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Valid burst not found ............................................................. .69
Valid burst not found ............................................................. .81
Valid burst not found ............................................................. .67
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1 Instrument Messages
**Instrument Messages Introduction**

The analyzer can generate various messages that appear on the display during operation. There are four types of messages. This chapter describes the following types of messages displayed on the analyzer:

- **User Error Messages**: Beginning on page 34, User Error Messages appear when an attempt has been made to set a parameter incorrectly or an operation has failed (such as saving a file). These messages are often generated during remote operation when an invalid programming command has been entered. These messages appear in the status line at the bottom of the display. If you are using the default display colors, the message will appear in yellow. The message will remain until you preset the analyzer, press **ESC**, or another message is displayed on the status line.

- **Informational Messages**: Beginning on page 82, Informational Messages provide information that requires intervention. These messages appear on the status line at the bottom of the display. If you are using the default display colors, the message will appear in green (ESA) or yellow (PSA). The message will remain until you preset the analyzer, press **ESC**, or another message is displayed on the status line. The information provided in brackets, for example `<filename>` or `<directory>`, is a variable that represents a specific input provided previously.

- **Status Messages**: Beginning on page 86, Status Messages appear on the right side of the analyzer display and/or set status bits in the SCPI Status Register system. These messages indicate a condition that may result in erroneous data being displayed. Most messages will only be displayed until the error condition is corrected. Multiple messages can be displayed and will be listed in the display area. In each case the name of the corresponding status bit is indicated in parenthesis. It will be noted if only a status bit is used (no message).

- **Pop-up Messages**: These messages indicate a condition that may require intervention. They appear in the middle of the display in a framed box. The message will remain until the appropriate intervention has taken place or the condition has been corrected.
Error Queues

There are two types of error queues, front panel and remote interface. These two queues are viewed and managed separately. Refer to Table 1-1. for more information on the characteristics of the Error Queue.

Front panel A summary of the last 11 error messages preceded by an error number may be viewed in the Error Queue by pressing, System then Show Errors. When a remote interface initiates activity that generates an error, the messages are output to the remote bus. When output to the remote interface, they are preceded by an error number.

Remote interface (SCPI) When a user error condition occurs in the analyzer as a result of SCPI (remote interface) activity, it is reported to both the front panel display error queue and the SCPI error queue. If it is a result of front panel activity, it reports to the front panel display error queue, and depending on the error, may also report to the SCPI error queue.

Table 1-1. Characteristics of the Error Queue

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Front-Panel Display Error Queue</th>
<th>SCPI Remote Interface Error Queue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (number of errors)</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>Overflow Handling</td>
<td>Circular (rotating). Drops oldest error as new error comes in.</td>
<td>Linear, first-in/first-out. Replaces newest error with: −350, Queue overflow</td>
</tr>
<tr>
<td>Viewing Entries</td>
<td>Press: System, Show Errors&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Use SCPI query SYSTem:ERROR?</td>
</tr>
<tr>
<td>Clearing the Queue</td>
<td>Press: System, Show Errors, Clear Error Queue</td>
<td>Power up. Send a *CLS command. Read last item in the queue.</td>
</tr>
</tbody>
</table>

<sup>a</sup> Error history includes the date and time an error last occurred, the error number, the error message, and the number of times the error occurred.
Error Message Format

The system-defined error numbers are chosen on an enumerated ("1 of N") basis. The error messages are listed in numerical order according to the error message number. Status and Informational messages without numbers will be listed in alphabetical order following the numerical listing.

In this chapter, an explanation is included with each error to further clarify its meaning. The last error described in each class (for example, -400, -300, -200, -100) is a “generic” error. There are also references to the IEEE Standard 488.2-1992, IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987. New York, NY, 1992.

Error messages are displayed at the bottom of the screen in the status line. If you are using the default display colors, the message will appear in yellow. The error number is available through the remote interface and the show errors screen; it is not displayed in the status line.

Figure 1-1. Error Message Example

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Error Message</th>
<th>Error Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-221</td>
<td>Settings conflict; parameter currently disabled</td>
<td>This parameter is grayed out (unavailable) in the current context. Check the individual parameter help/documentation for more information.</td>
</tr>
</tbody>
</table>

Explanation provided in this chapter (This is NOT displayed on the instrument)
## Error Message Types

Events do not generate more than one type of error. For example, an event that generates a query error will not generate a device-specific, execution, or command error.

<table>
<thead>
<tr>
<th>Error Range</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>−499 to 0</td>
<td>Query Errors</td>
<td>These errors indicate that the analyzer output queue control has detected a problem with the message exchange protocol described in IEEE 488.2, Chapter 6. Errors in this class set the query error bit (bit 2) in the event status register (IEEE 488.2, section 11.5.1). These errors correspond to message exchange protocol errors described in IEEE 488.2, 6.5. In this case:</td>
</tr>
<tr>
<td>−399 to −300</td>
<td>Device-Specific Errors</td>
<td>An error number in the range −399 to −300 indicates that the analyzer has detected an error where some device operations did not properly complete, possibly due to an abnormal hardware or firmware condition. This is not a error in response to a SCPI query or command, or command execution. The occurrence of any error in this class will cause the device-specific error bit (bit 3) in the event status register to be set.</td>
</tr>
<tr>
<td>−299 to −200</td>
<td>Execution Errors</td>
<td>These errors indicate that an error has been detected during analyzer execution.</td>
</tr>
<tr>
<td>−199 to −100</td>
<td>Command Errors</td>
<td>These errors indicate that the analyzer parser detected an IEEE 488.2 syntax error. Errors in this class set the command error bit (bit 5) in the event status register (IEEE 488.2, section 11.5.1). In this case:</td>
</tr>
<tr>
<td>64 to 799</td>
<td>Device-Specific Errors</td>
<td>These errors indicate that a device operation did not properly complete, possibly due to an abnormal hardware or firmware condition. These codes are also used for self-test response errors. Errors in this class set the device-specific error bit (bit 3) in the event status register (IEEE 488.2, section 11.5.1). The &lt;error_message&gt; string for a positive error is not part of the SCPI standard. A positive error indicates that the analyzer detected an error within the GPIB system, within the analyzer firmware or hardware, during the transfer of block data, or during calibration.</td>
</tr>
<tr>
<td>Greater than 10000</td>
<td>Measurement Applications Errors</td>
<td>These errors indicate that an error has been detected while executing measurements requiring a personality option such as the GSM Measurement Personality or those measurements found under the <strong>MEASURE</strong> front-panel key in SA mode.</td>
</tr>
</tbody>
</table>
Instrument Messages

Error Messages

NOTE: Error numbers are displayed in the error queue, not on the display.
To see an error number, press System, Show Errors.

None

Hardware Fail
ESA message NOT USED
A hardware failure has occurred. Get in touch with your service center.

0: No Error

0
No error
The queue is empty. Either every error in the queue has been read, or the queue was cleared by power-on or *CLS.

-499 to -400: Query Errors

NOTE: Error numbers are displayed in the error queue, not on the display.
To see an error number, press System, Show Errors.

-440 Query UNTERMINATED after indefinite response
Indicates that a query was received in the same program message after a query requesting an indefinite response was executed (see IEEE 488.2, 6.3.7.5).

-430 Query DEADLOCKED
Indicates that a condition causing a DEADLOCKED query error occurred (see IEEE 488.2, 6.3.1.7). For example, both the input buffer and the output buffer are full and the analyzer cannot continue. The analyzer automatically discards output to correct the deadlock.

-420 Query UNTERMINATED
Indicates that a condition causing an UNTERMINATED query error occurred (see IEEE 488.2, 6.3.2.2). For example, the device was addressed to talk and an incomplete program message was received.

-410 Query INTERRUPTED
Indicates that a condition causing an INTERRUPTED query error
occurred (see IEEE 488.2, 6.3.2.7). For example, a query was followed by DAB or GET before a response was completely sent.

−400 Query Error

This is a generic query error for devices that cannot detect more specific errors. The code indicates only that a query error as defined in IEEE 488.2, 11.5.1.1.7 and 6.3 has occurred.

−399 to −300: Device-Specific Errors

NOTE Error numbers are displayed in the error queue, not on the display.
To see an error number, press System, Show Errors.

−340 Calibration failed

The instrument requires an Align All Now. Restore the alignment by pressing System, Alignments, Align All Now.

−330 Self-test failed; EEPROM checksum for <card>

The card identification header for a hardware card is incorrect. If the card is not properly identified, the instrument is likely to be non-functional. Report this error to the nearest Agilent Technologies sales or service office.

−321 Out of memory

An internal operation needed more memory than was available. Report this error to the nearest Agilent Technologies sales or service office.

−310 System error; Pretune DAC Calibration failed

System error; Pretune DAC Cal failed midpoint verification

System error
An internal system problem was detected. Report this error to the nearest Agilent Technologies sales or service office.

−300 Device-specific error

This is a generic device-dependent error for devices that cannot detect more specific errors. The code indicates only that a device-dependent error as defined in IEEE 488.2, 11.5.1.1.6 has occurred. Report this error to the nearest Agilent Technologies sales or service office.

−299 to −200: Execution Errors

NOTE Error numbers are displayed in the error queue, not on the display.
To see an error number, press System, Show Errors.
−253 Corrupt media
A removable media was found to be bad or incorrectly formatted. Any existing data on the media may have been lost.

−250 Mass storage error; EEPROM write timeout on EEPROM
Failure to initialize EEPROM. Report this error to the nearest Agilent Technologies sales or service office.

−241 Hardware missing
Hardware missing; no such SIO address
Missing device hardware. For example, an option is not installed.

−230 Data corrupt or stale
Data corrupt or stale; EEPROM copy of <file>
Data corrupt or stale; NRAM copy of <file>
Possibly invalid data. A new measurement was started but not completed.

−224 Illegal parameter value
You have sent a parameter for this command that is not allowed. See the Function Reference.

−223 Too much data; not all points entered
Too much data; <description of the type of data exceeded>
Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.

−222 Data out of range
A legal program data element was parsed but could not be executed because the interpreted value was outside the legal range defined by the device (see IEEE 488.2 11.5.1.1.5). The displayed results may be clipped.

−221 Settings conflict;

...Averaging unavailable when Sig ID is on
User in ext mix with Sig ID on and try to select Averaging Mode.

...Cannot center unpreselected external mixer
Mixer Type is Unpreselected and user tries Preselector Centering.

...Command incompatible with band pair marker
Using remote commands, you have tried to adjust the start or stop frequency of a span pair marker. You can adjust only the center and span.
...External mixing unavailable when preamp on
Internal preamp is on and user tries to select external mixing.

...FFT unavailable when Sig ID is on
User in ext mix with Sig ID on and try to select Manual:FFT

...Settings Conflict, Preamp unavailable in external mixing mode
User in ext mix and tries turning on internal preamp.

...Sig ID requires EXTERNAL mixing mode
Input Mixer setting is INTERNAL and the user tries Sig ID.

...Sig ID unavailable in Manual:FFT
User in ext mix, in FFT, user tries Sig ID.

...Sig ID unavailable when Averaging is on
User in ext mix, in Averaging Mode, user tries Sig ID.

...Sig ID unavailable when Signal Track is on
User in ext mix, in Signal Track Mode, user tries Sig ID.

...Signal ID unavailable with Presel Mixer
User in Presel mixer, and tries to turn on Sig ID.

...Signal Track unavailable when Sig ID is on
User in ext mix with Sig ID on and try to select Signal Track.

**Settings conflict; parameter currently disabled**
This parameter is grayed out (unavailable) in the current context. Check the individual parameter help/documentation for more information.

**-200 Execution Error**
For devices that cannot detect more specific errors, this code indicates only that an execution error as defined in IEEE 488.2, 11.5.1.1.5 has occurred.

**-199 to -100: Command Errors**

<table>
<thead>
<tr>
<th>NOTE</th>
<th>Error numbers are displayed in the error queue, not on the display.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To see an error number, press System, Show Errors.</td>
</tr>
</tbody>
</table>
Expression data not allowed
A legal expression data was encountered, but was not allowed by the device at this point in parsing.

Invalid expression
The expression data element was invalid (see IEEE 488.2, 7.7.7.2). For example, unmatched parentheses or an illegal character.

Expression data error
This error, as well as errors -171 through -179, is generated when parsing an expression data element. This particular error message is used if the device cannot detect a more specific error.

Block data not allowed
A legal block data element was encountered, but not allowed by the device at this point in the parsing.

Invalid block data
A block data element was expected, but was invalid (see IEEE 488.2, 7.7.6.2). For example, an END message was received before the end length was satisfied.

Block data error
This error, as well as errors -161 through -169, is generated when parsing a block data element. This particular error message is used if the device cannot detect a more specific error.

String data not allowed
A string data element was encountered, but not allowed by the device at this point in the parsing.

Invalid string data
A string data element was expected, but was invalid (see IEEE 488.2, 7.7.5.2). For example, an END message was received before the terminal quote character.

String data error
This error, as well as errors -151 through -159, is generated when parsing a string data element. This particular error message is used if the device cannot detect a more specific error.

Character data not allowed
A legal character data element was encountered where prohibited by the device.
-144 Character data too long

The character data element contains more than twelve characters (see IEEE 488.2, 7.7.1.4).

-141 Invalid character data

Either the character data element contains an invalid character or the particular element received is not valid for the header.

-140 Character data error

This error, as well as errors -141 through -149, is generated when parsing a character data element. This particular error message is used if the device cannot detect a more specific error.

-138 Suffix not allowed

A suffix was encountered after a numeric element which does not allow suffixes.

-134 Suffix too long

The suffix contained more than twelve characters (see IEEE 488.2, 7.7.3.4).

-131 Invalid suffix

Attempt to send a SCPI command with a suffix that does not match the current units for the function.

The suffix does not follow the syntax described in IEEE 488.2, 7.7.3.2, or the suffix is inappropriate for this device.

-130 Suffix error

This error, as well as errors -131 through -139, is generated when parsing a suffix. This particular error message is used if the device cannot detect a more specific error.

-128 Numeric data not allowed

A legal numeric data element was received, but the device does not accept one in this position for the header.

-124 Too many digits

The mantissa of a decimal-numeric data element contained more than 255 digits excluding leading zeros (see IEEE 488.2, 7.7.2.4.1).

-123 Exponent too large

The magnitude of an exponent was greater than 32000 (see IEEE 488.2, 7.7.2.4.1).

-121 Invalid character in number

An invalid character for the data type being parsed was encountered. For example, an alpha in a decimal numeric or a “9” in octal data.
−120 Numeric data error; VGR

Numeric data error

This error, and errors −121 through −129, is generated when parsing a data element that appears to be numeric, including non-decimal numeric types. This message is used if the device cannot detect a more specific error.

−114 Header suffix out of range

The value of a header suffix attached to a program mnemonic makes the header invalid.

−113 Undefined header

The header is syntactically correct, but it is undefined for this specific device. For example, *XYZ is not defined for any device.

−112 Program mnemonic too long

The header contains more than twelve characters (see IEEE 488.2, 7.6.1.4.1).

−111 Header separator error

A character which is not a legal header separator was encountered while parsing the header.

−110 Command header error

An error was detected in the header. This message is used when the device cannot detect the more specific errors described for errors −111 through −119.

−109 Missing parameter

Fewer parameters were received than required for the header. For example, the *ESE common command requires one parameter, so receiving *ESE is not allowed.

−108 Parameter not allowed

More parameters were received than expected for the header. For example, the *ESE common command only accepts one parameter, so receiving *ESE 0,1 is not allowed.

−105 GET not allowed

A Group Execute Trigger was received within a program message (see IEEE 488.2, 7.7). Correct the GPIB controller program so that the GET does not occur within a line of GPIB program code.

−104 Data type error

The parser recognized a data element that is not allowed. For example, numeric or string data was expected, but block data was encountered.
-103  Invalid separator
The parser was expecting a separator and encountered an illegal character. For example, the semicolon was omitted after a program message unit.

-102  Syntax error
An unrecognized command or data type was encountered. For example, a string was received when the device does not accept strings.

-101  Invalid character
A syntactic command contains a character which is invalid for that type. For example, a header containing an ampersand, such as “SETUP&”. This error might be used in place of error numbers -114, -121, -141, and some others.

-100  Command error
This is a generic syntax error for devices that cannot detect more specific errors. The code indicates only that a command error as defined in IEEE 488.2, 11.5.1.1.4 has occurred.

64 to 799: Device-Specific Errors

64  System, Alignments, Align All Now, Needed

102  There is too much 50 MHz energy at the RF port for alignments to run. Reduce input power and run alignments again.

103  Sampling Oscillator Unlock; Failure acquiring SO frequency lock
Report this error to the nearest Agilent Technologies sales or service office.

104  1st LO Unlock; Failure acquiring FracN LO frequency lock
1st LO Unlock; Failure acquiring single loop FracN LO lock
The first LO on has lost phase lock. Report this error to the nearest Agilent Technologies sales or service office.

105  2nd LO Unlock
The second LO has lost phase lock. Report this error to the nearest Agilent Technologies sales or service office.

106  4th LO Unlock
The fourth LO has lost phase lock. Report this error to the nearest Agilent Technologies sales or service office.

107  Sample Clock Unlock
Report this error to the nearest Agilent Technologies sales or service office.
108  Cal Oscillator Unlock

Report this error to the nearest Agilent Technologies sales or service office.

129  Meas Uncal

The measurement is uncalibrated, usually due to sweeping a narrow RBW filter too quickly. Check the sweep time, span, and bandwidth settings, or press Auto Couple.

143  Final IF Overload

Either increase input attenuation or decrease the input signal level.

163  Freq Count: Reduce Span/RBW ratio

The span is too wide for the current resolution bandwidth. Either reduce the span or increase the RBW.

187  Directory already exists

190  Unable to save file, invalid path

191  File Operation Status; directory <name> created

File Operation Status; <name> directory deleted

File Operation Status; <name> file copied

File Operation Status; <name> file deleted

File Operation Status; <name> file loaded

File Operation Status; <name> file saved

File Operation Status; Volume <name> formatted

196  Can’t Auto-Couple Sweep Time in Zero Span

197  Marker Freq Count HW Failure

201  Option not installed

The desired operation cannot be performed because a required option is not installed. For example, pressing Source with no tracking generator installed in the analyzer will generate this error.

202  No peak found

No signal peak was found that meets the criteria under Peak Search, Search Param Criteria.

204  TG Frequency Limit

The tracking generator has reached the limit of its allowable frequency range.

205  Command not recognized

Indicates that the command sent from the remote interface was not recognized. Check the programming guide for correct syntax.
206 Unable to initialize flatness data
A failure occurred in setting the flatness data in the internal EEROM. Get in touch with your local Agilent Technologies sales and service office.

207 Unable to store flatness data
A failure occurred in setting the flatness data in the internal EEROM. Get in touch with your local Agilent Technologies sales and service office.

208 Preselector is not available at this frequency.
Preselection of frequencies below ~ 3 GHz is not supported. Preselector centering can be performed only for frequencies above 3.025 GHz.

209 Preselector centering failed
An attempt to center the preselector failed. You tried to center the preselector with the analyzer span too wide. Preselector centering can be performed only for spans below 1.123 GHz.

211 RBW limited to 1 kHz when Span > 5 MHz
In spans greater than 5 MHz, narrow (digital) resolution bandwidths, below 1 kHz, are not available.

213 Span limited to 5 MHz when RBW < 1 kHz
In narrow (digital) resolution bandwidths, below 1 kHz, spans greater than 5 MHz are not available.

214 TG start freq is less than 9 kHz
Tracking generator uncalibrated below 9 kHz.

215 TG start freq is less than 1/2 res bw
Tracking generator uncalibrated at start frequencies below 1/2 the current resolution bandwidth.

216 Invalid Baud Rate

217 RS-232 Interface Error
An error occurred on the serial interface.

219 Command not valid in this model
Indicates that the command sent from the remote interface does not apply to this analyzer model number. For example, attempting to center the preselector in an analyzer without a preselector will generate this error.

220 Trace Menu is unavailable when Sig Ident is ON
221 Invalid option, unable to uninstall package
You have attempted to remove a personality that is not currently installed. Verify command was entered correctly.

222 Command not valid when no measurement is active
Indicates that the command sent from the remote interface must be issued while a measurement is running in the analyzer.

223 Trigger Offset unavailable in swept spans
Trigger Offset is only available in Zero Span. Refer to “Trig” in your Agilent Spectrum Analyzer User’s Guide for a description of this function.

224 Option not licensed.
The selected option requires a license. Refer to the installation procedures in the user’s guide available for this particular option.

226 Actual Trig Delay = Remote Trig Delay + Remote Trig Offset

228 Preselector centering failed - inadequate peak
You tried to center the preselector with a trace peak of insufficient level. You may have pressed Presel Center with the marker placed below the signal peak.

229 3 – 26.5 GHz preselector bypassed, can’t adjust
The microwave preselector has been bypassed. Attempts to press or send the SCPI commands for Presel Center or Presel Adjust will result in this error.

230 Unpreselected external mixing - no preselector
While using external mixing with an unpreselected mixer, attempts to press or send the SCPI commands for Presel Center or Presel Adjust will result in this error.

231 Preselector unavailable while in external mixing
The internal preselectors cannot be used while in external mixing.

232 External mixing is off, can’t adjust external preselector
The preselector is unavailable when external mixing is turned off.

238 Trace smoothing: VBW filt or Average Detector; cannot use both

239 HW Diag is OFF

332 Average Type incompatible for scale.
Amplitude Scale command should be sent prior to the Average Type command.
601 PSA only
612 ESA only
File not found
The analyzer could not find the specified file.

601
Floppy disk full
The floppy disk is full. Clear some space by deleting unwanted files.

602 PSA only
605 ESA only
Media is protected
A save was attempted to a write-protected device.

602
Floppy disk error
An unknown error has occurred while accessing the floppy disk.

603 PSA only
615 ESA only
File is corrupt
Corrupted file
The file that you were trying to load is corrupt.

604 PSA only
607 ESA only
File name error
File name error; Directory does not have a default file type
File name error; Directory does not support extenders
File name error; Empty filename
File name error; Illegal extender
File name error; Illegal filename character
File name error; Only one: is allowed
File name error; Only one extender character allowed
An invalid file name was specified. Use filenames with a maximum of 8 characters (letters and digits only), and use a 3-character extension. File names are not case-sensitive. This error also occurs if you try to delete a nonexistent file.

615 PSA only
604 ESA only
File already exists
You attempted to save to a file that already exists. Either delete or rename the existing file or select a new name, then try again.

602 PSA only
605 ESA only
Media is protected
A save was attempted to a write-protected device.
Instrument Messages

Data corrupt or stale; EEPROM copy of <file>

**WARNING:** Contact the factory if you see this error.

This error indicates that a file stored in EEPROM has become corrupt and the Hamming codes are unable to repair the data.

When the EEPROM file has been corrupted, the system will store default values into both the Non-Volatile RAM and EEPROM copies of the file. If this error occurs often, it may indicate that there is a problem with the physical memory.

Data corrupt or stale; RAM copy of <file>

This error indicates that a file stored in Non-Volatile RAM has become corrupt and the Hamming codes are unable to repair the data.

When a Non-Volatile file has this error, the system will first try to verify the state of the data in EEPROM and if valid it will copy the data in EEPROM into the Non-Volatile ram copy of the file. When this happens, the system will remain calibrated. If this error occurs often, it may indicate that there is a problem with the physical memory.

Data questionable; EEPROM copy of <file>

EEPROM error occurred. The EEPROM copy of an internal file is either corrupt or otherwise unusable. The system automatically updates the non-volatile RAM copy of the EEPROM copy using a default initialization. The actual EEPROM file is left as it is. Report this error to the nearest Agilent Technologies sales or service office.

Media is corrupt

A save was attempted to a corrupt device.

File name error

File name error; Directory does not have a default file type
File name error; Directory does not support extenders
File name error; Empty filename
File name error; Illegal extender
File name error; Illegal filename character
File name error; Only one: is allowed
File name error; Only one extender character allowed

An invalid file name was specified. Use filenames with a maximum of 8 characters (letters and digits only), and use a 3-character extension. File names are not case-sensitive. This error also occurs if you try to delete a nonexistent file.
609 Restoration of NVRAM data

This error indicates that a file stored in Non-Volatile RAM has been corrected based on the Hamming codes stored with the file. After the correction, the file will contain the same data as when the instrument was shut off. If this error continues to occur on successive power cycles, it may indicate that there is a problem with the physical memory.

627 PSA only
609 ESA only Media is not writable

A save was attempted to a read-only device or device that could not be written to. Try a known-good disk.

ERROR/NUMBER “609 Restoration of NVRAM data” IS ALREADY USED FOR HAPPENING ./storage/directory/NRAM_Directory.cc HAP_nramDataCorrected

610 File access is denied

The file is protected or hidden and cannot be accessed.

611 File access IO busy;

duplicate :SERVice[:PRODuction]:CALibrate:BEGin

File access IO busy; :SERVice[:PRODuction]:CALibrate:END without a BEGin

601 PSA only
612 ESA only File not found

The analyzer could not find the specified file.

613 Flash memory is full

The internal flash memory is full. Clear some space by deleting unwanted files. If your analyzer has a serial number less than US41440000 or MY41440000 and Option B72 has not been installed, you may also increase the flash memory size by purchasing Option B72.

763 PSA only
614 ESA only Bad, missing, or unformatted disk

Bad or missing floppy disk

The floppy disk is not inserted properly, is not formatted, or the directory cannot be read. Insert a known good disk and try again.

615 PSA only
604 ESA only File already exists

You attempted to save to a file that already exists. Either delete or rename the existing file or select a new name, then try again.
603 PSA only
615 ESA only

File is corrupt
Corrupted file
The file that you were trying to load is corrupt.

617
Wrong density floppy inserted
The floppy disk has the wrong density. It should be 1.44 MB.

618
Illegal write access of Flash memory
Attempt to write to an unavailable area of internal flash memory.

619
Can’t Auto-Couple RBW in Zero Span
You sent a remote command to set the RBW into auto while in zero span. (Remote interface only.)

620
Can’t Auto-Couple Sweep Time in Zero Span
You sent a remote command to set the sweep time to auto while in zero span. (Remote interface only.)

622
External reference missing or out of range
The external frequency reference signal is missing, has too low an amplitude, or does not match the frequency value that you previously entered into instrument memory.

623
Printer not responding
Printer not responding; ioctl ERROR
Check the printer. It may not be connected properly or turned on.

625
Printer out of paper
Load paper in printer.

626
Print failed; Can’t open print file desc
Print failed; DisplayExport can’t create print file
Print failed; DisplayExport illegal print language
Print failed; DisplayExport insufficient RAM space
Print failed; DisplayExport undetermined error
Print failed; Error transferring image to printer
Print failed; Printer ioctl failed
Print failed; Unknown printer response

627 PSA only
609 ESA only

Media is not writable
A save was attempted to a read-only device or device that could not be written to. Try a known-good disk.
Connect RF OUT to INPUT
Attempt to align the tracking generator without its output connected. Connect the tracking generator RF OUT to the analyzer INPUT.

Connect Amptd Ref Output to Input
For Agilent Technologies E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B only: you must connect the AMPTD REF OUTPUT to the analyzer INPUT with the appropriate cable.

Auto Align not available when using Calibration Defaults
The Auto Alignment system cannot be used until an Align Now All is executed by pressing System, Alignments, Align Now, All. On all Agilent Technologies ESA spectrum analyzer models except Agilent Technologies E4401B and E4411B, you must connect the AMPTD REF OUT to the INPUT with the appropriate cable to perform this alignment. For Agilent Technologies E4401B and E4411B only: disconnect any signals from the INPUT prior to performing this procedure.

Invalid printer response
In attempting to identify the printer an invalid response was received. Check that you are using a supported printer. Be sure you are using the proper cable and that it is securely fastened.

Unsupported printer
A printer which is recognized, but known to be unsupported was identified. This printer cannot be used with the analyzer. For example, a printer only supported by Microsoft Windows will generate this error.

Unknown printer
In attempting to identify the printer, a valid response was received but the printer is not known to the analyzer. Use the Custom printer menu under Print Setup to configure the printer.

Printer interface error
An error occurred while trying to print. Make sure the printer is turned on and properly connected.

Printer Type is None
The current printer type is set to None, so no print operations are possible. Change the type in the Print Setup menu and try again.

In <filename>: [DATA] header missing
This message indicates that the data section of a file did not begin with the token [DATA].
In <filename>, line <nnn>: separator missing

The [HEADER] section of a file contains entries requiring an equal (=) sign, such as <keyword> = <value>. This message appears if the equal sign does not appear on the line.

In <filename>: error reading file

Appears when loading data from a limit line or corrections disk file and a failure to the file occurs.

In <filename>, line <numeric_value>: line too long

When loading data from a limit line or corrections disk file, this message will appear if the length of any line in the file exceeds 255 characters.

In <command>: bad data count (<numeric_value>): expected multiple of <numeric_value>

This message indicates that the data sent to a corrections or limit table via the DATA or MERGE commands does not have the expected length for the table. For example, this message would appear if an attempt were made to merge 7 numeric values into a limit table, since each logical entry requires 3 values (frequency, amplitude, and connected).

In <filename>, line <numeric_value>: error parsing tokens

This message may appear when loading data from a limit line or corrections disk file. It indicates a problem in the attempt to break a string of text into tokens. There may be too few tokens in the string. In other words, the file content must match the expected format. This typically happens when there are too few numeric values in the [DATA] section of a limit or corrections file.

In <filename>, line <numeric_value>: <xxx> is not numeric

This message may appear when loading data from a limit line or corrections disk file. It indicates that a non-numeric token <xxx> was found where a numeric token was expected. In other words, the file content must match the expected format.

Interpolation error: cannot compute log of <negative_frequency_value>

Occurs when the frequency interpolation of a limit line is set to log and the start frequency of the instrument is negative. The <negative_frequency_value> is limited to -80 MHz, so it may not match the frequency that caused the error.

In <filename>: bad amplitude unit <unit>

This message indicates that unit <unit> is not recognized or supported.
Too many data values at <freq_or_time_value>

This message may appear when data is sent to a corrections or limit table using the DATA or MERGE commands. These tables limit the number of amplitudes associated with a frequency or time to 2 or less. This message will appear if an attempt is made to attach 3 or more values to a frequency or time.

Instrument state set to initial values

Instrument state may be corrupt, state has been reset to initial values

While trying to load a trace or state, the state information was found to be in error. This may be because the state had been stored on a later revision of analyzer firmware. A default set of state variables was loaded instead. There is nothing wrong with the analyzer.

An error in the internal instrument state has been detected. The state has been reset to a default value.

Unable to load state from file

Attempt to load a state from a file failed.

Unable to save state to file

Attempt to save a state to a file failed. See the associated error messages for the cause (press System, Show Errors).

For PSA: If this error occurs after a mode switch that takes longer than normal, you may need to free up some instrument memory. When you switch to a different measurement mode, the analyzer must temporarily store instrument state data. If you have less than 500 kB of available memory, the switching process can take over 1 minute and result in this error. Use the File key menu to delete any unnecessary files from instrument memory.

Unable to load state from register

Attempt to load a state from an internal state register failed.

Unable to save state to register

Attempt to save a state to an internal state register failed. See the associated error messages for the cause (press System, Show Errors).

Unable to load user state, factory preset was done

A user preset failed, so the factory preset values were used. Save a valid state into user preset and try again.

Unable to save user state

Attempt to save a user preset state failed. See the associated error messages for the cause (press System, Show Errors).
759 Unable to load state saved from firmware Rev A.xx.xx; Restore Sys\nDefaults
Unable to load state
A saved state file from a newer firmware revision was attempted to be loaded into an older instrument.

760 ESA only Unable to query state
Query of state over the remote interface was unsuccessful.

761 ESA only Unable to set state
Attempt to set the state over the remote interface was unsuccessful.

762 ESA only Incorrect filename, allowable extensions are .trc or .csv
Attempt to save a trace to a file with an incorrect extension.

762 ESA only Unable to load file
A failure occurred while loading a file; the file was not loaded.

763 PSA only 614 ESA only Bad, missing, or unformatted disk
Bad or missing floppy disk
The floppy disk is not inserted properly, is not formatted, or the directory cannot be read. Insert a known good disk and try again.

763 ESA only Incorrect filename, allowable extensions are .gif or .wmf
Attempt to save a screen image to a file with an incorrect extension.

764 Unable to save file
Attempt to save a file failed; the file was not saved. See the associated error messages for the cause (press System, Show Errors).

765 Unable to load file
Attempt to load a file failed; the file was not loaded.

766 Unable to format drive

767 Failed to Initialize ISTATE regions. Fatal LDS error
Attempt to initialize the instrument state has failed. Cycle instrument power. If this fails to correct the problem, contact your nearest Agilent Technologies service center.

768 Unable to load user state, required instrument mode is not installed
Attempt to load a state failed, because the state was saved with a measurement personality that is not currently loaded. Load the appropriate personality and try again.
Invalid instrument mode

You have attempted to switch to an instrument mode that is currently not installed. Confirm that the mode name (for INST:SEL) or number (for INST:NSEL) was entered correctly and that the requested personality is actually installed in the instrument.

Incorrect filename, allowable extensions are .gif or .wmf

You sent a remote command to save a screen file but did not specify a valid extension.

Incorrect filename, allowable extension is .sta

You sent a remote command to save a state file but did not specify a valid extension.

Incorrect filename, allowable extensions are .trc or .csv

You sent a remote command to save a trace file but did not specify a valid extension.

Instrument mode requested is not supported


Store Ref trace before turning on Normalize

A reference trace must be available for the Normalize function to be activated. Refer to “View/Trace” in the Agilent ESA Spectrum Analyzer User’s Guide where the Normalize key function is explained in detail.

Cannot load a directory

Cannot load a directory, please choose a file

You have selected a directory instead of a file when attempting to perform the Load function under the File front-panel key.

No Peak Found

Video Trigger cannot be active with Average Detector

You sent a remote command to do one of the following:

- Turn on video trigger while the Average Detector or a Marker Function is active.
- Turn on the Average Detector or a Marker Function while Video Trigger is active.

Video Trigger cannot be used with Mkr Func due to Average Detector

Allowable span for current center frequency exceeded

Allowable CF for current span exceeded
Instrument Messages

WBIF Self Test Failed

Variable resistor 122 performs a loop-back self-test on power up. It does an ADC image calibration, then stores a sine wave in RAM and plays it out the DAC. It then measures the carrier power, image rejection and signal-to-noise ratio. If this test fails, the wideband IF pc assemblies are either incorrectly installed or have a hardware failure. Call your Agilent Service Representative.

There is diagnostic information available for the CE. The self test can be run with DIAG:WBIF:TEST? This command returns 4 values: passed, carrier power, image rejection and signal-to-noise ratio.

First look at the carrier power. If it is below -50, the LVDS cable is probably missing or faulty. If the carrier power is above 0 dBm, image rejection less than 40 but signal-to-noise ratio is more than 50, there is probably a bad ADC.

WBIF ADC Image Calibration Failed

The Opt 122 card uses two ADCs that must be kept in perfect synchronization to avoid unwanted images appearing in the spectrum. The instrument will occasionally perform an ADC Image Calibration (formerly known as Step Cal) to re-synchronize the ADCs. This calibration is only known to fail if there is a hardware problem.

WBIF Firmware Reset

Opt 122 has a local microprocessor controlling the hardware trigger. If this microprocessor resets, it will automatically restart and begin taking data again, posting this notice to the user. While this should never happen, it is a self-recovering error that requires no action on the part of the user. If, however, it starts to occur frequently, contact your Agilent service representative to find out if there is a firmware upgrade to solve this problem.

Acquiring Data...

No trigger before timeout; auto-triggered

Awaiting Trigger, no AUTO Trig

Memory limit caused Data Acquisition to be truncated

doing Alignment...

Greater than 10000: Measurement Applications Errors

NOTE

Error numbers are displayed in the error queue, not on the display.

To see an error number, press System, Show Errors.
**10008 to 10517: Power Suite Error Messages** An error number in this range indicates the instrument has detected an error relating to the Power Suite functionality.

**10008** Preferred resolution bandwidth not available.
The calculated required resolution bandwidth for this measurement is not available.

**10010** One or more harmonics past freq limit: number decreased.
Highest harmonic was past the frequency limit of the analyzer, so the number of measured harmonics was decreased.

**10011** First harmonic is past analyzer frequency limit.
First harmonic was past the frequency limit, so no harmonics can be measured. The analyzer will simply measure the fundamental. If you have the Agilent E4407B analyzer, Option AYZ allows the use of HP/Agilent 11970 Series, and HP/Agilent 11974 external mixers to extend the frequency range to 110 GHz. Operation to 325 GHz is also possible with non-HP/Agilent mixers.

**10012** No Fundamental > 0 Hz found in given span.
There were no frequencies greater than 0 Hz in the starting span, so the centre frequency at measurement entry will be used as the fundamental.

**10013** No Fundamental > -50 dBm found in given span.
There was no fundamental found, so the centre frequency at measurement entry will be used as the fundamental.

**10020** Signal Tracking is not available when Noise Correction is on.
If signal tracking is turned on while noise correction is on, it will be turned off. To use the signal tracking function, first turn noise correction off.

**10138** Valid GSM burst not found in frame (Burst Type)
No active GSM bursts that match the selected burst type have been detected in the RF input signal. Search was performed over a complete GSM frame.

**10139** Valid GSM burst not found in specified timeslot (Burst Type)
No active GSM bursts that match the selected burst type have been detected in the RF input signal. Search was performed over the specified timeslot.

**10140** Valid GSM burst not found in frame (Ref Burst)
No active GSM bursts that match the selected burst type have been detected in the RF input signal. Search was performed over the specified complete GSM frame using the Ref Burst type setting.
10141 Sync word not found in frame (Burst Type)
One or more active GSM bursts that match the selected burst type have been detected in the RF input signal, but none contain the selected Training Sequence Code (TSC). The search was performed over the complete GSM frame.

10142 Sync word not found in specified timeslot (Burst Type)
One or more active GSM bursts that match the selected burst type have been detected in the RF input signal, but none contain the selected Training Sequence Code (TSC). The search was only performed over the specified timeslot setting.

10143 Sync word not found in frame (Ref Burst)
One or more active GSM bursts that match the selected burst type have been detected in the RF input signal, but none contain the selected Training Sequence Code (TSC). The search was only performed using the Reference Burst type and the Ref TSC settings over the complete GSM frame.

10144 Unknown demod status
Demodulation is in an unknown state. Press Preset. If the error persists, get in touch with your service center.

10145 Opt AYX hardware required. Meas unavailable.
Option AYX must be installed for this measurement to be enabled.

10146 Options B7D & B7E hardware required. Meas unavailable.
The RF Communications Hardware (Option B7E) and Digital Signal Fast ADC (Option B7D) cards required to perform the demodulation are not present in the analyzer.

10147 Opt B7D bootrom requires upgrade.
The (Option B7D) bootrom revision is not supported by the currently loaded personality version. Refer to the user's guide for the personality in use.

10148 Opt BAH DSP algorithm files not installed. Meas unavailable.
Contact your Service Center.
The Digital Signal Processor algorithm files required to perform the demodulation are not present in the analyzer.

10148 B7D DSP Code Fail. Reload Opt BAH. Contact your Service Center.
The Digital Signal Processor algorithm files required to perform the demodulation are not present in the IDSP: drive.
10149  Opt BAH DSP algorithm code file requires upgrade.
The Digital Signal Processing algorithm code file revision is not supported by the currently loaded personality version. Refer to the user’s guide for the personality in use for more information on installation/upgrade.

10150  Opt BAH DSP algorithm coeff. file requires upgrade.
The Digital Signal Processor algorithm coefficient file revision is not supported by the currently loaded personality version. Refer to the user’s guide for the personality in use.

10151  Opt BAH DSP algorithm files failed to load, aborting measure.
The Digital Signal Processor algorithm files required to perform the demodulation are corrupt and cannot be loaded properly. Reinstall measurement personality.

10151  B7D DSP Code Fail. Reload Opt BAH. Contact your Service Center.
The Digital Signal Processor algorithm files required to perform the demodulation are present in the IDSP: drive and cannot be loaded properly into DSP RAM. Reinstall measurement personality.

10152  Lost trigger, aborting measurement.
The selected trigger source was present at the start of the measurement, but timed out before the measurement completed.

10153  DSP algorithm timeout, aborting measurement
The Digital Signal Processor demodulation algorithm timed-out for an unknown reason. This message normally indicates a problem with the modulated signal.

10154  Measurement not defined for Out of Band.
You have changed to an out-of-band frequency range. The band measurement only operates in the selected band.

10155  No Fast ADC hardware installed. Meas unavailable.
The analyzer cannot use sweep times of less than 5 msec when Option B7D or Option AYX is not installed. Therefore, the measurement will not be executed.

10156  No Fast ADC hardware installed.
The analyzer cannot use sweep times of less than 5 msec when Option B7D or Option AYX is not installed resulting in all the radio standards not being supported.

10156  The calibration data is invalid, and has been cleared.

10157  Tracking Generator hardware is not present. Meas unavailable.
The measurement requires a built-in tracking generator.
10158  This operation requires a measurement to be active.

10159  Entire trace is below threshold level

The measurement cannot operate properly because the trace has completely fallen below the threshold level. Change the threshold level to view trace.

10160  Valid burst not found

Cannot find a valid burst, either because it is not fully on the display, or the level is too low to be detected properly.

10160  Upper Custom Mask is Invalid!

The user-specified upper custom mask cannot be resolved into a limit line. The format may be bad.

10161  No Fast ADC hardware installed.

Cannot use sweep times less than 5 ms, due to the lack of a fadc, therefore the meas will be severely restricted.

10161  Lower Custom Mask is Invalid!

The user-specified lower custom mask cannot be resolved into a limit line. The format may be bad.

10162  Resolution BW <300 kHz.

This error message is a warning that the resolution bandwidth has been set below 300 kHz. The test results will not meet GSM specifications.

10163  Cannot find the Power vs Time Limits File.

The limit line definition file for the GSM standards has been deleted. This message is displayed while the Measure key is grayed out. Reinstall the GSM measurement personality.

10164  Band Measurement not defined for Out of Band.

You are attempting to monitor the band but have set the frequency outside the band. Reset the band for the particular standard for which you are testing or use the channel setting which does not require a frequency to be set. (Meas Setup, Method (Channel)).

10165  Carrier Not Present.

10166  Cannot update the list of cable types.

The cable file may have been moved or deleted accidentally. Reinstall the measurement personality. This message is applicable to the GSM (Option BAH) and Distance to Fault (Option 226) measurement personality options.
10166 Cannot locate the file that contains the list of cable types. The cable file may have been moved or deleted accidentally. Reinstall the measurement personality. This message is applicable to the GSM (Option BAH) and Distance to Fault (Option 226) measurement personality options.

10167 The file containing the list of cable types has been updated.

10168 Cannot update the list of cable types on drive C: The file update failed.

10170 The Cable Fault Measurement is active. Mode Setup is disabled. Mode setup is not available in the cable fault utility.

10172 Sweep Time too fast (<2 sec) The sweep time must be set to 2 seconds or longer for the results to be valid.

10173 Carrier Not Present.

10177 There are no spurs to inspect. You have attempted to switch the Inspect Spur menu key to the On position after the measurement has finished, but found no spurs.

10178 Carrier Not Present.

10179 Carrier Present. Test Stopped! A carrier was found in the transmit band. Either disable the carrier or insert a bandpass filter for the receive bandwidth.

10180 Gate option not installed. Results may not be accurate. This measurement method requires the use of the time-gate (option 1D6) in order to gate the spectrum during the 50-90% part of the burst. If the gate option is not installed, the measurement will still run although this warning will be displayed.

10181 Upper Custom Mask is Invalid! The user-specified upper custom mask cannot be resolved into a limit line. The format may be bad.

10182 Lower Custom Mask is Invalid! The user-specified lower custom mask cannot be resolved into a limit line. The format may be bad.

10183 Resolution BW < 300kHz. The test will not meet EDGE specifications because the resolution BW has fallen below 300 kHz.
10184 Cannot find the Power vs Time Limits File.
Cannot find the limit line definition file for the EDGE standards. This message is displayed while the Measure key is grayed out.

10185 Gate option not installed. Results may not be accurate.

10186 Measurement does not support the current radio standard.
The measurement you have chosen is currently greyed out. Select a radio standard which is supported or configure this measurement manually (Mode Setup, Radio Std. None).

10186 EDGE EVM only supports EDGE TCH burst type (Burst Type)

10187 Radio standard is not supported by the current measurement.
The standard you have chosen is currently greyed out. Select a radio standard which is supported by the current measurement or configure this measurement manually (Mode Setup, Radio Std. None).

10187 EDGE ORFS only supports EDGE TCH burst type (Burst Type)

10188 EDGE PVT only supports EDGE TCH burst type (Burst Type)

10189 EDGE PVT only supports EDGE TCH burst type (Ref Burst)

10190 Select a valid Radio Standard/Measurement combination to enable.
The Enable All Measurements menu key was pressed when it was disabled. To enable select a radio standard that is supported by the current measurement or a measurement that supports the current radio standard.

10190 EDGE ORFS only supports EDGE TCH burst type (Ref Burst)

10191 Mask unavailable for current Span – increase to display mask.
The current span setting is either narrower than the mask width or so wide that there are too few display points to allow the mask to be drawn. Increase or decrease the span to display the mask.

10191 EDGE EVM only supports EDGE TCH burst type (Ref Burst)

10192 Sweep Point/Span ratio below minimum – results may be inaccurate.
The sweep point to span ratio is below the minimum required to ensure the bucket ratio is large enough to test DVB-T masks

10218 Hardkeys are disabled.
Some of the forms (for example Receiver Spurious in GSM) do not allow you to close the form without either formally accepting or cancelling the form settings. For this reason, all of the hardkeys are disabled until you terminate the form.
10219 Awaiting trigger

The measurement requires a trigger to be present. If the trigger does not occur or is delayed, this message will be displayed. Check your trigger settings.

10227 Measurement suspended until carrier is turned off.

The receive channel power and the receive spur measurements are specified with the attenuation set to 0 dB. To prevent overload, the frequency spectrum of interest is monitored for signal levels which exceed a specified threshold before setting the attenuator to 0 dB. If a carrier is found, this message is displayed and the completion of the measurement will not occur until the carrier is removed. The carrier check may be turned off using the properties form under the front-panel Mode Setup key. You may also change the signal threshold which determines a carrier on the properties form.

10228 Cannot correlate to input signal.

This error is normally generated because of one of the following reasons: 1. There is no carrier signal. 2. Walsh channels other than the pilot are active. 3. There is some other modulation problem that will prevent the measurement from being made. This problem must be corrected before the measurement can continue.

10229 The regression portion failed.

This message occurs when (Option B7D) is not functioning properly. Demodulation measurements (modulation accuracy and code domain) might fail as a result of this error.

10230 DSP timed out, resetting DSP.

Digital Signal Processor was unable to finish the selected measurement within the given period of time. Restart the measurement.

10231 Measurement failed for unknown reasons.

Check instrument settings and restart measurement.

10232 RF Signal not found.

This message is generated if there is no signal at the center frequency that is greater than 10 dB above the displayed average noise level.

10233 Level is low, results may degrade.

The signal being measured is of low power. The results may not be as accurate as they would be if the signal level was higher.

10237 RF Board LO Unlocked. Contact service center.

This message occurs if the local oscillator on the (Option B7E) is in an unlocked state. This indicates broken hardware.
10238  RF Board SR Osc Unlocked. Contact service center.
This message occurs if the sample rate (SR) oscillator on Option B7E is in an unlocked state. This indicates broken hardware.

10239  Opt Freq Ref setting does not match external reference.
This message is generated if Source is set to External on the properties form under the front-panel Mode Setup key and the frequency on the same form is set to a frequency that does not match the frequency of the signal being used as the external reference.

10240  RF Board RF Osc Unlocked. Contact service center.
This message occurs if the reference oscillator on the (Option B7E) is in an unlocked state. This indicates broken hardware.

10241  RF Board could not detect any bursts in signal.
This message is generated when the trigger is set to RF Burst and (Option B7E) cannot detect a burst.

10245  Error reading file: SPCLIMIT.CSV. Cannot use custom limits.
The file could be missing or corrupt. Create a new limits file. Alternatively, the actual limits defined in the file might not allow the measurement to be executed. Redefine the limits or use the default limits. Restart the measurement.

10246  Error reading file: CDMASTUN.CSV. Please reinstall cdmaOne.
The file is missing or corrupt. Please reinstall the cdmaOne personality.

10247  Error reading file: CDPDMDA. Please reinstall cdmaOne.
The file is missing or corrupt. Please reinstall the cdmaOne personality.

10248  Error reading file: CDPPMCO. Please reinstall cdmaOne.
The file is missing or corrupt. Please reinstall the cdmaOne personality.

10249  Error reading file: CDPPMDA. Please reinstall cdmaOne.
The file is missing or corrupt. Please reinstall the cdmaOne personality.

10250  Error reading file: RHODMDA. Please reinstall cdmaOne.
The file is missing or corrupt. Please reinstall the cdmaOne personality.

10251  Error reading file: RHOPMCO. Please reinstall cdmaOne.
The file is missing or corrupt. Please reinstall the cdmaOne personality.

10256  Error reading file: OOBSTAB.CSV. Use Edit Table | Save Table.
This error is generated when you try to load a table (using the Load Table key on page 2 of the edit table form menu) before a table has been saved. You must first save a table using the Save Table key before trying to load a table using the Load Table key.
10259  Table could not be saved.

This message occurs if the C: drive is full or corrupt. Check the amount of space left on the drive.

10260  Table could not be loaded.

When trying to load a table, the previous table has been somehow corrupted. Use the Save Table key to save a valid table. Then edit the valid table, save it, and try to load it again.

10264  Emission bandwidth not found. Consider increasing span.

This error is normally generated when attempting occupied bandwidth measurements. The “X dB” value you entered (Meas Setup, X dB) to calculate the emission bandwidth is the difference between the highest point on the trace and the point “X dB” down on either side of the maximum. If the actual difference is less than the value entered, the emission bandwidth cannot be computed. Some responses to this situation are as follows:

1. Connect a signal to the input. (If there is no signal present, the difference between the trace minimum and maximum will generally be less than “X dB”.)

2. Increase the span. (If the signal is wide, the shoulders of the signal might not be present on the screen, and again, the difference between the trace minimum and maximum will be less than “X dB”.)

3. Center the signal. (There must be a point on the trace that is “X dB” down from the maximum on both sides of that maximum.)

10286  Burst not found.

Either the signal being analyzed has insufficient power, the rising or falling edges cannot be detected, or the burst is less than 126 microseconds.

10287  Valid Bluetooth burst not found. (Check Packet Type)

The burst that has been found does not correspond to the currently selected Bluetooth packet type (the burst length may be too short).

10288  Option B7D or AYX FADC hardware required. Meas unavailable.

The measurement you are attempting requires either the DSP and Fast ADC (Option B7D) or the Fast ADC (Option AYX) card to perform the demodulation, but neither are present in the analyzer.

10289  Opt 106 demod hardware required. Meas unavailable.

A demod measurement was attempted with no Bluetooth FM demod card present (Option 106).
10290 Parameter unavailable in demod measurements.
You have selected (by remote SCPI command) either RF Amplitude sync or Video trigger while running one of the demod measurements.

10291 Opt B7E RF hardware required. RF Burst unavailable.
You have selected (by remote SCPI command) RF Burst Trigger with no digital demodulation RF card present (RF Communications Hardware (Option B7E)).

10320 Opt 106 hardware required. Preamble sync unavailable.
You have selected (by remote SCPI command) preamble sync with no Bluetooth FM demodulation card present (Option 106).

10321 Start Marker must be at least 1% < Stop Marker.
You have attempted to input a start marker value that will result in the difference between the start and stop markers being less than 1%.

10322 Stop Marker must be at least 1% > Start Marker.
You have attempted to input a stop marker value that will result in the difference between the start and stop markers being less than 1%.

10323 Unable to Calculate Result using Current Setup.
You have changed the setup parameters such that the marker lines used to measure the power cannot be displayed therefore accurate measurements cannot be made.

10340 ‘10101010’ pattern not detected - results may be inaccurate.
This message is displayed if the measurement cannot detect the ‘10101010’ pattern in the payload. The measurement will continue and carry out the calculations on the payload data supplied, but may not be correct.

10350 Payload data pattern ‘10101010’ not present.
This message is displayed when the “Payload Data” parameter is set to Auto and the measurement has not detected either of the required patterns in the payload.

10351 Required payload data pattern ‘10101010’ not present.
This message is displayed after successfully measuring and holding the ‘11110000’ pattern if the measurement is restarted and the ‘10101010’ data pattern is not detected.

10352 Required payload data pattern ‘11110000’ not present.
This message is displayed after successfully measuring and holding the ‘10101010’ pattern if the measurement is restarted and the ‘11110000’ data pattern is not detected.
There is no valid result to hold.

You have attempted to hold either $\Delta f_1$ or $\Delta f_2$ before it has been measured.

Can’t compute result - not enough transitions.

This message is displayed when the measurement cannot find either a 111, 000, 101 or 010 pattern and is therefore unable to calculate the low or high frequency deviations.

Valid EDGE burst not found in frame (Burst Type)

No active EDGE bursts that match the selected burst type have been detected in the RF input signal. Search was performed over the complete EDGE frame.

Valid EDGE burst not found in specified timeslot (Burst Type)

No active EDGE bursts that match the selected burst type have been detected in the RF input signal. Search was performed over the specified timeslot.

Valid EDGE burst not found in frame (Ref Burst)

No active EDGE bursts that match the selected burst type have been detected in the RF input signal. Search was performed over the specified complete EDGE frame using the Ref Burst setting.


The DSP algorithm files required to perform the demodulation are not present in the instrument ISDP: drive.

Opt 252 DSP algorithm code file requires upgrade.

Opt 252 DSP algorithm coef. file requires upgrade.


The DSP algorithm files required to perform the demodulation are present in the instrument ISDP: drive, but cannot be loaded properly into DSP RAM.

EDGE Upgrade (252) unlicensed. Please contact your Agilent Sales Rep.

Valid signal not found.

This error is normally generated because of one of the following reasons:

1. There is no carrier signal.
2. The carrier signal power has changed during the measurement, causing ADC to over/under range.
3. There is some other modulation problem that will prevent the measurement from being made. This problem must be corrected before the measurement can continue.
10401  Valid burst not found in frame (Burst Type).
No active bursts that match the Burst Type have been detected in the RF input signal. The search was performed over the complete frame.

10402  Valid burst not found in specified timeslot (Burst Type).
No active bursts that match the Burst Type have been detected in the RF input signal. The search was only performed over the specified timeslot setting.

10403  Sync word not found in frame (TSC).
One or more active EDGE bursts that match the Normal Burst Type have been detected in the RF input signal, but none contain the selected Training Sequence Code (TSC). The search was performed over the complete EDGE frame.

10404  Sync word not found in specified timeslot (TSC).
One or more active EDGE bursts that match the Normal Burst Type have been detected in the RF input signal, but none contain the selected Training Sequence Code (TSC). The search was only performed over the specified timeslot setting.

10409  Wideband calibration not valid until Align Now, All performed.
Wideband calibration corrections cannot be applied to current demodulation results. Results will not meet specified demodulation performance levels until an Align Now, All has been performed.

10410  Measurement uncalibrated, wideband calibration required.
Wideband calibration corrections cannot be applied to the current demodulation results. Results will not meet specified demodulation performance levels until Wideband Cal has been selected and successfully performed.

10411  Measurement uncalibrated, symbol rate exceeds +/-10% nominal.
Wideband calibration corrections cannot be applied to current demodulation results, due to the Symbol Rate setting exceeding +/-10% of the nominal value. Results may not meet specified demodulation performance levels.

10412  Cal Data corrupt. Wideband cal failed. Using previous data.
Wideband calibration procedure failed for an unknown reason. New calibration data was not saved. Previous wideband calibration data is being used, if available. However, it is not acceptable. Before re-attempting Wideband Cal, ensure connection between the AMPTD REF OUT and the INPUT 50 Ω is in place. If the error persists, get in touch with your service center.
10413  B7D DSP Code Install Fail Opt.229. Contact your Service Center.

The Digital Signal Processor algorithm files required to perform the demodulation are not present in the analyzer. Reinstall the measurement personality and contact your service center.

10414  Opt 229 DSP algorithm code file requires upgrade.

The Digital Signal Processing algorithm code file revision is not supported by the currently loaded personality version. Refer to the user’s guide for the personality in use for more information on installation/upgrade.

10415  Opt 229 DSP algorithm coef. file requires upgrade.

The Digital Signal Processor algorithm coefficient file revision is not supported by the currently loaded personality version. Refer to the user’s guide for the personality in use for more information on installation/upgrade.

10416  B7D DSP Code Reload Fail Opt.229. Contact your Service Center.

The Digital Signal Processor algorithm files required to perform the demodulation are corrupt and cannot be loaded properly. Reinstall the measurement personality and contact your service center.

10417  This operation requires a measurement to be active.

The analyzer cannot perform this operation, because it requires a measurement to be running and no measurement is running.

10418  Demod Format setting does not allow this value for Points/Symbol.

Invalid Points/Symbol selection attempted for the given Demod Format setting.

10419  Carrier Not Present.

A carrier signal/burst is expected at the analyzer input. This signal cannot be found; however, the measurement will still run. Check input signal connection.

10420  Valid burst not found.

This error only occurs when RF Amptd is selected for Burst Sync. It indicates that a valid burst envelope which meets the specified Burst Search Threshold was not found within the specified Burst Search Length. Note that the demodulation measurement will proceed by attempting to demodulate the signal without Burst Sync alignment. Possible causes may be:

1. Carrier signal is not actually bursted.
2. Burst Search Threshold and/or Burst Search Length may need to be adjusted.
10421 Cannot lock to carrier.

This error only occurs when attempting to demodulate OFFSET QPSK signals. It indicates that the demodulation algorithm is unable to lock to your signal. Possible causes may be:

1. There is no carrier signal.
2. Carrier signal is present, but Demod settings do not match the modulation format of the OFFSET QPSK signal being measured.
3. OFFSET QPSK signal is too noisy to achieve carrier lock.

10425 B7D DSP Code Install Fail Opt.231. Contact your Service Center.

The Digital Signal Processor algorithm files required to for the 89600 VSA SW are not present in the analyzer. Reinstall the measurement personality and contact your service center.

10426 Opt 231 DSP algorithm code file requires upgrade.

The Digital Signal Processing algorithm code file revision is not supported by the currently loaded personality version. Refer to the user’s guide for the personality in use for more information on installation/upgrade.

10427 Opt 231 DSP algorithm coef. file requires upgrade.

The Digital Signal Processor algorithm coefficient file revision is not supported by the currently loaded personality version. Refer to the user’s guide for the personality in use for more information on installation/upgrade.


The Digital Signal Processor algorithm files required for the 89600 VSA SW are corrupt and cannot be loaded properly. Reinstall the measurement personality and contact your service center.
10450 Avg Mode changed to Repeat for Full Meas Type. Meas Type has been changed to Full. Exponential Average Mode is not available for Full Meas Type therefore Average Mode has been changed to Repeat.

10451 Avg Mode changed to Exp for Examine Meas Type. Meas Type has been changed to Examine. Repeat Average Mode is not available for Examine Meas Type therefore Average Mode has been changed to Exponential.

10452 Meas Type changed to Examine for Exp Avg Mode. Average Mode has been changed to Exponential. Full Meas Type is not available for Exponential Average Mode therefore Meas Type has been changed to Examine.

10453 Meas Type changed to Full for Repeat Avg Mode. Average Mode has been changed to Repeat. Examine Meas Type is not available for Repeat Average Mode therefore Meas Type has been changed to Full.

10454 Valid burst not found. Cannot find a valid burst, either because it is not fully on the display, or the level is too low to be detected properly.

10509 Did not find 4 signals > Peak Excursion. Or Require 4 Signals > PEAK EXCURSION above Threshold. Using the current instrument settings, the measurement cannot locate four signals with enough energy or resolution to perform an accurate measurement.

10510 Signals to not fit expected Intermod (TOI) pattern. Based on the current analyzer settings, the measurement cannot find two signals of high enough amplitude that can be resolved in such a manner that the third order products would lie within the measured span.

10511 100 spurs found. Additional spurs ignored. There are too many spurs for the table (the limit is 100), and any additional spurs that are found will be ignored.

10512 No spurs have been found. You have started a measurement in examine meas type, in single or continual sweep mode, or full meas type in single sweep mode, but no spurs were found.

10513 No ranges are defined. There are no active ranges in the range table. The user will need to activate at least one range.
10514  Avg Mode changed to Repeat for Full Meas Type
       Meas Type has been changed to Full. Exponential Average Mode is not available for Full Meas Type therefore Average Mode has been changed to Repeat.

10515  Avg Mode changed to Exp for Examine Meas Type
       Meas Type has been changed to Examine. Repeat Average Mode is not available for Examine Meas Type therefore Average Mode has been changed to Exponential.

10516  Meas Type changed to Examine for Exp Avg Mode
       Average Mode has been changed to Exponential. Full Meas Type is not available for Exponential Average Mode therefore Meas Type has been changed to Examine.

10517  Meas Type changed to Full for Repeat Avg Mode
       Average Mode has been changed to Repeat. Examine Meas Type is not available for Repeat Average Mode therefore Meas Type has been changed to Full.

10524 to 10561: Phase Noise Error Messages (Option 226)  An error number in this range indicates the instrument has detected an error relating to the Phase Noise personality.

10524  This measurement does not support the *.CSV file format.
       You cannot load or save base instrument traces, as this is not supported by the Log Plot measurement.

10525  Invalid format: CSV files are not supported by this measurement.
       You cannot load or save base instrument traces, as this is not supported by the Log Plot measurement.

10525  Use View/Trace menu when loading or saving logarithmic traces.
       You cannot load CSV format trace files or save traces in the CSV format in the Log Plot measurement of the Phase Noise Measurement Personality.

10526  Cannot display Ref Trace because it has no data.
       Reference trace cannot be displayed, as there is currently no data assigned to it - use the functions under the Store Ref Trace menu, or load a trace to assign some data.

10527  Invalid Marker Trace. Marker moved to Raw Trace.
       Cannot place markers on the reference trace, because the reference trace is currently turned off or has no data.
Failed to Load trace. Bad file format.
The load trace operation could not be completed, as the input file was not in the expected format. You can only load traces that were previously saved using the 'Save Trace' feature.

Trace file contains no compatible traces.
The trace file may have been created by another version of the Phase Noise personality, which uses a different trace format that is incompatible with the version you are running. Please check you are running the most up to date version of the personality.

Trace file was created by incompatible version of Opt. 226
The trace file may have been created by another version of the Phase Noise personality, which uses a different trace format that is incompatible with the version you are running. Please check you are running the most up to date version of the personality.

Cannot open trace file for writing. Save Failed.
Cannot write the trace file to the destination filename. This could be because the disk is full, or possibly due to a filename error. If using a floppy disk, check there is a formatted disk in the drive.

Cannot save Ref Trace because it contains no data.
Check the Ref Trace is turned on, and contains some valid trace data.

Trace file saved successfully.
The trace saving operation was successful.

Carrier Not Present
No Carrier > -50 dBm found at the analyzer input within the search span.
Solution: Modify center frequency to be closer to actual carrier, or alternatively apply carrier of sufficient amplitude at the current center frequency.

Cancellation trace is not set to Reference or has no data.
When performing phase noise cancellation, you need to supply a reference trace that will be used to cancel out the background noise of the analyzer. The reference trace must be in Reference (View) mode, and selected by the Ref Trace parameter under the Cancellation menu.

Cancellation disabled while measuring DANL Floor.
Phase Noise cancellation does not make sense when measuring the DANL Floor, so for this reason it has been disabled.
10537 Cancellation trace has different X-Scale to Smoothed trace.

When performing phase noise cancellation, you need to supply a reference trace that will be used to cancel out the background noise of the analyzer. The reference trace must have been measured over the same range of offsets, and on the same instrument as the current measurement being performed.

10560 Carrier Not Present. Verify frequency and amplitude settings.

No Carrier >−50 dBm found at the analyzer input within the search span. Solution: Modify center frequency to be closer to actual carrier, or alternatively apply carrier of sufficient amplitude at the current center frequency.

10561 Signal Tracking disabled when measuring DANL Floor (Removal).

Measuring the DANL Floor with DANL Method set to Removal requires that the user remove the signal and attach a load to the analyzer RF Input. Signal Tracking requires that the carrier be measured many times per measurement, so the two are inherently incompatible.

10601 to 10700: GSM and EDGE Error Messages (Options BAH and 202) An error number in this range indicates the instrument has detected an error relating to the GSM or EDGE personality.

10602 Sync word not found

An attempt to position a GSM trace into the mask, when not enough data was present. Try using the Restart key to clear the problem. This can be caused by a bad GSM burst, or the RF Sync Delay set too far.

10604 GSM burst out of limits

The GSM signal did not fit into the mask in the Power vs. Time measurement.

10606 Insufficient pre-Trig for demod – decrease Trig Delay

10608 Incorrect RBW for demod – change RBW

10610 GSM Hopping enabled, waiting for valid burst

10612 Invalid GSM burst timing

A GSM-like burst was acquired, but its timing is not valid. Ensure the correct Burst Type has been selected.

10614 Valid GSM burst not found

In a GSM measurement, data was acquired but a GSM burst was not found, with the timeslot mode disabled.

10616 Cannot synchronize frame trigger

Cannot synchronize the frame trigger to the even second clock.
10618 Dynamic range not optimum
10620 Cannot synchronize to RF amplitude (burst error)
10622 GSM RF sync delay is out of range
    Change RF Sync Delay.
10624 Sync word not found
    In a GSM measurement using demodulation, the training sequence code
    (sync word) could not be found.
10626 Signal too noisy
    In a GSM measurement, indicates that a burst could not be found in a
    signal that appears noisy.
10628 Sync is RF Ampl (not Training Seq). Bits not accurate
10630 Marker X value not adjusted when right of Rise&Fall mark
10632 Incorrect trigger holdoff
10634 Break freq > FFT filter edge
10636 SCPI marker query not available in GSM Rise&Fall
10638 GSM Pwr Meas requires trig delay < −50 μs. Delay set to −50 μs
10640 Carrier frequency outside device’s transmit band
    The entered channel/carrier frequency is not within the range of your
    current mode setup selection of standard and device.
10642 ADC overload -- Carrier not at expected frequency
    The carrier frequency of the signal may not match the instruments
    channel frequency setting.
10644 Requested timeslot number not present
    The selected timeslot is not on. (Timeslot is referenced to the trigger
    point.)
10646 Tx Band Spur measurement not defined for mobiles
    Only base station testing is available.
10648 Carrier power too low for optimum dynamic range
    For better dynamic range, transmit band spur measurements require
    >10 dBm signal power at the RF input port.
10650 Unexpected carrier frequency (BMT only)
    The transmit band spur measurement only allows bottom (B), middle (M),
    and top (T) channel frequencies for each supported frequency band. The
    carrier frequency must be set to the bottom, middle or top frequency of the
    current frequency band.
10652  EVM Measurement only supports EDGE TCH burst type
10654  Unable to demodulate signal
10655  Input overload
       Excessive input power has been detected which will cause the ADC to dip the signal. Reduce the signal level, change the attenuator setting (under Input menu), or press Restart if the RF Input Range is Auto.
10656  Tx Band Spur measurement does not support this frequency band
       The transmit band spur measurement does not support all of the commercially available frequency bands. You need to change your selection under Mode Setup, Radio, Band to one of the supported bands.
10657  Pretrigger too long
10658  Valid GSM burst not found for selected timeslot
       In a GSM measurement, data was acquired but a GSM burst was not found, with the timeslot mode enabled.

10701 to 10800: W-CDMA Error Messages (Option BAF) An error number in this range indicates the instrument has detected an error relating to the W-CDMA personality.

10702  Signal too noisy
10704  Input power too low
       The instrument only identifies a channel as active if it meets the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the Active Set Threshold function in the Meas Setup menu.
10768  Cannot correlate to input signal
       Cannot correlate to the input signal and no active channel is found. (from the composite EVM measurement) An active channel must meet the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the active set threshold function in the Meas Setup menu.
10772  Burst not found.
       Either the signal being analyzed has insufficient power, the rising or falling edges cannot be detected, or the burst is less than 126 microseconds.
10776  Cannot sync DPCCH pilot.
       This error message appears when an in Slot power measurement (Chip Power) is selected and the DPCCH sync is not done correctly.
10778 Valid PRACH burst not found.

This error message appears when an PRACH power measurement (Waveform/Chip Power) is selected and a valid PRACH burst is not found.

10801 to 10900: cdma2000 Error Messages (Option B78) An error number in this range indicates the instrument has detected an error relating to the cdma2000 personality.

10824 Signal too noisy
10826 Input power too low

The instrument only identifies a channel as active if it meets the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the Active Set Threshold function in the Meas Setup menu.

10868 Can not get long code phase (RS-232)

For MS (mobile station) measurements, the long code phase information could not be obtained from the signal at the RS-232 port (from code domain power measurement or composite EVM measurement).

10872 Cannot correlate to input signal

Cannot correlate to the input signal and no active channel is found. (from composite EVM measurement) An active channel must meet the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the active set threshold function in the Meas Setup menu.

10901 to 10925: NADC Error Messages (Option BAE) An error number in this range indicates the instrument has detected an error relating to the NADC personality.

10902 Sync word not found

In an EVM measurement, the sync word is not found and the synchronization cannot be established when Sync Word is selected in the Burst Sync menu.

10904 Valid NADC burst not found

A valid NADC burst is not found when the Device is MS.

10906 Signal too noisy

The valid EVM measurement cannot be performed, because the input signal is too noisy.

10908 Burst Delay out of limit for EVM (2 ms)

In an EVM measurement, the Burst Delay value must be less than 2 ms.
10926 to 10950: **PDC Error Messages (Option BAE)** An error number in this range indicates the instrument has detected an error relating to the PDC personality.

10926  Sync word not found
       In an EVM measurement, the sync word is not found and the synchronization cannot be established when Sync Word is selected in the Burst Sync menu.

10928  Valid PDC burst not found
       A valid PDC burst is not found when the Device is MS.

10930  Signal too noisy
       The valid EVM measurement cannot be performed, because the input signal is too noisy.

10932  Burst Delay out of limit for EVM (2 ms)
       In an EVM measurement, the Burst Delay value must be less than 2 ms.

10951 to 10975: **cdmaOne Error Messages (Option BAC)** An error number in this range indicates the instrument has detected an error relating to the cdmaOne personality.

10952  Signal exceeds maximum allowable power

10954  Input overload
       Excessive input power has been detected which will cause the ADC to clip the signal. Reduce the signal level, change the attenuator/max total power setting (under Input menu), or press Restart if the RF Input Range is Auto.

10956  Channel center frequency outside device’s transmit band.

10960  No power at carrier frequency
       No power was detected as a CW or a modulated signal.

10962  Cannot correlate to input signal
       A correlation failure with the pilot CDMA channel occurred during synchronous demodulation.

10976 to 11000: **Phase Noise Error Messages (Option 226)** An error number in this range indicates the instrument has detected an error relating to the Phase Noise personality.

10976  CMD ERR, <name of offending command>
       When a command or command argument is not recognized by the parser a command error is generated.
10977  PARAMETER ERROR, <name of offending parameter>
When the “GRAT” or “ANNOT” 8566 series commands are used with arguments other than ON, OFF, 1 or 0.

10978  INVALID ITEM, <offending item>
The invalid item message appears when a value that is not part of the commands list of enumerated arguments is entered.

10979  INVALID SAVE REG, <invalid register>
When the RCLS or RC commands are used to recall a state register that wasn’t previously saved with the SAVES or SV commands.

10980  INVALID TRACE, <trace>
When the argument to a trace command is not part of the predefined trace enumeration (TRA, TRB or TRC).

10981  CMD NOT SUPPORTED, <command>
Command not supported errors are generated when a valid 8566 command that is not supported by Chameleon is executed.

10982  LOG FILE FULL, CLEAR FOR FURTHER ERROR LOGGING

10983  LOG FILE CLEARED

**12000 to 12999: Noise Figure Error Messages (Option 219)** An error number in this range indicates the instrument has detected an error relating to the Noise Figure personality.

12116  Two entries already exist at frequency.
When specifying limit line point, if there are more than two points at the same frequency, the new limit point is discarded and the existing limit is used.

12219  Command not valid in this mode.
Indicates that the command sent from the Remote interface does not apply for this DLP.

12303  User cal invalidated
The existing user cal has been invalidated because of one of the following reasons:
- Meas mode changed
- Freq outside cal range
- Fixed LO changed
- Sideband changed
12304  Alignment Failed
Calibration failed because an error was encountered at some point during
the calibration (for example gain < 0)

12305  Mode Setup Error
A mode setup error occurred because one of the following:

• System input frequency out of range
• External LO frequency out of range
• Stop freq must be less than fixed LO freq
• Start freq must be greater than start IF freq
• LO – Stop freq must be ≥ min system input freq
• Start freq must be greater than fixed LO freq
• Stop IF freq must be less than fixed LO freq
• Start – LO freq must be ≥ min system input freq
• Stop freq must be less than stop RF freq
• Start freq must be greater than start RF freq

12307  Required Input attenuation not calibrated
Corrected measurements have been requested and the required RF
front-end setting of x dB has not been calibrated.

12308  Invalid frequency list for measurement mode
A frequency within the frequency list cannot be used to make a
measurement in the current mode.

12309  No entries in frequency list
A measurement was attempted with List frequency mode or a SCPI query
of the frequency list table was made and the frequency list table is empty.

12310  No entries in ENR table
A measurement was attempted or a SCPI query of an ENR table was made
and there were no entries in the relevant ENR table (Common, Meas or
Cal).

12311  No entries in Limit Line table
An attempt is made to either display or test against a limit line table
which has no entries.

12312  RF re-range required: Meas Restarted.
During a continuous measurement, a change of RF front-end attenuation
was required. To do this the measurement needs to be restarted.

12313  IF over range req. RF re-range: Meas Restarted.
During a continuous measurement, an IF section over range condition
occurred, requiring a change of RF front-end attenuation. To do this, the
measurement needs to be restarted.
Instrument Messages

12314  No entries in loss table
A measurement is attempted or a SCPI query of a before or after loss table
is made and there are no entries in the relevant loss table.

12316  T hot must be greater than T cold
A spot T hot has been specified which is not greater than T cold.

12603  Illegal MSDOS name given
An invalid filename has been specified. Use filenames with a maximum of
8 characters (letters and digits only) and use a 3 character extension. Note
that lowercase and uppercase are perceived as the same.

12604  File already exists
Attempt to store a file that already exists. Delete or rename the old file
and try again.

12605  Media is protected
A store was attempted to a write-protected device.

12606  Media is not writable
A store was attempted to a read-only device.

12612  File does not exist
The file you were trying to recall could not be found.

12762  Incorrect filename, allowable extension CSV
Attempt to load/store table data with an incorrect extension.

12768  Failed to load ENR data
A problem occurred when trying to load or store table data.

12769  Failed to store ENR data
A problem occurred when trying to load or store table data.

12770  Incorrect filename, allowable extension ENR
Attempt to load/store table data with an incorrect extension.

12771  Failed to load Frequency List
A problem occurred when trying to load or store table data.

12772  Failed to store Frequency List
Attempt to load/store table data with an incorrect extension.

12773  Incorrect filename, allowable extension LST
Attempt to load/store table data with an incorrect extension.

12774  Failed to load Limit line
Attempt to load/store table data with an incorrect extension.

12775  Failed to store Limit line

Attempt to load/store table data with an incorrect extension.

12776  Incorrect filename, allowable extensions LIM

Attempt to load/store table data with an incorrect extension.

12778  Failed to store Trace

A problem occurred when trying to load or store table data.

12779  Failed to load Loss data

A problem occurred when trying to load or store table data.

12780  Failed to store Loss data

A problem occurred when trying to load or store table data.

12781  Incorrect filename, allowable extension LOS

Attempt to load/store table data with an incorrect extension.

12995  Noise Figure DLP requires Noise Source Control Hardware

You have attempted to initiate the Noise Figure mode with the Noise Source Control hardware installed in your instrument. You must install the Noise Source Control hardware before running the Noise Figure mode.

13001 to 13100: 1xEV-DO Error Messages (Option 204)  An error number in this range indicates the instrument has detected an error relating to the 1xEV personality.

13024  Signal too noisy

13026  Input power too low

The instrument only identifies a channel as active if it meets the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the Active Set Threshold function in the Meas Setup menu.

13070  Cannot correlate to input signal

Cannot correlate to the input signal and no active channel is found. (from composite EVM measurement) An active channel must meet the default threshold criteria that it is within 20 dB of the highest power code channel. The threshold can be changed using the active set threshold function in the Meas Setup menu.

13074  Valid 1xEV burst not found

In a 1xEV measurement, data was acquired but a 1xEV burst was not found, with the timeslot mode disabled.
13101 to 13200: Flexible Digital Modulation Analysis Error Messages (Option 241) An error number in this range indicates the instrument has detected an error relating to the Flexible Digital Modulation Analysis personality.

13102 Valid signal not found
The input signal cannot be demodulated because of inappropriate parameter settings or incorrect signal.

13104 Valid burst not found
The burst signal cannot be detected because of inappropriate parameter settings or incorrect signal.

13106 Sync word not found
The sync word cannot be detected because of inappropriate parameter settings or incorrect signal.

13108 Points/Symbol changed to an even number because of demod format
Offset QPSK allows only even values for points/symbol. The user changed the demod format to OQPSK while the points/symbol was set to an odd value. Therefore, the points/symbol was re-set to an even number.

13110 Sync Pattern includes non-hex characters
The sync pattern should only consist of hex characters. Invalid characters are converted to 0.

13112 Sync Word Length changed to new upper limit
The upper limit of Sync word bits is 128. If the code word length (sync word length) exceeds this value, then the sync word length is cut off. This warning may happen only when the demod format is changed.

13114 Sync offset value not valid
The sync offset value is too far off from a value that would be reasonable to measure valid portion of data. So the measurement gives up trying to apply the offset value.

13116 Search Length is shortened because of high IF Band Width
The upper limit of the search length is 50 ms when the IF bandwidth is > 6.7 MHz, and it is 100 ms when IF BW is < 6.7 MHz.

Instrument Messages Without Numbers

Error Messages Without Numbers

Error
Attempt to change signal data failed.

EMC message, NOT USED
Instrument Messages

Error
Awaiting valid signal.
This indicates that software enhanced triggering is ON and 5 successive failures have been detected within a demod measurement

Error
Signal frequency malformed. Signal not added.

Error
Unable to retrieve signal (remote).
EMC message NOT USED

Error
Unable to uninstall personality, file not deletable.
This message occurs when you try to delete a personality which has been marked as non-deletable. The personality is marked non-deletable at the factory. Get in touch with your nearest service center for further assistance.

Informational Messages
These messages simply provide information; you are not required to do anything. Information in brackets (such as <directoryname>), is a previously-provided input.
Informational messages appear at the bottom of the screen in the status line.

Informational <directoryname> directory deleted
The directory indicated has been successfully deleted.

Informational <directoryname> directory deleted
The directory indicated has been successfully deleted.

Informational <name1> <directoryname1> directory renamed to <name2> <directoryname2>
Directory name1 has been successfully renamed to directory name2.

Informational <filename> file copied
The filename indicated has been successfully copied.

Informational <filename> file deleted
The filename indicated has been successfully deleted.

Informational <filename> file loaded
The filename indicated has been successfully loaded.

Informational <filename> file saved
The filename indicated has been successfully saved.

Informational <filename> too many data entries
This message may appear when loading data from a limit line or ampcor disk file. The [DATA] section of such a file can contain at most 200 lines of data. This message is displayed if that limit is exceeded.
Informational  

\(<name1> <filename1> file renamed to \(<name2> <filename2>\)\)

File name1 has been successfully renamed to file name2.

Informational  

\(\text{Atten auto set to 15 dB}\)

Indicates that an input signal has been detected which is of sufficient level to damage the input circuitry and the input attenuator has been automatically set to 15 dB. If the signal level is reduced, the attenuator will stay at 15 dB. This overload protection occurs at an input power level of 13 dBm (68 dBmV for Option 1DP) ± 7 dB when the input attenuation is auto coupled and set to <15 dB. To return to the original measurement setup, reduce the input signal level and press \(\text{Amplitude}\). Then press \(\text{Attenuation (Auto)}\).

Overload protection is only available in the Agilent Technologies E4401B and E4411B.

Informational  

\(\text{Auto ranging...}\)

Displayed during autoranging.

Informational  

\(\text{B7D and/or B7E not found. Code Domain not available.}\)

Digital Signal Processing and Fast Analog to Digital Converter (Option B7D) and/or RF Communications Hardware (Option B7E) are not installed options on your analyzer. Code domain is therefore not available.

Informational  

\(\text{B7D and/or B7E not found. Mod Acc not available.}\)

Digital Signal Processing and Fast Analog to Digital Converter (B7D) and/or RF Communications Hardware (B7E) are not installed options on your analyzer. Modulation accuracy is therefore not available.

Informational  

\(\text{Carrier Not Present.}\)

A carrier signal/burst is expected at the analyzer input. This signal cannot be found; however, the measurement will still run. Check input signal connection.

Informational  

\(\text{Channel frequency outside device’s transmit band.}\)

Reset channel number or frequency.

Informational  

\(\text{Default spur table values loaded.}\)

No spur table has been previously saved when the Out-of-Band Spurious measurement begins. Press \(\text{Meas Setup, Edit Table}\) to enter the frequency ranges of interest and press \(\text{Save Table}\) to save that information. This saved table will be loaded the next time the measurement is run.
Informational Device = Mobile. Code Domain not available.

Code Domain measurement is grayed out when the device is set to mobile under the Mode Setup front-panel key. Code Domain measurement is only accessible when the device is set to base and RF Communications Hardware (Option B7E) or Enhanced Memory Upgrade (Option B72) are installed.

Informational Directory already exists

Each directory and file must have a unique name. The directory name you have entered is currently being used on the selected drive. You may either enter a new name or rename the directory currently existent.

Informational Device = Mobile. Mod Acc not available.

Modulation accuracy measurement is grayed out when the device is set to mobile under Mode Setup, front-panel key. Modulation accuracy is only accessible when the device is set to base and RF Communications Hardware (Option B7E) or Enhanced Memory Upgrade (Option B72) are installed.

Informational Directory already exists

Each directory and file must have a unique name. The directory name you have entered is currently being used on the selected drive. You may either enter a new name or rename the directory currently existent. Refer to “File Menu Functions” in the Agilent ESA Spectrum Analyzer User’s Guide.

Informational ENR table will be extrapolated

One or more calibration or measurement frequency points exceeds the currently loaded Cal or Meas ENR Table frequency ranges. The corresponding ENR tables lowest frequency ENR value will be re-used for frequencies less than the table range, and the highest frequency ENR value will be re-used for frequencies greater than the table range.

Informational Entire trace is below the threshold level.

The measurement cannot operate properly because the trace has fallen completely below the threshold level. Change the threshold level to view signal.

Informational Invalid format: CSV files are not supported by this measurement.

When utilizing the Phase Noise Personality: Option 226, the *.CSV file format is not available.

Informational Invalid EDGE burst timing.

The burst has manually been positioned off the display.
Informational Measurement halted. Press a measurement key to continue.
This error occurs after you choose Cancel to refrain from setting the attenuator to 0 dB during the Receive Channel Power and Receive Spur measurements.

Informational No Fast ADC hardware installed. Meas unavailable.
The analyzer cannot use sweep times of less than 5 milliseconds when Option B7D or Option AYX is not installed. Therefore the measurement will not be executed.

Informational Not enough frequency range to measure harmonics for channel.
Selected harmonics are above the frequency range of the analyzer.
THIS MESSAGE IS NO LONGER USED FOR FW A.08.00 AND ABOVE.

Informational One or more harmonics beyond freq limit: number decreased.
The highest harmonic was beyond the frequency limit of the analyzer, so the number of measured harmonics was decreased.

Informational Option activated
This message is displayed after entering the selected option’s License Key.

Informational Please set RF input range (INPUT menu) to manual first.
In order to manually set the reference level and/or the attenuation under the Amplitude front-panel key, the RF Input Range menu under the Input front-panel key must be set to Man (manual).

Informational Shutdown in process.
The analyzer is responding to the Standby key selection, and is executing the shutdown procedure.

Informational Table loaded successfully.
When the Load Table key was pressed on the second page of the edit table form while in the out-of-band spurious measurement, the file was present. The information has been loaded into the measurement where it may be edited again. This message will also appear when the out-of-band spurious measurement is opened if a spur table has been previously saved.

Informational Table saved successfully.
This message appears after you press the Save Table key on the second page of the edit table for the out-of-band spurious measurement. It indicates that the current spur table has been written successfully to disk and is available to be loaded by means of the Load Table key.

Informational The calibration data is invalid, and has been cleared.
A parameter has changed that affects calibration. Therefore the calibration data has been reset, and for best results recalibration is recommended.
Instrument Messages

Informational
The file containing the list of cable types has been updated.
The file update was successful.

Informational
This measurement does not support the *.CSV file format.
When utilizing the Phase Noise Personality: Option 226, *.CSV (comma
separated values) file format is not available.

Informational
This operation requires a measurement to be active.
The analyzer cannot perform this operation, because it requires a
measurement to be running and no measurement is running.

Informational
Tracking Peak Needed.
This message is displayed when there has been a change in Resolution
Bandwidth, Span, or Alignment since the previous Tracking Peak.
The message does not apply to the E4401B or E4411B Spectrum Analyzer.

Informational
Use trigger delay to align bit p0 center on marker.
 Tells you where to manually align P0.

Informational
WARNING: You are about to delete all of the contents of
directory xxxxxx “x:\xxxxx\”. Press Delete Now again to
proceed or any other key to abort.

If you select a directory or subdirectory to delete, this popup message is
displayed when you press Delete Now. (xxxxxx “x: \xxxxx\” in the message
is the full path and directory name).

Informational
Waiting for end of data acquisition to access floppy disk

Informational
Volume <name> formatted
The indicated disk has been successfully formatted.

Status Messages

These messages indicate conditions that can cause the display of incorrect data. The name
of the corresponding status bit appears in parenthesis. Some messages display only the
status bit (as noted).

Status messages appear in the upper right portion of the screen grid.

Status
* (Invalid Data)
Data on the screen may not match the screen annotation. For example,
while analyzer settings are changing or when any trace is in view mode.

Status
50 MHz Osc Unlevel (50 MHz Osc Unleveled)
The internal 50 MHz amplitude reference source has become unleveled.
This condition must be corrected before a valid alignment can be
performed.
Status  
(ADC Align Failure) status bit only, no message

The alignment routine was unable to align the analog-to-digital converter (ADC).

Status  
Align Now All Needed (Align Needed)

The instrument requires complete alignment. Press System, Alignments, Align Now, All. On all Agilent Technologies ESA spectrum analyzer models except Agilent Technologies E4401B and E4411B, you must connect the AMPTD REF OUT to the INPUT with the appropriate cable to perform this alignment. For Agilent Technologies E4401B and E4411B only: disconnect any signals from the INPUT prior to performing this procedure. If this message recurs, load defaults (System, Alignments, Load Defaults) and then perform Alignment Now, All.

Status  
Align Now RF Needed (Align Now RF Needed)

The instrument requires RF alignment. Press System, Alignments, Align Now, RF (EXT Cable). On all Agilent Technologies ESA spectrum analyzer models except Agilent Technologies E4401B and E4411B, you must connect the AMPTD REF OUT to the INPUT with the appropriate cable to perform this alignment. For Agilent Technologies E4401B and E4411B only: disconnect any signals from the INPUT prior to performing this procedure.

Status  
Align RF Skipped (Align RF Skipped)

The RF alignment has been skipped because a 50 MHz signal was detected at the INPUT; alignment will resume when the 50 MHz signal is removed. The alignment will not work when there is too much input power at 50 MHz. The instrument may not continue to measure properly. To remove the message, remove the 50 MHz input signal, then perform an Align Now, RF. Press System, Alignments, Align Now, RF. On all Agilent Technologies ESA spectrum analyzer models except E4401B and E4411B, you must connect the AMPTD REF OUT to the INPUT with the appropriate cable to perform this alignment. For Agilent Technologies E4401B and E4411B only: disconnect any signals from the INPUT prior to performing this procedure.

Status  
Align RF Skipped, Align signal amplitude too low

The RF alignment has been skipped because the calibration output power is too low.
Status: DC Coupled

Indicates the input of the analyzer is DC coupled (Input/Output, Coupling (DC)). This setting is necessary when measuring frequencies below 100 kHz on E4402B with Option UKB, E4404B, and E4405B analyzers. For E4407B analyzers with Option UKB, you must set the coupling to DC when measuring below 10 MHz. Take care to limit the input level to 0 Vdc and +30 dBm whenever you are in DC coupled mode.

Status: Demod ON: reduce span for audible detection

When the Demod function is active and the speaker is turned on, the ratio of the resolution bandwidth to span must be greater than 0.002 to properly demodulate and listen to the resulting audio signal. You must decrease the span to continue the measurement.

Status: Ext Ref (no corresponding status bit)

The instrument’s frequency reference has been set to External Reference. This message will appear even if an external reference is not connected to the instrument. The external reference frequency must also be entered.

Indicates that the frequency reference is being supplied by an external 10 MHz source.

Status: External LO frequency out of range

One or more external LO frequencies are out of range. Check that the LO frequency limits are set correctly and check the entered measurement frequencies and measurement mode.

Status: Final IF Overload (IF/ADC Overrange)

The final IF section has been overloaded. Measurement results may be invalid. Either increase the input attenuation or decrease the input signal level.

Status: First IF Overload (IF/ADC Overrange)

The first IF section has been overloaded. Measurement results may be invalid. Either increase the input attenuation or decrease the input level.

Status: Flat corr off (no corresponding status bit)

Indicates that the flatness corrections have been turned off.

Status: (FM Demod Align Failure) status bit only, no message

A failure has occurred during the FM Demod alignment. Measurement results may be invalid.

Status: Freq corr off (no corresponding status bit)

Indicates that the frequency corrections have been manually disabled. Press System, Alignments, Freq Correct, (On) to restore.
<table>
<thead>
<tr>
<th>Status</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freq Count: Reduce Span/RBW ratio</strong></td>
<td>The span is too wide for the current resolution bandwidth. Either reduce the span or increase the RBW.</td>
</tr>
<tr>
<td><strong>Freq outside cal range</strong></td>
<td>The existing user cal has been invalidated because the current measurement frequencies lie partially or wholly outside the range of frequencies used for user-cal.</td>
</tr>
<tr>
<td><strong>Frequency Reference Error (Freq Ref Unlocked)</strong></td>
<td>The frequency reference lock loop has unlocked or is near an unlock condition. This message can occur when either the internal or external reference is selected. If external reference is selected, assure the frequency of the external reference source exactly matches the user entered value displayed on the reference menu key. The frequency reference has been tuned too far off of 10 MHz. This condition may be corrected by cycling power on the analyzer.</td>
</tr>
<tr>
<td><strong>(IF Align Failure) status bit only, no message</strong></td>
<td>A failure has occurred during the IF alignment. Measurement results may be invalid.</td>
</tr>
<tr>
<td><strong>IF Gain fixed</strong></td>
<td>The autoranging function of the analyzer has been turned off (Amplitude, More, More, IF Gain (Fixed)). This setting is useful when measuring signals that require fast measurement time, narrow resolution bandwidths (&lt;1 kHz), and &lt;70 dB of display range. For more information on this setting, refer to IF Gain key description in the ESA Spectrum Analyzer User’s Guide.</td>
</tr>
<tr>
<td><strong>IF Overload (IF/ADC Over Range)</strong></td>
<td>The IF section has been overloaded. Measurement results may be invalid.</td>
</tr>
<tr>
<td><strong>Input is internal (no corresponding status bit)</strong></td>
<td>This message applies to the Agilent Technologies E4401B and E4411B only. Indicates the 50 MHz Amptd Ref selection is On. With the 50 MHz amplitude reference on, the input is routed through an internal signal path.</td>
</tr>
<tr>
<td><strong>LO – Stop freq must be &gt;= min system input freq</strong></td>
<td>The current measurement mode requires that the stop RF (input to DUT) frequency must be more than the minimum system input frequency away from the fixed LO frequency.</td>
</tr>
<tr>
<td><strong>(LO Align Failure) status bit only, no message</strong></td>
<td>A failure has occurred during the alignment of the local oscillator (LO). Measurement results may be invalid.</td>
</tr>
</tbody>
</table>
### Status

**LO Out Unlevel (LO Out Unleveled)**

Indicates the output of the local oscillator (LO) has become unleveled. This condition must be corrected to make valid measurements.

**LO Unlevel (LO Unleveled)**

Indicates the internal circuitry of the local oscillator (LO) has become unleveled. This condition must be corrected to make valid measurements.

**LO Unlock (Synth Unlocked)**

Indicates the phase locked circuitry of the local oscillator (LO) has become unlocked. This condition must be corrected to make valid measurements.

**Log Corr Off (no corresponding status bit)**

The log amplifier corrections have been turned off.

**Marker Count:Widen Res BW**

The ratio of the resolution bandwidth to span must be greater than 0.002 for the marker count function to work properly. Increase the resolution bandwidth or decrease the span to continue the measurement.

**Meas Uncal (Oversweep)**

The measurement is uncalibrated, usually due to sweeping a narrow RBW filter too quickly. Check the sweep time, span, and bandwidth settings, or press **Auto Couple**.

**Measurement outside Internal Preamp range**

The Internal Preamp is currently turned on, but the measurement is being performed outside the range of the preamp.

**Measurement partially outside Internal Preamp range**

The Internal Preamp is currently turned on, and the measurement range is being performed partly within and partly outside this range. Recommendation is that the user turns preamp off to ensure consistent results across the entire measurement.

**Overload: Reduce Signal and press <ESC> (Input Overload Tripped)**

This message applies to the Agilent Technologies E4401B and E4411B only. A signal has been applied to the input connector that caused the overload protection circuitry to engage. The input signal must be reduced. After the signal is reduced, press **ESC** to reset the overload detector so that you can continue using the analyzer.

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**CAUTION**

Exposing the analyzer to high levels of input power over a prolonged period of time can damage the internal circuitry.
Status
Peaking Signal (no corresponding status bit)
The instrument is executing a tracking generator peak.

Status
Preferred resolution bandwidth not available.
The calculated required resolution bandwidth for this measurement is not available.

Status
(RF Align Failure) status bit only, no message
A failure has occurred during the alignment of the RF section.
Measurement results may be invalid.

Status
Signal Ident On, Amptd Uncal (Signal Ident On)
Indicates that the amplitude measurement could be uncalibrated because the signal identification feature is on.

Status
Signal level is low.
Indicates the signal can be correlated, however the level is below that specified to ensure accurate measurement results.

Status
Source LO Unlevel (Source LO Uneveled)
The internal circuitry of the local oscillator (LO) in the tracking generator has become unleveled. This condition must be corrected to make valid measurements.

Status
Source LO Unlock (Source Synth Unlocked)
The phase-locked circuitry of the local oscillator (LO) in the tracking generator has become unlocked. This condition must be corrected to make valid measurements.

Status
Source Unlevel (Source Unleveled)
Indicates the source power is set higher or lower than the analyzer can provide, the frequency span extends beyond the specified frequency range of the tracking generator, or the calibration data for the source is incorrect.

Status
Start freq must be greater than fixed LO freq
The current measurement mode requires that the start frequency must be greater than the fixed LO frequency.

Status
Start freq must be greater than start RF freq
The current measurement mode requires that the start IF (output to DUT) frequency must be greater than the start RF (input to DUT) frequency.

Status
Start – LO freq must be >= min system input freq
The current measurement mode requires that the start RF (input to DUT) frequency must be more than the minimum system input frequency away from the fixed LO frequency.
Status  Stop freq must be less than fixed LO freq

The current measurement mode requires that the stop frequency must be
less than the fixed LO frequency.

Status  Stop freq must be less than stop RF freq

The current measurement mode requires that the stop IF (output to DUT)
frequency must be less than the stop RF (input to DUT) frequency.

Status  Stop IF freq must be less than fixed LO freq

The current measurement mode requires that the stop IF (output to DUT)
frequency must be less than the fixed LO frequency.

Status  System, Alignments, Align All Now Needed (Align Needed)

This message occurs only when Auto Align is set to Alert.

The instrument requires an Align All Now. Restore the alignment by
pressing System, Alignments, Align All Now.

Status  System input frequency out of range

One or more system input frequencies are out of range. If using a
frequency list, check that all entries are valid for current measurement
mode.

Status  System Alignments, Align Now, All Required

Internal alignment correction data has been lost. Press System,
Alignments, Align Now, All to clear this message from the display.

Status  (TG Align Failure) status bit only, no message

A failure has occurred during the tracking generator (TG) alignment.

Status  Video shift off (no corresponding status bit)

Indicates the video shift has been manually disabled; this will impair
readings.

Annunciator Bar Messages

Annunciator  Align

This message appears in the left side of the annunciator bar in red. When
this message appears it indicates that there is one or more condition that
has affected the alignment. For the possible conditions and suggested
resolutions, refer to Align Now All Needed (Align Needed) on page 87,
Align Now RF Needed (Align Now RF Needed) on page 87, Align RF
Skipped (Align RF Skipped) on page 87, and System Alignments, Align
Now, All Required on page 92.
Annunciator Ext Ref

This message appears in the right side of the annunciator bar in green. When this message appears it indicates that there is one or more condition that affects the reference source. For the possible conditions and suggested resolutions, refer to Ext Ref on page 88.

Annunciator FreqRefUnlock

This message appears in the left side of the annunciator bar in red. When this message appears it indicates that there is one or more condition that results in a frequency reference error. For the possible conditions and suggested resolutions, refer to Frequency Reference Error (Freq Ref Unlocked) on page 89.

Annunciator Overload

This message appears in the left side of the annunciator bar in red. When this message appears it indicates that there is one or more condition that causes a system overload. For the possible conditions and suggested resolutions, refer to IF Overload on page 89 and the Status overload on page 90.

Annunciator Uncal

This message appears in the left side of the annunciator bar in red. When this message appears it indicates that there is one or more condition that results in uncalibrated results. For the possible conditions and suggested resolutions, refer to Meas Uncal (Oversweep) on page 90.

Annunciator Unlevel

This message appears in the left side of the annunciator bar in red. When this message appears it indicates that there is one or more condition that affects the leveling of an internal signal, such as the local oscillator (LO) or the tracking generator (source). For the possible conditions and suggested resolutions, refer to 50 MHz Osc Unlevel (50 MHz Osc Unleveled) on page 86, LO Out Unlevel (LO Out Unleveled) on page 90, Source LO Unlevel (Source LO Unleveled) on page 91, and Source Unlevel (Source Unleveled) on page 91.

Annunciator Unlock

This message appears in the left side of the annunciator bar in red. When this message appears it indicates that there is one or more condition that affects locking one or more of the local oscillators (LOs). For the possible conditions and suggested resolutions, refer to LO Unlock (Synth Unlocked) on page 90.
2 Functional Tests
What You Will Find in This Chapter

This chapter describes the functional tests and provides information on how to perform them.

What Are the Functional Tests?

Functional tests are tests of various instrument parameters that give a high degree of confidence that the analyzer is operating correctly. They are recommended as a check of analyzer operation for incoming inspection or after a repair. Measurement uncertainty analysis is not available for functional tests, and the analyzer is checked against limits that are wider than the published specifications. The functional tests are designed to test an analyzer operating within the temperature range defined by the analyzer specifications using a minimum set of test equipment. If a test does not pass, performance tests must be run to confirm a problem exists.

Functional Test Versus Performance Verification

Functional tests use a minimum set of test equipment to check a much smaller range of parameters (and a limited number of data points for each parameter) than do performance verification tests. Functional tests use limits that are wider than the published specifications; measurement uncertainty analysis is not available for functional tests.

NOTE

If a functional test does not pass, you must run performance verification tests to confirm that a problem exists.

Performance verification tests span a wide range of instrument parameters and provide the highest level of confidence that the instrument conforms to published specifications. These tests can be time consuming and require extensive test equipment.

This chapter includes the following:

- **Before Performing a Functional Test** on page 97 (what to do first).
- **Test Equipment** on page 98 (a list of the equipment required for all of the tests).
- **PSA Functional Tests** (PSA only):
  - Amplitude Accuracy at 50 MHz on page 102
  - Displayed Average Noise Level (DANL) on page 107
  - Frequency Readout Accuracy on page 109
  - Frequency Response (Flatness) on page 111
  - Amplitude Linearity on page 115
  - Second Harmonic Distortion (SHD) on page 118
- **ESA Functional Tests** (ESA only):
  - Displayed Average Noise Level on page 122
— Frequency Readout Accuracy on page 139
— Marker Count Accuracy on page 141
— Frequency Response (Flatness) on page 142
— Reference Level Accuracy on page 146
— Resolution Bandwidth Switching Uncertainty on page 151
— Scale Fidelity on page 154
— Second Harmonic Spurious Responses on page 157
— Tracking Generator Level Flatness: Models E4401B and E4411B, Options 1DN and 1DQ on page 160

Each functional test includes:

• Test limits (pass/fail criteria)
• A description of the test
• The equipment required for the test
• A figure showing how to connect the equipment
• Step-by-step instructions
• One or more tables in which to record the measurement results

**Before Performing a Functional Test**

1. Ensure that you have the proper test equipment.
2. Switch on the unit under test (UUT) and let it warm up (in accordance with warm-up requirements in the instrument specifications).
3. Allow sufficient warm-up time for the required test equipment (refer to individual instrument documentation for warm-up specifications).
4. Ensure that the analyzer’s frequency reference is set to Internal:
   a. Press the **System, Reference** keys.
   b. If the **Freq Ref** softkey does not have Int underlined, press the **Freq Ref** softkey until it is underlined.
5. Following instrument warm-up, perform the auto align routine:
   Press **System, Alignments, Align All Now**.

**NOTE**

Functional test accuracy depends on the precision of the test equipment used. Ensure that all of the test equipment is calibrated before running a functional test.
# Test Equipment

The table below summarizes the test equipment needed to perform all of the functional tests. Alternate equipment model numbers are given in case the recommended equipment is not available.

If neither the recommended nor the alternative test equipment are available, substitute equipment that meets or exceeds the critical specifications listed.

<table>
<thead>
<tr>
<th>Analyzer</th>
<th>Item</th>
<th>Critical Specifications</th>
<th>Recommended Agilent Model</th>
<th>Alternate Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adapters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>3.5 mm (f) to 3.5mm (f)</td>
<td>(connector saver for 83630B)</td>
<td>5061-5311</td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>3.5 mm (f) to N (f)</td>
<td></td>
<td>1250-1745</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>2.4 mm (f) to 3.5 mm (m)</td>
<td>E4446A, E4448A only</td>
<td>11901D</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>BNC (f) to SMA (m)</td>
<td></td>
<td>1250-1200</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>BNC (m) to SMA (f)</td>
<td></td>
<td>1250-1700</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>BNC (m) to SMA (f)</td>
<td></td>
<td>1250-2015</td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>Type N (f) to BNC (m)</td>
<td></td>
<td>1250-1534</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Type N (f) to N (f)</td>
<td></td>
<td>1250-1472</td>
<td>1250-0777</td>
</tr>
<tr>
<td>PSA ESA</td>
<td>Type N (m) to 3.5 mm (f)</td>
<td></td>
<td>1250-1744</td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>Type N (m) to 3.5 mm (m)</td>
<td></td>
<td>1250-1743</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Type N (m) to BNC (f)</td>
<td></td>
<td>1250-1476</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Type N (m) to BNC (f)</td>
<td></td>
<td>1250-0780</td>
<td></td>
</tr>
<tr>
<td><strong>Attenuators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>10 dB Step Attenuator</td>
<td>Range: 0 to 60 dB</td>
<td>355D</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>20 dB Fixed Attenuator</td>
<td>Accuracy: &lt; 0.5 dB</td>
<td>8491A</td>
<td>8491B</td>
</tr>
<tr>
<td><strong>Cables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>APC 3.5 mm (1 meter)</td>
<td></td>
<td>8120-4921</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>APC 3.5 mm</td>
<td>E4407B and E4408B only</td>
<td>11500E</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>APC 3.5 mm</td>
<td></td>
<td>11500D</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Type-N, 152-cm (60-in)</td>
<td></td>
<td>11500D</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>APC 3.5 mm</td>
<td>E4407B and E4408B only</td>
<td>11500E</td>
<td></td>
</tr>
</tbody>
</table>
### Functional Tests

#### Test Equipment

<table>
<thead>
<tr>
<th>Analyzer</th>
<th>Item</th>
<th>Critical Specifications</th>
<th>Recommended Agilent Model</th>
<th>Alternate Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA ESA</td>
<td>Cable, BNC (2 required)</td>
<td>120 cm (48 in.) BNC cable</td>
<td>10503A</td>
<td></td>
</tr>
</tbody>
</table>

#### Signal Source

<table>
<thead>
<tr>
<th>PSA</th>
<th>Synthesized Sweeper</th>
<th>Frequency: 10 MHz to 26.5 GHz</th>
<th>Harmonic level: &lt;−40 dBc</th>
<th>Amplitude range 10 to −20 dBm</th>
<th>Frequency Accuracy: 0.02%</th>
<th>83630B</th>
<th>83640B, 83650B</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA</td>
<td>Synthesized Sweeper</td>
<td>Frequency: 10 MHz to 50 GHz</td>
<td>Harmonic level: &lt;−40 dBc</td>
<td>Amplitude range 10 to −20 dBm</td>
<td>Frequency Accuracy: 0.02%</td>
<td>83650B</td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Synthesized Sweeper</td>
<td>Frequency: 10 MHz to 26.5 GHz</td>
<td>Harmonic level: &lt;−40 dBc</td>
<td>Amplitude range 10 to −20 dBm</td>
<td>Frequency Accuracy: 0.02%</td>
<td>83640A/B</td>
<td>836XX series</td>
</tr>
</tbody>
</table>

#### Miscellaneous Equipment

<table>
<thead>
<tr>
<th>PSA ESA</th>
<th>Filter, 50 MHz Low Pass</th>
<th>Cutoff Frequency: 50 MHz</th>
<th>Rejection at 65 MHz: &gt;40 dB</th>
<th>Rejection at 75 MHz: &gt;60 dB</th>
<th>Rejection at 80 MHz: &gt;60 dB</th>
<th>0955-0306</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA</td>
<td>Power Meter</td>
<td>Power Reference Accuracy: ±1.2%</td>
<td>Compatible with power sensor</td>
<td>E4418B</td>
<td>E4419B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Power Meter</td>
<td>Power Reference Accuracy: ±1.2%</td>
<td>Compatible with power sensor</td>
<td>438A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>Power Sensor</td>
<td>Frequency Range: 50 MHz to 26.5 GHz</td>
<td>Amplitude Range: −25 to 10 dBm</td>
<td>8485A</td>
<td>E4413A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Power Sensor</td>
<td>Frequency Range: 100 kHz to 3.0 GHz</td>
<td>Amplitude Range: −25 to 10 dBm</td>
<td>8485A</td>
<td>E4413A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Power Sensor</td>
<td>Frequency Range: 50 MHz to 50 GHz</td>
<td>E4446A, E4448A only</td>
<td>8487D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA ESA</td>
<td>Power Splitter, 3.5 mm</td>
<td>Nominal Insertion Loss: 6 dB</td>
<td>Tracking Between Ports: &lt;0.25 dB</td>
<td>11667B</td>
<td>11667A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Power Splitter</td>
<td>Frequency Range: 50 MHz to 50 GHz</td>
<td>Tracking between ports: &lt;0.25 dB</td>
<td>E4446A, E4448A only</td>
<td>11667C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyzer</td>
<td>Item</td>
<td>Critical Specifications</td>
<td>Recommended Agilent Model</td>
<td>Alternate Agilent Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>-------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Power Splitter, 3.5 mm</td>
<td>Nominal Insertion Loss: 6 dB Tracking Between Ports: &lt;0.25 dB E4401B, E4402B, E4403B, E4404B, E4405B and E4411B only</td>
<td>11667A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Power Splitter, 3.5 mm</td>
<td>Nominal Insertion Loss: 6 dB Tracking Between Ports: &lt;0.25 dB E4407B and E4408B only</td>
<td>11667B</td>
<td>11667A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Termination, 50Ω</td>
<td>Type N (m) Connector Frequency: 1 MHz to 4 GHz</td>
<td>909A Option 012</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESA</td>
<td>Termination, 50Ω</td>
<td>Type N (m) Connector Frequency: 1 MHz to 4 GHz</td>
<td>908A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 PSA Functional Tests
Amplitude Accuracy at 50 MHz

Test Limits

Amplitude Accuracy should remain within ±1.0 dB of the measured source value across the range of source levels and changes in resolution bandwidth. Option 1DS (preamp option) should remain within ±1.3 dB of measured values.

Test Description

A synthesized sweeper is used as the signal source for the test. The source amplitude is varied using the signal source amplitude control. The resolution bandwidth is also varied on the spectrum analyzer. The source amplitude is measured by the power meter and spectrum analyzer at each setting, and the values compared. The difference between each pair of measurements indicates the amplitude accuracy.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Type-N(m), to 3.5 mm(m)</td>
<td>1250-1743</td>
</tr>
<tr>
<td>Adapter</td>
<td>3.5 mm(f) to 3.5 mm(f)</td>
<td>5061-5311</td>
</tr>
<tr>
<td>Attenuator, 20 dB</td>
<td>Accuracy: &lt;0.5 dB</td>
<td>8491A</td>
</tr>
<tr>
<td>Cable</td>
<td>APC 3.5 mm, 1 meter</td>
<td>8120-4921</td>
</tr>
<tr>
<td>Power Meter</td>
<td>Compatible with power sensor</td>
<td>E4418B</td>
</tr>
<tr>
<td>Power Sensor</td>
<td>Amplitude Range: −25 dBm to 10 dBm</td>
<td>8485A</td>
</tr>
<tr>
<td>Power Splitter</td>
<td>3.5 mm</td>
<td>11667B</td>
</tr>
<tr>
<td></td>
<td>6 dB loss</td>
<td></td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>Typical Temperature Stability: 0.01 dB°C</td>
<td>83630B</td>
</tr>
</tbody>
</table>
**Procedure**

1. Zero and calibrate the power meter.

2. Configure equipment as shown in Figure 3-1, with the power splitter connected to the spectrum analyzer input.

   **CAUTION**
   To minimize stress on the test equipment connections, support the power sensor.

3. If the auto alignment for the analyzer has not been performed within the past 24 hours, press System, Alignments, Align All Now to perform the auto alignment routine.

4. Press Preset (Factory Preset) on the analyzer.

5. Set up the spectrum analyzer by pressing:
   - **Frequency**, 50, MHz
   - **Span**, 2, MHz
   - **Input/Output, RF Coupling** (DC)
   - **Amplitude, Attenuation**, 10, dB
   - **Sweep, Auto Swp Time**, Accy

6. Set up the synthesized sweeper by pressing:
   - **CW**, 50, MHz
   - **Power Level, -4, dBm**
   - **RF (On)**
7. On the spectrum analyzer, press:
   
   BW/Avg, Average (On)
   20, Enter

8. Perform the following steps for each row listed in Table 3-1:
   
   a. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in Table 3-1.
   
   b. Set the Attenuation and Span as listed in each row of the table.
   
   c. Record the source amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 3-1.
   
   d. On the spectrum analyzer, press Restart, Peak Search.
   
   e. Wait for the spectrum analyzer to finish averaging.
   
   f. Record the signal amplitude, as measured by the analyzer in the Measured Amplitude column of Table 3-1.
   
   g. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column:

   $$\text{Amplitude Accuracy Error} = \text{Meas} \_ \text{amp} - \text{Power} \_ \text{meter}$$
Figure 3-2. Amplitude Accuracy Test Setup

![Amplitude Accuracy Test Setup Diagram]

Table 3-1 Amplitude Accuracy Results

<table>
<thead>
<tr>
<th>Nominal Source Amplitude (dBm)</th>
<th>Preamp (Option 1DS)</th>
<th>Attenuation (dB)</th>
<th>Span (MHz)</th>
<th>Measured Amplitude Meas_amp (dBm)</th>
<th>Power Meter Amplitude Power_meter (dBm)</th>
<th>Amplitude Accuracy Error (dB)</th>
<th>Test Limit (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>−4</td>
<td>Off</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td>±1.0</td>
<td>±1.0</td>
</tr>
<tr>
<td>−9</td>
<td>Off</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
<td>±1.0</td>
<td>±1.0</td>
</tr>
<tr>
<td>−14</td>
<td>Off</td>
<td>10</td>
<td>0.5</td>
<td></td>
<td></td>
<td>±1.0</td>
<td>±1.0</td>
</tr>
<tr>
<td>−4</td>
<td>Off</td>
<td>20</td>
<td>0.1</td>
<td></td>
<td></td>
<td>±1.3</td>
<td>±1.3</td>
</tr>
<tr>
<td>−14</td>
<td>Off</td>
<td>20</td>
<td>0.1</td>
<td></td>
<td></td>
<td>±1.3</td>
<td>±1.3</td>
</tr>
<tr>
<td>−4</td>
<td>Off</td>
<td>30</td>
<td>0.1</td>
<td></td>
<td></td>
<td>±1.3</td>
<td>±1.3</td>
</tr>
<tr>
<td>−14</td>
<td>Off</td>
<td>30</td>
<td>0.1</td>
<td></td>
<td></td>
<td>±1.3</td>
<td>±1.3</td>
</tr>
</tbody>
</table>
Testing Option 1DS (Preamp)

Instruments containing Option 1DS must have the preamp function turned on and tested. In order to enable this function, press Amplitude, More 1 of 3, Int Preamp (On).

Procedure

1. Connect the 20 dB pad between the input of the spectrum analyzer and the power splitter, as shown in Figure 3-1.
2. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in Table 3-2.
3. Assure the spectrum analyzer input attenuation is set to 10 dB.
4. Set the Res BW and Span as listed in Table 3-2.
5. Record the source amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 3-2.
7. Wait for the analyzer to finish averaging.
8. Record the signal amplitude as measured by the analyzer in the measured amplitude column of Table 3-2.
9. Calculate the signal amplitude accuracy using the following equation:
   \[
   \text{Amplitude Accuracy Error} = \text{Meas}_\text{amp} + 20 \text{ dB} - \text{Corrected Power Value}
   \]
10. Record the results under the Amplitude Accuracy Error column of Table 3-2.

Table 3-2 Amplitude Accuracy Results (Option 1DS)

<table>
<thead>
<tr>
<th>Nominal Source Amplitude (dBm)</th>
<th>Preamp (Option 1DS)</th>
<th>Res BW (kHz)</th>
<th>Span (kHz)</th>
<th>Measured Amplitude Meas_amp (dBm)</th>
<th>Power Meter Amplitude Power_meter (dBm)</th>
<th>Amplitude Accuracy Error (dB)</th>
<th>Test Limit (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-13</td>
<td>On</td>
<td>1</td>
<td>106</td>
<td></td>
<td></td>
<td></td>
<td>1.2</td>
</tr>
</tbody>
</table>
Displayed Average Noise Level (DANL)

**Test Limits (with 0 dB input attenuation)**

See Table 3-3 for values.

**Test Description**

The Displayed Average Noise Level (DANL) of the spectrum analyzer is measured across a 10 kHz frequency span at several center frequencies. The analyzer input is terminated into a 50Ω load. A test is performed to assure the measurement is not performed in the presence of a residual response. The measurement is then averaged, and the result is normalized to a 1 Hz bandwidth.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Termination</td>
<td>50Ω Type-N(m)</td>
<td>909A Option 012</td>
</tr>
</tbody>
</table>

**Figure 3-3 DANL Test Setup**

![DANL Test Setup](image)

**Procedure**

1. Configure the equipment as shown in Figure 3-3.
2. Press **Preset** (Factory Preset) on the analyzer.
3. Set up the spectrum analyzer by pressing:
   - **FREQUENCY**, Center Freq, 5 MHz
   - **Input/Output**, RF Coupling, DC
   - Span, 10 kHz
   - **AMPLITUDE**, –70 dBm
   - Amplitude, Attenuation, 0, dB
   - **BW/Avg**, 1, kHz
   - Video BW, 100 Hz
   - Average (On), 20, Enter
PSA Functional Tests

Displayed Average Noise Level (DANL)

4. Press **Display**, then press the **Display Line** key.

5. Rotate the RPG knob and set the display line at the average amplitude of the displayed
noise floor by visual inspection.

6. Confirm that the measurement will be performed on the spectrum analysis noise floor
and not on a residual response within the displayed 10 kHz span.

**NOTE** Ignore the residual response if one appears when taking the measurement.

7. Enter the value of the display line as the Measured Average Noise Level at 5 MHz
column in **Table 3-3**.

8. Normalize the measured value to a 1 Hz BW by adding −30 dB to the measured value.

**NOTE** The −30 dB value is added because the formula used to calculate the value of
the noise power in a 1 Hz BW when measured with a 1 kHz BW is:

\[
\text{Noise} = 10 \log \left( \frac{\text{BW}_2}{\text{BW}_1} \right)
\]

where \( \text{BW}_2 \) is the 1 kHz BW we measure and
\( \text{BW}_1 \) is 1 Hz BW we want to normalize to.

Therefore, \( 10 \log (1000) = 30 \text{ dB} \), so the noise floor will be 30 dB lower in a
1 Hz BW.

9. Enter the normalized value of the displayed average noise level in **Table 3-3**.

10. The value of the normalized displayed average noise should be less than the
specification value.

11. Change the analyzer center frequency to the next value listed in **Table 3-3**

12. Repeat steps 4 through 10 to fill in the remainder of **Table 3-3** for your analyzer
frequency range.

**Table 3-3**  Displayed Average Noise Level (DANL) Results

<table>
<thead>
<tr>
<th>Center Frequency</th>
<th>Measured Average Noise Level (dBm)</th>
<th>Normalized Average Noise Level/(1 Hz BW) (dBm)</th>
<th>Test Limits (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 MHz</td>
<td></td>
<td></td>
<td>−140</td>
</tr>
<tr>
<td>2 GHz</td>
<td></td>
<td></td>
<td>−149</td>
</tr>
<tr>
<td>6 GHz</td>
<td></td>
<td></td>
<td>−147</td>
</tr>
<tr>
<td>13 GHz</td>
<td></td>
<td></td>
<td>−145</td>
</tr>
<tr>
<td>20 GHz</td>
<td></td>
<td></td>
<td>−142</td>
</tr>
<tr>
<td>26.5 GHz</td>
<td></td>
<td></td>
<td>−136</td>
</tr>
<tr>
<td>40 GHz</td>
<td></td>
<td></td>
<td>−124</td>
</tr>
<tr>
<td>50 GHz</td>
<td></td>
<td></td>
<td>−126</td>
</tr>
</tbody>
</table>
Frequency Readout Accuracy

Test Limits

Frequency Readout Accuracy is equivalent to the following equation:

\[ \pm (0.25\% \times \text{span} + 5\% \times \text{RBW} + 2 \text{ Hz} + 0.5 \times \text{horizontal resolution}) \]

NOTE
See results table for actual values.

Test Description

The frequency readout accuracy is measured in several spans and center frequencies that allow both internal analyzer synthesizer modes and prefilter bandwidths to be tested. Frequency reference error is eliminated by using the same frequency standard for the analyzer and signal source.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specification (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Type-N(m), to 3.5 mm(f)</td>
<td>1250-1744</td>
</tr>
<tr>
<td>Adapter</td>
<td>3.5 mm(f) to 3.5 mm(f)</td>
<td>5061-5311</td>
</tr>
<tr>
<td>Cable</td>
<td>APC 3.5 mm, 1 meter</td>
<td>8120-4921</td>
</tr>
<tr>
<td>Cable</td>
<td>BNC, 120 cm</td>
<td>10503A</td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>Frequency: Capable of 2 GHz (must have external reference input)</td>
<td>83630B</td>
</tr>
</tbody>
</table>

Figure 3-4. Frequency Readout Accuracy Test Setup
**Procedure**

1. Configure the equipment as shown in Figure 3-4. Confirm the analyzer’s built-in auto alignment has been performed within the past 24 hours.

2. Perform the following steps to set up the equipment:
   a. On the synthesized sweeper, press **PRESET**, then set the controls as follows:
      - **POWER LEVEL**, -10, dBm
      - **CW**, 1505, MHz, **RF** (On)
   b. On the spectrum analyzer, press **Preset**.

3. Set up the spectrum analyzer by pressing:
   - **System, Reference**, 10, MHz, **Ext** (On)
   - **Frequency**, 1505, MHz
   - **Det/Demod, Detector, Sample**
   - **Span**, 2990, MHz

   **NOTE** Ensure Ref Level is set to 0 dBm. In addition, ensure Resolution BW and Video BW are both set to Auto.

4. Press **Peak Search** on the analyzer to measure the frequency readout accuracy. If the instrument is functioning correctly, the marker reading in the active function block will be between the values listed in Table 3-4. Record the marker value in the Marker Frequency Readout column in Table 3-4.

5. On the spectrum analyzer, change the span and center frequency as listed in Table 3-4.

6. Change the synthesized sweeper frequency to match the center frequency of the analyzer.

7. Repeat steps 4 through 6 until the Marker Frequency Readout column of Table 3-4 is complete.

**Table 3-4 Frequency Readout Accuracy Results**

<table>
<thead>
<tr>
<th>Span (MHz)</th>
<th>Center Frequency (MHz)</th>
<th>Minimum</th>
<th>Marker Frequency Readout</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>2990</td>
<td>1505</td>
<td>1.495 GHz</td>
<td>1.515 GHz</td>
<td></td>
</tr>
<tr>
<td>127.2</td>
<td>1505</td>
<td>1.5045 GHz</td>
<td>1.5055 GHz</td>
<td></td>
</tr>
<tr>
<td>54.1</td>
<td>1505</td>
<td>1.5048 GHz</td>
<td>1.5052 GHz</td>
<td></td>
</tr>
<tr>
<td>7.95</td>
<td>1505</td>
<td>1.504968 GHz</td>
<td>1.505032 GHz</td>
<td></td>
</tr>
<tr>
<td>0.106</td>
<td>1505</td>
<td>1.5049996 GHz</td>
<td>1.5050004 GHz</td>
<td></td>
</tr>
<tr>
<td>1.98</td>
<td>517.59</td>
<td>517.5829 MHz</td>
<td>517.5971 MHz</td>
<td></td>
</tr>
<tr>
<td>1.98</td>
<td>832.50</td>
<td>832.4928 MHz</td>
<td>832.5071 MHz</td>
<td></td>
</tr>
</tbody>
</table>
Frequency Response (Flatness)

Test Limits

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Limit Relative to 50 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hz to 3 GHz</td>
<td>±1.5 dB</td>
</tr>
<tr>
<td>&gt; 3 GHz to 6.6 GHz</td>
<td>±2.5 dB</td>
</tr>
<tr>
<td>&gt; 6.6 GHz to 22 Ghz</td>
<td>±3.0 dB</td>
</tr>
<tr>
<td>&gt; 22 GHz to 26.5 GHz</td>
<td>±3.5 dB</td>
</tr>
<tr>
<td>&gt; 26.5 GHz</td>
<td>±3.5 dB</td>
</tr>
</tbody>
</table>

Test Description

The frequency response test measures the spectrum analyzer's amplitude error as a function of the tuned frequency. Measurements are made ranging from 50 MHz to the maximum frequency range of your analyzer. The signal source amplitude is measured with a power meter to eliminate error due to source flatness. The measured value is normalized to 50 MHz.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Type N(m) to 3.5 mm(m)</td>
<td>1250-1743</td>
</tr>
<tr>
<td>Adapter</td>
<td>Type N(m) to 3.5 mm(f)</td>
<td>1250-1744</td>
</tr>
<tr>
<td>Adapter a</td>
<td>2.4 mm(f) to 3.5 mm(m)</td>
<td>11901D</td>
</tr>
<tr>
<td>Adapter</td>
<td>3.5 mm(f) to 3.5 mm(f)</td>
<td>5061-5311</td>
</tr>
<tr>
<td>Cable</td>
<td>3.5 mm, 1 meter</td>
<td>8120-4921</td>
</tr>
<tr>
<td>Cables</td>
<td>BNC, 120 cm (48 in.)</td>
<td>10503A</td>
</tr>
<tr>
<td>Power Meter</td>
<td>Compatible with power sensor</td>
<td>E 4418B</td>
</tr>
<tr>
<td>Power Sensor</td>
<td>Frequency Range 50 MHz to 26.5 GHz</td>
<td>8485A</td>
</tr>
<tr>
<td>Power Sensor a</td>
<td>Frequency Range 50 MHz to 50 GHz</td>
<td>8487D</td>
</tr>
<tr>
<td>Power Splitter</td>
<td>Frequency Range 50 MHz to 26.5 GHz Tracking between ports: &lt;0.25 dB</td>
<td>11667B</td>
</tr>
</tbody>
</table>
PSA Functional Tests

Frequency Response (Flatness)

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Splitter a</td>
<td>Frequency Range: 50 MHz to 50 GHz Tracking between ports: &lt;0.25 dB</td>
<td>11667C</td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>Frequency Range: 50 MHz to 26 GHz</td>
<td>83630B</td>
</tr>
<tr>
<td>Synthesized Sweeper a</td>
<td>Frequency Range: 50 MHz to 50 GHz</td>
<td>83650B</td>
</tr>
</tbody>
</table>

a. Only used for higher frequency PSA models (E4446A, E4448A), but can be used for testing all PSA models.

Figure 3-5. Frequency Response Test Setup

![Frequency Response Test Setup Diagram](image)

Procedure

1. Zero and calibrate the power meter and power sensor as described in the power meter operation manual.

2. Configure the equipment as shown in Figure 3-5.

---

NOTE

Connect the power splitter to the spectrum analyzer input using the appropriate adapter. Do not use a cable.

3. Assure the spectrum analyzer’s built-in auto alignment has been performed within the last 24 hours.

4. Preset (Factory Preset) both the spectrum analyzer and the synthesized sweeper.

5. Set up the synthesized sweeper by pressing:

   - CW, 50, MHz
   - Power level, –8, dBm
6. Set up the spectrum analyzer by pressing:

- **Frequency**, 50, MHz
- **Span**, 50, kHz
- **Amplitude** (ref level), –10, dBm
- **BW/Avg, Average** (On), 10, Enter

7. Adjust the synthesized sweeper output power for a power meter display of –14 dBm ±0.1 dB.

---

**NOTE**

The power level of the synthesized sweeper remains unchanged for the duration of the test.

---

8. Press the **Peak Search** key on the signal analyzer to position the marker on the peak of the signal.

9. Refer to Table 3-5, “Frequency Response (Flatness) Results.” Enter the amplitude of the signal displayed on the spectrum analyzer into the MeasAmp column of Table 3-5.

10. Enter the power meter reading into the **PowerMeter** column of Table 3-5.

11. Tune the synthesized sweeper and spectrum analyzer to the next frequency listed in Table 3-5.

12. Enter the power sensor calibration factor into the power meter.

13. For frequencies 3 GHz and above, press **Amplitude**, then **Presel Center** to center the preselector filter for an optimum amplitude measurement.

14. Repeat steps 8-13 and complete the remainder of Table 3-5 for the frequency range of your analyzer.

15. Compute the measurement error (MeasError = MeasAmp – PowerMeter).

16. Compute the flatness error normalized to 50 MHz:

   \[(\text{MeasError} - \text{MeasError} @ 50 \text{ MHz})\]

17. Enter the computed flatness error value into the FlatNorm column of Table 3-5.

18. Compare the value of FlatNorm to the test limit.
## Table 3-5  Frequency Response (Flatness) Results

<table>
<thead>
<tr>
<th>Center Frequency</th>
<th>Analyzer Amplitude Measamp</th>
<th>Power Meter Measurement Power\text{meter}</th>
<th>Meas Error Measerror</th>
<th>Flatness Normalized to 50 MHz Flat\text{Norm}</th>
<th>Flatness Error Test Limits (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 MHz</td>
<td></td>
<td></td>
<td>0</td>
<td>Ref</td>
<td>±1.5</td>
</tr>
<tr>
<td>1 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±1.5</td>
</tr>
<tr>
<td>2 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±1.5</td>
</tr>
<tr>
<td>3 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±1.5</td>
</tr>
<tr>
<td>3.5 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±2.5</td>
</tr>
<tr>
<td>5 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±2.5</td>
</tr>
<tr>
<td>6 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±2.5</td>
</tr>
<tr>
<td>7 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.0</td>
</tr>
<tr>
<td>10 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.0</td>
</tr>
<tr>
<td>13 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.0</td>
</tr>
<tr>
<td>14 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.0</td>
</tr>
<tr>
<td>16 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.0</td>
</tr>
<tr>
<td>22 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.0</td>
</tr>
<tr>
<td>23 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
<tr>
<td>25 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
<tr>
<td>26.5 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
<tr>
<td>28 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
<tr>
<td>31.5 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
<tr>
<td>42 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
<tr>
<td>48 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>±3.5</td>
</tr>
</tbody>
</table>
Amplitude Linearity

Test Limits
The linearity error will be $\leq \pm 1.0$ dB with $\leq -10$ dBm at the mixer.

Test Description
This test checks the amplitude linearity of the instrument by maintaining a constant reference level and measuring signals of different amplitudes over most of the display range. This test sets the input attenuator to 10 dB and the Reference Level to 0 dBm. The external attenuator is set to 0 dB, and the amplitude of the source is adjusted to set the displayed signal at the reference level.

The instrument’s internal marker is used to measure the reference amplitude. The Marker Delta function is activated and the RF input is reduced using the external precision step attenuator. Signal input levels from 0 dBm to $-50$ dBm are measured.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Type-N(m), to BNC(f)</td>
<td>1250-1476</td>
</tr>
<tr>
<td>Adapter</td>
<td>3.5 mm(f) to 3.5mm(f)</td>
<td>5061-5311</td>
</tr>
<tr>
<td>Adapter</td>
<td>BNC(m) to SMA(f)</td>
<td>1250-1700</td>
</tr>
<tr>
<td>APC 3.5 mm (1 meter)</td>
<td>APC 3.5 mm, 1 meter</td>
<td>8120-4921</td>
</tr>
<tr>
<td>Attenuator, 10 dB Step</td>
<td>Range: 0-50 dB&lt;br&gt;Frequency: 50 MHz&lt;br&gt;Accuracy: $\pm 0.25$ dB</td>
<td>355D</td>
</tr>
<tr>
<td>Cables (2 required)</td>
<td>BNC, 120 cm (48 in.)</td>
<td>10503A</td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>Output Level Accuracy: 0 to $-15$ dBm: $\pm 1.0$ dB</td>
<td>83630B</td>
</tr>
</tbody>
</table>
Figure 3-6. Amplitude Linearity Setup

NOTE
Averaging is used for all measurements to improve repeatability and reduce measurement uncertainty.

Procedure

1. Configure the equipment as shown in Figure 3-6.

2. Set up the synthesized sweeper by pressing:
   - Frequency, 50, MHz
   - Amplitude, –2, dBm
   - RF On/Off, On

3. Set up the spectrum analyzer by pressing:
   - Preset (Factory Preset)
   - Frequency, 50, MHz
   - Span, Zero Span

NOTE
On the analyzer, ensure the reference level is 0 dBm and the attenuator is set to 10 dB.

   - BW/AVG, 30, kHz
   - Average, 10, Enter
   - Marker (to turn on Marker function)

4. Set the external 10 dB step attenuator to 0 dB.

5. Adjust the amplitude on the signal source until the marker amplitude on the analyzer reads 0 dBm ±0.2 dB.

6. On the analyzer, press the Single key to trigger a 10 sweep average.

7. On the analyzer, activate the Marker Delta function by pressing Marker, Delta.
8. Perform the following steps for each attenuator setting listed in the table below:
   a. Select the next External attenuator setting.
   b. Press the Single key to trigger a 10 sweep average.
   c. Enter the delta marker value into Table 3-6.
   d. Check delta marker reading against the test limits.

**Table 3-6  Amplitude Linearity Results**

<table>
<thead>
<tr>
<th>External Attenuator Setting</th>
<th>Minimum (dB)</th>
<th>Marker Delta Value (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>N/A</td>
<td>Reference</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>−11.0</td>
<td></td>
<td>−9.0</td>
</tr>
<tr>
<td>20</td>
<td>−21.0</td>
<td></td>
<td>−19.0</td>
</tr>
<tr>
<td>30</td>
<td>−31.0</td>
<td></td>
<td>−29.0</td>
</tr>
<tr>
<td>40</td>
<td>−41.0</td>
<td></td>
<td>−39.0</td>
</tr>
<tr>
<td>50</td>
<td>−51.0</td>
<td></td>
<td>−49.0</td>
</tr>
</tbody>
</table>
Second Harmonic Distortion (SHD)

Test Limits

<table>
<thead>
<tr>
<th>Applied Frequency</th>
<th>Mixer Level</th>
<th>Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 MHz</td>
<td>–20 dBm</td>
<td>&lt;–55 dBc</td>
</tr>
</tbody>
</table>

Test Description

This test checks the second harmonic distortion of the spectrum analyzer by tuning to twice the input frequency and examining the level of the distortion product. A low pass filter is inserted between the source and the spectrum analyzer to prevent the second harmonic from artificially raising the second harmonic product displayed on the analyzer.

The power level at the input mixer is 20 dB higher than specified to allow the distortion product to be seen. For example, the instrument specification may state that with a –40 dBm signal at the input mixer, the distortion product should be suppressed by >–75 dBc.

The equivalent Second Harmonic Intercept (SHI) is 35 dBm (–40 dBm + 75 dBc). This test is performed with –20 dBm at the mixer and verifies the distortion product is suppressed by –55 dBc. This ensures the SHI is also 35 dBm (–20 dBm + 55 dBc).

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Type-N(m) to BNC(f)</td>
<td>1250-1476</td>
</tr>
<tr>
<td>Adapter</td>
<td>BNC(m) to SMA(f)</td>
<td>1250-1700</td>
</tr>
<tr>
<td>Cable</td>
<td>APC 3.5 mm, 1 meter</td>
<td>8120-4921</td>
</tr>
<tr>
<td>Cable</td>
<td>BNC, 120 cm</td>
<td>10503A</td>
</tr>
<tr>
<td>Filter, 50 MHz Low Pass</td>
<td>Cutoff Frequency: 50 MHz</td>
<td>0955-0306</td>
</tr>
<tr>
<td></td>
<td>Rejection at 65 MHz: &gt;40 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rejection at 75 MHz: &gt;60 dB</td>
<td></td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>Frequency: 50 MHz</td>
<td>83630B</td>
</tr>
<tr>
<td></td>
<td>Spectral Purity: Better than –30 dBc</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3-7. Second Harmonic Distortion Test Setup

Procedure

1. Configure the equipment as shown in Figure 3-7.
2. Press Preset (Factory Preset) on the spectrum analyzer and the synthesized sweeper.
3. Set up the spectrum analyzer by pressing:
   - **Frequency**, 40 MHz
   - **Amplitude**, –10, dBm
   - **Span**, 1 MHz
4. Set up the synthesized sweeper by pressing:
   - **CW Frequency**, 40 MHz
   - **Level**, –10, dBm
   - **RF** (On)
5. On the analyzer, press **Peak Search**.
6. Adjust the synthesized sweeper amplitude for a spectrum analyzer display of –10 dBm ±0.1 dBm.
7. On the analyzer, activate the marker delta function by pressing the **Marker** and **Delta** keys.
8. Set the analyzer Center Frequency to 80 MHz.
9. Press **BW/Avg, Average**, and enter the number 20, using the numeric keypad. Then, press **Enter** to begin the twenty sweep averaging routine and read the Marker Delta value. Enter the displayed value under the Measured Second Harmonic Distortion (dBc) heading in **Table 3-7**.
## Second Harmonic Distortion Results

<table>
<thead>
<tr>
<th>Applied Frequency (MHz)</th>
<th>Measured Second Harmonic Distortion (dBc)</th>
<th>Specification (dBc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td>&lt;= -55</td>
</tr>
</tbody>
</table>
# Displayed Average Noise Level

## Test Limits

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Model (50 Ω Input)</th>
<th>Maximum (50 Ω Input)</th>
<th>TR Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 500 MHz</td>
<td>E4401B, E4411B</td>
<td>-119 dBm</td>
<td>1</td>
</tr>
<tr>
<td>501 MHz to 1.0 GHz</td>
<td>E4401B, E4411B</td>
<td>-117 dBm</td>
<td>2</td>
</tr>
<tr>
<td>1.01 GHz to 1.5 GHz</td>
<td>E4401B</td>
<td>-114 dBm</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>E4411B</td>
<td>-113 dBm</td>
<td>3</td>
</tr>
<tr>
<td>10 MHz to 1.0 GHz</td>
<td>E4402B, E4403B</td>
<td>-117 dBm</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>E4404B, E4405B, E4407B, E4408B</td>
<td>-116 dBm</td>
<td>5</td>
</tr>
<tr>
<td>1.01 GHz to 2.0 GHz</td>
<td>E4402B, E4403B</td>
<td>-116 dBm</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>E4404B, E4405B, E4407B</td>
<td>-116 dBm</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>E4408B</td>
<td>-115 dBm</td>
<td>8</td>
</tr>
<tr>
<td>2.01 GHz to 3.0 GHz</td>
<td>E4402B, E4403B</td>
<td>-114 dBm</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>E4404B, E4405B, E4407B, E4408B</td>
<td>-112 dBm</td>
<td>10</td>
</tr>
<tr>
<td>3.01 GHz to 6.0 GHz</td>
<td>E4404B, E4405B, E4407B, E4408B</td>
<td>-112 dBm</td>
<td>11</td>
</tr>
<tr>
<td>6.01 GHz to 6.7 GHz</td>
<td>E4404B</td>
<td>-111 dBm</td>
<td>12</td>
</tr>
<tr>
<td>6.01 GHz to 12.0 GHz</td>
<td>E4405B, E4407B</td>
<td>-111 dBm</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>E4408B</td>
<td>-110 dBm</td>
<td>14</td>
</tr>
<tr>
<td>12.01 GHz to 13.2 GHz</td>
<td>E4405B</td>
<td>-107 dBm</td>
<td>15</td>
</tr>
<tr>
<td>12.01 GHz to 22 GHz</td>
<td>E4407B, E4408B</td>
<td>-107 dBm</td>
<td>16</td>
</tr>
<tr>
<td>22.01 GHz to 26.5 GHz</td>
<td>E4407B</td>
<td>-106 dBm</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>E4408B</td>
<td>-101 dBm</td>
<td>18</td>
</tr>
</tbody>
</table>
Test Description

The Displayed Average Noise Level is measured within the frequency range specified. The analyzer input is terminated in either 50 \( \Omega \) or 75 \( \Omega \), depending on analyzer options.

The test tunes the analyzer frequency across the band, uses the marker to locate the frequency with the highest response, and then reads the average noise in zero span.

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Model (75 ( \Omega ) Input)</th>
<th>Maximum (50 ( \Omega ) Input)</th>
<th>TR Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz to 500 MHz</td>
<td>E4401B</td>
<td>– 66 dBmV</td>
<td>19</td>
</tr>
<tr>
<td>10 MHz to 500 MHz</td>
<td>E4411B</td>
<td>– 65 dBmV</td>
<td>20</td>
</tr>
<tr>
<td>501 MHz to 1.0 GHz</td>
<td>E4401B, E4411B</td>
<td>– 60 dBmV</td>
<td>21</td>
</tr>
<tr>
<td>1.01 GHz to 1.5 GHz</td>
<td>E4401B</td>
<td>– 56 dBmV</td>
<td>22</td>
</tr>
<tr>
<td>1.01 GHz to 1.5 GHz</td>
<td>E4411B</td>
<td>– 53 dBmV</td>
<td>23</td>
</tr>
</tbody>
</table>

Figure 4-1 Equipment Setup
ESA Functional Tests
Displayed Average Noise Level

Procedure (10 MHz to 500 MHz) E4401B and E4411B

1. Connect the equipment as shown in Figure 4-1.

2. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   FREQUENCY, Start Freq, 10, MHz
   Stop Freq, 500, MHz

   AMPLITUDE, -70, dBm (50 Ω Input only)
   AMPLITUDE, More, Y Axis Units, dBmV (75 Ω Input only)
   AMPLITUDE, Ref Level, -21.24, dBmV (75 Ω Input only)
   BW/Avg, Res BW, 1, MHz
   Video BW, 10, kHz

3. Press the following keys on the analyzer:

   Single
   BW/Avg, Average (On), 3, Enter
   Single
   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps, then stop).

4. Press Peak Search. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (a) or (b) in Table 4-1 on page 138 for 10 MHz to 500 MHz.

5. Press the following keys on the analyzer:

   Sweep, Sweep (Cont)
   BW/Avg, Average (Off)
   BW/Avg, Res BW (Auto)
   Video BW (Auto)
   SPAN, 50, kHz
   FREQUENCY

6. Press Center Freq, and set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (a) or (b) of Table 4-1 on page 138 for 10 MHz to 500 MHz.

7. Press the following keys on the analyzer:

   BW/Avg, Res BW, 1, kHz
   Video BW, 30, Hz
   Single

   Wait for the sweep to finish.

8. Press the following keys on the analyzer:

   Display, Display Line (On)

   Adjust the display so that it is centered on the average trace noise, ignoring any residual responses.
9. Record the display line amplitude setting as TR Entry 1 (TR Entry 19 or 20 for a 75 Ω Input) in Table 4-1 on page 138. The Average Noise Level should be less than the Maximum for the appropriate input impedance.

**Procedure (501 MHz to 1.0 GHz) E4401B and E4411B**

1. Press the following keys on the analyzer:
   - **Sweep, Sweep (Cont)**
   - **FREQUENCY, Start Freq, 501, MHz**
   - **Stop Freq, 1.0, GHz**
   - **BW/Avg, Res BW, 1, MHz**
   - **Video BW, 10, kHz**

2. Press the following keys on the analyzer:
   - **Single**
   - **BW/Avg, Average (On), 3, Enter**
   - **Single**

   Wait until **AVG 3** is displayed to the left of the graticule (the analyzer will take 3 sweeps, then stop).

3. Press **Peak Search**, and record the marker frequency next to your analyzer model in the Measured Frequency column as entry (c) in Table 4-1 on page 138 for 501 MHz to 1.0 GHz.

4. Press the following keys on the analyzer:
   - **Sweep, Sweep (Cont)**
   - **BW/Avg, Average (Off)**
   - **BW/Avg, Res BW (Auto)**
   - **Video BW (Auto)**
   - **SPAN, 50, kHz**
   - **FREQUENCY**

5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (c) in Table 4-1 on page 138 for 501 MHz to 1.0 GHz.

6. Press the following keys on the analyzer:
   - **BW/Avg, Res BW, 1, kHz**
   - **Video BW, 30, Hz**
   - **Single**

   Wait for the sweep to finish.

7. Press the following keys on the analyzer:
   - **Display, Display Line (On)**

   Adjust the display line so that it is centered on the average trace noise, ignoring any
residual responses.

8. Record the display line amplitude setting as TR Entry 2 (TR Entry 21 for a 75 Ω Input) in Table 4-1 on page 138. The Average Noise Level should be less than the Maximum for the appropriate input impedance.

**Procedure (1.01 GHz to 1.5 GHz) E4401B and E4411B**

1. Press the following keys on the analyzer:
   - **Sweep, Sweep (Cont)**
   - **FREQUENCY, Start Freq, 1.0 GHz**
   - **Stop Freq, 1.5 GHz**
   - **BW/Avg, Res BW, 1, MHz**
   - **Video BW, 10, kHz**

2. Press the following keys on the analyzer:
   - **Single**
   - **BW/Avg, Average (On), 3, Enter**
   - **Single**

   Wait until **AVG 3** is displayed to the left of the graticule (the analyzer will take 3 sweeps, then stop).

3. Press **Peak Search**, and record the marker frequency next to your analyzer model in the Measured Frequency column as entry (d) or (e) in Table 4-1 on page 138 for 1.01 GHz to 1.5 GHz.

4. Press the following keys on the analyzer:
   - **Sweep, Sweep (Cont)**
   - **BW/Avg, Average (Off)**
   - **BW/Avg, Res BW (Auto)**
   - **Video BW (Auto)**
   - **SPAN, 50, kHz**
   - **FREQUENCY**

5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (d) or (e) in Table 4-1 on page 138 for 1.01 GHz to 1.5 GHz.

6. Press the following keys on the analyzer:
   - **BW/Avg, Res BW, 1, kHz**
   - **Video BW, 30, Hz**
   - **Single**

   Wait for the sweep to finish.
7. Press the following keys on the analyzer:

   * Display, Display Line (On)*

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. Record the display line amplitude setting as TR Entry 3 (TR Entry 22 or 23 for a 75 Ω Input) in Table 4-1 on page 138. The average noise level should be less than the Maximum for the appropriate input impedance.

### Procedure (10 MHz to 1 GHz) E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B

1. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   * FREQUENCY, Start Freq, 10, MHz
   * Stop Freq, 1.0, GHz

   * AMPLITUDE, –70, dBm
   * Attenuation (Man), 0, dB
   * BW/Avg, Res BW, 1, MHz
   * Video BW, 10, kHz

2. Press the following keys on the analyzer:

   * Single
   * BW/Avg, Average (On), 3, Enter
   * Single

   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take three sweeps, then stop).

3. Press Peak Search. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (f) or (g) in Table 4-1 on page 138 for 10 MHz to 1.0 GHz.

4. Press the following keys on the analyzer:

   * Sweep, Sweep (Cont)
   * BW/Avg, Average (Off)
   * BW/Avg, Res BW (Auto)
   * Video BW (Auto)
   * SPAN, 50, kHz
   * FREQUENCY

5. Press Center Freq. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (f) or (g) in Table 4-1 on page 138 for 10 MHz to 1.0 GHz.
6. Press the following keys on the analyzer:
   
   BW/Avg, Res BW, 1, kHz  
   Video BW, 30, Hz  
   Single
   
   Wait for the sweep to finish.

7. Press the following keys on the analyzer:
   
   Display, Display Line (On)
   
   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. If the analyzer is an E4402B or E4403B, record the display line amplitude setting as TR Entry 4 in Table 4-1 on page 138. Otherwise, record the display line amplitude setting as TR Entry 5 in Table 4-1 on page 138. The average noise level should be less than the Maximum.

**Procedure (1.01 GHz to 2 GHz) E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B**

1. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   FREQUENCY, Start Freq, 1.01, GHz  
   Stop Freq, 2, GHz

   AMPLITUDE, –70, dBm  
   Attenuation (Man), 0, dB  
   BW/Avg, Res BW, 1, MHz  
   Video BW, 10, kHz

2. Press the following keys on the analyzer:

   Single  
   BW/Avg, Average (On), 3, Enter  
   Single
   
   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press Peak Search. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (h), (i) or (j) in Table 4-1 on page 138 for 1.01 GHz to 2 GHz.
4. Press the following keys on the analyzer:

   - Sweep, Sweep (Cont)
   - BW/Avg, Average (Off)
   - BW/Avg, Res BW (Auto)
   - Video BW (Auto)
   - SPAN, 50, kHz
   - FREQUENCY

5. Press Center Freq. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (h), (i) or (j) in Table 4-1 on page 138 for 1.01 GHz to 2 GHz.

6. Press the following keys on the analyzer:

   - BW/Avg, Res BW, 1, kHz
   - Video BW, 30, Hz
   - Single

   Wait for the sweep to finish.

7. Press the following keys on the analyzer:

   - Display, Display Line (On)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. If the analyzer is an E4402B or E4403B, record the display line amplitude setting as TR Entry 6 in Table 4-1 on page 138. Otherwise, record the display line amplitude setting as TR Entry 7 or 8 in Table 4-1 on page 138. The average noise level should be less than the Maximum.

### Procedure (2.01 GHz to 3.0 GHz) E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B

1. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   - FREQUENCY, Start Freq, 2.01, GHz
   - Stop Freq, 3.0, GHz

   - AMPLITUDE, –70, dBm
   - Attenuation (Man), 0, dB
   - BW/Avg, Res BW, 1, MHz
   - Video BW, 10, kHz
2. Press the following keys on the analyzer:

   Single
   BW/Avg, Average (On), 3, Enter
   Single

   Wait until **AVG** 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press **Peak Search**. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (k) or (l) in Table 4-1 on page 138 for 2.01 GHz to 3.0 GHz.

4. Press the following keys on the analyzer:

   Sweep, Sweep (Cont)
   BW/Avg, Average (Off)
   BW/Avg, Res BW (Auto)
   Video BW (Auto)
   SPAN, 50, kHz
   FREQUENCY

5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (k) or (l) in Table 4-1 on page 138 for 2.01 GHz to 3.0 GHz.

6. Press the following keys on the analyzer:

   BW/Avg, Res BW, 1, kHz
   Video BW, 30, Hz
   Single

   Wait for the sweep to finish.

7. Press the following keys on the analyzer:

   Display, Display Line (On)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. If the analyzer is an E 4402B or E 4403B, record the display line amplitude setting as TR Entry 9 in Table 4-1 on page 138 Otherwise, record the display line amplitude setting as TR Entry 10 in Table 4-1 on page 138 The Average Noise Level should be less than the maximum.
Procedure (3.01 GHz to 6.0 GHz) E4404B, E4405B, E4407B, and E4408B

1. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   FREQUENCY, Start Freq, 3.01, GHz  
   Stop Freq, 6.0, GHz

   AMPLITUDE, –70, dBm  
   Attenuation (Man), 0, dB  
   BW/Avg, Res BW, 1, MHz  
   Video BW, 10, kHz

2. Press the following keys on the analyzer:

   Single  
   BW/Avg, Average (On), 3, Enter  
   Single

   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press Peak Search. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (m) in Table 4-1 on page 138 for 3.01 GHz to 6.0 GHz.

4. Press the following keys on the analyzer:

   Sweep, Sweep (Cont)  
   BW/Avg, Average (Off)  
   BW/Avg, Res BW (Auto)  
   Video BW (Auto)  
   SPAN, 50, kHz  
   FREQUENCY

5. Press Center Freq. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (m) in Table 4-1 on page 138 for 3.01 GHz to 6.0 GHz.

6. Press the following keys on the analyzer:

   BW/Avg, Res BW, 1, kHz  
   Video BW, 30, Hz  
   Single

   Wait for the sweep to finish.

7. Press the following keys on the analyzer:

   Display, Display Line (On)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.
8. Record the display line amplitude setting as TR Entry 11 in Table 4-1 on page 138. The Average Noise Level should be less than the Maximum.

**Procedure (6.01 GHz to 6.7 GHz) E4404B**

1. Press **System**, **Power On/Preset**, **Preset Type** (Factory), **Preset** on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   - FREQUENCY, Start Freq, 6.01, GHz
   - Stop Freq, 6.7, GHz
   - AMPLITUDE, –70, dBm
   - Attenuation (Man), 0, dB
   - BW/Avg, Res BW, 1, MHz
   - Video BW, 10, kHz

2. Press the following keys on the analyzer:

   - Single
   - BW/Avg, Average (On), 3, Enter
   - Single

   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press **Peak Search**. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (n) in Table 4-1 on page 138 for 6.01 GHz to 6.7 GHz.

4. Press the following keys on the analyzer:

   - Sweep, Sweep (Cont)
   - BW/Avg, Average (Off)
   - BW/Avg, Res BW (Auto)
   - Video BW (Auto)
   - SPAN, 50, kHz
   - FREQUENCY

5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (n) in Table 4-1 on page 138 for 6.01 GHz to 6.7 GHz.

6. Press the following keys on the analyzer:

   - BW/Avg, Res BW, 1, kHz
   - Video BW, 30, Hz
   - Single

   Wait for the sweep to finish.
7. Press the following keys on the analyzer:

   Display, Display Line (On)

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. Record the display line amplitude setting as TR Entry 12 in Table 4-1 on page 138. The Average Noise Level should be less than the Maximum.

**Procedure (6.01 GHz to 12.0 GHz) E4405B, E4407B, and E4408B**

1. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   FREQUENCY, Start Freq, 6.01, GHz
   Stop Freq, 12.0, GHz

   AMPLITUDE, –70, dBm
   Attenuation (Man), 0, dB
   BW/Avg, Res BW, 1, MHz
   Video BW, 10, kHz

2. Press the following keys on the analyzer:

   Single
   BW/Avg, Average (On), 3, Enter
   Single

   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press Peak Search. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (o) or (p) in Table 4-1 on page 138 for 6.01 GHz to 12.0 GHz.

4. Press the following keys on the analyzer:

   Sweep, Sweep (Cont)
   BW/Avg, Average (Off)
   BW/Avg, Res BW (Auto)
   Video BW (Auto)
   SPAN, 50, kHz
   FREQUENCY

5. Press Center Freq. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (o) or (p) in Table 4-1 on page 138 for 6.01 GHz to 12.0 GHz.
6. Press the following keys on the analyzer:
   
   BW/Avg, Res BW, 1, kHz  
   Video BW, 30, Hz  
   Single  
   
   Wait for the sweep to finish.

7. Press the following keys on the analyzer:
   
   Display, Display Line (On)  
   
   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. Record the display line amplitude setting as TR Entry 13 or 14 in Table 4-1 on page 138. The average noise level should be less than the Maximum.

**Procedure (12.01 GHz to 13.2 GHz) E4405B**

1. Press Preset System, Power On/Preset, Preset Type (Factory), Preset, on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:
   
   FREQUENCY, Start Freq, 12.01, GHz  
   Stop Freq, 13.2, GHz  
   
   AMPLITUDE, −70, dBm  
   Attenuation (Man), 0, dB  
   BW/Avg, Res BW, 1, MHz  
   Video BW, 10, kHz  
   
2. Press the following keys on the analyzer:
   
   Single  
   BW/Avg, Average (On), 3, Enter  
   Single  
   
   Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press Peak Search. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (q) in Table 4-1 on page 138 for 12.01 GHz to 13.2 GHz.

4. Press the following keys on the analyzer:
   
   Sweep, Sweep (Cont)  
   BW/Avg, Average (Off)  
   BW/Avg, Res BW (Auto)  
   Video BW (Auto)  
   SPAN, 50, kHz  
   FREQUENCY
5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (q) in **Table 4-1 on page 138** for 12.01 GHz to 13.2 GHz.

6. Press the following keys on the analyzer:

   - **BW/Avg, Res BW, 1, kHz**
   - **Video BW, 30, Hz**
   - **Single**

   Wait for the sweep to finish.

7. Press the following keys on the analyzer:

   - **Display, Display Line (On)**

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. Record the display line amplitude setting as TR Entry 15 in **Table 4-1 on page 138**. The Average Noise Level should be less than the Maximum.

**Procedure (12.01 GHz to 22 GHz) E4407B and E4408B**

1. Press **System, Power On/Preset, Preset Type (Factory), Preset** on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   - **FREQUENCY, Start Freq, 12.01, GHz**
   - **Stop Freq, 22, GHz**

   - **AMPLITUDE, –70, dBm**
   - **Attenuation (Man), 0, dB**
   - **BW/Avg, Res BW, 1, MHz**
   - **Video BW, 10, kHz**

2. Press the following keys on the analyzer:

   - **Single**
   - **BW/Avg, Average (On), 3, Enter**
   - **Single**

   Wait until **AVG 3** is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).

3. Press **Peak Search**. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (r) in **Table 4-1 on page 138** for 12.01 GHz to 22 GHz.
4. Press the following keys on the analyzer:

- **Sweep, Sweep (Cont)**
- **BW/Avg, Average (Off)**
- **BW/Avg, Res BW (Auto)**
- **Video BW (Auto)**
- **SPAN, 50, kHz**
- **FREQUENCY**

5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (r) in Table 4-1 on page 138 for 12.01 GHz to 22 GHz.

6. Press the following keys on the analyzer:

- **BW/Avg, Res BW, 1, kHz**
- **Video BW, 30, Hz**
- **Single**

Wait for the sweep to finish.

7. Press the following keys on the analyzer:

- **Display, Display Line (On)**

Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. Record the display line amplitude setting as TR Entry 16 in Table 4-1 on page 138. The Average Noise Level should be less than the Maximum.

### Procedure (22.01 GHz to 26.5 GHz) E4407B and E4408B

1. Press **System, Power On/Preset, Preset Type (Factory), Preset** on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

- **FREQUENCY, Start Freq, 22.01, GHz**
- **Stop Freq, 26.5, GHz**

- **AMPLITUDE, – 70, dBm**
- **Attenuation (Man), 0, dB**
- **BW/Avg, Res BW, 1, MHz**
- **Video BW, 10, kHz**

2. Press the following keys on the analyzer:

- **Single**
- **BW/Avg, Average (On), 3, Enter**
- **Single**

Wait until AVG 3 is displayed to the left of the graticule (the analyzer will take 3 sweeps and then stop).
3. Press **Peak Search**. Record the marker frequency next to your analyzer model in the Measured Frequency column as entry (s) or (t) in Table 4-1 on page 138 for 22.01 GHz to 26.5 GHz.

4. Press the following keys on the analyzer:
   - **Sweep**, **Sweep (Cont)**
   - **BW/Avg, Average (Off)**
   - **BW/Avg, Res BW (Auto)**
   - **Video BW (Auto)**
   - **SPAN, 50, kHz**
   - **FREQUENCY**

5. Press **Center Freq**. Set the center frequency of the analyzer to the frequency recorded in the Measured Frequency column as entry (s) or (t) in Table 4-1 on page 138 for 22.01 GHz to 26.5 GHz.

6. Press the following keys on the analyzer:
   - **BW/Avg, Res BW, 1, kHz**
   - **Video BW, 30, Hz**
   - **Single**

   Wait for the sweep to finish.

7. Press the following keys on the analyzer:
   - **Display, Display Line (On)**

   Adjust the display line so that it is centered on the average trace noise, ignoring any residual responses.

8. Record the display line amplitude setting as TR Entry 17 or 18 in Table 4-1 on page 138. The Average Noise Level should be less than the Maximum.
### Table 4-1 Display Average Noise Level Worksheet

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range</th>
<th>Measured Frequency</th>
<th>Average Noise Level (TR Entry)</th>
<th>Maximum 50 Ω Input</th>
<th>75 Ω Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4401B</td>
<td>10 MHz to 500 MHz</td>
<td>(a) __________</td>
<td>(1) or (19) __________</td>
<td>-119 dBm</td>
<td>-66 dBmV</td>
</tr>
<tr>
<td>E4411B</td>
<td>10 MHz to 500 MHz</td>
<td>(b) __________</td>
<td>(1) or (20) __________</td>
<td>-119 dBm</td>
<td>-65 dBmV</td>
</tr>
<tr>
<td>E4401B, E4411B</td>
<td>501 MHz to 1.0 GHz</td>
<td>(c) __________</td>
<td>(2) or (21) __________</td>
<td>-117 dBm</td>
<td>-60 dBmV</td>
</tr>
<tr>
<td>E4401B</td>
<td>1.01 GHz to 1.5 GHz</td>
<td>(d) __________</td>
<td>(3) or (22) __________</td>
<td>-114 dBm</td>
<td>-56 dBmV</td>
</tr>
<tr>
<td>E4411B</td>
<td>1.01 GHz to 1.5 GHz</td>
<td>(e) __________</td>
<td>(3) or (23) __________</td>
<td>-113 dBm</td>
<td>-53 dBmV</td>
</tr>
<tr>
<td>E4402B, E4403B</td>
<td>10 MHz to 1.0 GHz</td>
<td>(f) __________</td>
<td>(4) __________</td>
<td>-117 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4404B, E4405B, E4407B, E4408B</td>
<td>10 MHz to 1.0 GHz</td>
<td>(g) __________</td>
<td>(5) __________</td>
<td>-116 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4402B, E4403B</td>
<td>1.01 GHz to 2.0 GHz</td>
<td>(h) __________</td>
<td>(6) __________</td>
<td>-116 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4404B, E4405B, E4407B</td>
<td>1.01 GHz to 2.0 GHz</td>
<td>(i) __________</td>
<td>(7) __________</td>
<td>-116 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4408B</td>
<td>1.01 GHz to 2.0 GHz</td>
<td>(j) __________</td>
<td>(8) __________</td>
<td>-115 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4402B, E4403B</td>
<td>2.01 GHz to 3.0 GHz</td>
<td>(k) __________</td>
<td>(9) __________</td>
<td>-114 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4404B, E4405B, E4407B, E4408B</td>
<td>2.01 GHz to 3.0 GHz</td>
<td>(l) __________</td>
<td>(10) __________</td>
<td>-112 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4404B, E4405B, E4407B, E4408B</td>
<td>3.01 GHz to 6.0 GHz</td>
<td>(m) __________</td>
<td>(11) __________</td>
<td>-112 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4404B</td>
<td>6.01 GHz to 6.7 GHz</td>
<td>(n) __________</td>
<td>(12) __________</td>
<td>-111 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4405B, E4407B</td>
<td>6.01 GHz to 12.0 GHz</td>
<td>(o) __________</td>
<td>(13) __________</td>
<td>-111 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4408B</td>
<td>6.01 GHz to 12.0 GHz</td>
<td>(p) __________</td>
<td>(14) __________</td>
<td>-110 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4405B</td>
<td>12.01 GHz to 13.2 GHz</td>
<td>(q) __________</td>
<td>(15) __________</td>
<td>-107 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4407B, E4408B</td>
<td>12.01 GHz to 22 GHz</td>
<td>(r) __________</td>
<td>(16) __________</td>
<td>-107 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4407B</td>
<td>22.01 GHz to 26.5 GHz</td>
<td>(s) __________</td>
<td>(17) __________</td>
<td>-106 dBm</td>
<td>N/A</td>
</tr>
<tr>
<td>E4408B</td>
<td>22.01 GHz to 26.5 GHz</td>
<td>(t) __________</td>
<td>(18) __________</td>
<td>-101 dBm</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Frequency Readout Accuracy

Test Limits

<table>
<thead>
<tr>
<th>Span</th>
<th>Minimum)</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz</td>
<td>1.48988 GHz</td>
<td>1.49012 GHz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>1.4899988 GHz</td>
<td>1.4900012 GHz</td>
</tr>
<tr>
<td>Marker Count Accuracy with Counter Resolution at 1 Hz</td>
<td>1.489999999 GHz</td>
<td>1.490000001 GHz</td>
</tr>
</tbody>
</table>

Test Description

The frequency readout accuracy of the analyzer is tested with an input signal of known frequency. Frequency reference error is eliminated by using the same frequency standard for the analyzer and the synthesized sweeper.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>10 MHz to 1.5 GHz External Reference Input</td>
<td>8340A/B or 836XX Series</td>
</tr>
<tr>
<td>Adapters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-N (f), to APC 3.5(f)</td>
<td></td>
<td>1250-1745</td>
</tr>
<tr>
<td>Cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-N, 152-cm (60-in)</td>
<td></td>
<td>11500D</td>
</tr>
<tr>
<td>BNC, 122-cm (48-in)</td>
<td></td>
<td>10503A</td>
</tr>
<tr>
<td>Additional Equipment for 75-Ohm Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pad, minimum loss</td>
<td></td>
<td>11852B</td>
</tr>
<tr>
<td>Type-N (f), to BNC (m), 75 Ω</td>
<td></td>
<td>1250-1534</td>
</tr>
</tbody>
</table>
**Figure 4-2 Equipment Setup**

![Equipment Setup Diagram]

**Procedure**

1. Connect the equipment as shown in Figure 4-2. Remember to connect the 10 MHz REF OUT of the analyzer to the 10 MHz REF IN of the synthesized sweeper.

2. Perform the following steps to set up the equipment:
   
   a. Press **INSTRUMENT PRESET** on the synthesized sweeper, then set the controls to:
      
      - CW, 1.490, GHz
      - POWER LEVEL, 10, – dBm
   
   b. Press **System, Power On/Preset, Preset Type** (Factory), **Preset** on the analyzer, then wait for the preset routine to finish. Set the analyzer by pressing the following keys:
      
      - Frequency, 1.490, GHz
      - SPAN, 10, MHz
      - BW/Avg, Res BW, 100, kHz
      - Video BW, 30, kHz

   **CAUTION** Use only 75 Ω cables, connectors, or adapters on analyzers with 75 Ω inputs, or damage to connectors will occur.

3. Press **Peak Search** on the analyzer to measure the frequency readout accuracy. Record this in the Marker Frequency Readout column in **Table 4-2 on page 141**.

4. Press **Span**, 100, kHz, **BW/Avg**, Res BW, 1, kHz, **Video BW**, 1, kHz.

5. Press **Peak Search** on the analyzer to measure the frequency readout accuracy. Record this in the Marker Frequency Readout column in **Table 4-2 on page 141**.

**NOTE** The Frequency Readout Accuracy is now complete. Continue with the Marker Count Accuracy functional check.
Marker Count Accuracy

Procedure

1. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer, then wait for the preset routine to finish. Set the analyzer to measure the marker count accuracy by pressing the following keys:
   - Frequency, 1.490, GHz
   - SPAN, 10, MHz
   - BW/Avg, Res BW, 100, kHz
   - Freq Count, Resolution, 1, Hz

2. Press Peak Search, then wait for a count to be taken (it may take several seconds).
3. Record the Cntx1 frequency as the Marker Frequency Readout in Table 4-2.

Table 4-2 Frequency Readout and Marker Count Accuracy Worksheet

<table>
<thead>
<tr>
<th>Span</th>
<th>Minimum</th>
<th>Marker Frequency Readout</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MHz</td>
<td>1.48988 GHz</td>
<td></td>
<td>1.49012 GHz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>1.4899988 GHz</td>
<td></td>
<td>1.4900012 GHz</td>
</tr>
<tr>
<td>Marker Count Accuracy w/Counter Resolution at 1 Hz</td>
<td>1.489999999 GHz</td>
<td></td>
<td>1.490000001 GHz</td>
</tr>
</tbody>
</table>
Frequency Response (Flatness)

Test Limits

<table>
<thead>
<tr>
<th>ESA Model</th>
<th>Frequency</th>
<th>Minimum (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4411B &amp; E4401B</td>
<td>9 kHz to 1.5 GHz</td>
<td>-1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>E4402B &amp; E4403B</td>
<td>9 kHz to 3 GHz</td>
<td>-1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>E4404B</td>
<td>9 kHz to 3 GHz</td>
<td>-1.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>3.01 GHz to 6.7 GHz</td>
<td>-3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>E4405B</td>
<td>9 kHz to 3 GHz</td>
<td>-1.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>3.01 GHz to 6.7 GHz</td>
<td>-3.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>6.71 GHz to 13.2 GHz</td>
<td>-3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>E4407B &amp; E4408B</td>
<td>9 kHz to 3 GHz</td>
<td>-1.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>3.01 GHz to 6.7 GHz</td>
<td>-3.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>6.71 GHz to 13.2 GHz</td>
<td>-3.5</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>13.21 GHz to 25 GHz</td>
<td>-4.0</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>25 GHz to 26.5 GHz</td>
<td>-4.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Test Description

The output of the synthesized sweeper is fed through a power splitter to a power sensor and the analyzer. The synthesized sweeper’s power level is adjusted at 50 MHz to place the displayed signal at the analyzer center horizontal graticule line. Measurements are made at various points depending on the model being tested. The signal source amplitude is measured with a power meter to eliminate errors due to source flatness. The power meter is zeroed and calibrated before starting the measurement.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td></td>
<td>8340A/B or 836xx Series</td>
</tr>
<tr>
<td>Adapters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-N (f) to BNC (f)</td>
<td></td>
<td>1250-1474</td>
</tr>
<tr>
<td>APC 3.5 (f) to APC 3.5 (f)</td>
<td></td>
<td>5061-5311</td>
</tr>
<tr>
<td>BNC (f) to SMA (m)</td>
<td></td>
<td>1250-1237</td>
</tr>
</tbody>
</table>
ESA Functional Tests
Frequency Response (Flatness)

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type-N (m), to APC 3.5(m)</td>
<td></td>
<td>1250-1743</td>
</tr>
<tr>
<td><strong>Cables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) APC 3.5mm (36 in)</td>
<td>E4407B and E4408B only</td>
<td>8120-4921 or 11500E</td>
</tr>
<tr>
<td>BNC (m) both ends, (48 in)</td>
<td></td>
<td>10503A</td>
</tr>
<tr>
<td><strong>Additional Equipment for 75-Ohm Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pad, minimum loss</td>
<td></td>
<td>11852B</td>
</tr>
<tr>
<td>Type-N (f), to BNC (m)</td>
<td></td>
<td>1250-1534</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Meter</td>
<td></td>
<td>EPM-441A (E4418A)</td>
</tr>
<tr>
<td>Power Sensor, 75 Ω</td>
<td></td>
<td>8483A</td>
</tr>
<tr>
<td>Power Sensor, 50 Ω</td>
<td></td>
<td>8485A</td>
</tr>
<tr>
<td>Power Splitter</td>
<td></td>
<td>11667B</td>
</tr>
</tbody>
</table>

**Figure 4-3 Equipment Setup**

![Equipment Setup Diagram]

**Procedure**

1. Zero and calibrate the power meter and power sensor as described in the power meter operation manual.
2. Connect the equipment as shown in Figure 4-3.

**CAUTION**

Use only 75 Ω cables, connectors, or adapters on analyzers with 75 Ω connectors, or damage to the connectors will occur.

3. Set the synthesized sweeper controls as follows:

   FREQUENCY, Center Freq, 50, MHz
   POWER LEVEL, –8, dBm

4. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer and wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   FREQUENCY, 50, MHz
   CF Step, 50, MHz
   SPAN, 20, kHz
   AMPLITUDE, More, Y Axis Units, dBm
   AMPLITUDE, –10, dBm
   AMPLITUDE, Attenuation, 10, dB
   Scale/Div, 2, dB
   BW/Avg, Res BW, 10, kHz
   Video BW, 3, kHz
   Peak Search
   FREQUENCY, Signal Track (On)

5. Adjust the synthesized sweeper power level for a marker amplitude reading of –14 dBm +/- 0.10 dB.

**NOTE**

The power level of the synthesized sweeper remains unchanged for the duration of the test. For each new test frequency, the power sensor cal factor should be entered to minimize measurement errors.

6. Refer to Table 4-3 on page 145 Enter the marker readout amplitude for 50 MHz as displayed on the analyzer in the Analyzer Amplitude column.

7. Enter the power meter reading in the Power Meter Amplitude column.

8. Compute the flatness error at 50 MHz using the following equation and record the results in the Flatness Error column:

   Flatness Error = Analyzer Amplitude – Power Meter Amplitude

9. Perform the following steps for each center frequency setting listed in Table 4-3 on page 145.

   a. Tune the source to the next frequency listed in the Center Frequency column.
   b. Enter the power sensor cal factor for the new test frequency.
c. Tune the analyzer center frequency by pressing the \( \uparrow \) key or press **FREQUENCY**, **Center Freq**, “n”, and **MHz** (where “n” is the next test frequency in Table 4-3 on page 145).

d. Press **Peak Search**.

e. Enter the power meter reading in the Power Meter Amplitude column.

f. Enter the analyzer reading in the Analyzer Amplitude column.

g. Compute the flatness error using the following equation and record the results in the Flatness Error column:

\[
\text{Flatness Error} = \text{Analyzer Amplitude} - \text{Power Meter Amplitude}
\]

The flatness error should be less than the specified amount.

---

**Table 4-3  Frequency Response Worksheet**

<table>
<thead>
<tr>
<th>Model</th>
<th>Center Freq</th>
<th>Analyzer Amplitude</th>
<th>Power Meter Amplitude</th>
<th>Flatness Error</th>
<th>Flatness Error Test Limits (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Models</td>
<td>50 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td></td>
<td>100 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td></td>
<td>750 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td></td>
<td>1250 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td></td>
<td>1500 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td>E4402B – E4408B</td>
<td>2000 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td></td>
<td>2500 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td></td>
<td>2999 MHz</td>
<td></td>
<td></td>
<td></td>
<td>± 1.5</td>
</tr>
<tr>
<td>E4402B – E4408B</td>
<td>4250 MHz</td>
<td></td>
<td></td>
<td>± 3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5750 MHz</td>
<td></td>
<td></td>
<td>± 3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6699 MHz</td>
<td></td>
<td></td>
<td>± 3.0</td>
<td></td>
</tr>
<tr>
<td>E4402B – E4408B</td>
<td>8000 MHz</td>
<td></td>
<td></td>
<td>± 3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9000 MHz</td>
<td></td>
<td></td>
<td>± 3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10000 MHz</td>
<td></td>
<td></td>
<td>± 3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11000 MHz</td>
<td></td>
<td></td>
<td>± 3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13199 MHz</td>
<td></td>
<td></td>
<td>± 3.5</td>
<td></td>
</tr>
<tr>
<td>E4407B &amp; E4408B</td>
<td>14000 MHz</td>
<td></td>
<td></td>
<td>± 4.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19000 MHz</td>
<td></td>
<td></td>
<td>± 4.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24000 MHz</td>
<td></td>
<td></td>
<td>± 4.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26500 MHz</td>
<td></td>
<td></td>
<td>± 4.5</td>
<td></td>
</tr>
</tbody>
</table>
Reference Level Accuracy

Test Limits

<table>
<thead>
<tr>
<th>Reference Level</th>
<th>Minimum (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>dBm</td>
<td>dBmV</td>
<td></td>
</tr>
<tr>
<td>-30</td>
<td>21.76</td>
<td>Reference</td>
</tr>
<tr>
<td>-20</td>
<td>31.76</td>
<td>-1.40</td>
</tr>
<tr>
<td>-10</td>
<td>41.76</td>
<td>1.40</td>
</tr>
<tr>
<td>-40</td>
<td>11.76</td>
<td>-1.40</td>
</tr>
<tr>
<td>-50</td>
<td>1.76</td>
<td>-1.40</td>
</tr>
<tr>
<td>-60</td>
<td>-8.24</td>
<td>-1.40</td>
</tr>
<tr>
<td>-70</td>
<td>-18.24</td>
<td>-2.0</td>
</tr>
</tbody>
</table>

Test Description

A 50 MHz CW signal is applied to the Input of the analyzer. The amplitude of the source and the analyzer’s reference level are decreased in 10 dB steps. The analyzer marker functions are used to measure the amplitude difference between steps. Reference Level Accuracy is tested in both Log and Linear Scale Modes. Most of the error is contributed from the output attenuator inaccuracy in the synthesized sweeper and not the analyzer.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Sources</td>
<td>Output Level Accuracy\n0 to -15 dBm: ±1.0 dB\n-16 dBm to -63 dBm: ±1.4 dB\n≤ -64 dBm: ≥2.0 dB</td>
<td>8340A/B or 836XX Series</td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-N (m), to BNC f)</td>
<td></td>
<td>1250-1476</td>
</tr>
<tr>
<td>Cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-N, 152-cm (60-in)</td>
<td></td>
<td>11500D</td>
</tr>
<tr>
<td>BNC, 122-cm (48-in)</td>
<td></td>
<td>10503A</td>
</tr>
<tr>
<td>Additional Equipment for 75-Ohm Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pad, minimum loss</td>
<td></td>
<td>11852B</td>
</tr>
</tbody>
</table>
Log Mode Procedure

1. Connect the equipment as shown in Figure 4-4.

2. Press PRESET on the synthesized sweeper. Set the synthesized sweeper controls as follows:

   - **CW**, 50, MHz
   - **Power Level**, –30, dBm

3. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer, then wait for the preset routine to finish. Press System, Alignments, Auto Align, Off. Set the analyzer by pressing the following keys:

   - **FREQUENCY**, Center Freq, 50, MHz
   - **SPAN**, 50, kHz
   - **AMPLITUDE**, –30, dBm (50 Ω Input only)
   - **AMPLITUDE**, More, Y Axis Units, dBmV (75 Ω Input only)
   - **AMPLITUDE**, 21.76, dBmV (75 Ω Input only)
   - **Attenuation** (Man), 5, dB
   - **BW/Avg**, Res BW, 3, kHz
   - **Video BW**, 30, Hz
4. Press **Peak Search** on the analyzer. Adjust the amplitude on the synthesized sweeper until the marker amplitude on the analyzer reads –30 dBm +/− 0.10 dB. Enter the synthesized sweeper power level as the Synthesized Sweeper Amplitude reference in Table 4-4 on page 148.

**NOTE**
Under these analyzer conditions, the sweep time is 1.7 seconds. Therefore, the marker amplitude updates are fairly slow when adjusting the synthesizer output power.

5. Now that the reference has been established in step 4, adjust the synthesized sweeper power level and the analyzer reference level according to Table 4-4 on page 148. (The synthesized sweeper output power and the analyzer’s reference level will be changed in 10 dB steps.)

6. On the analyzer, press **Single**, wait for a sweep to finish, and then press **Peak Search**, **Marker**, **Delta**.

7. For each new synthesized sweeper power level and analyzer reference level change, press the following keys on the analyzer:

   - **Single**
   - **Peak Search**
   - **Record the Analyzer Marker Amplitude reading in Table 4-4.**

---

**Table 4-4  Reference Level Accuracy Worksheet (Log Mode)**

<table>
<thead>
<tr>
<th>Analyzer Reference Level</th>
<th>Synthesized Sweeper Amplitude (dBm)</th>
<th>Minimum (dB)</th>
<th>Analyzer Marker Δ Amplitude (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>–30</td>
<td>21.76</td>
<td>Reference = _____</td>
<td>0 (Reference)</td>
<td>0 (Reference)</td>
</tr>
<tr>
<td>–20</td>
<td>31.76</td>
<td>Reference + (10 dB)</td>
<td>8.60</td>
<td>11.40</td>
</tr>
<tr>
<td>–10</td>
<td>41.76</td>
<td>Reference + (20 dB)</td>
<td>18.60</td>
<td>21.40</td>
</tr>
<tr>
<td>–40</td>
<td>11.76</td>
<td>Reference + (-10 dB)</td>
<td>-11.40</td>
<td>-8.60</td>
</tr>
<tr>
<td>–50</td>
<td>1.76</td>
<td>Reference + (-20 dB)</td>
<td>-21.40</td>
<td>-18.60</td>
</tr>
<tr>
<td>–60</td>
<td>- 8.24</td>
<td>Reference + (-30 dB)</td>
<td>-31.40</td>
<td>-28.60</td>
</tr>
<tr>
<td>–70</td>
<td>-18.24</td>
<td>Reference + (-40 dB)</td>
<td>-42.0</td>
<td>-38.0</td>
</tr>
</tbody>
</table>
Linear Mode Procedure

1. Set the power level on the synthesized sweeper to \(-30\) dBm by pressing **Power Level, \(-30\), dBm**.

2. Set the analyzer by pressing the following keys:

   - **Sweep, Sweep (Cont)**
   - **AMPLITUDE, More, Y Axis Units, dBm (50 \(\Omega\) Input)**
   - **AMPLITUDE, \(-30\), dBm (50 \(\Omega\) Input)**
   - **AMPLITUDE, More, Y Axis Units, dBmV (75 \(\Omega\) Input)**
   - **AMPLITUDE, +21.76, dBmV (75 \(\Omega\) Input)**
   - **Scale Type (Lin)**

3. Adjust the amplitude on the synthesized sweeper until the marker amplitude on the analyzer reads \(-30\) dBm +/- 0.10 dB. Enter the synthesized sweeper power level as the Synthesized Sweeper Amplitude reference in **Table 4-5 on page 150**.

   **NOTE** Under these analyzer conditions, the sweep time is 1.7 seconds. Therefore, the marker amplitude updates are fairly slow when adjusting the synthesizer output power.

4. Now that the reference has been established in step 4, adjust the synthesized sweeper power level and the analyzer reference level according to **Table 4-5 on page 150** (The synthesized sweeper output power and the analyzer's reference level will be changed in 10 dB steps.)

5. On the analyzer, press **Single**, wait for a sweep to finish, and then press **Peak Search, Marker, Delta**.

6. For each new synthesized sweeper power level and analyzer reference level change, press the following keys on the analyzer:

   - **Single**
   - **Peak Search**

   Record the Analyzer Marker Amplitude reading in **Table 4-5**.
### Table 4-5  Reference Level Accuracy Worksheet (Linear Mode)

<table>
<thead>
<tr>
<th>Analyzer Reference Level (dBm)</th>
<th>Synthesized Sweeper Amplitude (dBm)</th>
<th>Minimum (dB)</th>
<th>Analyzer Marker Δ Amplitude (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30</td>
<td>21.76</td>
<td>Reference = _____</td>
<td>0 (Reference)</td>
<td>0 (Reference)</td>
</tr>
<tr>
<td>-20</td>
<td>31.76</td>
<td>Reference + (10 dB)</td>
<td>8.60</td>
<td>11.40</td>
</tr>
<tr>
<td>-10</td>
<td>41.76</td>
<td>Reference + (20 dB)</td>
<td>18.60</td>
<td>21.40</td>
</tr>
<tr>
<td>-40</td>
<td>11.76</td>
<td>Reference + (–10 dB)</td>
<td>–11.40</td>
<td>–8.60</td>
</tr>
<tr>
<td>-50</td>
<td>1.76</td>
<td>Reference + (–20 dB)</td>
<td>–21.40</td>
<td>–18.60</td>
</tr>
<tr>
<td>-70</td>
<td>–18.24</td>
<td>Reference + (–40 dB)</td>
<td>–42.0</td>
<td>–38.0</td>
</tr>
</tbody>
</table>
Resolution Bandwidth Switching Uncertainty

Test Limits

<table>
<thead>
<tr>
<th>Resolution Bandwidth</th>
<th>Minimum (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kHz</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>3 kHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>30 kHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>300 kHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>3 MHz</td>
<td>-0.3 dB</td>
<td>0.3 dB</td>
</tr>
<tr>
<td>5 MHz</td>
<td>-0.6 dB</td>
<td>0.6 dB</td>
</tr>
</tbody>
</table>

Test Description

To measure the resolution-bandwidth switching uncertainty, an amplitude reference is taken with the resolution bandwidth set to 1 kHz. The resolution bandwidth is changed to settings between 5 MHz and 3 kHz and the amplitude variation is measured at each setting using the marker delta function and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

No equipment required for analyzer models E4401B and E4411B.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNC, 9 inch</td>
<td></td>
<td>10502A</td>
</tr>
<tr>
<td><strong>Adapter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type N to BNC</td>
<td></td>
<td>1250-0780 or 1250-1476</td>
</tr>
</tbody>
</table>
Procedure

1. Press **System**, **Power On/Preset**, **Preset Type** (Factory), **Preset** on the analyzer. Wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   - **Input/Output, Amptd Ref (On)** (E4401B and E4411B)

   Connect a cable from the **AMPTD REF OUT** to the **INPUT 50 Ω**, as shown in **Figure 4-5** (E4402B, E4403B, E4404B, E4405B, E4407B, and E4408B).

2. **FREQUENCY**, 50, MHz
   **SPAN**, 50, kHz
   **AMPLITUDE**, More, Y Axis Units, dBm (75 Ω Input only)
   **AMPLITUDE**, –20, dBm
   **AMPLITUDE**, Scale/Div, 1, dB
   **BW/Avg, Res BW**, 1, kHz
   **Video BW**, 1, kHz

2. Press **AMPLITUDE** and use the knob to adjust the reference level until the signal appears five divisions (mid-screen) below the reference level. Press the following keys on the analyzer:

   - **Peak Search**
   - **Marker, Delta**
   - **FREQUENCY, Signal Track** (On)

3. Set the analyzer Resolution Bandwidth and Span according to **Table 4-6 on page 153**.

4. Press **Peak Search**, then record the $\Delta$ Mkr 1 amplitude reading in **Table 4-6**.
5. Repeat step 3 and 4 for each of the remaining resolution bandwidth and span settings listed in Table 4-6. The $\Delta$ Mkr 1 amplitude reading should be within the range indicated in the table “Test Limits” on page 151.

Table 4-6 Resolution Bandwidth Switching Uncertainty Worksheet

<table>
<thead>
<tr>
<th>Resolution Bandwidth Setting</th>
<th>SPAN Setting</th>
<th>$\Delta$ Mkr 1 Amplitude Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kHz</td>
<td>50 kHz</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>3 kHz</td>
<td>50 kHz</td>
<td></td>
</tr>
<tr>
<td>10 kHz</td>
<td>50 kHz</td>
<td></td>
</tr>
<tr>
<td>30 kHz</td>
<td>500 kHz</td>
<td></td>
</tr>
<tr>
<td>100 kHz</td>
<td>500 kHz</td>
<td></td>
</tr>
<tr>
<td>300 kHz</td>
<td>5 MHz</td>
<td></td>
</tr>
<tr>
<td>1 MHz</td>
<td>10 MHz</td>
<td></td>
</tr>
<tr>
<td>3 MHz</td>
<td>10 MHz</td>
<td></td>
</tr>
</tbody>
</table>
Scale Fidelity

Test Limits

<table>
<thead>
<tr>
<th>dB from Reference Level</th>
<th>Minimum (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>-1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>-16</td>
<td>-1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>-28</td>
<td>-1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>-40</td>
<td>-1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>-52</td>
<td>-1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>-64</td>
<td>-2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Test Description

A 50 MHz CW signal is applied from a synthesized sweeper to the input of the analyzer. The source is adjusted for a response at the reference level. The synthesized sweeper amplitude is adjusted to achieve a nominal amplitude below the reference level. The analyzer's amplitude marker is compared to the actual source change to determine the scale fidelity error. Most of the error is the source's output attenuator inaccuracy from the synthesized sweeper.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Sources</td>
<td>Output Level Accuracy</td>
<td>8340A/B or 836XX Series</td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td>0 to -15 dBm: ±1.0 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-16 dBm to -63 dBm: ±1.4 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤ -64 dBm: ≥2.0 dB</td>
<td></td>
</tr>
<tr>
<td>Adapters</td>
<td>Type-N (m), to BNC (f)</td>
<td>1250-1476</td>
</tr>
<tr>
<td>Cables</td>
<td>Type-N, 152-cm (60-in)</td>
<td>11500D</td>
</tr>
<tr>
<td></td>
<td>BNC, 122-cm (48-in)</td>
<td>10503A</td>
</tr>
<tr>
<td>Additional Equipment for 75-Ohm Input</td>
<td>Pad, minimum loss</td>
<td>11852B</td>
</tr>
<tr>
<td></td>
<td>Type-N (f), to BNC (m)</td>
<td>1250-1534</td>
</tr>
</tbody>
</table>
### Procedure

1. Connect the equipment as shown in Figure 4-6.

2. Preset the synthesized sweeper. Set the synthesized sweeper controls as follows:
   - CW, 50 MHz
   - Power Level, 0 dBm (50 Ω Input)
   - Power Level, 4 dBm (75 Ω Input)

3. Press **System**, **Power On/Preset**, **Preset Type** (Factory), **Preset** on the analyzer, then wait for the preset routine to finish. Press **System**, **Alignments**, **Auto Align**, Off. Set the analyzer by pressing the following keys:
   - **FREQUENCY**, **Center Freq**, 50 MHz
   - **SPAN**, 45 kHz
   - **AMPLITUDE**, **Attenuation**, 10 dB
   - **BW/Avg**, Res BW, 3 kHz
   - **Video BW**, 1 kHz
   - **Peak Search**

4. Adjust the amplitude on the synthesized sweeper until the marker amplitude on the analyzer reads 0 dBm +/- 0.10 dB. Record the synthesized sweeper output level as the reference in Table 4-7 on page 156.

   **NOTE** 75 Ω Input only. Adjust the synthesized sweeper amplitude until the analyzer’s marker reads 48.8 dBmV +/- 0.10 dB.

5. On the analyzer, press the following keys:
   - Single
   - Peak Search
   - Marker, Delta
6. Record the marker delta reading in Table 4-7. At each new synthesized sweeper power level, press Single, Peak Search, and record the marker amplitude level.

Table 4-7  Scale Fidelity Worksheet

<table>
<thead>
<tr>
<th>Synthesized Sweeper Level</th>
<th>Minimum (dB)</th>
<th>Marker Level (dB)</th>
<th>Maximum (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference=______</td>
<td>0 (Reference)</td>
<td>0 (Reference)</td>
<td></td>
</tr>
<tr>
<td>Reference -4 dB</td>
<td>-5.0</td>
<td></td>
<td>-3.0</td>
</tr>
<tr>
<td>Reference -16 dB</td>
<td>-17.40</td>
<td></td>
<td>-15.60</td>
</tr>
<tr>
<td>Reference -28 dB</td>
<td>-29.40</td>
<td></td>
<td>-26.60</td>
</tr>
<tr>
<td>Reference -40 dB</td>
<td>-41.40</td>
<td></td>
<td>-38.60</td>
</tr>
<tr>
<td>Reference -52 dB</td>
<td>-53.40</td>
<td></td>
<td>-50.60</td>
</tr>
<tr>
<td>Reference -64 dB</td>
<td>-66.0</td>
<td></td>
<td>-62.0</td>
</tr>
</tbody>
</table>
Second Harmonic Spurious Responses

Test Limits

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4401B</td>
<td>-55 dBc</td>
</tr>
<tr>
<td>E4402B</td>
<td>-55 dBc</td>
</tr>
<tr>
<td>E4403B</td>
<td>-50 dBc</td>
</tr>
<tr>
<td>E4404B</td>
<td>-55 dBc</td>
</tr>
<tr>
<td>E4405B</td>
<td>-55 dBc</td>
</tr>
<tr>
<td>E4407B</td>
<td>-55 dBc</td>
</tr>
<tr>
<td>E4408B</td>
<td>-50 dBc</td>
</tr>
<tr>
<td>E4411B</td>
<td>-55 dBc</td>
</tr>
</tbody>
</table>

Test Description

To test second harmonic distortion, a 50 MHz low pass filter is used to filter the source output, ensuring that harmonics read by the analyzer are internally generated and not coming from the source. The source power and input attenuation on the analyzer are adjusted so –20 dBm is the power level at the first mixer.

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Sources</td>
<td></td>
<td>8340A/B or 836XX Series</td>
</tr>
<tr>
<td>Synthesized Sweeper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 MHz Low pass filter</td>
<td>Rejection at 80 MHz: &gt;60 dB</td>
<td>0955-0306</td>
</tr>
<tr>
<td>Adapters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Type-N (m) to BNC (f)</td>
<td></td>
<td>1250-1476</td>
</tr>
<tr>
<td>BNC (f) to BNC (f)</td>
<td></td>
<td>1250-0080</td>
</tr>
<tr>
<td>Type-N (f), to APC 3.5(f)</td>
<td></td>
<td>1250-1745</td>
</tr>
<tr>
<td>Cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) BNC, 122-cm (48-in)</td>
<td></td>
<td>10503A</td>
</tr>
</tbody>
</table>
### ESA Functional Tests

#### Second Harmonic Spurious Responses

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional Equipment for 75 Ω Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pad, minimum loss</td>
<td></td>
<td>11852B</td>
</tr>
<tr>
<td>Type-N (f), to BNC (m)</td>
<td></td>
<td>1250-1534</td>
</tr>
</tbody>
</table>

**Figure 4-7 Equipment Setup**

1. Connect the equipment as shown in Figure 4-7.
2. Set the synthesized sweeper controls as follows:

   - **Frequency**, 40, MHz
   - **POWER LEVEL**, −10, dBm (50 Ω Input only)
   - **POWER LEVEL**, −4.3, dBm (75 Ω Input only)

**NOTE**

75 Ω Input only. Connect the minimum loss adapter between the low pass filter and 75 Ω Input.
3. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer. Wait for the preset routine to finish.
   Set the analyzer by pressing the following keys:
   
   FREQUENCY, Center Freq, 40, MHz
   SPAN, 1, MHz
   AMPLITUDE, -10, dBm (50 Ω input only)
   AMPLITUDE, 44, dBmV (75 Ω input only)
   Attenuation (Man), 10, dB
   BW/Avg, Res BW, 30, kHz

4. Adjust the synthesized sweeper power level to place the peak of the signal at the reference level.

5. Set the analyzer by pressing the following keys:
   
   SPAN, 50, kHz
   BW/Avg, Res BW, 1, kHz
   Video BW, 100, Hz

6. Wait for two sweeps to finish, then press the following analyzer keys:
   
   Peak Search
   Mkr →
   Mkr → CF Step
   Marker, Delta
   FREQUENCY

7. Press the ↑ key on the analyzer to step to the second harmonic (at 80 MHz). Press Peak Search. The marker delta amplitude reading should be less than the Maximum value listed in the Test Limits Table.
### Tracking Generator Level Flatness: Models E4401B and E4411B, Options 1DN and 1DQ

#### Test Limits

<table>
<thead>
<tr>
<th>Flatness ≤ 10 MHz, 50 Ω</th>
<th>Maximum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.5 dB</td>
<td>2.5 dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flatness &gt; 10 MHz, 50 Ω</th>
<th>Maximum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.0 dB</td>
<td>2.0 dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flatness &gt; 10 MHz, 75 Ω</th>
<th>Maximum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3.0 dB</td>
<td>3.0 dB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flatness &gt; 10 MHz, 75 Ω</th>
<th>Maximum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.5 dB</td>
<td>2.5 dB</td>
<td></td>
</tr>
</tbody>
</table>

#### Test Description

A calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz. The power meter is set for REL mode so that future power level readings are in dB relative to the power level at 50 MHz. The tracking generator is then stepped to several frequencies throughout its range. The output power difference relative to the power level at 50 MHz is measured at each frequency and recorded. Analyzers with 75 Ω tracking generators are only tested from 1 MHz to 1500 MHz.

#### Critical Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Critical Specifications (for this test)</th>
<th>Recommended Agilent Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Meter</td>
<td></td>
<td>438A or E4418A, E4419A</td>
</tr>
<tr>
<td>RF Power Sensor</td>
<td>Frequency Range: 100 kHz to 1.5GHz</td>
<td>8482A</td>
</tr>
<tr>
<td><strong>Cables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNC, 122-cm (48-in) (2)</td>
<td></td>
<td>10503A</td>
</tr>
<tr>
<td><strong>Additional Equipment for 75 Ω Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 Ω Power Sensor</td>
<td>Frequency Range: 1 MHz to 1.5GHz</td>
<td>8483A</td>
</tr>
<tr>
<td>Type-N (f) to BNC (m), 75 Ω Adapter</td>
<td></td>
<td>1250-1534</td>
</tr>
</tbody>
</table>
Procedure

1. Calibrate the tracking generator by pressing System, Alignments, Align Now, TG. Connect the RF Out to the Input when prompted.

2. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer, then wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   - **FREQUENCY**, Center Freq, 50, MHz
   - CF Step, 500, MHz
   - SPAN, Zero Span
   - Source, Amplitude (On), 0, dBm (50 Ω RF Output only)
   - Source, Amplitude (On), 42.76, dBmV (75 Ω RF Output only)

3. Zero and calibrate the power meter and RF power sensor. Make sure the power meter is reading out in dBm. Enter the power sensor 50 MHz cal factor into the power meter.

   **NOTE** 75 Ω RF Out only: Zero and calibrate the 75 Ω power sensor.

4. Connect the power sensor to the RF Out on the analyzer as shown in Figure 4-8.

   **NOTE** 75 Ω RF Out only: Connect the 75 Ω power sensor through an adapter to the RF Out 75 Ω.

5. Press REL on the power meter. The power meter readout amplitudes are now relative to the power level at 50 MHz.

6. Set the analyzer center frequency to 100 kHz by pressing **FREQUENCY**, 100, kHz.

   **NOTE** 75 Ω RF Out only: Set the analyzer center frequency to 1 MHz.

7. Enter the appropriate power sensor Cal Factor for the test frequency into the power meter as indicated on the label of the power sensor.

8. Record the power level displayed on the power meter as the Level Flatness in Table 4-8.
9. Repeat steps 7 through 8 to measure the flatness at each center frequency setting listed in Table 4-8. The $\dagger$ may be used to tune to center frequencies above 500 MHz.

<table>
<thead>
<tr>
<th>Center Frequency</th>
<th>Level Flatness (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz or 1 MHz$^a$</td>
<td></td>
</tr>
<tr>
<td>5 MHz</td>
<td></td>
</tr>
<tr>
<td>40 MHz</td>
<td></td>
</tr>
<tr>
<td>50 MHz</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>80 MHz</td>
<td></td>
</tr>
<tr>
<td>500 MHz</td>
<td></td>
</tr>
<tr>
<td>1000 MHz</td>
<td></td>
</tr>
<tr>
<td>1500 MHz</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ This frequency is 100 kHz for analyzers with 50 Ω tracking generators, and 1 MHz for analyzers with 75 Ω tracking generators.
Tracking Generator Level Flatness: E4402B, E4403B, E4404B, E4405B, E4407B and E4408B, Option 1DN

Test Limits

<table>
<thead>
<tr>
<th>Flatness ≤ 10 MHz</th>
<th>Maximum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>−3.5 dBm</td>
<td>+3.5 dBm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flatness &gt; 10 MHz</th>
<th>Maximum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>−2.5 dBm</td>
<td>−2.5 dBm</td>
<td></td>
</tr>
</tbody>
</table>

Test Description

A calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz. The power meter is set for REL mode so that future power level readings are in dB relative to the power level at 50 MHz. The tracking generator is then stepped to several frequencies throughout its range. The output power difference relative to the power level at 50 MHz is measured at each frequency and recorded.

<table>
<thead>
<tr>
<th>Item</th>
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<th>Recommended Agilent Model</th>
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<td>Power Meter</td>
<td></td>
<td>438A or E4418A, E4419A</td>
</tr>
<tr>
<td>RF Power Sensor</td>
<td>Frequency Range: 100 kHz to 3.0 GHz</td>
<td>8482A</td>
</tr>
<tr>
<td><strong>Adapters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type-N (f) to BNC (m), 75-Ohm</td>
<td></td>
<td>1250-1534</td>
</tr>
<tr>
<td><strong>Cables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) BNC, 122-cm (48-in)</td>
<td></td>
<td>10503A</td>
</tr>
</tbody>
</table>
Procedure

1. Calibrate the tracking generator by pressing System, Alignments, Align Now, TG. Connect the RF OUT to the RF INPUT when prompted.

2. Press System, Power On/Preset, Preset Type (Factory), Preset on the analyzer, then wait for the preset routine to finish. Set the analyzer by pressing the following keys:

   FREQUENCY, Center Freq, 50, MHz
   CF Step, 100, MHz
   SPAN, Zero Span
   Source, Amplitude (On), –20, dBm
   System, Alignments, Auto Align, Off

3. Zero and calibrate the power meter and power sensor. Make sure the power meter is reading out in dBm. Enter the power sensor 50 MHz cal factor into the power meter.

4. Connect the power sensor to the RF Out on the analyzer as shown in Figure 4-9.

5. Press REL on the power meter. The power meter readout amplitudes are now relative to the power level at 50 MHz.

6. Set the analyzer center frequency to 100 kHz by pressing FREQUENCY, 100, kHz.

7. Enter the appropriate power sensor Cal Factor for the test frequency into the power meter as indicated on the label of the power sensor. This must be done at each test frequency.

8. Record the power level displayed on the power meter as the Level Flatness in Table 4-9 on page 165.

9. Repeat steps 5 through 7 to measure the flatness at each center frequency setting listed in Table 4-9. The † may be used to tune to center frequencies above 500 MHz.

## Table 4-9  Tracking Generator Level Flatness Worksheet

<table>
<thead>
<tr>
<th>Center Frequency</th>
<th>Level Flatness (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz</td>
<td></td>
</tr>
<tr>
<td>5 MHz</td>
<td></td>
</tr>
<tr>
<td>40 MHz</td>
<td></td>
</tr>
<tr>
<td>50 MHz</td>
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<td>80 MHz</td>
<td></td>
</tr>
<tr>
<td>500 MHz</td>
<td></td>
</tr>
<tr>
<td>1000 MHz</td>
<td></td>
</tr>
<tr>
<td>1500 MHz</td>
<td></td>
</tr>
<tr>
<td>2000 MHz</td>
<td></td>
</tr>
<tr>
<td>2300 MHz</td>
<td></td>
</tr>
<tr>
<td>2500 MHz</td>
<td></td>
</tr>
<tr>
<td>2700 MHz</td>
<td></td>
</tr>
<tr>
<td>3.0 GHz</td>
<td></td>
</tr>
</tbody>
</table>
ESA Functional Tests

Tracking Generator Level Flatness: E4402B, E4403B, E4404B, E4405B, E4407B and E4408B, Option 1DN
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