 MHz) – LO frequency (600 MHz) = 200 MHz

The measurements setup diagram is shown in Figure 3-15.

![Figure 3-15. Measurement Setup Diagram Shown on Analyzer Display](image)

11. To view the mixer’s output power as a function of its input power, press:

VIEW MEASURE

12. To set up an active marker to search for the 1 dB compression point of the mixer, press:

Scale Ref
AUTO SCALE
Marker Fctn MKR SEARCH ON SEARCH MAX

Making Mixer Measurements 3-19
13. Press:

![Markers and Mode]

The measurement results show the mixer's 1 dB compression point. By changing the target value, you can easily locate other compression points (for example, 0.5 dB, 3 dB). See Figure 3-16.

14. Read the compressed power on by turning marker A off.

![Markers and Mode]

**Figure 3-16.**
Example Swept Power Conversion Compression Measurement

3-20 Making Mixer Measurements
Isolation Example Measurements

Figure 3-17. Signal Flow in a Mixer Example
LO to IF Isolation

Figure 3-18. Connections for a Mixer Isolation Measurement

Figure 3-19.
Example Mixer LO to RF Isolation Measurement

3-22 Making Mixer Measurements
RF Feedthrough

Figure 3-20. Connections for a Mixer RF Feedthrough Measurement

You can measure the IF to RF isolation in a similar manner, but with the following modifications:

- Use the analyzer source as the IF signal drive.
- View the leakage signal at the RF port.

Figure 3-21. Example Mixer RF Feedthrough Measurement
4

Printing, Plotting, and Saving Measurement Results

Configuring a Print Function

1. Connect the printer to the analyzer interface port.

2. Press \texttt{(Local) SET ADDRESSES PRINTER PORT PRINTER TYPE 1} until the correct printer choice appears.

3. Select one of the following printer interfaces:
   - Choose \texttt{PRINTER PORT HP IB} if your printer has an HP-IB interface.
   - Enter the HP-IB address of the printer, followed by \texttt{x1}.
   - Press \texttt{(Local) SYSTEM CONTROLLER} or \texttt{USE PASS CONTROL}.
   - Choose \texttt{PARALLEL COPY} if your printer has a parallel (centronics) interface.
   - Choose \texttt{SERIAL COPY} if your printer has a serial (RS-232) interface, and then configure the print function as follows:
     - Press \texttt{PRINTER BAUD RATE} and enter the printer’s baud rate, followed by \texttt{x1}.
     - Select the transmission control method that is compatible with your printer, press \texttt{XMIT CNTRL} (transmit control-handshaking protocol) until the correct method appears.
Defining a Print Function

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

1. Press \textit{DEFINE PRINT.}
2. Press \textit{PRINT: MONOCHROME} or \textit{PRINT: COLOR.}
3. Press AUTO-F E D until the correct choice (ON or OFF) is highlighted.
   - Choose HUT 0-F E D ON if you want to print one measurement per page.
   - Choose HUT 0-F E D OFF if you want to print multiple measurements per page.

**Note**  
Laser printers and some DeskJet printers do not begin to print until a full page, or a partial page and a form feed, have been received.

If You Are Using a Color Printer

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

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

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

To Reset the Printing Parameters to Default Values

1. Press \textit{DEFINE PRINT DEFAULT PRINT SETUP.}

4-2 Printing, Plotting, and Saving Measurement Results
Configuring a Plot Function

If You Are Plotting to an HPGL/2 Compatible Printer

2. Press [Local] SET ADDRESSES PRINTER PORT 1 and then press PRNTR TYPE HP until the correct printer choice appears.

3. Configure the analyzer for one of the following printer interfaces:
   - Choose PRNTR PORT HP if your printer has an HP-IB interface.
     - Enter the HP-IB address of the printer, followed by (x1).
     - Press [Local] SYSTEM CONTROLLER or USE PASS CONTROL.
   - Choose PARALLEL [COM] 1 if your printer has a parallel (centronics) interface.
   - Choose SERIAL [COM] 1 if your printer has a serial (RS-232) interface, and then configure the print function as follows:
     a. Press PRINTER BAUD RATE and enter the printer’s baud rate, followed by (x1).
     b. ‘Ib select the transmission control method that is compatible with your printer, press [Local] XMIT CTRL (transmit control - handshaking protocol) until the correct method appears.

4. Press [Local] SET ADDRESSES PLOTTER PORT and then PLTR TYPE until PLTR TYPE CHPLG PRT] appears.
If You Are Plotting to a Pen Plotter

1. Press \texttt{(Local) SET ADDRESSES PLOTTER PORT} and then \texttt{PLTR TYPE} until \texttt{PLTli TYPE EPLOTTER} appears.

2. Configure the analyzer for one of the following plotter interfaces:
   - Choose \texttt{PLTR PORT HP IB} if your plotter has an HP-IB interface.
   - Enter the HP-IB address of the plotter, followed by \texttt{@}.
   - Press \texttt{(Local) SYSTEM CONTROLLER or USE PASS CONTROL}.
   - Choose \texttt{PHHLEl COPY} if your plotter has a parallel (centronics) interface.
   - Choose \texttt{SERICAL} if your plotter has a serial (RS-232) interface, and then configure the print function as follows:
     a. Press \texttt{PRINTER BAUD RATE} and enter the plotter's baud rate, followed by \texttt{(x1)}.
     b. Select the transmission control method that is compatible with your plotter, press \texttt{XTXTR L (transmit control - handshaking protocol)} until the correct method appears.
If You Are Plotting to a Disk Drive

1. press \textbf{Local} \textbf{SET ADDRESSES PLOTTER PORT DISK.}

2. Press \textbf{Save/Recall SELECT D15K} and select the disk drive that you will plot to.

- Choose \textbf{INTERNAL DISK} if you will plot to the analyzer internal disk drive.
- Choose \textbf{EXTERNAL DISK} if you will plot to a disk drive that is external to the analyzer.
Defining a Plot Function

Note

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

1. Press \( \text{DEFINE PLOT} \).

Choosing Display Elements

2. Choose which of the following measurement display elements that you want to appear on your plot:

Selecting Auto-Feed

3. Press \( \text{HUT FEED} \) until the correct choice is highlighted.

- Choose \( \text{HUT FEED 11} \) if you want multiple plots on the same sheet of paper.
- Choose \( \text{HUT FEED 12} \) if you want a “page eject” sent to the plotter or HPGL compatible printer after each time you press \( \text{PLOT} \).

Note

The peripheral ignores \( \text{HUT FEED 1} \) when you are plotting to a quadrant.

4-6 Printing, Plotting, and Saving Measurement Results
Selecting Pen Numbers and Colors

4. Press MORE and select the plot element where you want to change the pen number. For example, press P E N N U M D A T A and then modify the pen number. The pen number selects the color if you are plotting to an HPGL/2 compatible color printer.

Press (xl) after each modification.

Table 4-1. Default Pen Numbers and Corresponding Colors

<table>
<thead>
<tr>
<th>Pen Number</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>white</td>
</tr>
<tr>
<td>1</td>
<td>cyan</td>
</tr>
<tr>
<td>2</td>
<td>magenta</td>
</tr>
<tr>
<td>3</td>
<td>blue</td>
</tr>
<tr>
<td>4</td>
<td>yellow</td>
</tr>
<tr>
<td>5</td>
<td>green</td>
</tr>
<tr>
<td>6</td>
<td>red</td>
</tr>
<tr>
<td>7</td>
<td>black</td>
</tr>
</tbody>
</table>

Table 4-2. Default Pen Numbers for Plot Elements

<table>
<thead>
<tr>
<th>Corresponding Key</th>
<th>Plot Element</th>
<th>Channel 1 Channel 3 Pen Numbers</th>
<th>Channel 2 Channel 4 Pen Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEN NUM DATA</td>
<td>Measurement Data Trace</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PEN NUM MEMORY</td>
<td>Displayed Memory Trace</td>
<td>5, 6</td>
<td></td>
</tr>
<tr>
<td>PEN NUM GRATICULE</td>
<td>Graticule and Reference Line</td>
<td>1</td>
<td>1, 1</td>
</tr>
<tr>
<td>PEN NUM TEXT</td>
<td>Displayed Text</td>
<td>7, 7</td>
<td></td>
</tr>
<tr>
<td>PEN NUM MARKER</td>
<td>Displayed Markers and Values</td>
<td>7, 7</td>
<td></td>
</tr>
</tbody>
</table>

Printing, Plotting, and Saving Measurement Results 4-7
Note: You can set all the pen numbers to black for a plot in black and white. You must define the pen numbers for each measurement channel (channel 1/channel 3 and channel B/channel 4).

Selecting Line Types

5. Press **MORE** and select each plot element line type that you want to modify.

**Table 4-3. Default Line Types for Plot Elements**

<table>
<thead>
<tr>
<th>Plot Elements</th>
<th>Channel 1 and 3</th>
<th>Channel 2 and 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Line Type Numbers</td>
<td>Line Type Numbers</td>
</tr>
<tr>
<td>Data Trace</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Memory Trace</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

Figure 4-2. Line Types Available

4-8 Printing, Plotting, and Saving Measurement Results
Choosing Scale

6. Press `SCALE PLOT` until the selection appears that you want.
   - `SCALE PLOT [FULL]`
   - `SCALE PLOT [GRAT]`

![Diagram showing grid lines and two points labeled P1 and P2]

Figure 4-3. Locations of P1 and P2 in `SCALE PLOT [GRAT]` Mode

Choosing Plot Speed

7. Press `PLOT SPEED` until the plot speed appears that you want.
   - Choose `PLOT SPEED [FAST]` 1 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 `DEFINE PLOT` to restore the default settings.

If You Are Plotting to an HPGL Compatible Printer

1. Configure and define the plot, as explained in “Configuring a Plot Function” and “Defining a Plot Function” located earlier in this chapter.

2. Press `PLOT PLOTTER FORM FEED` to print the data the printer has received.
To Save Measurement Results

Note
You can only save measurement data to a disk. 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 three different arrays which vary in modification flexibility when they're recalled.

<table>
<thead>
<tr>
<th>Define Save</th>
<th>Modification Flexibility During Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Data Array</td>
<td>Most</td>
</tr>
<tr>
<td>Data Array</td>
<td>Medium</td>
</tr>
<tr>
<td>Format Array</td>
<td>Least</td>
</tr>
</tbody>
</table>

You can also save data-only. A data-only file is saved to disk with default filenames DATA00D1 to DATA31D1 for channel 1, DATA00D2 to DATA31D2 for channel 2, DATA00D3 to DATA31D3 for channel 3, and DATA00D4 to DATA31D4 for channel 4. However, these files are not instrument states and cannot be recalled.
1. Press (SAVE RECALL) SELECT DISK.

2. Choose one of the following disk drives:
   - INTERNAL DISK
   - EXTERNAL DISK

3. Press (SAVE RECALL) 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 (When ON, the other choices are ignored.)

Note: If you select DATA ONLY ON, you cannot recall and display the file contents on the analyzer. This type of data is intended for computer manipulation. DATA ONLY ON always saves corrected data.

Printing, Plotting, and Saving Measurement Results 4-11
5. Choose the type of format you want:

- Choose **SAVE USING BINARY** for all applications except **CITIFILE, S2P**, or CAE applications.
- Choose **SAVE USING ASCII** for **CITIFILE, S2P**, and CAE applications or when you want to import the information into a spread sheet format.

6. Press **RETURN SAVE STATE**.

---

**Recalling an Instrument State**

1. Press **SAVE RECALL** **SELECT DISK**.

2. Choose from the following storage devices:

   - **INTERNAL MEMORY**
   - **INTERNAL DISK**
   - **EXTERNAL DISK**

3. Press the **[]** repeatedly until the name of the Ele that you want to recall is highlighted.

4. Press **RETURN RECALL STATE**.
Optimizing Measurement Results

Increasing Measurement Accuracy

Connector Repeatability
- Inspect the connectors.
- Clean the connectors.
- Gauge the connectors.
- Use correct connection techniques.

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
- Use a temperature-controlled environment.
- Ensure the temperature stability of the calibration devices.
- Avoid handling the calibration devices unnecessarily during calibration.
- Ensure the ambient temperature is ±1° of measurement calibration temperature.
Frequency Drift

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

Performance Verification

- Perform a measurement verification at least once per year.

Reference Plane and Port Extensions

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

Press \text{Cal} \text{MORE PORT EXTENSIONS EXTENSIONS ON}. Then enter the delay to the reference plane.
Clarifying Type-N Connector Sex

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 $\text{SHORT} \ (F)$ refers to the short that will be connected to the female test port.

Response Error-Correction for Reflection Measurements

1. Select the type of measurement you want to make.
2. In select a response correction, press:
   
   ![Figure 5-1](image)
   
   **Figure 5-1. Standard Connections for a Response Error-Correction for Reflection Measurement**

3. Inb measure the standard when the displayed trace has settled, press:
   
   $\text{SHORT}$ or $\text{OPEN}$
**Response Error-Correction for Transmission Measurements**

1. Select the type of measurement you want to make.
2. Enter a response correction, press:

   ![Cal] CALIBRATE MENU RESPONSE

3. Measure the standard, press:

   THRU

**Response and Isolation Error-Correction for Transmission Measurements**

This procedure is intended for measurements that have a measurement range of greater than 90 dB.

1. Select the type of measurement you want to make.
2. Enter a response and isolation correction, press:

   ![Cal] CALIBRATE MENU RESPONSE & ISOLATION RESPONSE

3. Make a “thru” connection between the points where you will connect your device under test.
4. Measure the standard, when the displayed trace has settled, press:

   THRU

**5-4 Optimizing Measurement Results**
5. Connect impedance-matched loads to PORT 1 and PORT 2, as shown in Figure 5-3. Include the adapters that you would include for your device measurement.

![Figure 5-3. Standard Connections for a Response and Isolation Error-Correction for Transmission Measurements](image)

6. To help remove crosstalk noise, set the analyzer as follows:
   a. Press `@` **AVERAGING ON AVERAGING FACTOR** and enter at least four times more averages than desired during the device measurement.
   b. Press `Cal` **MORE ALTERNATE A AND B** to eliminate one crosstalk path.

7. To measure the calibration standard, press:

   ```
   Cal RESUME CAL SEQUENCE I SOL ' N STD
   ```

8. Return the averaging to the original state of the measurement. For example, reduce the averaging factor by at least four times or turn averaging off.

9. To compute the isolation error coefficients, press:

   ```
   Cal RESUME CAL SEQUENCE DONE RESP I SOL ' N CAL
   ```
One-Port Reflection Error-Correction

1. Select the type of measurement you want to make.

2. To select the correction type, press:

   **CALIBRATE MENU** and select the correction type.

   - If you want to make a reflection measurement at PORT 1, press:
     
     \[ S11 \ 1=PORT \]

   - If you want to make a reflection measurement at PORT 2, press:

     \[ S22 \ 1=PORT \]

![Network Analyzer Diagram](image)

**Figure 5-4. Standard Connections for a One-Port Reflection Error-Correction**

- To measure the standards in sequence, press:
  
  OPEN
  
  SHORT
  
  LOAD

- To compute the error coefficients, press:

  **DONE**: 1-PORT CAL

---

5-6 Optimizing Measurement Results
Full Two-Port Error-Correction

1. Set any measurement parameters that you want for the device measurement: power, format, number of points, or IF bandwidth.

2. lb select the correction type, press:

   ![CAL I BRATE MENU FULL 2-PORT REFLECTION](image)

   - FOR REFLECTION
   - FOR TRANSMISSION
   - FOR ISOLATION

3. 'lb measure the standards in sequence, press:
   
   **FORWARD:** OPEN
   **FORWARD:** SHORT
   **FORWARD:** LOAD

4. Repeat the open-short-load measurements described above, but connect the devices in turn to PORT 2, and use the **REVERSE:** OPEN, **REVERSE:** SHORT, and **REVERSE:** LOAD softkeys.

5. 'lb compute the reflection correction coefficients, press:
   
   **STANDARDS DONE**

6. 'lb start the transmission portion of the correction, press:
   
   **TRANSMISSION**

7. Make a “thru” connection between the points where you will connect your device under test as shown in Figure 5-5.

---

**Figure 5-5.**

Standard Connections for Full Two-Port Error-Correction

---

Optimizing Measurement Results 5-7
8. 'lb measure the standard, when the trace has settled, press:

   DO BOTH FWD+REV

9. Press ISOLATION and select from the following two options:

   □ If you will be measuring devices with a dynamic range less than 90 dB, press:
     OMIT ISOLATION

   □ If you will be measuring devices with a dynamic range greater than 90 dB, follow these steps:
     a. Connect impedance-matched loads to PORT 1 and PORT 2. Include the adapters that you would include for your device measurement.
     b. Activate at least four times more averages than desired during the device measurement.
     c. Press (Cal) RESUME CAL SEQUENCE
        ISOLATION FWD ISOL'N ISOL'N STD
        REV ISOL'N ISOL'N STD ISOLATION DONE.
     d. Return the averaging to the original state of the measurement, and press (Cal) RESUME CAL SEQUENCE.

10. 'lb compute the error coefficients, press:

    DONE 2-PORT CAL
Power Meter Measurement Calibration

You can use the power meter to monitor and correct the analyzer source power to achieve calibrated absolute power at the test port. You can also use this calibration to set a reference power for receiver power calibration, and mixer measurement calibration.

**Note**  
Loss of Power Calibration Data

If your instrument state has not been saved after a power meter calibration, the power correction data will be lost if any of the following circumstances exists:

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

## Entering the Power Sensor Calibration Data

Entering the power sensor calibration data compensates for the frequency response of the power sensor, thus ensuring the accuracy of power meter calibration.

1. Make sure that your analyzer and power meter are configured.

2. Press [Cal] PWRMTR CALLOSS/SENSR LISTSCALE FACTOR SENSOR A.

## Compensating for Directional Coupler Response

If you use a directional coupler to sample power in your measurement configuration, you should enter the coupled arm power loss value into the power loss table, using the following procedure.

1. Press [Cal] PWRMTR CALLOSS/SENSR LISTS POWER LOSS.
Using Sample-and-Sweep Correction Mode

![Diagram of Sample-and-Sweep Mode](image)

Figure 5-6. Sample-and-Sweep Mode for Power Meter Calibration

1. Calibrate and zero the power meter.
2. Connect the equipment as shown in Figure 5-6.
3. Select the HP 87533 as the system controller:

   \[
   \text{SET} \ \text{HDDRE}!~!;\text{EY}~！
   \]

4. Set the power meter's address:

   \[
   \text{SET ADDRESSES} \\
   \text{ADDRESS: P MTR/HP-1B} \ #\ # \ x1
   \]

5. Select the appropriate power meter by pressing

   \[
   \text{POWER MTR} [ \ \text{I} \ \text{until the correct model number is displayed} \ (\text{HP 436A or HP 438A/437}).
   \]

6. Set test port power to the approximate desired corrected power.

7. Press \( \text{PWRT MTR CAL} \) and enter the test port power level that you want at the input to your test device. For example, if you enter \( \text{-10 (xl)} \), the display will read \( \text{CAL POWER -10} \).

8. If you want the analyzer to make more than one power measurement at each frequency data point, press:

   \[
   \text{NUMBER OF READINGS} \ n \ x1, \text{(where } n \text{ = the number of desired iterations)}.
   \]

   If you increase the number of readings, the power meter correction time will substantially increase.

5-10 Optimizing Measurement Results
9. Press \texttt{Cal PWRMTR CAL ONE SWEEP TAKE CAL SWEEP}.

### Using Continuous Correction Mode

![Diagram of Continuous Correction Mode](image)

**Figure 5-7.** Continuous Correction Mode for Power Meter Calibration

1. Connect a power splitter or directional coupler to the port supplying RF power to your test device, as shown in Figure 5-7.

2. Set test port power to approximate desired leveled power.

3. Press \texttt{Cal PWRMTR CAL} and enter the test port power level that you want the analyzer to maintain at the input to your test device. Compensate for the power loss of the power splitter or directional coupler in the setup.

4. If you want the analyzer to make more than one power measurement at each frequency data point, press \texttt{NUMBER OF READINGS n} (where \(n\) = the number of desired iterations).

   If you increase the number of readings, the power meter correction time will substantially increase.

5. Press \texttt{Cal PWRMTR CAL EACH SWEEP TAKE CAL SWEEP} to activate the power meter correction.
Increasing Sweep Speed

To Use Swept List Mode

Selectable IF bandwidths can increase the throughput of the measurement by allowing the user to specify narrow bandwidths only where needed.

1. In set up a swept list measurement, press (Menu)
   SWEEP TYPE MENU EDIT LIST ADD.
2. The frequency segments can be defined in any of the following terms:
   - start/stop/number of points/power/IFBW
   - start/stop/step/power/IFBW
   - center/span/number of points/power/IFBW
   - center/span/step/power/IFBW
To Decrease the Frequency Span

Modify the frequency span to eliminate as many band switches as possible while maintaining measurement integrity. Refer to the following table to identify the analyzer’s band switch points:

<table>
<thead>
<tr>
<th>Baud</th>
<th>Frequency Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.01 MHz to 3 MHz</td>
</tr>
<tr>
<td>1</td>
<td>3 MHz to 3.3 MHz</td>
</tr>
<tr>
<td>2</td>
<td>3.3 MHz to 16 MHz</td>
</tr>
<tr>
<td>3</td>
<td>16 MHz to 31 MHz</td>
</tr>
<tr>
<td>4</td>
<td>31 MHz to 61 MHz</td>
</tr>
<tr>
<td>5</td>
<td>61 MHz to 121 MHz</td>
</tr>
<tr>
<td>6</td>
<td>121 MHz to 296 MHz</td>
</tr>
<tr>
<td>7</td>
<td>296 MHz to 536 MHz</td>
</tr>
<tr>
<td>8</td>
<td>536 MHz to 893 MHz</td>
</tr>
<tr>
<td>9</td>
<td>893 MHz to 1.607 GHz</td>
</tr>
<tr>
<td>10</td>
<td>1.607 GHz to 3 GHz</td>
</tr>
<tr>
<td>11</td>
<td>3 GHz to 4.95 GHz</td>
</tr>
<tr>
<td>12 (Option 006)</td>
<td>4.95 GHz to 6 GHz</td>
</tr>
</tbody>
</table>

To Set the Auto Sweep Time Mode

Press (Menu) SWEEP T ME (xl) to re-enter the auto mode.
To Widen the System Bandwidth

1. Press \(\text{Avg}\) IF \(\text{BW}\).
2. Set the IF bandwidth to change the sweep time.

<table>
<thead>
<tr>
<th>IF BW</th>
<th>Sweep Time (sec) (^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000</td>
<td>0.077</td>
</tr>
<tr>
<td>3700</td>
<td>0.102</td>
</tr>
<tr>
<td>3000</td>
<td>0.128</td>
</tr>
<tr>
<td>1000</td>
<td>0.254</td>
</tr>
<tr>
<td>300</td>
<td>0.707</td>
</tr>
<tr>
<td>100</td>
<td>2.010</td>
</tr>
<tr>
<td>30</td>
<td>6.980</td>
</tr>
<tr>
<td>10</td>
<td>21.40</td>
</tr>
</tbody>
</table>

\(^1\) Preset condition,
\(\text{CF}=1\text{GHz}, \text{Span}=100\text{MHz}\);
includes retrace time.

To Reduce the Averaging Factor

1. Press \(\text{Avg}\) \(\text{AVG}\). \(\text{FACTOR}\).
2. Enter an averaging factor that is less than the value displayed on the analyzer screen and press (xl).
To Reduce the Number of Measurement Points


2. Enter a number of points that is less than the value displayed on the analyzer screen and press (x). The analyzer sweep time does not change proportionally with the number of points, but as indicated below.

<table>
<thead>
<tr>
<th>Number of Points</th>
<th>Sweep Time (secs)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>0.062</td>
</tr>
<tr>
<td>101</td>
<td>0.066</td>
</tr>
<tr>
<td>201</td>
<td>0.106</td>
</tr>
<tr>
<td>401</td>
<td>0.181</td>
</tr>
<tr>
<td>801</td>
<td>0.330</td>
</tr>
<tr>
<td>1601</td>
<td>0.633</td>
</tr>
</tbody>
</table>

¹ Preset condition, CF = 1 GHz, Span = 100 MHz, Correction off; includes retrace time. Measurement speed can be improved by selecting the widest IF BW setting of 6000 Hz.

To Set the Sweep Type

1. Press [Menu] SWEEP TYPE MENU.

2. Select the sweep type.
To Activate Chop Sweep Mode

- Press \( \text{Cal} \) MORE CHOP A and B.

To Use Fast 2-Port Calibration

With the 2-port calibration on, faster measurements may be made by not measuring the reverse path for every forward sweep. This is controlled by the test set switch command.

1. lb access the test set switch functions, press:
   \( \text{Cal} \) MORE TEST SET SW
2. lb activate the hold mode, press:
   \( 0 \times 1 \)
   The analyzer will then display TEST SET SW HOLD.
3. lb enter the number of sweeps mode, press:
   \( X \times 1 \)
   The analyzer will then display TEST SET SW X SWEEPS.
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: + 26 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** AVERAGINGFACTOR.
2. Enter a value followed by (x).
3. Press **AVERAGING ON**.
Reducing Trace Noise

Activate Averaging
1. Press \textbf{M} \textbf{A} \textbf{V} \textbf{E} \textbf{R} \textbf{A} \textbf{G} \textbf{I} \textbf{N} \textbf{G} \textbf{F} \textbf{A} \textbf{T} \textbf{O} \textbf{R}.
2. Enter a value followed by \textbf{x} \textbf{1}.
3. Press \textbf{A} \textbf{V} \textbf{E} \textbf{R} \textbf{A} \textbf{G} \textbf{I} \textbf{N} \textbf{G} \textbf{O} \textbf{N}.

Change System Bandwidth
1. Press \textbf{F} \textbf{B} \textbf{W}.
2. Enter the IF bandwidth value that you want, followed by \textbf{x} \textbf{1}.

Reducing Receiver Crosstalk
Set the alternate sweep, press \textbf{C} \textbf{A} \textbf{l} \textbf{M} \textbf{O} \textbf{R} \textbf{E} \textbf{A} \textbf{L} \textbf{T} \textbf{R} \textbf{N} \textbf{A} \textbf{T} \textbf{E} \textbf{A} \textbf{A} \textbf{N} \textbf{T} \textbf{E} \textbf{A} \textbf{R} \textbf{T} \textbf{E} \textbf{A} \textbf{R} \textbf{T} \textbf{E} \textbf{A} \textbf{T} \textbf{E} \textbf{R}.
Softkey Locations

The following table lists the softkey functions alphabetically, and the corresponding front-panel access key. Full-page menu maps are available in the *HP 8753E Network Analyzer User’s Guide.*
### Table 6-1. Softkey Locations

<table>
<thead>
<tr>
<th>Softkey</th>
<th>Front-Panel Access Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ MODE: MENU</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ MODE: OFF</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ REF = 1</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ REF = 2</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ REF = 3</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ REF = 4</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ REF = 5</td>
<td>Marker</td>
</tr>
<tr>
<td>Δ REF = Δ FIXED MARK</td>
<td>Marker</td>
</tr>
<tr>
<td>1XS</td>
<td>Meas</td>
</tr>
<tr>
<td>2X: [1&amp;2]/[3&amp;4]</td>
<td>Display</td>
</tr>
<tr>
<td>2X: [1&amp;3]/[2&amp;4]</td>
<td>Display</td>
</tr>
<tr>
<td>4 PARAM DISPLAYS</td>
<td>Display</td>
</tr>
<tr>
<td>A</td>
<td>Meas</td>
</tr>
<tr>
<td>A/B</td>
<td>Meas</td>
</tr>
<tr>
<td>A/R</td>
<td>Meas</td>
</tr>
<tr>
<td>ACTIVE ENTRY</td>
<td>Display</td>
</tr>
<tr>
<td>ACTIVE MRK: MAGNITUDE</td>
<td>Display</td>
</tr>
<tr>
<td>ADAPTER: COAX</td>
<td>Cal</td>
</tr>
<tr>
<td>ADAPTER: WAVEGUIDE</td>
<td>Cal</td>
</tr>
<tr>
<td>ADAPTER: DELAY</td>
<td>Cal</td>
</tr>
</tbody>
</table>

6-2 Softkey Locations
### Table 6-1. Softkey Locations (continued)

<table>
<thead>
<tr>
<th>Softkey</th>
<th>Front-Panel Access Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTER REMOVAL</td>
<td>Cal</td>
</tr>
<tr>
<td>ADDRESS: 8753</td>
<td>Local</td>
</tr>
<tr>
<td>ADDRESS: CONTROLLER</td>
<td>Local</td>
</tr>
<tr>
<td>ADDRESS: DISK</td>
<td>Local</td>
</tr>
<tr>
<td>ADDRESS: DISK</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>ADDRESS: PMTR/HPIB</td>
<td>Local</td>
</tr>
<tr>
<td>ADJUST DISPLAY</td>
<td>Display</td>
</tr>
<tr>
<td>ALL OFF</td>
<td>Marker</td>
</tr>
<tr>
<td>ALL SEGS SWEEP</td>
<td>Menu</td>
</tr>
<tr>
<td>ALTERNATE A and B</td>
<td>Cal</td>
</tr>
<tr>
<td>AMPLITUDE</td>
<td>System</td>
</tr>
<tr>
<td>AMPLITUDE OFFSET</td>
<td>System</td>
</tr>
<tr>
<td>ANALOG IN Aux Input</td>
<td>Meas</td>
</tr>
<tr>
<td>ARBITRARY IMPEDANCE</td>
<td>Cal</td>
</tr>
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<td>ASSERT SRO</td>
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<tr>
<td>AUTO FEED on OFF</td>
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</tr>
<tr>
<td>AUTO SCALE</td>
<td>Scale Ref</td>
</tr>
<tr>
<td>AUX CHAN on OFF</td>
<td>Display</td>
</tr>
<tr>
<td>AVERAGING FACTOR</td>
<td>Avg</td>
</tr>
<tr>
<td>AVERAGING on OFF</td>
<td>Avg</td>
</tr>
<tr>
<td>AVERAGING RESTART</td>
<td>Avg</td>
</tr>
<tr>
<td>B</td>
<td>Meas</td>
</tr>
<tr>
<td>B/R</td>
<td>Meas</td>
</tr>
<tr>
<td>BACKGROUND INTENSITY</td>
<td>Display</td>
</tr>
<tr>
<td>BANDPASS</td>
<td>System</td>
</tr>
<tr>
<td>BEEP DONE on OFF</td>
<td>Display</td>
</tr>
<tr>
<td>BEEP FAIL on OFF</td>
<td>System</td>
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<tr>
<td>BEEP WARN on OFF</td>
<td>Display</td>
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<tr>
<td>BLANK DISPLAY</td>
<td>Display</td>
</tr>
<tr>
<td>Softkey</td>
<td>Front-Panel Access Key</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>BRIGHTNESS</td>
<td>Display</td>
</tr>
<tr>
<td>C0</td>
<td>Cal</td>
</tr>
<tr>
<td>C1</td>
<td>Cal</td>
</tr>
<tr>
<td>C2</td>
<td>Cal</td>
</tr>
<tr>
<td>C3</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL FACTOR</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL FACTOR SENSOR A</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL FACTOR SENSOR B</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 2.4 mm</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 2.92 mm</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 2.92 mm</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 3.5 mm C</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 3.5 mm D</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: XRL 3.5 mm</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 7 mm</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 450 Ω</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: 750 Ω</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL KIT: USER KIT</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL Z0: LINE 20</td>
<td>Cal</td>
</tr>
<tr>
<td>CAL Z0: SYSTEM 20</td>
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<td>CALIBRATE MENU</td>
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<td>CH1 DATA []</td>
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<tr>
<td>CH1 DATA LIMIT LN</td>
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<tr>
<td>CH1 MEM</td>
<td>Display</td>
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<tr>
<td>CH1 MEM [ ]</td>
<td>Copy</td>
</tr>
<tr>
<td>Softkey</td>
<td>Front-Panel Access Key</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>CH2 DATA</td>
<td>Copy</td>
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<tr>
<td>CH2 DATA LIMIT LH</td>
<td>Display</td>
</tr>
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<td>CH2 MEM</td>
<td>Copy</td>
</tr>
<tr>
<td>CH2 MEM REF LINE</td>
<td>Display</td>
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<tr>
<td>CH3 DATA</td>
<td>Copy</td>
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<tr>
<td>CH3 DATA LIMIT LH</td>
<td>Display</td>
</tr>
<tr>
<td>CH3 MEM</td>
<td>Display</td>
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<td>CH3 MEM REF LINE</td>
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<td>CH4 DATA</td>
<td>Copy</td>
</tr>
<tr>
<td>CH4 DATA LIMIT LH</td>
<td>Display</td>
</tr>
<tr>
<td>CH4 MEM</td>
<td>Display</td>
</tr>
<tr>
<td>CH4 MEM REF LINE</td>
<td>Copy</td>
</tr>
<tr>
<td>CHAN PWR [COUPLED]</td>
<td>Menu</td>
</tr>
<tr>
<td>CHAN PWR [UNCOPLED]</td>
<td>Menu</td>
</tr>
<tr>
<td>CHANNEL POSITION</td>
<td>Display</td>
</tr>
<tr>
<td>CHOP A and B</td>
<td>Cal</td>
</tr>
<tr>
<td>CLEAR BIT</td>
<td>Seq</td>
</tr>
<tr>
<td>CLEAR LIST</td>
<td>Menu</td>
</tr>
<tr>
<td>CLEAR SEQUENCE</td>
<td>Seq</td>
</tr>
<tr>
<td>COAX</td>
<td>Cal</td>
</tr>
<tr>
<td>COAXIAL DELAY</td>
<td>Scale/Ref</td>
</tr>
<tr>
<td>COLOR</td>
<td>Display</td>
</tr>
<tr>
<td>CONFIGURE</td>
<td>System</td>
</tr>
<tr>
<td>CONFIGURE EXTERNAL DISK</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>CONTINUE SEQUENCE</td>
<td>Seq</td>
</tr>
<tr>
<td>CONTINUOUS</td>
<td>Menu</td>
</tr>
<tr>
<td>CONVERSION [1]</td>
<td>Menu</td>
</tr>
<tr>
<td>CORRECTION On/Off</td>
<td>Cal</td>
</tr>
<tr>
<td>COUPL ED On/Off</td>
<td>Menu</td>
</tr>
</tbody>
</table>
### Table 6-1. Softkey Locations (continued)

<table>
<thead>
<tr>
<th>Softkey</th>
<th>Front-Panel Access Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW FREQ</td>
<td>Menu</td>
</tr>
<tr>
<td>CW TIME</td>
<td>Menu</td>
</tr>
<tr>
<td>D2/D1 to D2 on OFF</td>
<td>Display</td>
</tr>
<tr>
<td>DATA and MEMORY</td>
<td>Display</td>
</tr>
<tr>
<td>DATA ARRAY on OFF</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>DATA/MEM</td>
<td>Display</td>
</tr>
<tr>
<td>DATA = MEM</td>
<td>Display</td>
</tr>
<tr>
<td>DATA → MEMORY</td>
<td>Display</td>
</tr>
<tr>
<td>DATA ONLY on OFF</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>DECISION MAKING</td>
<td>Seq</td>
</tr>
<tr>
<td>DECOR LOOP COUNTER</td>
<td>Seq</td>
</tr>
<tr>
<td>DEFAULT COLORS</td>
<td>Display</td>
</tr>
<tr>
<td>DEFAULT PLOT SETUP</td>
<td>Copy</td>
</tr>
<tr>
<td>DEFAULT PRINT SETUP</td>
<td>Copy</td>
</tr>
<tr>
<td>DEFINE DISK=SAVE</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>DEFINE PLOT</td>
<td>Copy</td>
</tr>
<tr>
<td>DEFINE PRINT</td>
<td>Copy</td>
</tr>
<tr>
<td>DEFINE STANDARD</td>
<td>Cal</td>
</tr>
<tr>
<td>DELAY</td>
<td>Format</td>
</tr>
<tr>
<td>DELAY/THRU</td>
<td>Cal</td>
</tr>
<tr>
<td>DELETE ALL FILES</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>DELETE F ICE</td>
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</tr>
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6-6 Softkey Locations
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Softkey Locations 6-9
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610 Softkey Locations
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Softkey Locations 6-11
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6-12 Softkey Locations
Table 6-1. Softkey Locations (continued)

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Table 6-1. Softkey Locations (continued)
### Table 6-1. Softkey Locations (continued)

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620 Softkey Locations
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<tr>
<td>USER: KIT</td>
<td>Cal</td>
</tr>
<tr>
<td>USE: SENSOR A: B</td>
<td>Cal</td>
</tr>
<tr>
<td>VELOCITY FACTOR</td>
<td>Cal</td>
</tr>
<tr>
<td>VIEW: MEASURE</td>
<td>System</td>
</tr>
<tr>
<td>VOLUME NUMBER</td>
<td>Local</td>
</tr>
<tr>
<td>VOLUME NUMBER</td>
<td>Save/Recall</td>
</tr>
<tr>
<td>WAIT</td>
<td>Seq</td>
</tr>
<tr>
<td>WARNING</td>
<td>Display</td>
</tr>
<tr>
<td>WARNING [ ]</td>
<td>Copy</td>
</tr>
<tr>
<td>WAVEGUIDE</td>
<td>Cal</td>
</tr>
<tr>
<td>WAVEGUIDE DELAY</td>
<td>Scale Ref</td>
</tr>
<tr>
<td>WIDE</td>
<td>System</td>
</tr>
<tr>
<td>WIDTH: VALUE</td>
<td>Marker Fctn</td>
</tr>
<tr>
<td>WIDTHS: on: OFF</td>
<td>Marker Fctn</td>
</tr>
</tbody>
</table>
Table 6-1. Softkey Locations (continued)

<table>
<thead>
<tr>
<th>Softkey</th>
<th>Front-Panel Access Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>WINDOW</td>
<td>System</td>
</tr>
<tr>
<td>WINDOW: MAXIMUM</td>
<td>System</td>
</tr>
<tr>
<td>WINDOW: MINIMUM</td>
<td>System</td>
</tr>
<tr>
<td>WINDOW: NORMAL</td>
<td>System</td>
</tr>
<tr>
<td>XMIT:CHRL[]</td>
<td>Local</td>
</tr>
<tr>
<td>Y:REFL</td>
<td>Meas</td>
</tr>
<tr>
<td>Y:TRANS</td>
<td>Meas</td>
</tr>
<tr>
<td>Z:REFL</td>
<td>Meas</td>
</tr>
<tr>
<td>Z:TRANS</td>
<td>Meas</td>
</tr>
</tbody>
</table>
Error Messages

Error Messages in Alphabetical Order

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

**2-PORT CAL REQUIRED FOR AUX CHANNEL USE**

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>217</td>
<td>This message is displayed if you attempt to enable an auxiliary channel by pressing <strong>AUX CHAN</strong> on <strong>OFF</strong> without a full 2-port calibration being active. Perform (or recall) a full 2-port calibration and set <strong>CORRECTION</strong> on <strong>OFF</strong> to <strong>ON</strong> in the <strong>Cal</strong> menu. Then you can enable an auxiliary channel by pressing <strong>AUX CHAN</strong> on <strong>OFF</strong> in the <strong>Display</strong> menu.</td>
</tr>
</tbody>
</table>

**ABORTING COPY OUTPUT**

<table>
<thead>
<tr>
<th>Information Message</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This message is displayed briefly if you have pressed <strong>Local</strong> to abort a copy operation. If the message is not subsequently replaced by error message number 25, <strong>PRINT ABORTED</strong>, the copy device may be hung. Press <strong>Local</strong> once more to exit the abort process and verify the status of the copy device. At this point, the copy device will probably have an error condition which must be fixed (for example: out of paper or paper jam).</td>
</tr>
</tbody>
</table>
**ADDITIONAL STANDARDS NEEDED**

Error Number 68

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

**ADDRESSED TO TALK WITH NOTHING TO SAY**

Error Number 31

You have sent a read command to the analyzer (such as ENTER 716) without first requesting data with an appropriate output command (such as OUTPDATA). The analyzer has no data in the output queue to satisfy the request.

**HI R FLOW RESTRICTED: CHECK FAN FILTER**

Error Number 20

Something is restricting the air flow into the analyzer. Check for any debris and clean or replace the fan filter.

**ALL REGISTERS HAVE BEEN USED**

Error Number 200

You have used all of the available registers; you can store no more instrument states even though you may still have sufficient memory. There are 31 registers available, plus the present instrument state.

**ANALOG BUS DISABLED IN 6 KHZ IF BW**

Error Number 212

When you press **Avg** IF **BW** E60001, the analog bus is disabled and not available for use in troubleshooting. For a description of the analog bus, refer to the *HP 8753E Service Guide*.

7-2 Error Messages
ANALOG INPUT OVERLOAD

Error Number 60
The power level of the analog input is too high. Reduce the power level of the analog input source.

ANOTHER SYSTEM CONTROLLER ON HP-IB BUS

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

ARGUMENT OUT OF RANGE

Error Number 206
The argument for a programming command is out of the specified range. Refer to the *HP 8753E Programming and Command Reference Guide* for a list of programming commands and argument ranges.

ASCII: MISSING 'BEGIN' STATEMENT

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

ASCII: MISSING 'CITIFILE' STATEMENT

Error Number 194
The citifile you just downloaded over the HP-IB or via disk was not properly organized. The analyzer is unable to read the “CITIFILE” statement.
ASCII: MISSING 'DATA' STATEMENT

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

ASCII: MISSING 'VAR' STATEMENT

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

AVERAGING INVALID ON NON-RATIO MEASURE

Error Number 13
You cannot use sweep-to-sweep averaging in single-input measurements. Sweep-sweep averaging is valid only for ratioed measurements (A/R, B/R, A/B, and S-parameters). You can use noise reduction techniques, such as narrower IF bandwidth, for single input measurements.

BAD FREQ FOR HARMONIC OR FREQ OFFSET

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

BATTERY FAILED. STATE MEMORY CLEARED

Error Number 183
The battery protection of the non-volatile CMOS memory has failed. The CMOS memory has been cleared. Refer to the HP 8753E Network Analyzer Service Guide for battery replacement instructions.

7-4 Error Messages
BATTERY LOW! STORE SAVE REGS TO DISK

Error Number 184 The battery protection of the non-volatile CMOS memory is in danger of failing. If this occurs, all of the instrument state registers stored in CMOS memory will be lost. Save these states to a disk and refer to the HP 8753E Network Analyzer Service Guide for battery replacement instructions.

BLOCK INPUT ERROR

Error Number 34 The analyzer did not receive a complete data transmission. This is usually caused by an interruption of the bus transaction. Clear by pressing the [Local] key or aborting the I/O process at the controller.

BLOCK INPUT LENGTH ERROR

Error Number 35 The length of the header received by the analyzer did not agree with the size of the internal array block. Refer to the HP 8753E Programming and Command Reference Guide for instructions on using analyzer input commands.

CALIBRATION ABORTED

Error Number 74 You have changed the active channel during a calibration so the calibration in progress was terminated. Make sure the appropriate channel is active and restart the calibration.
**CALIBRATION REQUIRED**

Error Number 63
A calibration set could not be found that matched the current stimulus state or measurement parameter. You will have to perform a new calibration.

---

**CANNOT FORMAT DOS DISKS ON THIS DRIVE**

Error Number 185
You have attempted to initialize a floppy disk to DOS format on an external disk drive that does not support writing to all 80 tracks of the double density and high density disks. The older single-sided disks had only 66 tracks and some disk drives were limited to accessing that number of tracks. 'lb format the disk, either choose another external disk drive or use the analyzer's internal disk drive.

---

**CANNOT MODIFY FACTORY PRESET**

Error Number 199
You have attempted to rename, delete, or otherwise alter the factory preset state. The factory preset state is permanently stored in CMOS memory and cannot be altered. If your intent was to create a user preset state, you must create a new instrument state, save it, and then rename it to “UPRESET”.

---

**CANNOT READ/WRITE HFS FILE SYSTEM**

Error Number 203
The disk is being accessed by the analyzer and is found to contain an HFS (hierarchical file system) or files nested within subdirectories. The analyzer does not support HFS. Replace the disk medium with a LIF or DOS formatted disk that does not contain files nested within subdirectories.

---

7-6 Error Messages
CAN'T STORE/LOAD SEQUENCE, INSUFFICIENT MEMORY

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

CAUTION: AUX CHANNELS MEASURE S-PARAMETERS ONLY

Error Number 216  This message is displayed if you attempt to select a measurement type other than an S-parameter for an auxiliary channel.

CAUTION: CORRECTION OFF: AUX CHANNEL(S) DISABLED

Error Number 215  This message is displayed when correction is forced off due to a stimulus change that is not compatible with the current calibration while an auxiliary channel is enabled. The auxiliary channels are restored when correction is turned on by pressing (Cal) on OFF.

CAUTION: POWER OUT MAY BE UNLEVEL

Error Number 179  There is either a hardware failure in the source or you have attempted to set the power level too high. The analyzer allows the output power to be set higher or lower than the specified available power range. However, these output powers may be unleveled or unavailable. Check to see if the power level you set is within specifications. If it is, refer to the HP 8753E Network Analyzer Service Guide for troubleshooting.

CH1 (CH2) TARGET VALUE NOT FOUND

Error Number 159  Your target value for the marker search function does not exist on the current data trace.
CONTINUOUS SWITCHING NOT ALLOWED

Error Number 10 Your current measurement requires different power ranges on channel 1 and channel 2. To protect the attenuator from undue mechanical wear, test set hold will be activated.

The “tsH” (test set hold) indicator in the left margin of the display indicates that the inactive channel has been put in the sweep hold mode.

COPY: device not responding; copy aborted

Error Number 170 The printer or plotter is not accepting data. Verify the cable connections, HP-IB addresses, and otherwise ensure that the copy device is ready.

COPY OUTPUT COMPLETED

Information Message The analyzer has completed outputting data to the printer or plotter. The analyzer can now accept another copy command.

CORRECTION AND DOMAIN RESET

Error Number 65 When you change the frequency range, sweep type, or number of points, error-correction is switched off and the time domain transform is recalculated, without error-correction. You can either correct the frequency range, sweep type, or number of points to match the calibration, or perform a new calibration. Then perform a new time domain transform.

7-8 Error Messages
CORRECTION CONSTANTS NOT STORED

Error Number 3
A store operation to the EEPROM was not successful.
You must change a switch position on the A9 CPU assembly. Refer to the “A9 CC Switch Position Procedure” in the “Adjustments and Correction Constants” chapter of the HP 8753E Network Analyzer Service Guide.

CORRECTION ON: AUX CHANNEL(S) RESTORED

Error Number 214
This message is displayed when a calibration is restored and that calibration previously had one or both auxiliary channels enabled.

CORRECTION TURNED OFF

Error Number 66
Critical parameters in your current instrument state do not match the parameters for the calibration set, therefore correction has been turned off. The critical instrument state parameters are sweep type, start frequency, frequency span, and number of points.

CURRENT PARAMETER NOT IN CAL SET

Error Number 64
Correction is not valid for your selected measurement parameter. Either change the measurement parameters or perform a new calibration.

D2/D1 INVALID WITH SINGLE CHANNEL

Error Number 130
You can only make a D2/D1 measurement if both channels are on.
D2/D1 INVALID: CH1 CH2 NUM PTS DIFFERENT
Error Number 152 You can only make a D2/D1 measurement if both channels have the same number of points.

DEADLOCK
Error Number 111 A fatal firmware error occurred before instrument preset completed. Call your local Hewlett-Packard sales and service office.

DEMODULATION NOT VALID
Error Number 17 Demodulation was selected when the analyzer was not in CW tune mode. Select demodulation only after putting the analyzer into CW time mode.

DEVICE: not on, no. + connect., wrong addr
Error Number 119 The device at the selected address cannot be accessed by the analyzer. Verify that the device is switched on, and check the HP-IB connection between the analyzer and the device. Ensure that the device address recognized by the analyzer matches the HP-ID address set on the device itself.

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

7-10 Error Messages
DISK HARDWARE PROBLEM
Error Number 39 The disk drive is not responding correctly. Refer to the HP 8753E Network Analyzer Service Guide for troubleshooting information. If using an external disk drive, refer to the disk drive operating manual.

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

DISK MEDIUM NOT INITIALIZED
Error Number 40 You must initialize the disk before it can be used.

DISK MESSAGE LENGTH ERROR
Error Number 190 The analyzer and the external disk drive aren't communicating properly. Check the HP-IB connection and then try substituting another disk drive to isolate the problem instrument.

DISK: not on, not connected, wrong address
Error Number 38 The disk cannot be accessed by the analyzer. Verify power to the disk drive, and check the HP-IB connection between the analyzer and the disk drive. Ensure that the disk drive address recognized by the analyzer matches the HP-IB address set on the disk drive itself.

Error Messages 7-11
DISK READ/WRITE ERROR

Error Number 189
There may be a problem with your disk. Try a new floppy disk. If a new floppy disk does not eliminate the error, suspect hardware problems.

DISK WEAR - REPLACE DISK SOON

Error Number 49
Cumulative use of the disk is approaching the maximum. Copy files as necessary using an external controller. If no controller is available, load instrument states from the old disk and store them to a newly initialized disk using the save/recall features of the analyzer. Discard the old disk.

DOMAIN RESET

Error Number 67
Time domain calculations were reset due to a change in the frequency range, sweep type, or number of points. Perform a new time domain transform on the new state.

DOS NAME LIMITED TO 8 CHAR + 3 CHAR EXTENSION

Error Number 180
A DOS file name must meet the following criteria:
- minimum of 1 character
- format is filename.ext
  - maximum of 8 characters in the filename
- maximum of 3 characters in the extension field (optional)
  - a dot separates the filename from the extension field (the dot is not part of the name on the disk)

7-12 Error Messages
DUPLICATING TO THIS SEQUENCE NOT ALLOWED

Error Number 125
A sequence cannot be duplicated to itself.

EXCEEDED 7 STANDARDS PER CLASS

Error Number 72
When modifying calibration kits, you can define a maximum of seven standards for any class.

EXTERNAL SOURCE MODE REQUIRES CW TIME

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

EXT SOURCE NOT READY FOR TRIGGER

Error Number 191
There is a hardware problem with the HP 8625A external source. Verify the connections between the analyzer and the external source. If the connections are correct, refer to the source operating manual.

EXT SRC: NOT ON/CONNECTED OR WRONG ADDR

Error Number 162
The analyzer is unable to communicate with the external source. Check the connections and the HP-IB address on the source.

FILE NOT COMPATIBLE WITH INSTRUMENT

Information Message
You cannot recall user graphics that had been saved on an earlier model of analyzer with a monochrome display. These files cannot be used with the HP 87533.
FILE NOT FOUND

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

FILE NOT FOUND OR WRONG TYPE

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

FIRST CHARACTER MUST BE A LETTER

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

FORMAT NOT VALID FOR MEASUREMENT

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

FORMATTING DATA

Information Message The list information is being processed for a list data output to a copy device and stored in the copy spool buffer. During this time, the analyzer's resources are dedicated to this task (which takes less than a few seconds).

FREQ OFFSET ONLY VALID IN NETWORK ANALYZER MODE

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

7-14 Error Messages
FREQS CANNOT BE CHANGED, TOO MANY POINTS
Error Number 204
The number of points selected for setting the low pass transform frequencies is too high. Reduce the number of points so that the low pass criteria is met.

FUNCTION NOT AVAILABLE
Error Number 202
The function you requested over HP-IB is not available on the current instrument.

FUNCTION NOT VALID
Error Number 14
The function you requested is incompatible with the current instrument state.

FUNCTION NOT VALID DURING MOD SEQUENCE
Error Number 131
You cannot perform sequencing operations while a sequence is being modified.

FUNCTION NOT VALID FOR INTERNAL MEMORY
Error Number 201
The function you selected only works with disk files.

FUNCTION ONLY VALID DURING MOD SEQUENCE
Error Number 164
You can only use the `GOSUB SEQUENCE` capability when you are building a sequence. Attempting to use this `softkey` at any other time returns an error message and no action is taken.
**HP 8753 Source Parameters Changed**

Error Number 61

Some of the stimulus parameters of the instrument state have been changed, because you have turned correction on. A calibration set for the current measurement parameter was found and activated. The instrument state was updated to match the stimulus parameters of the calibration state.

This message also appears when you have turned on harmonic mode or frequency offset, and the present frequency range cannot be used with one of these modes.

**HP 1B Copy In Progress, Abort With Local**

Error Number 169

An HP-IB copy was already in progress when you requested the HP-IB for another function. lb abort the first copy, press (Local), otherwise the HP-IB is unavailable until the first copy is completed.

**IF BW Key Disabled, Edit List Mode TBL**

Information Message

When list IF bandwidth has been enabled and swept list mode is on, you will not be able to change the IF bandwidth using the IF key. lb change the IF bandwidth, edit the swept list table.

**Illegal Unit Or Volume Number**

Error Number 46

The disk unit or volume number set in the analyzer is not valid. Refer to the disk drive operating manual.
INIT DISK removes all data from disk

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

INITIALIZATION FAILED

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

INSTRUMENT STATE MEMORY CLEARED

Error Number 56 All instrument state registers have been cleared from memory along with any saved calibration data, memory traces, and calibration kit definitions. Additionally, all user-settable selections (such as HP-IB addresses) are set to their defaults.

INSUFFICIENTMEMORY

Error Number 51 Your last front panel or HP-IB request could not be implemented due to insufficient memory space. In some cases, this is a fatal error from which you can escape only by presetting the instrument.

INSUFFICIENTMEMORYFORPRINT/PLOT

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

Error Messages 7-17
INSUFFICIENT MEMORY, PWRMTRCAL OFF

Error Number 154

There is not enough memory space for the power meter calibration array. Increase the available memory by clearing one or more save/recall registers, or by reducing the number of points.

INVALID KEY

Error Number 2

You pressed an undefined softkey.

LIMIT THBLE EMPTY

Error Number 205

Limit lines cannot be turned on unless a limit table has been created. Refer to “Testing a Device with Limit Lines” in Chapter 2 for information on how to create a limit table.

LIST MODE OFF; INVALID W/ LO FREQ

Error Number 182

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

LIST THBLE EMPTY

Error Number 9

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

7-18 Error Messages
LOG SWEEP REQUIRES 2 OCTAYE MINIMUM SPAN

Error Number 150

A logarithmic sweep is only valid if the stop frequency is greater than four times the start frequency. For frequency spans of less than two octaves, the sweep type automatically reverts to linear sweep.

LOW PASS: FREQ LIMITS CHANGED

Information Message

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

MEMORY FOR CURRENT SEQUENCE IS FULL

Error Number 132

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

MORE SLIDES NEEDED

Error Number 71

When you use a sliding load (in a user-defined calibration hit), you must set at least three slide positions to complete the calibration.
NO CALIBRATION CURRENTLY IN PROGRESS

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

---

NO DISK MEDIUM IN DRIVE

Error Number 41 You have no disk in the current disk unit. Insert a disk, or check the disk unit number stored in the analyzer.

---

NO FAIL FOUND

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

---

NO FILE(S) FOUND ON DISK

Error Number 45 No files of the type created by an analyzer store operation were found on the disk or the disk drive is empty. If you requested a specific file title, that file was not found on the disk.

---

NO IF FOUND: CHECK R INPUT LEVEL

Error Number 5 The first **IF** signal was not detected during pretune. Check the front panel **R channel** jumper. If there is no visible problem with the jumper, refer to the **HP 8753E Network Analyzer Service Guide** for troubleshooting.
NO LIMIT LINES DISPLAYED
Error Number 144 You can turn limit lines on but they cannot be displayed on polar or Smith chart display formats.

NO MARKER DELTA -SPAN NOT SET
Error Number 15 You must turn the delta marker mode on, with at least two markers displayed, in order to use the MARKER ⎯ SPAN softkey function.

NO MEMORY AVAILABLE FOR INTERPOLATION
Error Number 123 You cannot perform interpolated error correction due to insufficient memory.

NO MEMORY AVAILABLE FOR SEQUENCING
Error Number 126 You cannot modify the sequence due to insufficient memory.

NO SPACE FOR NEW CAL. CLEAR REGISTERS
Error Number 70 You cannot store a calibration set due to insufficient memory. You can free more memory by clearing a saved instrument state from an internal register (which may also delete an associated calibration set, if all the instrument states using the calibration kit have been deleted). You can store the saved instrument state and calibration set to a disk before clearing them. After deleting the instrument states, press (Preset) to run the memory packer.

Error Messages 7-21
**NOT ALLOWED DURING POWER METER CAL**

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

**NOT ENOUGH SPACE ON DISK FOR STORE**

Error Number 44  The store operation will **overflow** the available disk space. Insert a new disk or purge files to create free disk space.

**NO VALID MEMORY TRACE**

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

**NO VALID STATE IN REGISTER**

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

**ONLY LETTERS AND NUMBERS ARE ALLOWED**

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

Error Number 1 The function you requested requires a capability provided by an option to the standard analyzer. That option is not currently installed. (Refer to Chapter 1 for a description of the available options.)

OVERLAP LIST TYPE CHANGED TO STEPPED

Error Number 211 The list type changed to stepped because one or more frequency segments in the swept list table overlapped. Change the frequency ranges of the overlapping segments and switch back to swept list mode.

PHRLLPPEL PORT NOT AVAILABLE FOR GPIO

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

PHRLLPPEL PORT NOT AVAILABLE FOR COPY

Error Number 167 You have defined the parallel port as general purpose I/O (GPIO) for sequencing. The definition was made under the [Local] key menus. To access the parallel port for copy, set the selection to PARALLEL COPY.1.
**PHASE LOCK CAL FAILED**

Error Number 4

An internal phase lock calibration routine is automatically executed at power-on, preset, and any time a loss of phase lock is detected. This message indicates that phase lock calibration was initiated and the first IF detected, but a problem prevented the calibration from completing successfully. Refer to the *HP 8753E Network Analyzer Service Guide* and execute pretune correction test 48.

This message may appear if you connect a mixer between the RF output and R input before turning on frequency offset mode. Ignore it: it will go away when you turn on frequency offset. This message may also appear if you turn on frequency offset mode before you define the offset.

**PHASE LOCK FAILURE**

Error Number 7

The first IF signal was detected at pretune, but phase lock could not be acquired. Refer to the *HP 8753E Network Analyzer Service Guide* for troubleshooting.

**PHASE LOCK LOST**

Error Number 8

Phase lock was acquired but then lost. Refer to the *HP 8753E Network Analyzer Service Guide* for troubleshooting information.

**PLOT ABORTED**

Error Number 27

When you press the **Local** key, the analyzer aborts the plot in progress.

---

7-24 Error Messages
PLOTTER: not on, not connect, wrong addr

Error Number 26
The plotter does not respond to control. Verify power to the plotter, and check the HP-IB connection between the analyzer and the plotter. Ensure that the plotter address recognized by the analyzer matches the HP-IB address set on the plotter itself.

PLOTTER NOT READY—PINCHWHEELS UP

Error Number 28
The plotter pinch wheels clamp the paper in place. If you raise the pinch wheels, the plotter indicates a “not ready” status on the bus.

POSSIBLE FALSE LOCK

Error Number 6
Phase lock has been achieved, but the source may be phase locked to the wrong harmonic of the synthesizer. Perform the source pre-tune correction routine documented in the “Adjustments and Correction Constants” chapter in the HP 8753E Network Analyzer Service Guide.

POWER METER INVALID

Error Number 116
The power meter indicates an out-of-range condition. Check the test setup.
POWER METER NOT SETTLED

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

POWER SUPPLY HOT!

Error Number 21
The temperature sensors on the A8 post-regulator assembly have detected an over-temperature condition. The power supplies regulated on the post-regulator have been shut down.

POWER SUPPLY SHUTDOWN!

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

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

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

PRINT ABORTED

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

7-26 Error Messages
print color not supported with EPSON

Error Number 178
You have defined the printer type as EPSON-l%. Color print is not supported with this printer. The print will abort.

PRINTER: busy

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

PRINTER: error

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

PRINTER: not connected

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

PRINTER: not handshaking

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

PRINTER: not on line

Error Number 172
The printer at the parallel port is not set on line.
PRINTER: not on, not connected, wrong addr

Error Number 24 The printer does not respond to control. Verify power to the printer, and check the HP-IB connection between the analyzer and the printer. Ensure that the printer address recognized by the analyzer matches the HP-ID address set on the printer itself.

---

PRINTER: paper error

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

---

PRINTER: power off

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

---

PRINT/PLOT IN PROGRESS, ABORT WITH LOCAL

Error Number 166 If a print or plot is in progress and you attempt a second print or plot, this message is displayed and the second attempt is ignored. To abort a print or plot in progress, press (Local).

---

PROCESSING DISPLAY LIST

Information Message The display information is being processed for a screen print to a copy device and stored in the copy spool buffer. During this time, the analyzer’s resources are dedicated to this task (which takes less than a few seconds).

---

7-28 Error Messages
PWR MTR NOT ON/CONNECTED OR WRONG ADORS

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

RANGE CAUSED POWER LVL CHANGE IN LIST

Error Number 213
The selected power range changed the power level of one or more segments in the swept list table. Change the segment power or change the power range.

REQUESTED DATA NOT CURRENTLY AVAILABLE

Error Number 30
The analyzer does not currently contain the data you have requested. For example, this condition occurs when you request error term arrays and no calibration is active.

SAVE FAILED. INSUFFICIENT MEMORY

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

SEGMENT #n POWER OUTSIDE RANGE LIMIT

Information Message
The selected power range does not support the power level of one or more segments in the swept list table. This message appears when swept list mode is not on and reports the first segment that is out of range. Change the segment power or change the power range.
### SEGMENT #n START FREQ OVERLAPS PREVIOUS SEGMENT

**Information Message**

A segment entered in the swept list table caused one or more frequency segments to overlap. This message appears when swept list mode is not on and reports the first segment that is overlapping another. Change the frequency ranges of the overlapping segments.

---

### SELECTED SEQUENCE IS EMPTY

**Error Number 124**

The sequence you attempted to run does not contain instrument commands.

---

### SELF TEST #n FAILED

**Service Error Number 112**

Internal test #n has failed. Several internal test routines are executed at instrument preset. The analyzer reports the first failure detected. Refer to the *HP 8753E Network Analyzer Service Guide* for troubleshooting information on internal tests and the self-diagnose feature.

---

### SEQUENCE ABORTED

**Error Number 157**

The sequence running was stopped prematurely when you pressed the (Local) key.

---

### SEQUENCE MAY HAVE CHANGED, CAN'T CONTINUE

**Error Number 153**

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

---

*7-30 Error Messages*
SLIDES ABORTED (MEMORY REALLOCATION)

Error Number 73
You cannot perform sliding load measurements due to insufficient memory. Increase the available memory by clearing one or more save/recall registers and pressing [Preset], or by storing files to a disk.

SOURCE POWER DISABLED, EDIT LIST MODE TBL

Information Message When list power has been enabled and swept list mode is on, you will not be able to change the power level using the POWER key. To change the power level, edit the swept list table.

SOURCE POWER TURNED OFF, RESET UNDER POWER MENU

Information Message You have exceeded the maximum power level at one of the inputs and power has been automatically reduced. The annotation P indicates that power trip has been activated. When this occurs, reset the power and then press [Menu] POWER SOURCE PWR on OFF, to switch on the power.

STARTING COPY SPOOLER

Information Message The analyzer is beginning to output data from the spool buffer to the copy device. The analyzer resumes normal operation; the data is being output to the copy device in the background.

Error Messages 7-31
SWEEP MODE CHANGED TO CW TIME SWEEP
Error Number 187 If you select external source auto or manual instrument mode and you do not also select CW mode, the analyzer is automatically switched to CW.

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

SWEEP TIME TOO FAST
Error Number 12 The fractional-N and digital IF circuits have lost synchronization. Refer to the HP 8753E Network Analyzer Service Guide for troubleshooting information.

SWEEP TRIGGER SET TO HOLD
Information Message The instrument is in a hold state and is no longer sweeping. lb take a new sweep, press (Menu) TRIGGER MENUSINGLE or CONTINUOUS.
**SYNTAX ERROR**

Error Number 33  You have improperly formatted an HP-IB command. Refer to the *HP 8753E Programming and Command Reference Guide* for proper command syntax.

**SYST CTRL OR PASS CTRL IN LOCAL MENU**

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

**TEST ABORTED**

Error Number 113  You have prematurely stopped a service test.

**THIS LIST FREQ INVALID**

Error Number 133  You have set frequencies in the list that are outside of the allowable frequency range of the analyzer. Reduce the frequency range of the list.
Too Many Nested Sequences. Seq Aborted

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

Too Many Segments or Points

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

Transform, Gate Not Allowed

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

Trouble! Check Setup and Start Over

Service Error: 115
Your equipment setup for the adjustment procedure in progress is not correct. Check the setup diagram and instructions HP 8753E Network Analyzer Service Guide. Start the procedure again.

Waiting for Clean Sweep

Information Message:
In single sweep mode, the instrument ensures that all changes to the instrument state, if any, have been implemented before taking the sweep. The command that you have initiated is being processed and will not be complete until the new sweep is completed. An asterisk * is displayed in the left margin until a complete fresh sweep has been taken.

7-34 Error Messages
WAITING FOR DISK

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

WAITING FOR HP-IB CONTROL

Information Message You have instructed the analyzer to use pass control (USEPASC). When you send the analyzer an instruction that requires active controller mode, the analyzer requests control of the bus and simultaneously displays this message. If the message remains, the system controller is not relinquishing the bus.

WRITE ATTEMPTED WITHOUT SELECTING INPUT TYPE

Error Number 32 You have sent the data header “#A” to the analyzer with no preceding input command (such as INPUDATA). The instrument recognized the header but did not know what type of data to receive. Refer to the HP 8753E Programming and Command Reference Guide for command syntax information.

WRONG DISK FORMAT, INITIALIZE DISK

Error Number 77 You have attempted to store, load, or read Ele titles, but your disk format does not conform to the Logical Interchange Format (LIF) or DOS format. You must initialize the disk before reading or writing to it.
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