Instrument Messages and Functional Tests

Agilent Technologies PSA Series Spectrum Analyzers

This manual provides documentation for the following instruments:

E4440A (3 Hz – 26.5 GHz)
E4443A (3 Hz – 6.7 GHz)
E4445A (3 Hz – 13.2 GHz)
E4446A (3 Hz – 44 GHz)
E4448A (3 Hz – 50 GHz)

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Contents

Contents

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 20, 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 37, 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. 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 38, 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

Characteristic	Front-Panel Display Error Queue	SCPI Remote Interface Error Queue
Capacity (number of errors)	11	30
Overflow Handling	Circular (rotating). Drops oldest error as new error comes in.	Linear, first-in/first-out. Replaces newest error with: `–350,Queue overflow`
Viewing Entries	Press: **System**, **Show Errors**[a]	Use SCPI query `SYSTem:ERRor?`
Clearing the Queue	Press: **System**, **Show Errors**, **Clear Error Queue**	Power up. Send a `*CLS` command. Read last item in the queue.

a. 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.

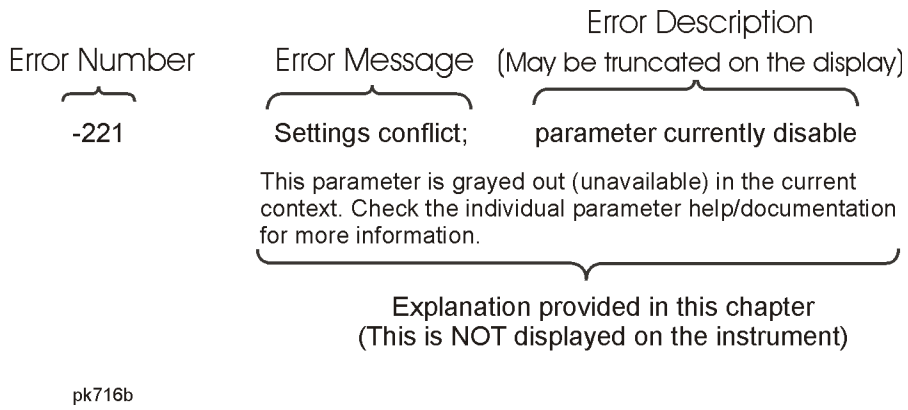
Error Message Format

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



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.

–499 to –400: Query Errors

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:

- Either an attempt is being made to read data from the output queue when no output is either present or pending, or
- Data in the output queue has been lost.

–399 to –300: Device-Specific Errors

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.

–299 to –200: Execution Errors

These errors indicate that an error has been detected during analyzer execution.

–199 to –100: Command Errors

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:

- Either an IEEE 488.2 syntax error has been detected by the parser (a control-to-device message was received that is in violation of the IEEE 488.2 standard. Possible violations include a data element which violates device listening formats or whose type is unacceptable to the device.), or
- An unrecognized header was received. These include incorrect device-specific headers and incorrect or unimplemented IEEE 488.2 common commands.

64 to 799: Device-Specific Errors

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 <error_message> 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.

Greater than 10000: Measurement Applications Errors

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 **MEASURE** front-panel key in SA mode.

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**.

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**.

–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`

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`

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; Command incompatible with span pair marker`

`Settings conflict; 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.

–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

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

To see an error *number*, press **System**, **Show Errors**.

–120 `Numeric data error; VGR`

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.

–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 `High 50 MHz Power Level`

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.

177 `Diagnostic override of Firmware Control; :DIAGnostic:ABUS`

`Diagnostic override of Firmware Control; :DIAGnostic:AMP`

`Diagnostic override of Firmware Control; :DIAGnostic:LATCh`

`Diagnostic override of Firmware Control; :DIAGnostic:MLATCh`

`Diagnostic override of Firmware Control; :DIAGnostic:REGister:VALue`

`Diagnostic override of Firmware Control; :DIAGnostic:SBUS`

`Diagnostic override of Firmware Control; :DIAGnostic:SBUS:DBD`

`Diagnostic override of Firmware Control; :DIAGnostic:SIO:PARallel`

`Diagnostic override of Firmware Control; :DIAGnostic:SIO:SERial`

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> directory renamed to <name>`

`File Operation Status; <name> renamed <name>`

`File Operation Status; <name> file copied`

`File Operation Status; <name> file deleted`

File Operation Status; <name> file loaded

File Operation Status; <name> file renamed to <name>

File Operation Status; <name> renamed <name>

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 Criteria**.

205 Ext Ref

208 Unable to execute preselector centering, not tuned to YTF band

You tried to center the preselector with the analyzer frequency too low. Preselector centering can be performed only for frequencies above 3.025 GHz.

209 Preselector centering 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.

210 .Attenuation\n%s

223 Neg. Trig Delay unavailable in Swept Mode/Zero Span, zero used

Neg. Trig Delay unavailable in Swept Mode, zero delay used.

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.

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

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

239 HW Diag is OFF

249 AC Coupled

601 File not found

The analyzer could not find the specified file.

602 Media is protected

A save was attempted to a write-protected device.

603 `File is corrupt`

The file that you were trying to load is corrupt.

604 `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.

605 `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.

606 `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.

608 `Mass storage error; EEPROM write timeout`

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.

610 `File access is denied`

The file is protected 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`

615 `File 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.

619 `Can't Auto-Couple RBW in Zero Span`

You sent a remote command to set the RBW into auto while in zero span.

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.

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 Media not writable

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

628 Amplitude corrections; %s: file not found

629 In %s: [DATA] header missing; dataHeaderMissingStr

630 In %s: separator missing; separatorMissingStr

633 In %s: too many DATA entries; tooManyLinesStr

634 In %s: bad data count (%d); expected multiple of %d; badDataCountStr; CORR:CSET:DATA

In %s: bad data count (%d); expected multiple of %d; badDataCountStr; CORR:CSET:DATA:MERG

In %s: bad data count (%d); expected multiple of %d; badDataCountStr; LLINE:DATA

In %s: bad data count (%d); expected multiple of %d; badDataCountStr; LLINE:DATA:MERG

635 In %s: error parsing tokens; generalParseErrorStr

636 In %s: %s is not numeric; nonNumericStr

638 In %s: bad amplitude unit %s; badAmplUnitStr

639 too many data values at %.6E; multiplicityErrorStr

640 File system synchronized

647 Interpolation error: %s; interpolationErrorStr

751 Instrument state set 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.

752 Unable to load state from file

Attempt to load a state from a file failed.

753 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**).

755 Unable to load state from register

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

756 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**).

757 `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.

758 `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`

A saved state file from a newer firmware revision was attempted to be loaded into an older instrument.

763 `Bad, missing, or unformatted 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.

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.

770 `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.

772 `Cannot load a directory`

780 No Peak Found

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

781 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.

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

783 Allowable span for current center frequency exceeded

784 Allowable CF for current span exceeded

791 Acquiring Data...

795 No trigger before timeout; auto-triggered

797 Awaiting Trigger, no AUTO Trig

801 Memory limit caused Data Acquisition to be truncated

805 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.

The resolution bandwidth required to measure the highest harmonic is not available on your analyzer. Reduce the resolution bandwidth and restart the measurement.

10011 Second harmonic is past analyzer frequency limit.

The frequency range of your analyzer does not include the first multiple of

the captured fundamental frequency.

10012 `No Fundamental > 0 Hz found in given span.`

There were no frequencies greater than 0 Hz in the starting span, so the measurement was stopped.

10013 `No Fundamental > -50 dBm found in given span.`

A fundamental was not found, so the measurement was stopped.

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.

10152 `Lost trigger, aborting measurement.`

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

10155 `No Fast ADC hardware installed.`

Cannot use sweeptimes less than 5 ms, due to the lack of a FADC, therefore the meas will be **severely** restricted.

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 `Upper Custom Mask is Invalid!`

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

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.

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**).

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**).

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.`

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.`

The user has 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 `Command Error`

10515 `Invalid Item`

10516 `Invalid Trace`

10517 `Invalid Parameter`

10518 `Invalid State Register`

10519 `Evaluation Error`

10520 Command not supported

10521 Log File Full

10522 Log File Cleared

10524 to 10561: Phase Noise Error Messages 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.

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.

10529 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.

10530 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.

10531 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.

10532 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.

10533 `Cannot save Ref Trace because it contains no data.`

Check the Ref Trace is turned on, and contains some valid trace data.

10534 `Trace file saved successfully.`

The trace saving operation was successful.

10535 `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.

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 An error number in this range indicates the instrument has detected an error relating to the GSM personality.

10602 `Not enough data to fit into GSM mask`

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 clip 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 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.

10801 to 10900: cdma2000 Error Messages 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 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 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 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.

Instrument Messages Without Numbers

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.

`<directoryname> directory deleted`

The directory indicated has been successfully deleted.

`<name1> directory renamed to <name2>`

Directory name1 has been successfully renamed to directory name2.

`<filename> file copied`

The filename indicated has been successfully copied.

`<filename> file deleted`

The filename indicated has been successfully deleted.

`<filename> file loaded`

The filename indicated has been successfully loaded.

`<filename> file saved`

The filename indicated has been successfully saved.

`<name1> file renamed to <name2>`

File name1 has been successfully renamed to file name2.

`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.

`WARNING: You are about to delete all of the contents of directory xxxxxx. 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` in the message is the full path and directory name).

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.

`* (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.

`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.

`(ADC Align Failure)` *status bit only, no message*

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

`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.

`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.

`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.

`Freq Count: Reduce Span/RBW ratio`

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

`Frequency Reference Error (Freq Ref Unlocked)`

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 softkey.

`(IF Align Failure)` *status bit only, no message*

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

`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.

`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**.

`(RF Align Failure)` *status bit only, no message*

A failure has occurred during the alignment of the RF section. Measurement results may be invalid.

`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**.

2 Functional Tests

These tests, which check various instrument parameters within the temperature range defined by the instrument specifications, offer a high degree of confidence that the analyzer is operating correctly. These tests are recommended as a check of instrument operation (at incoming inspection or after a repair).

This chapter includes the following:

- Before Performing a Functional Test (what to do first) on page 43.
- Test Equipment (a list of the equipment required for *all* of the tests) on page 44.
- Functional Tests:
  - — Amplitude Accuracy at 50 MHz on page 46
  - — Displayed Average Noise Level on page 50
  - — Frequency Readout Accuracy on page 53
  - — Frequency Response (Flatness) on page 55
  - — Amplitude Linearity on page 59
  - — Second Harmonic Spurious Responses on page 62

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

Functional Tests vs. Performance Verification Tests

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.

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.

Item	Critical Specifications	Recommended Agilent Model	Alternate Agilent Model
Adapters			
3.5 mm(f) to 3.5mm(f) (connector saver for 83630B)		5061-5311	
3.5 mm(f) to N(f)		1250-1745	
BNC(f) to SMA(m)		1250-1200	
BNC(m) to SMA(f)		1250-1700	
Type N(f) to BNC(m)		1250-1534	
Type N(f) to N(f)		1250-1472	1250-0777
Type N(m) to 3.5 mm(f)		1250-1744	
Type N(m) to 3.5 mm(m)		1250-1743	
Type N(m) to BNC(f)		1250-1476	
Attenuators			
10 dB Step Attenuator	*Range*: 0 to 60 dB	355D	
20 dB Fixed Attenuator	*Accuracy*: < 0.5 dB	8491A	8491B
Cables			
APC 3.5 mm (1 meter)		8120-4921	
Cable, BNC (2 required)	120 cm (48 in.) BNC cable	10503A	
Signal Source			
Synthesized Sweeper	*Frequency*: 10 MHz to 26.5 GHz *Harmonic level*: < –40 dBc *Amplitude range*: 10 to –20 dBm *Frequency Accuracy*: 0.02%	83630B	83640B, 83650B

Item	Critical Specifications	Recommended Agilent Model	Alternate Agilent Model
Miscellaneous Equipment			
Filter, 50 MHz Low Pass	*Cutoff Frequency*: 50 MHz *Rejection at 65 MHz*: > 40 dB *Rejection at 75 MHz*: > 60 dB	0955-0306	
Power Meter	*Power Reference Accuracy*: ±1.2% Compatible with power sensor	E4418B	E4419B
Power Sensor	*Frequency Range*: 50 MHz to 26.5 GHz *Amplitude Range*: –25 to 10 dBm	8485A	E4413A
Power Splitter, 3.5 mm	*Nominal Insertion Loss*: 6 dB *Tracking Between Ports*: < 0.25 dB	11667B	11667A
Termination, 50Ω	Type N(m) Connector *Frequency*: 1 MHz to 4 GHz	909A Option 012	

Amplitude Accuracy at 50 MHz

Test Limits

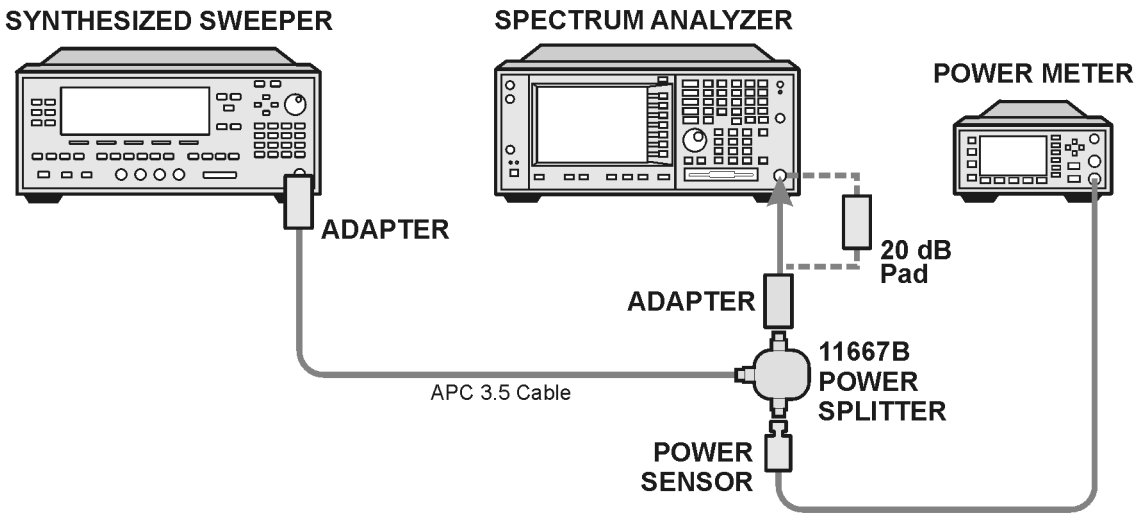
Amplitude Accuracy should remain within ±1.0 dB of the measured source value across the range of source levels and changes in resolution bandwidth. Option 1DS (preamp option) should remain within ±1.3 dB of measured values.

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.

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

Figure 2-1 Amplitude Accuracy Test Setup



Procedure

1. Zero and calibrate the power meter.
2. Configure equipment as shown in Figure 2-1, 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 2-1:

   a. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in Table 2-1.

   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 2-1.

   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 2-1.

   g. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column:

      Amplitude Accuracy Error = Meas_amp – Power_meter

Table 2-1 Amplitude Accuracy Results

Nominal Source Amplitude (dBm)	Preamp (Option 1DS)	Attenuation (dB)	Span (MHz)	Measured Amplitude Meas_amp (dBm)	Power Meter Amplitude Power_meter (dBm)	Amplitude Accuracy Error (dB)	Test Limit (dB)
–4	Off	10	2				± 1.0
–9	Off	10	1				± 1.0
–14	Off	10	0.5				± 1.0
–4	Off	20	0.1				± 1.3
–14	Off	20	0.1				± 1.3
–4	Off	30	0.1				± 1.3
–14	Off	30	0.1				± 1.3

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 2-1
2. Set the synthesized sweeper amplitude to the value listed in the Nominal Source Amplitude column in Table 2-2.
3. Assure the spectrum analyzer input attenuation is set to 10 dB.
4. Set the Res BW and Span as listed in Table 2-2.
5. Record the source amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 2-2.
6. On the spectrum analyzer, press **Restart**, **Peak Search**.
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 2-2.
9. Calculate the signal amplitude accuracy using the following equation:

   Amplitude Accuracy Error = Meas_amp + 20 dB – Corrected Power Value

10. Record the results under the Amplitude Accuracy Error column of Table 2-2.

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

Nominal Source Amplitude (dBm)	Preamp (Option 1DS)	Res BW (kHz)	Span (kHz)	Measured Amplitude Meas_amp (dBm)	Power Meter Amplitude Power_meter (dBm)	Amplitude Accuracy Error (dB)	Test Limit (dB)
–13	On	1	106				1.2

Displayed Average Noise Level (DANL)

Test Limits (with 0 dB input attenuation)

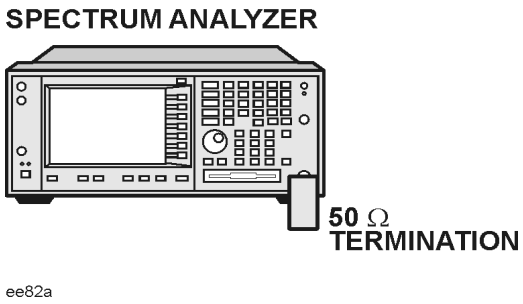
See Table 2-3 for values.

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.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Termination	50Ω Type-N(m)	909A Option 012

Figure 2-2 DANL Test Setup



Procedure

1. Configure the equipment as shown in Figure 2-2.
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**
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 2-3.
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:

Noise = 10 Log (BW 2/BW 1) where BW 2 is the 1 kHz BW we measure and BW 1 is 1 Hz BW we want to normalize to.

Therefore, 10 Log (1000) = 30 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 2-3.
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 2-3.
12. Repeat steps 4 through 10 to fill in the remainder of Table 2-3.

Table 2-3 Displayed Average Noise Level (DANL) Results

Center Frequency	Measured Average Noise Level (dBm)	Normalized Average Noise Level (1 Hz BW) (dBm)	Test Limits (dBm)
5 MHz			–140
2 GHz			–149
6 GHz			–147
13 GHz			–145
20 GHz			–142
26.5 GHz			–136

Frequency Readout Accuracy

Test Limits

Frequency Readout Accuracy is equivalent to the following equation:

± (0.25% x span + 5% X RBW + 2 Hz + 0.5 x horizontal resolution)

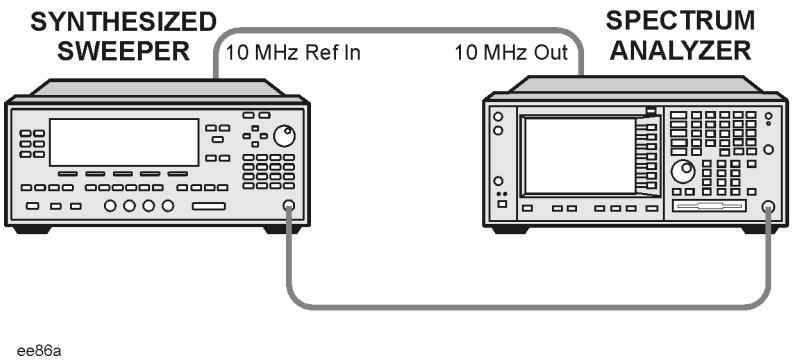
NOTE See results table for actual values.

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.

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

Figure 2-3. Frequency Readout Accuracy Test Setup



Procedure

1. Configure the equipment as shown in Figure 2-3.. 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, **–10dBm**
      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 2-4. Record the marker value in the Marker Frequency Readout column in Table 2-4.
5. On the spectrum analyzer, change the span and center frequency as listed in Table 2-4.
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 2-4 is complete.

Table 2-4 Frequency Readout Accuracy Results

Span (MHz)	Center Frequency (MHz)	Minimum	Marker Frequency Readout	Maximum
2990	1505	1.495 GHz		1.515 GHz
127.2	1505	1.5045 GHz		1.5055 GHz
54.1	1505	1.50480 GHz		1.50520 GHz
7.95	1505	1.504968 GHz		1.505032 GHz
0.106	1505	1.5049996 GHz		1.5050004 GHz
1.98	517.59	517.5829 MHz		517.5971 MHz
1.98	832.50	832.4928 MHz		832.5071 MHz

Frequency Response (Flatness)

Test Limits

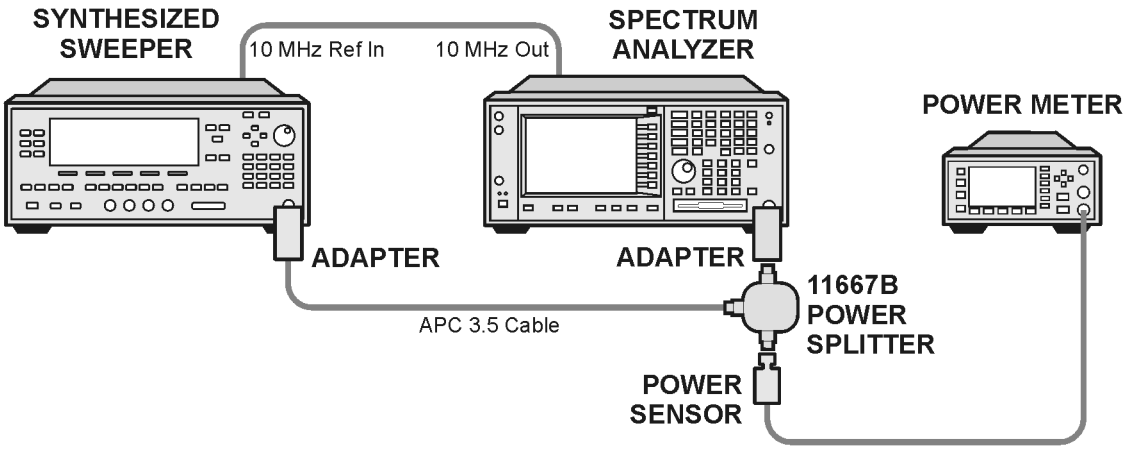
Frequency Range	Limit Relative to 50 MHz
3 Hz to 3 GHz	±1.5 dB
> 3 GHz to 6.6 GHz	±2.5 dB
> 6.6 GHz to 22 Ghz	±3.0 dB
> 22 GHz to 26.5 GHz	±3.5 dB

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 26 GHz. 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.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter	Type N(m) to 3.5 mm(m)	1250-1743
Adapter	Type N(m) to 3.5 mm(f)	1250-1744
Adapter	3.5 mm(f) to 3.5 mm(f)	5061-5311
Cable	APC 3.5 mm, 1 meter	8120-4921
Cables	BNC, 120 cm (48 in.)	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	*Frequency Range*: 50 MHz to 26.5 GHz	8485A
Power Splitter	*Frequency Range*: 50 MHz to 26.5 GHz *Tracking between ports*: < 0.25 dB	11667B
Synthesized Sweeper	*Frequency Range*: 50 MHz to 26 GHz	83630B

Figure 2-4 Frequency Response Test Setup



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 2-4.

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

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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 2-5, "Frequency Response (Flatness) Results." Enter the amplitude of the signal displayed on the spectrum analyzer into the $Meas_{Amp}$ column of Table 2-5.
10. Enter the power meter reading into the $Power_{Meter}$ column of Table 2-5.
11. Tune the synthesized sweeper and spectrum analyzer to the next frequency listed in Table 2-5.
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 2-5.
15. Compute the measurement error ($Meas_{Error} = Meas_{Amp} - Power_{Meter}$).
16. Compute the flatness error normalized to 50 MHz:
($Meas_{Error} - Meas_{Error}$ @ 50 MHz)
17. Enter the computed flatness error value into the $Flat_{Norm}$ column of Table 2-5.
18. Compare the value of $Flat_{Norm}$ to the test limit.

Table 2-5 Frequency Response (Flatness) Results

Center Frequency	Analyzer Amplitude $Meas_{amp}$	Power Meter Measurement $Power_{meter}$	Meas Error $Meas_{error}$	Flatness Normalized to 50 MHz $Flat_{Norm}$	Flatness Error Test Limits (dB)
50 MHz				0	Ref
1 GHz					±1.5
2 GHz					±1.5
3 GHz					±1.5
3.5 GHz					±2.5
5 GHz					±2.5
6 GHz					±2.5
7 GHz					±3.0
10 GHz					±3.0
13 GHz					±3.0
14 GHz					±3.0
16 GHz					±3.0
22 GHz					±3.0
23 GHz					±3.5
25 GHz					±3.5
26.5 GHz					±3.5

Amplitude Linearity

Test Limits

The linearity error will be ≤ ±1.0 dB with ≤ –10 dBm at the mixer.

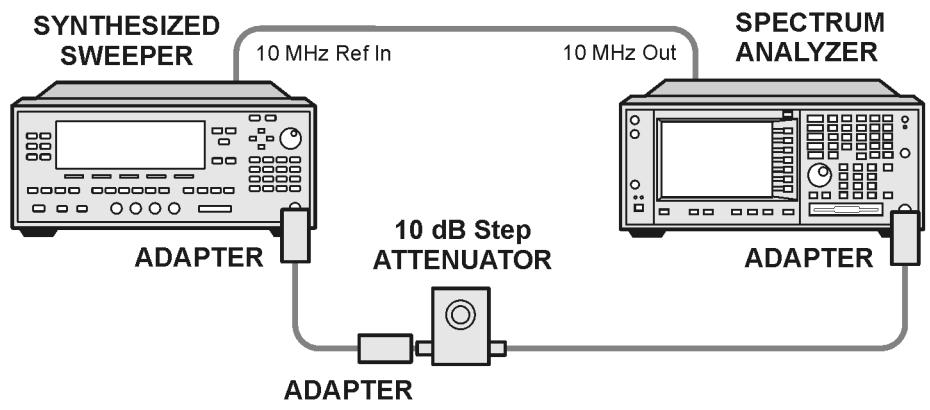
Test Description

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.

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter	Type-N(m), to BNC(f)	1250-1476
Adapter	3.5 mm(f) to 3.5mm(f)	5061-5311
Adapter	BNC(m) to SMA(f)	1250-1700
APC 3.5 mm (1 meter)	APC 3.5 mm, 1 meter	8120-4921
Attenuator, 10 dB Step	*Range*: 0-50 dB *Frequency*: 50 MHz *Accuracy*: ±0.25 dB	355D
Cables (2 required)	BNC, 120 cm (48 in.)	10503A
Synthesized Sweeper	*Output Level Accuracy*: 0 to –15 dBm: ±1.0 dB	83630B

Figure 2-5 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 2-5.
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 2-6.
   d. Check delta marker reading against the test limits.

Table 2-6 Amplitude Linearity Results

External Attenuator Setting	Minimum (dB)	Marker Delta Value (dB)	Maximum (dB)
0	N/A	Reference	N/A
10	–11.0		–9.0
20	–21.0		–19.0
30	–31.0		–29.0
40	–41.0		–39.0
50	–51.0		–49.0

Second Harmonic Distortion (SHD)

Test Limits

Applied Frequency	Mixer Level	Distortion
40 MHz	–20 dBm	< –55 dBc

Test Description

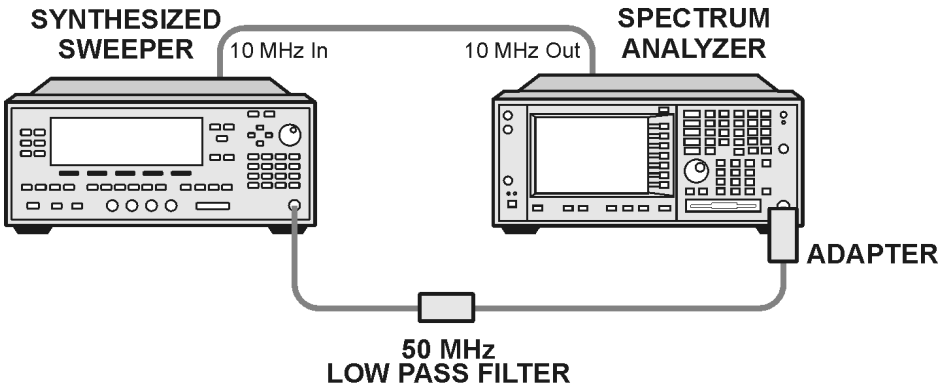
This test checks the second harmonic distortion of the spectrum analyzer by tuning to twice the input frequency and examining the level of the distortion product. A low pass filter is inserted between the source and the spectrum analyzer to prevent the second harmonic from artificially raising the second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

Item	Critical Specifications (for this test)	Recommended Agilent Model
Adapter	Type-N(m) to BNC(f)	1250-1476
Adapter	BNC(m) to SMA(f)	1250-1700
Cable	APC 3.5 mm, 1 meter	8120-4921
Cable	BNC, 120 cm	10503A
Filter, 50 MHz Low Pass	*Cutoff Frequency*: 50 MHz *Rejection at 65 MHz*: > 40 dB *Rejection at 75 MHz*: > 60 dB	0955-0306
Synthesized Sweeper	*Frequency*: 50 MHz *Spectral Purity*: Better than –30 dBc	83630B

Figure 2-6 Second Harmonic Distortion Test Setup



Procedure

1. Configure the equipment as shown in Figure 2-6.
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 2-7.

Table 2-7 Second Harmonic Distortion Results

Applied Frequency (MHz)	Measured Second Harmonic Distortion (dBc)	Specification (dBc)
40		<–55

P

Q

R

S

T

U

W