# Instrument Messages and Functional Tests

## Agilent Technologies
## EMC Series Analyzers

**This manual documents firmware revision A.08.xx**

**This manual provides documentation for the following instruments:**

**E7401A (9 kHz- 1.5 GHz)**
**E7402A (9 kHz - 3.0 GHz)**
**E7403A (9 kHz - 6.7 GHz)**
**E7404A (9 kHz - 13.2 GHz)**
**E7405A (9 kHz - 26.5 GHz)**


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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.

- Status Messages, beginning on page 37, 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).
- Informational Messages, beginning on page 42, provide information that requires intervention. These messages appear in the status line at the bottom of the display. If you have a color display and 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 in the status line. The information provided in brackets, for example <filename> or <directory>, is a variable that represents a specific input provided previously.
- User Error Messages, beginning on page 18, 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 have a color display and 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 in the status line. A summary of the last 30 error messages preceded by an error number may be viewed in the Error Queue by pressing, **System** then **Show Errors**. Refer to Table 1-1 for more information on the characteristics of the Error Queue. 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.

  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. These two queues are viewed and managed separately.

**Table 1-1 Characteristics of the Error Queue**

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

Note that the error number is displayed under the **System**, **Show Errors** key sequence.

- Pop-up 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 Message Format

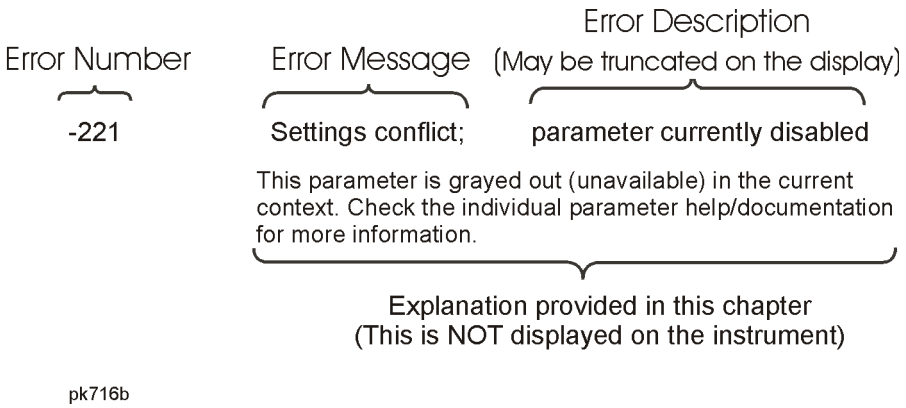
The system–defined error numbers are chosen on an enumerated (“1 of N”) basis. The error messages are listed in numerical order according to the error message number. Status and Informational messages without numbers will be listed in alphabetical order following the numerical listing.

**NOTE** To see an error *number*, view the error queue as described on page 15.

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 (yellow on color displays). 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.

### 201 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.

# Instrument Messages

## Error Messages

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

To see an error *number*, view the error queue as described on page 15.

0 `No error`

The queue is empty. Every error in the queue has been read or the queue was purposely 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*, view the error queue as described on page 15.

–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*, view the error queue as described on page 15.

–310 `System error`

Indicates that an error, termed “system error” by the device, has occurred.

–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.

### –299 to –200: Execution Errors

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

To see an error *number*, view the error queue as described on page 15.

–230 `Data corrupt or stale.`

Possibly invalid data. A new measurement was started but not completed.

–223 `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.

–221 `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`

This is a generic execution error for devices that cannot detect more specific errors. The code indicates only that a execution error as defined in IEEE 488.2, 11.5.1.1.4 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*, view the error queue as described on page 15.

–178 `Expression data not allowed`

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

–171 `Invalid expression`

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

–170 `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.

–168 `Block data not allowed`

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

–161 `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.

–160 `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.

–158 `String data not allowed`

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

–151 `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.

–150 `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.

–148 `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`

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

This error, as well as errors –121 through –129, is generated when parsing a data element which appears to be numeric, including non-decimal numeric types. This particular error 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.

### 201 to 799: Device-Specific Errors

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

To see an error *number*, view the error queue as described on page 15.

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.

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.

209 `Preselector centering failed`

An attempt to center the preselector failed.

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`

Attempt to use invalid baud rate. Refer to the programming language chapter of *Agilent Technologies EMC Analyzer Programmer's Guide* for more information.

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 model number. For example, attempting to center the preselector in an analyzer without a preselector will generate this error.

221 Invalid option, unable to uninstall package

You have attempted to remove a personality that is not currently installed. Verify command was entered correctly.

223 Trigger Offset unavailable in swept spans

Trigger Offset is only available in Zero Span. Refer to "Trig" in the Agilent EMC 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.

332 Average Type incompatible for scale.

Amplitude Scale command should be sent prior to the Average Type command.

601 Floppy disk full

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

602 Floppy disk error

An unknown error has occurred while accessing the floppy disk.

604 `File already exists`

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

605 `Media is protected`

A save was attempted to a write-protected device.

606 `Media is corrupt`

A save was attempted to a corrupt device.

607 `File Name Error`

An invalid file name 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. This error will also occur if you attempt to delete a nonexistent file.

609 `Media is not writable`

A save was attempted to a read-only device.

610 `File access is denied`

The file is protected or hidden and cannot be accessed.

612 `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.

614 `Bad or missing floppy disk`

The floppy is not inserted or the directory could not be read. Insert a known good disk and try again.

615 `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.)

651 `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**.

652 `Connect Amptd Ref Output to Input`

*For Agilent Technologies E7402A, E7403A, E7404A, and E7405A only:* you must connect the **AMPTD REF OUTPUT** to the analyzer **INPUT** with the appropriate cable.

653 `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 EMC analyzer models except Agilent Technologies E7401A, you must connect the **AMPTD REF OUT** to the **INPUT** with the appropriate cable to perform this alignment. *For Agilent Technologies E7401A only:* disconnect any signals from the **INPUT** prior to performing this procedure.

701 `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.

702 `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.

703 `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.

704 `Printer interface error`

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

705 `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.

727 `In <filename>: [DATA] header missing`

This message indicates that the data section of a file did not begin with the token [**DATA**].

728 `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.

729 `In <filename>: error reading file`

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

730 `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.

731 `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).

732 `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.

733 `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.

734 `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.

735 `In <filename>: bad amplitude unit <unit>`

This message indicates that unit <unit> is not recognized or supported.

736 `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.

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

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

752 `Unable to load state from file`

Loading of state from a file failed.

753 `Unable to save state to file`

Saving of state to a file failed.

755 `Unable to load state from register`

Loading a state from an internal state register failed.

756 `Unable to save state to register`

Saving of state to an internal register failed.

757 `Unable to load user state, factory preset was done`

An attempt to perform 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`

An attempt to save to the **User Preset** state failed.

759 `Unable to load state`

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

760 `Unable to query state`

Query of state over the remote interface was unsuccessful.

761 `Unable to set state`

Attempt to set the state over the remote interface was unsuccessful.

762 `Incorrect filename, allowable extensions are .trc or .csv`

Attempt to save a trace to a file with an incorrect extension.

762 `Unable to load file`

A failure occurred while loading a file; the file was not loaded.

763 `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`

A failure occurred while saving a file; the file was not saved.

769 `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.

770 `Instrument mode requested is not supported`

Instrument mode specified with: INST command is not valid. Refer to Chapter 5, “Instrument Subsystem” of *Agilent Technologies EMC Analyzer Programmer's Guide* for more information.

771 `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 EMC Analyzer User’s Guide where the **Normalize** key function is explained in detail.

772 `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.

## Instrument Messages without Numbers

### Error Messages

`Invalid index used to reference signal.`

Index used to change a signal's comments is out of range.

`Preselector not available`

Displayed if the preselector didn't respond.

`Signal add failed.`

Displayed if the analyzer failed to add a signal to the signal list, from a remote SCPI command, for an unknown reason.

`Signal list is full. Signal not added.`

Displayed if the signal list is full when you try to add a signal to the signal list using the remote SCPI command “CALC:EMI:SLISt:ADD <data>”, but list is full (maximum is 2000 signals in list.)

`Signal missing required frequency. Signal not added.`

Displayed when attempting to add a signal to the signal list from remote and the frequency value is missing (“CALC:EMI:SLISt:ADD <data>”.)

`Signal not added to list.`

Displayed when **Marker to List** is pressed and append fails for an unknown reason.

`Signal not added to list. Signal list is at capacity.`

Displayed when **Marker to List** is pressed and append fails because the signal list is full.

`Signal string contains bad flag for mark. Signal not added.`

Displayed when attempting to add a signal to the signal list from remote and the signal mark flag in <data> has a value that's not 0, 1, On, or Off ("CALC:EMI:SLISt:ADD <data>").

`Signal string contains detector flag. Signal not added.`

Displayed when attempting to add a signal to the signal list from remote and one of the detector flags in <data> has a value that's not 0, 1, On, or Off ("CALC:EMI:SLISt:ADD <data>").

`Signal string malformed. Signal not added.`

Displayed when attempting to add a signal to the signal list from remote and the string argument (<data>) is missing ("CALC:EMI:SLISt:ADD <data>").

`Strong Adjacent Signal`

Displayed if a valid measurement couldn't be made because the signal couldn't be ranged high enough on screen for an accurate measurement.

`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.

### Status Messages

Status `* (Invalid Data)`

This indicator is displayed when 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)`

A 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 EMC analyzer models except Agilent Technologies E7401A, you must connect the **AMPTD REF OUT** to the **INPUT** with the appropriate cable to perform this alignment. *For Agilent Technologies E7401A 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 EMC analyzer models except Agilent Technologies E7401A, you must connect the **AMPTD REF OUT** to the **INPUT** with the appropriate cable to perform this alignment. *For Agilent Technologies E7401A 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 EMC analyzer models except E7401A, you must connect the **AMPTD REF OUT** to the **INPUT** with the appropriate cable to perform this alignment. *For Agilent Technologies E7401A only:* disconnect any signals from the **INPUT** prior to performing this procedure.

If this message occurs and you are going to make a measurement near 50 MHz, select **System**, **Alignments**, **Auto Align**, and **All but RF**.

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 E7402A with Option UKB, E7403A, and E7404A analyzers. For E7405A 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)`

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

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.

Status `Frequency Reference Error (Freq Ref Unlocked)`

The frequency reference has been tuned too far off of 10 MHz. This condition may be corrected by cycling power on the analyzer.

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

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

Status `IF Gain fixed`

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 (< 1 kHz), and < 70 dB of display range. For more information on this setting, refer to IF Gain key description in the *EMC Analyzer User's Guide*.

Status `IF Overload (IF/ADC Over Range)`

The IF section has been overloaded. Measurement results may be invalid.

Status `Input is internal (no corresponding status bit)`

*This message applies to the Agilent Technologies E7401A 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.

Status `(LO Align Failure) status bit only, no message`

A failure has occurred during the alignment of the local oscillator (LO). Measurement results may be invalid.

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.

Status `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.

Status `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.

Status `Log Corr Off (no corresponding status bit)`

The log amplifier corrections have been turned off.

Status `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.

Status `Meas Uncal (Oversweep)`

The measurement is uncalibrated. Check the sweep time, span and bandwidth settings, or press **Auto Couple** and **Auto All**.

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

*This message applies to the Agilent Technologies E7401A 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.

**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 `(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 `Source LO Unlevel (Source LO Unleveled)`

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 `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.

### Informational Messages

Informational `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 120 dbµV ± 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 **Amplitude**. Then press **Attenuation (Auto)**.

Overload protection is only available in the Agilent Technologies E7401A.

Informational `Clear all signal marks.`

Cleared all marked signals from signal list. Displayed when **Clear All** is pressed.

Informational `Complementing marked signals.`

Marking all signals that were previously unmarked and removing the marks from previously marked signals. Displayed when **Complement** is pressed.

Informational `Deleted all signals.`

Deleted all signals from signal list. Displayed when **Delete All** is pressed.

Informational `Deleting marked signals.`

Deleted marked signals from signal list. Displayed when **Delete Mrkd** is pressed.

Informational `Deleted signal.`

Deleted currently selected signal from signal list. Displayed when **Delete Signal** is pressed.

Informational `<directoryname> directory deleted`

The directory indicated has been successfully deleted.

Informational `<directoryname1> directory renamed to <directoryname2>`

Directory name1 has been successfully renamed to directory name2.

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 *EMC Analyzer User’s Guide*.

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 `<filename1> file renamed to <filename2>`

Filename1 has been successfully renamed to filename2.

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 `Marking all duplicate signals.`

Marking all signals in list that are close to each other in frequency. Displayed when **Mark All Dups** is pressed.

Informational `Marking all signals.`

All signals in signal list are marked. Displayed when **Mark All** is pressed.

Informational `Marking lower duplicate signals.`

Marking all signals in list that are lower in frequency out of those who are close to each other in frequency. Displayed when **Mark Lwr Dups** is pressed.

Informational `Marking signals to end of list.`

Marking all signals in list from the currently selected signal to the last signal at the end of the list. Displayed when **Mark To End** is pressed.

Informational `Measurement Aborted`

Displayed when **AutoMeasure** is stopped by an **Abort** from **Meas Control**.

Informational `Measurement Done`

Displayed when **AutoMeasure** is finished.

Informational `Measurement paused; press Resume to continue, Abort, or Restart.`

Displayed when **AutoMeasure** is stopped by a **Pause** from **Meas Control**. You must press **Resume** to continue, **Abort** to cancel the measurement and reset the analyzer to begin a new measurement, or **Restart** to begin a new measurement.

Informational `Measurement Resuming...`

Displayed if AutoMeasure is stopped by a Resume from Meas Control.

Informational `Measuring Signal...`

Displayed while signal measurement process is running after **Remeasure**, **Remeas All**, **Remeas Mrkd**, or **Meas at Marker** is pressed or when **AutoMeasure** is running.

Informational `Measuring Signal...Done`

Displayed when the signal measurement process is complete.after **Remeasure**, **Remeas All**, **Remeas Mrkd**, or **Meas at Marker** is pressed or when **AutoMeasure** is finished running.

Informational `Option activated`

This message is displayed after entering the selected option's License Key.

Informational `Remeasuring current signal.`

Remeasure currently selected signal in list. Displayed when **Remeasure** is pressed.

Informational `Remeasuring all signals.`

Remeasure all signals in list. Displayed when **Remeas All** is pressed.

Informational `Remeasuring marked signals.`

Remeasure all marked signals in list. Displayed when **Remeas Mrkd** is pressed.

Informational `Shutdown in process.`

The analyzer is responding to the **Standby** key selection, and is executing the shutdown procedure.

Informational `Signal Added To List.`

Displayed every time a signal is measured and added to the Signal List when **AutoMeasure** is run or **Marker To List** or **Meas To List** is pressed.

Informational `Signal comment truncated to 31 characters.`

Displayed when attempting to add a signal to the signal list using the remote SCPI command “CALC:EMI:SLISt:ADD <data>” and the comment field is longer that 31 characters. The message is not displayed long enough for you to read because the signal is added immediately and the “Signal Added To List” message comes up right away.

Informational `Signal Search Complete, <#> Found.`

Displayed when all peaks in the given trace that meet the current user-specified peak excursion and threshold criteria are found when **AutoMeasure** is run.

Informational `Sorting by ascending average amplitude.`

Displayed when setting the sorting in the signal list to ascending average amplitude from the remote SCPI command (“CALCulate:EMI:SLISt:SORT AVERage, ASC”).

Informational `Sorting by ascending frequency.`

Displayed when setting the sorting in the signal list to ascending frequency from remote SCPI command (“CALCulate:EMI:SLISt:SORT FREQ, ASC”).

Informational `Sorting by ascending LL1 delta.`

Displayed when setting the sorting in the signal list to ascending LL1 delta from remote SCPI command (“CALCulate:EMI:SLISt:SORT LLINE1, ASC”).

Informational `Sorting by ascending LL2 delta.`

Displayed when setting the sorting in the signal list to ascending LL2 delta from remote SCPI command (“CALCulate:EMI:SLISt:SORT LLINE2, ASC”).

Informational `Sorting by ascending peak amplitude.`

Displayed when setting the sorting in the signal list to ascending peak amplitude from remote SCPI command (“CALCulate:EMI:SLISt:SORT PEAK, ASC”).

Informational `Sorting by ascending quasi-peak amplitude.`

Displayed when setting the sorting in the signal list to ascending quasi-peak amplitude from remote SCPI command (“CALCulate:EMI:SLISt:SORT QPEak, ASC”).

Informational `Sorting by descending average amplitude.`

Displayed when setting the sorting in the signal list to descending average amplitude from remote SCPI command (“CALCulate:EMI:SLISt:SORT AVERage, DESC”).

Informational `Sorting by descending frequency.`

Displayed when setting the sorting in the signal list to descending frequency from remote SCPI command (“CALCulate:EMI:SLISt:SORT FREQ, DESC”).

Informational `Sorting by descending LL1 delta.`

Displayed when setting the sorting in the signal list to descending LL1 delta from remote SCPI command (“CALCulate:EMI:SLISt:SORT LLINE1, DESC”).

Informational `Sorting by descending LL2 delta.`

Displayed when setting the sorting in the signal list to descending LL2 delta from remote SCPI command (“CALCulate:EMI:SLISt:SORT LLINE2, DESC”).

Informational `Sorting by descending peak amplitude.`

Displayed when setting the sorting in the signal list to descending peak amplitude from remote SCPI command (“CALCulate:EMI:SLISt:SORT PEAK, DESC”).

Informational `Sorting by descending quasi-peak amplitude.`

Displayed when setting the sorting in the signal list to descending quasi-peak amplitude from remote SCPI command (“CALCulate:EMI:SLISt:SORT QPEak, DESC”).

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 E7401A Analyzer.

Informational `WARNING: You are about to delete all of the contents on directory “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**. (“x:\xxxxx\” in the message is the full path and directory name).

Informational `Volume <name> formatted`

The indicated disk has been successfully formatted.

# 2 Functional Testing

# 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

Performance verification tests check a wide range of analyzer parameters and provide the highest level of confidence that the analyzer is operating satisfactorily. They are used to verify that the analyzer conforms to published specifications. They are time consuming and require extensive test equipment. The functional tests check a much smaller range of parameters and a limited number of data points for each parameter. They require only limited test equipment.

# Test Descriptions

Each of the following test descriptions include the test limits (pass/fail criteria), a description of what the test does or what it measures, a list of equipment required for the performance of the test, an illustration of the test setup used, and a step by step test procedure. The tests are designed to be run on an analyzer operating within the operational temperature range defined by the analyzer specifications. Only perform tests after the specified warm-up time.

At the end of each test is a test results worksheet. Copy a worksheet to record your test results for each procedure you'll be conducting.

Table 2-1 on page 54 includes a complete list of test equipment for all procedures in this chapter.

The tests included in this chapter are as follows:

**Table 2-1**

| Test Equipment for All Procedures in Chapter 3: | Specifications: | Recommended Model: |
|---|---|---|
| **Signal Sources** | | |
| Synthesized Sweeper | 10 MHz-to maximum specified frequency of analyzer. Ext Ref Input | 8340A/B or 836XX series |
| **Adapters** | | |
| Type-N (m), to APC 3.5 (m) | | 1250-1743 |
| Type-N (m) to BNC (f) | | 1250-0780 |
| Type-N (f), to APC 3.5 (f) | | 1250-1745 |
| Termination, 50 Ω Type-N (m) | | 908A |
| (2) Type-N (m), to APC 3.5 (f) | | 1250-1476 |
| 3.5 mm (m) to 3.5 mm (m) | | 5061-5311 |
| SMA (f) to BNC (m) | | 1250-2015 |
| **Cables** | | |
| (2) BNC, 122-cm (48-in) | | 10503A |
| APC 3.5 mm | | 11500D |
| Type-N, 152-cm (60-in) | | 11500D |
| BNC, 9 inch | | 10502A |
| BNC, 122-cm (48-in) | | 10503A |
| APC 3.5 mm | E7405A only | 11500E |
| **Meters** | | |
| Power Meter | | 438A or E4418A, E4419A |
| RF Power Sensor | 100 kHz to 3.0 GHz | 8482A |
| Microwave Power Sensor | 50 MHz to 26.5GHz | 8485A |
| **Miscellaneous** | | |
| Power Splitter | E7401A, E7402A, E7403A, and E7404A only | 11667A |
| Power Splitter | E7405A only | 11667B |

**Table 2-1**

| | | |
|---|---|---|
| 50 MHz Low pass filter | Rejection at 80 MHz: >60 dB | 0955-0306 |

# Displayed Average Noise Level

## Test Limits

| Frequency Range | Model (50 Ω Input) | Maximum (50 Ω Input) | TR Entry |
|---|---|---|---|
| 10 MHz to 500 MHz | E7401A | – 119 dBm | 1 |
| 501 MHz to 1.0 GHz | E7401A | – 117 dBm | 2 |
| 1.01 GHz to 1.5 GHz | E7401A | – 114 dBm | 3 |
| 10 MHz to 1.0 GHz | E7402A | – 117 dBm | 4 |
| | E7403A, E7404A, E7405A | – 116 dBm | 5 |
| 1.01 GHz to 2.0 GHz | E7402A | – 116 dBm | 6 |
| | E7403A, E7404A, E7405A | – 116 dBm | 7 |
| 2.01 GHz to 3.0 GHz | E7402A | – 114 dBm | 8 |
| | E7403A, E7404A, E7405A | – 112 dBm | 9 |
| 3.01 GHz to 6.0 GHz | E7403A, E7404A, E7405A | – 112 dBm | 10 |
| 6.01 GHz to 6.7 GHz | E7403A | – 111 dBm | 11 |
| 6.01 GHz to 12.0 GHz | E7404A, E7405A | – 111 dBm | 12 |
| 12.01 GHz to 13.2 GHz | E7405A | – 107 dBm | 13 |
| 12.01 GHz to 22 GHz | E7405A | – 107 dBm | 14 |
| 22.01 GHz to 26.5 GHz | E7405A | – 106 dBm | 15 |

## Test Description

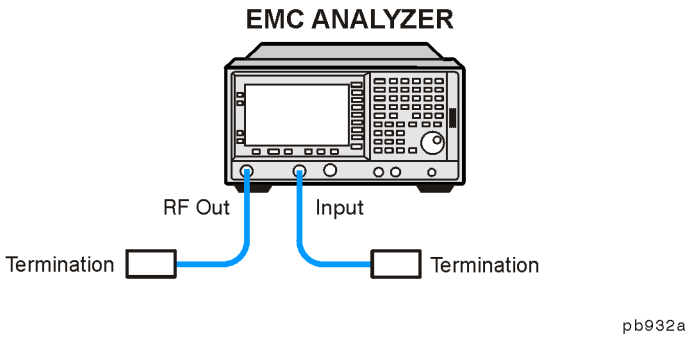
The Displayed Average Noise Level is measured within the frequency range specified. The analyzer input is terminated in 50 Ω.

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.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended Agilent Model |
|---|---|---|
| **Adapters** | | |
| Termination, 50 Ω Type-N (m) | | 908A |

**Figure 2-1** **Equipment Setup**




## Procedure (10 MHz to 500 MHz) *E7401A*

1. Connect the equipment as shown in Figure 2-1.
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**, **More**, **Y Axis Units**, **dBm**

   **AMPLITUDE**, –70, **dBm**

   **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) in Table 2-2 on page 72 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) of Table 2-2 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 in Table 2-2 on page 72. The Average Noise Level should be less than the Maximum.

## Procedure (501 MHz to 1.0 GHz) *E7401A*

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 (b) in Table 2-2 on page 72 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 (b) in Table 2-2 on page 72 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 in Table 2-2 on page 72. The Average Noise Level should be less than the Maximum.

## Procedure (1.01 GHz to 1.5 GHz) *E7401A*

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 (c) in Table 2-2 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 (c) in Table 2-2 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 in Table 2-2. The average noise level should be less than the Maximum.

## Procedure (10 MHz to 1 GHz) *E7402A, E7403A, E7404A, and E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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 (d) or (e) in Table 2-2 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 (d) or (e) in Table 2-2 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 E7402A, record the display line amplitude setting as TR Entry 4 in Table 2-2. Otherwise, record the display line amplitude setting as TR Entry 5 in Table 2-2. The average noise level should be less than the Maximum.

## Procedure (1.01 GHz to 2 GHz) *E7402A, E7403A, E7404A, and E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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 (f) or (g) in Table 2-2 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 (f) or (g) in Table 2-2 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 E7402A, record the display line amplitude setting as TR Entry 6 in Table 2-2. Otherwise, record the display line amplitude setting as TR Entry 7 in Table 2-2. The average noise level should be less than the Maximum.

## Procedure (2.01 GHz to 3.0 GHz) *E7402A, E7403A, E7404A, and E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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) or (i) in Table 2-2 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 (h) or (i) in Table 2-2 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 E7402A, record the display line amplitude setting as TR Entry 8 in Table 2-2. Otherwise, record the display line amplitude setting as TR Entry 9 in Table 2-2. The Average Noise Level should be less than the maximum.

## Procedure (3.01 GHz to 6.0 GHz) *E7403A, E7404A, and E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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 (j) in Table 2-2 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 (j) in Table 2-2 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 10 in Table 2-2. The Average Noise Level should be less than the Maximum.

## Procedure (6.01 GHz to 6.7 GHz) *E7403A*

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**, **More**, **Y Axis Units**, **dBm**

   **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) in Table 2-2 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 (k) in Table 2-2 for 6.01 GHz to 6.7 GHz.

   Press the following keys on the analyzer:

   **BW/Avg**, **Res BW**, 1, **kHz**

   **Video BW**, 30, **Hz**

   **Single**

   Wait for the sweep to finish.

   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.

6. Record the display line amplitude setting as TR Entry 11 in Table 2-2. The Average Noise Level should be less than the Maximum.

## Procedure (6.01 GHz to 12.0 GHz) *E7404A and E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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 (l) in Table 2-2 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 (l) in Table 2-2 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 12 in Table 2-2. The average noise level should be less than the Maximum.

## Procedure (12.01 GHz to 13.2 GHz) *E7404A*

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**, **More**, **Y Axis Units**, **dBm**

   **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 2-2 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 (m) in Table 2-2 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 13 in Table 2-2. The Average Noise Level should be less than the Maximum.

## Procedure (12.01 GHz to 22 GHz) *E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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 2-2 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 (n) in Table 2-2 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 14 in Table 2-2. The Average Noise Level should be less than the Maximum.

## Procedure (22.01 GHz to 26.5 GHz) *E7405A*

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**, **More**, **Y Axis Units**, **dBm**

   **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) in Table 2-2 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 (o) in Table 2-2 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 15 in Table 2-2. The Average Noise Level should be less than the Maximum.

**Table 2-2 Display Average Noise Level Worksheet**

| Model Number | Frequency Range | Measured Frequency | Average Noise Level (TR Entry) | Maximum | |
|---|---|---|---|---|---|
| | | | | 50 Ω Input | 75 Ω Input |
| E7401A | 10 MHz to 500 MHz | (a) _____ | (1) _____ | – 119 dBm | N/A |
| E7401A | 501 MHz to 1.0 GHz | (b) _____ | (2) _____ | – 117 dBm | N/A |
| E7401A | 1.01 GHz to 1.5 GHz | (c) _____ | (3) _____ | – 114 dBm | N/A |
| E7402A | 10 MHz to 1.0 GHz | (d) _____ | (4) _____ | – 117 dBm | N/A |
| E7403A E7404A, E7405A | 10 MHz to 1.0 GHz | (e) _____ | (5) _____ | – 116 dBm | N/A |
| E7402A | 1.01 GHz to 2.0 GHz | (f) _____ | (6) _____ | – 116 dBm | N/A |
| E7403A, E7404A, E7405A | 1.01 GHz to 2.0 GHz | (g) _____ | (7) _____ | – 116 dBm | N/A |
| E7402A | 2.01 GHz to 3.0 GHz | (h) _____ | (8) _____ | – 114 dBm | N/A |
| E7403A, E7404A, E7405A | 2.01 GHz to 3.0 GHz | (i) _____ | (9) _____ | – 112 dBm | N/A |
| E7403A, E7404A, E7405A | 3.01 GHz to 6.0 GHz | (j) _____ | (10) _____ | – 112 dBm | N/A |
| E7403A | 6.01 GHz to 6.7 GHz | (k) _____ | (11) _____ | – 111 dBm | N/A |

**Table 2-2 Display Average Noise Level Worksheet (Continued)**

| Model Number | Frequency Range | Measured Frequency | Average Noise Level (TR Entry) | Maximum | |
|---|---|---|---|---|---|
| | | | | 50 Ω Input | 75 Ω Input |
| E7404A, E7405A | 6.01 GHz to 12.0 GHz | (l) _____ | (12) _____ | – 111 dBm | N/A |
| E7405A | 12.01 GHz to 13.2 GHz | (m)_____ | (13) _____ | – 107 dBm | N/A |
| E7405A | 12.01 GHz to 22 GHz | (n) _____ | (14) _____ | – 107 dBm | N/A |
| E7405A | 22.01 GHz to 26.5 GHz | (o) _____ | (15) _____ | – 106 dBm | N/A |

# EMI Detector

## Test Limits

| Test Description | Test Limits |
|---|---|
| **EMI Detector Procedures** | **Peak, Quasi-Peak, or Average Values** |
| 200 Hz Procedure | +/– 2 dB |
| 9 kHz Procedure | |
| 120 kHz Procedure | |

## Test Description

The internal 50 MHz signal is applied to the input of the analyzer. For each of the CISPR filters (200 Hz, 9 kHz, and 120 kHz) a peak, quasi-peak, and average measurement is made on the 50 MHz CW signal.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Adapters** | | |
| Type-N (m) to BNC (f) | | 1250-0780 |
| **Cables** | | |
| BNC (m) to BNC (m), 9 inches | | HP 10502A |

**Figure 2-2** **Equipment Setup**

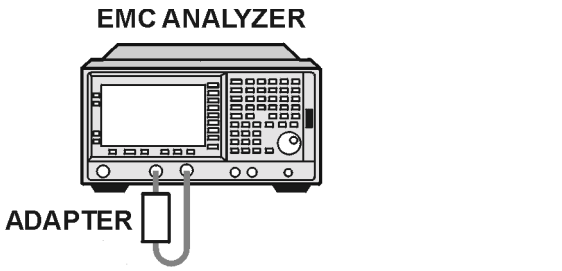
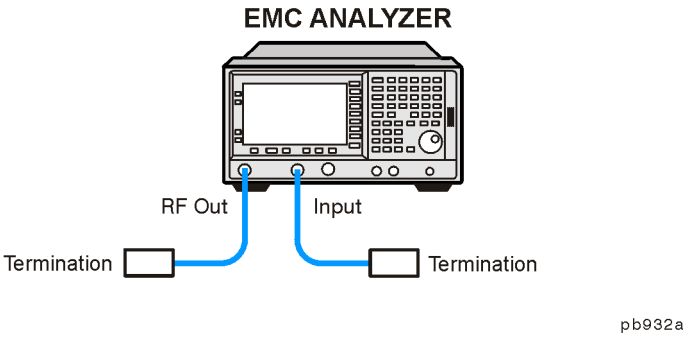


**Figure 2-3 Equipment Setup**




## 200 Hz Procedure

1. Connect the equipment as shown in Figure 2-2 on page 74.

**NOTE** For the E7401A, it is not necessary to connect the AMPTD REF OUT to the analyzer's 50Ω input. It switches internally.

2. Press **Preset** on the analyzer and wait for the preset routine to finish. Set the analyzer up by pressing the following keys:

   **Input/Output**, **Amptd Ref Out (f=50 MHz) (On)**
   **FREQUENCY**, **Center Freq**, 50, **MHz**
   **Span**, **2**, **kHz**
   **AMPLITUDE**, **Attenuation**, 5, **dB**, **More**, **Y Axis Units**, **dBm**
   **BW/Avg**, **Res BW**, **200 Hz**, **Video BW**, 300, **Hz**
   **AMPLITUDE**, 25, **—dBm** (E7401A only)
   **AMPLITUDE**, 20, **—dBm** (E7402A, E7403A, E7404A, and E7405A only)
   **Peak Search**
   **MEASURE**, **Meas at Marker**

3. Wait for the Measure at Marker routine to finish and then record the peak, quasi-peak, and average values measured by the analyzer. When the measurement is complete, a box will appear in the upper left hand corner of the screen with the most recent measurement information. Record these on your worksheet in 200 Hz Procedure.

## 9 kHz Procedure

1. Connect the equipment as shown in Figure 2-2 on page 74.

**NOTE** For the E7401A, it is not necessary to connect the AMPTD REF OUT to the analyzer's 50Ω input. It switches internally.

2. Press **Preset** on the analyzer and wait for the preset routine to finish. Set the analyzer up by pressing the following keys:

   **Input/Output**, **Amptd Ref Out (f=50 MHz) (On)**
   **FREQUENCY**, **Center Freq**, 50, **MHz**
   **Span**, 500, **kHz**
   **AMPLITUDE**, **Attenuation**, 5, **dB**, **More**, **Y Axis Units**, **dBm**
   **BW/Avg**, **Res BW**, **9 kHz**, **Video BW**, 10, **Hz**
   **AMPLITUDE**, 25, **—dBm** (E7401A only)
   **AMPLITUDE**, 20, **—dBm** (E7402A, E7403A, E7404A, and E7405A only)
   **Peak Search**
   **MEASURE**, **Meas at Marker**

3. Wait for the Measure at Marker routine to finish and then record the peak, quasi-peak, and average values measured by the analyzer. When the measurement is complete, a box will appear in the upper left hand corner of the screen with the most recent measurement information. Record these in your worksheet in 9 kHz Procedure.

## 120 kHz Procedure

1. Connect the equipment as shown in Figure 2-2 on page 74.

**NOTE** For the E7401A, it is not necessary to connect the AMPTD REF OUT to the analyzer's 50Ω input. It switches internally.

2. Press **Preset** on the analyzer and wait for the preset routine to finish. Set the analyzer up by pressing the following keys:

   **Input/Output**, **Amptd Ref Out (f=50 MHz) (On)**
   **FREQUENCY**, **Center Freq**, 50, **MHz**
   **Span**, 2, **MHz**
   **AMPLITUDE**, **Attenuation**, 5, **dB**, **More**, **Y Axis Units**, **dBm**
   **BW/Avg**, **Res BW**, **120 kHz**, **Video BW**, 300, **Hz**
   **AMPLITUDE**, 25, **—dBm** (E7401A only)
   **AMPLITUDE**, 20, **—dBm** (E7402A, E7403A, E7404A, and E7405A only)
   **Peak Search**
   **MEASURE**, **Meas at Marker**

3. Wait for the Measure at Marker routine to finish and then record the peak, quasi-peak, and average values measured by the analyzer. When the measurement is complete, a box will appear in the upper left hand corner of the screen with the most recent measurement information. Record these in your worksheet in 120 kHz Procedure.

**Table 2-3 EMI Detector Worksheet**

| Test Description | Detector | | |
|---|---|---|---|
| **EMI Detector Procedures** | **Peak** | **Quasi-peak** | **Average** |
| 200 Hz Procedure | | | |
| 9 kHz Procedure | | | |
| 120 kHz Procedure | | | |

# Frequency Readout Accuracy

## Test Limits

| Span | Minimum | Maximum |
|---|---|---|
| 10 MHz | 1.48988 GHz | 1.49012 GHz |
| 100 kHz | 1.4899988 GHz | 1.4900012 GHz |
| Marker Count Accuracy with Counter Resolution at 1 Hz | 1.489999999 GHz | 1.490000001 GHz |

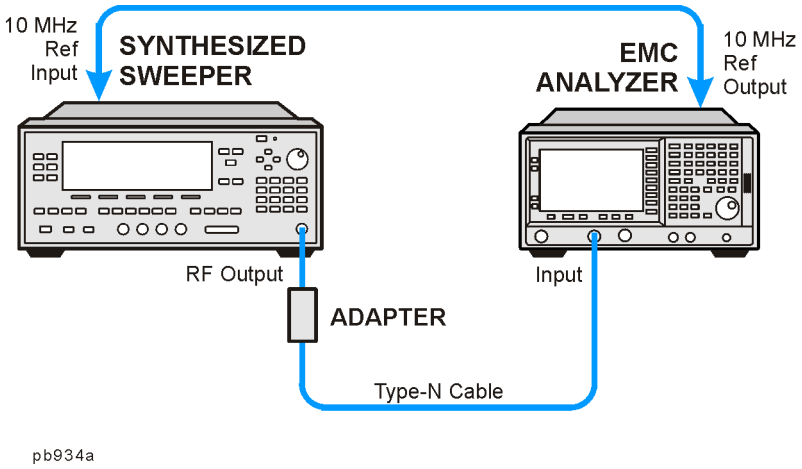
## Test Description

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.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Signal Sources** | | |
| Synthesized Sweeper | 10 MHz to 1.5 GHz External Reference Input | 8340A/B or 836XX Series |
| **Adapters** | | |
| Type-N (f), to APC 3.5(f) | | 1250-1745 |
| **Cables** | | |
| Type-N, 152-cm (60-in) | | 11500D |
| BNC, 122-cm (48-in) | | 10503A |

**Figure 2-4** **Equipment Setup**




## Procedure

1. Connect the equipment as shown in Figure 2-4. 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 as follows:

      **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**, Center Freq, 1.490, **GHz**
      **SPAN**, 10, **MHz**
      **BW/Avg**, **Res BW**, 100, **kHz**
      **Video BW**, 30, **kHz**

3. Press **Peak Search** on the analyzer to measure the frequency readout accuracy. Record this in the Marker Frequency Readout column in Table 2-4 on page 80.
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 2-4 on page 80.

**NOTE** The Frequency Readout Accuracy in 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**, **Center Freq**, 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 **Cntr1** frequency as the Marker Frequency Readout in Table 2-4.

**Table 2-4 Frequency Readout and Marker Count Accuracy Worksheet**

| Span | Minimum | Marker Frequency Readout | Maximum |
|---|---|---|---|
| 10 MHz | 1.48988 GHz | | 1.49012 GHz |
| 100 kHz | 1.4899988 GHz | | 1.4900012 GHz |
| Marker Count Accuracy w/Counter Resolution at 1 Hz | 1.489999999 GHz | | 1.490000001 GHz |

# Frequency Response

## Test Limits

| EMC Model | Frequency | Minimum (dB) | Maximum (dB) |
|---|---|---|---|
| E7401A | 9 kHz to 1.5 GHz | –1.5 | 1.5 |
| E7402A | 9 kHz to 3 GHz | –1.5 | 1.5 |
| E7403A | 9 kHz to 3 GHz | –1.5 | 1.5 |
| | 3.01 GHz to 6.7 GHz | –3.0 | 3.0 |
| E7404A | 9 kHz to 3 GHz | –1.5 | 1.5 |
| | 3.01 GHz to 6.7 GHz | –3.0 | 3.0 |
| | 6.71 GHz to 13.2 GHz | –3.5 | 3.5 |
| E7405A | 9 kHz to 3 GHz | –1.5 | 1.5 |
| | 3.01 GHz to 6.7 GHz | –3.0 | 3.0 |
| | 6.71 GHz to 13.2 GHz | –3.5 | 3.5 |
| | 13.21 GHz to 25 GHz | –4.0 | 4.0 |
| | 25 GHz to 26.5 GHz | –4.5 | 4.5 |

## Test Description

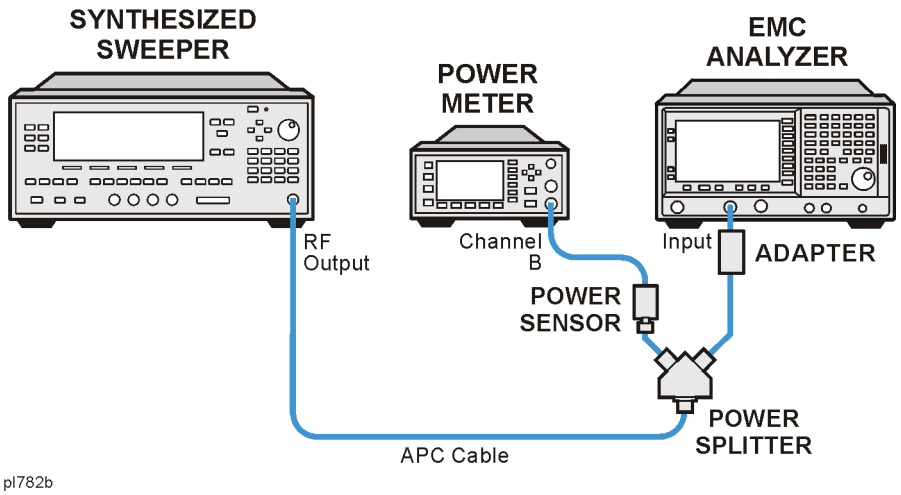
The output of the synthesized sweeper is fed through a power splitter to a power sensor and the analyzer. The synthesized sweeper's power level is adjusted at 50 MHz to place the displayed signal at the analyzer center horizontal graticule line. Measurements are made at various points depending on the 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.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Signal Sources** | | |
| Synthesized Sweeper | | 8340A/B or 836xx Series |

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Adapters** | | |
| Type-N (m), to APC 3.5(m) | | 1250-1743 |
| **Cables** | | |
| (2) APC 3.5mm (36 in) | E7405A only | 8120-4921 or 11500E |
| BNC (m) both ends, (48 in) | | 10503A |
| **Miscellaneous** | | |
| Power Meter | | EPM-441A (E4418A) |
| Power Sensor, 50 Ω | | 8485A |
| Power Splitter | | 11667B |

**Figure 2-5 Equipment Setup**




## 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 2-5.
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 2-5, "Frequency Response Worksheet." 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 2-5.

   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 ⇑ key or press **FREQUENCY**, **Center Freq**, "n", and **MHz** (where "n" is the next test frequency in Table 2-5).

   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:

Flatness Error = Analyzer Amplitude – Power Meter Amplitude

The flatness error should be less than the specified amount.

**Table 2-5 Frequency Response Worksheet**

| Model | Center Freq | Analyzer Amplitude | Power Meter Amplitude | Flatness Error | Flatness Error Test Limits (dB) |
|---|---|---|---|---|---|
| All Models | 50 MHz | | | | ± 1.5 |
| | 100 MHz | | | | ± 1.5 |
| | 750 MHz | | | | ± 1.5 |
| | 1250 MHz | | | | ± 1.5 |
| | 1500 MHz | | | | ± 1.5 |
| E7402A – E7405A | 2000 MHz | | | | ± 1.5 |
| | 2500 MHz | | | | ± 1.5 |
| | 2999 MHz | | | | ± 1.5 |
| E7402A – E7405A | 4250 MHz | | | | ± 3.0 |
| | 5750 MHz | | | | ± 3.0 |
| | 6699 MHz | | | | ± 3.0 |
| E7402A – E7405A | 8000 MHz | | | | ± 3.5 |
| | 9000 MHz | | | | ± 3.5 |
| | 10000 MHz | | | | ± 3.5 |
| | 11000 MHz | | | | ± 3.5 |
| | 13199 MHz | | | | ± 3.5 |
| E7405A | 14000 MHz | | | | ± 4.0 |
| | 19000 MHz | | | | ± 4.0 |
| | 24000 MHz | | | | ± 4.0 |
| | 26500 MHz | | | | ± 4.5 |

# Reference Level Accuracy

## Test Limits

| Reference Level | | Minimum (dB) | Maximum (dB) |
|---|---|---|---|
| dBm | dBmV | | |
| –30 | 21.76 | Reference | Reference |
| –20 | 31.76 | –1.40 | 1.40 |
| –10 | 41.76 | –1.40 | 1.40 |
| –40 | 11.76 | –1.40 | 1.40 |
| –50 | 1.76 | –1.40 | 1.40 |
| –60 | –8.24 | –1.40 | 1.40 |
| –70 | –18.24 | –2.0 | 2.0 |

## Test Description

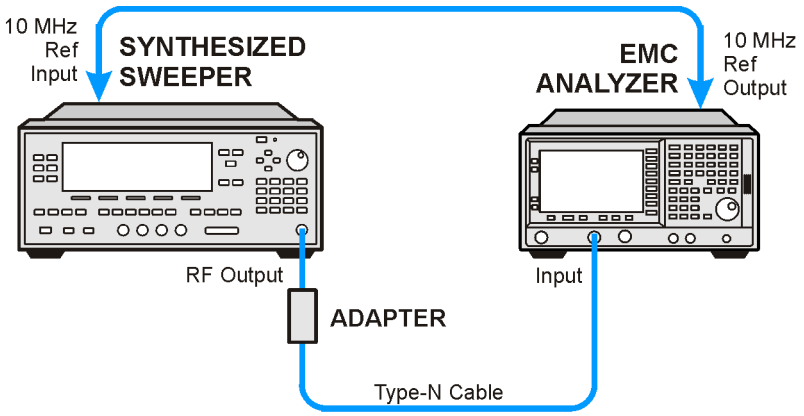
A 50 MHz CW signal is applied to the Input of the analyzer. The amplitude of the source and the analyzer's reference level are decreased in 10 dB steps. The analyzer marker functions are used to measure the amplitude difference between steps. Reference Level Accuracy is tested in both Log and Linear Scale Modes. Most of the error is contributed from the output attenuator inaccuracy in the synthesized sweeper and not the analyzer.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Signal Sources** | | |
| Synthesized Sweeper | Output Level Accuracy<br>0 to –15 dBm: ±1.0 dB<br>–16 dBm to –63 dBm: ±1.4 dB<br>≤ –64 dBm: ≥2.0 dB | 8340A/B or 836XX Series |
| **Adapters** | | |
| Type-N (m), to APC 3.5 (f) | | 1250-1745 |
| **Cables** | | |

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| Type-N, 152-cm (60-in) | | 11500D |
| BNC, 122-cm (48-in) | | 10503A |

**Figure 2-6** **Equipment Setup**




## Log Mode Procedure

1. Connect the equipment as shown in Figure 2-6.
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**, **More**, **Y Axis Units**, **dBm**
   **AMPLITUDE**, –30, **dBm**
   **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 2-6 on page 87.

**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 2-6 on page 87. (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 2-6.

**Table 2-6 Reference Level Accuracy Worksheet (Log Mode)**

| Analyzer Reference Level | | Synthesized Sweeper Amplitude (dBm) | Minimum (dB) | Analyzer Marker Δ Amplitude (dB) | Maximum (dB) |
|---|---|---|---|---|---|
| dBm | | | | | |
| –30 | | Reference = _____ | 0 (Reference) | 0 (Reference) | 0 (Reference) |
| –20 | | Reference + (10 dB) | 8.60 | | 11.40 |
| –10 | | Reference + (20 dB) | 18.60 | | 21.40 |
| –40 | | Reference + (–10 dB) | –11.40 | | –8.60 |
| –50 | | Reference + (–20 dB) | –21.40 | | –18.60 |
| –60 | | Reference + (–30 dB) | –31.40 | | –28.60 |
| –70 | | Reference + (–40 dB) | –42.0 | | –38.0 |

## 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**
   **AMPLITUDE**, –30, **dBm** (50 Ω Input)
   **Scale Type (Lin)**
   **Marker**, **Off**

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 2-7.

**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 2-7. (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 2-7.

**Table 2-7 Reference Level Accuracy Worksheet (Linear Mode)**

| Analyzer Reference Level | | Synthesized Sweeper Amplitude (dBm) | Minimum (dB) | Analyzer Marker Δ Amplitude (dB) | Maximum (dB) |
|---|---|---|---|---|---|
| dBm | | | | | |
| –30 | | Reference = _____ | 0 (Reference) | 0 (Reference) | 0 (Reference) |
| –20 | | Reference + (10 dB) | 8.60 | | 11.40 |
| –10 | | Reference + (20 dB) | 18.60 | | 21.40 |
| –40 | | Reference + (–10 dB) | –11.40 | | –8.60 |
| –50 | | Reference + (–20 dB) | –21.40 | | –18.60 |

**Table 2-7 Reference Level Accuracy Worksheet (Linear Mode)**

| Analyzer Reference Level | | Synthesized Sweeper Amplitude (dBm) | Minimum (dB) | Analyzer Marker Δ Amplitude (dB) | Maximum (dB) |
|---|---|---|---|---|---|
| dBm | | | | | |
| –60 | | Reference + (–30 dB) | –31.40 | | –28.60 |
| –70 | | Reference + (–40 dB) | –42.0 | | –38.0 |

# Resolution Bandwidth Switching Uncertainty

## Test Limits

| Resolution Bandwidth | Minimum (dB) | Maximum (dB) |
|---|---|---|
| 1 kHz | 0 (Ref) | 0 (Ref) |
| 3 kHz | –0.3 dB | 0.3 dB |
| 10 kHz | –0.3 dB | 0.3 dB |
| 30 kHz | –0.3 dB | 0.3 dB |
| 100 kHz | –0.3 dB | 0.3 dB |
| 300 kHz | –0.3 dB | 0.3 dB |
| 1 MHz | –0.3 dB | 0.3 dB |
| 3 MHz | –0.3 dB | 0.3 dB |
| 5 MHz | –0.6 dB | 0.6 dB |

## Test Description

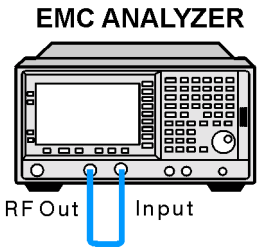
To measure the resolution-bandwidth switching uncertainty, an amplitude reference is taken with the resolution bandwidth set to 1 kHz. The resolution bandwidth is changed to settings between 5 MHz and 3 kHz and the amplitude variation is measured at each setting using the marker delta function and compared to the specification. The span is changed as necessary to maintain approximately the same aspect ratio.

## Required Equipment

No equipment required for analyzer models E7401A.

| Instrument | Critical Specifications (for this test) | Recommended Model |
|---|---|---|
| **Cables** | | |
| BNC, 9 inch | | 10502A |
| **Adapter** | | |
| Type N to BNC | | 1250-0780 or 1250-1476 |

**Figure 2-7 Equipment Setup**




pl783b

## Procedure

**NOTE** The 50 MHz reference output will automatically be switched internally on the E7401A and will not require any external connections. All other EMC analyzers require that the AMPTD REF OUT be connected to the INPUT to perform this test.

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)** (E7401A)
   **Input/Output**, **Amptd Ref Out (On)** (E7402A, E7403A, E7404A, and E7405A).
   Connect a cable from the **AMPTD REF OUT** to the **INPUT 50 Ω**, as shown in Figure 2-7(E7402A, E7403A, E7404A, and E7405A).
   **FREQUENCY**, 50, **MHz**
   **SPAN**, 50, **kHz**
   **AMPLITUDE**, **More**, **Y Axis Units**, **dBm**
   **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 2-8 on page 92.

4. Press **Peak Search**, then record the Δ Mkr 1 amplitude reading in Table 2-8.

5. Repeat step 3 and 4 for each of the remaining resolution bandwidth and span settings listed in Table 2-8. The Δ Mkr 1 amplitude reading should be within the range indicated in the table "Test Limits" on page 90.

**Table 2-8 Resolution Bandwidth Switching Uncertainty Worksheet**

| Resolution Bandwidth Setting | SPAN Setting | Δ Mkr 1 Amplitude Reading |
|---|---|---|
| 1 kHz | 50 kHz | 0 (Ref) |
| 3 kHz | 50 kHz | |
| 10 kHz | 50 kHz | |
| 30 kHz | 500 kHz | |
| 100 kHz | 500 kHz | |
| 300 kHz | 5 MHz | |
| 1 MHz | 10 MHz | |
| 3 MHz | 10 MHz | |
| 5 MHz | 50 MHz | |

# Scale Fidelity

## Test Limits

| dB from Reference Level | Minimum (dB) | Maximum (dB) |
|---|---|---|
| –4 | –1.0 | 1.0 |
| –16 | –1.4 | 1.4 |
| –28 | –1.4 | 1.4 |
| –40 | –1.4 | 1.4 |
| –52 | –1.4 | 1.4 |
| –64 | –2.0 | 2.0 |

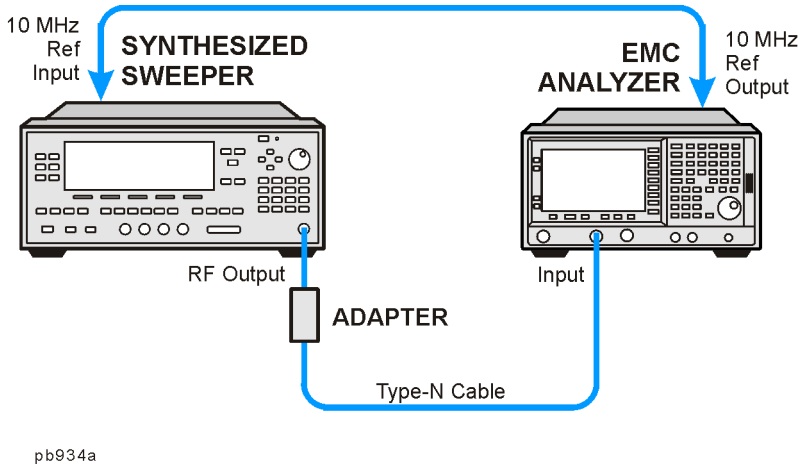
## Test Description

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.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Signal Sources** | | |
| Synthesized Sweeper | Output Level Accuracy<br>0 to –15 dBm: ±1.0 dB<br>–16 dBm to –63 dBm: ±1.4 dB<br>≤ –64 dBm: ≥2.0 dB | 8340A/B or 836XX Series |
| **Adapters** | | |
| Type-N (m), to APC 3.5 (f) | | 1250-1475 |
| **Cables** | | |
| Type-N, 152-cm (60-in) | | 11500D |
| BNC, 122-cm (48-in) | | 10503A |

**Figure 2-8** **Equipment Setup**




## Procedure

1. Connect the equipment as shown in Figure 2-8.
2. Preset the synthesized sweeper. Set the synthesized sweeper controls as follows:

   **CW**, 50, **MHz**
   **Power Level**, 0, **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**, **45**, **kHz**
   **AMPLITUDE**, **More**, **Y Axis Units**, **dBm**
   **AMPLITUDE**, **Attenuation**, 10, **dB**
   **BW/Avg**, **Res BW**, 3, **kHz**
   **Video BW**, 1, **kHz**
   **Peak Search**

4. Adjust the amplitude on the sythesized 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 2-9 on page 95.
5. On the analyzer, press the following keys:

   **Single**
   **Peak Search**
   **Marker**, **Delta**

6. Record the marker delta reading in Table 2-9. At each new synthesized sweeper power level, press **Single**, **Peak Search**, and record the marker amplitude level.

**Table 2-9 Scale Fidelity Worksheet**

| Synthesized Sweeper Level | Minimum (dB) | Marker Level (dB) | Maximum (dB) |
|---|---|---|---|
| Reference=_____ | 0 (Reference) | | 0 (Reference) |
| Reference –4 dB | –5.0 | | –3.0 |
| Reference –16 dB | –17.40 | | –15.60 |
| Reference –28 dB | –29.40 | | –26.60 |
| Reference –40 dB | –41.40 | | –38.60 |
| Reference –52 dB | –53.40 | | –50.60 |
| Reference –64 dB | –66.0 | | –62.0 |

# Second Harmonic Spurious Responses

## Test Limits

| Model Number | Maximum |
|---|---|
| E7401A | –55 dBc |
| E7402A | –55 dBc |
| E7403A | –55 dBc |
| E7404A | –55 dBc |
| E7405A | –55 dBc |

## 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.

## Required Equipment

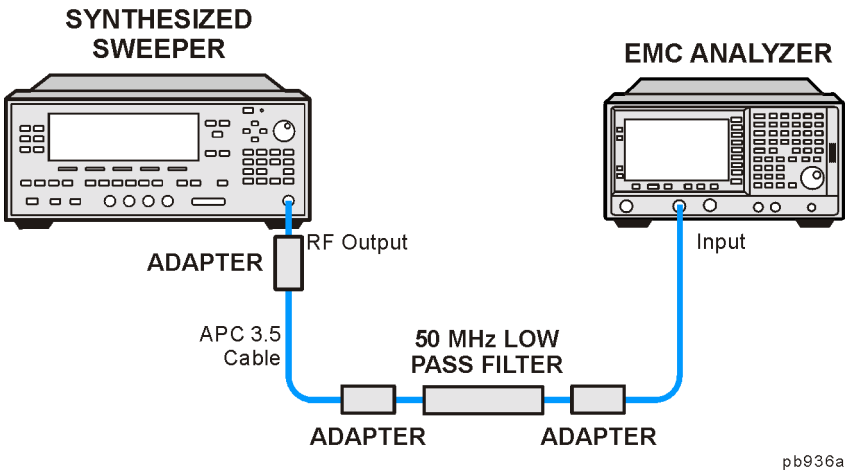
**Table 2-10**

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Signal Sources** | | |
| Synthesized Sweeper | | 8340A/B or 836XX Series |
| **Miscellaneous** | | |
| 50 MHz Low pass filter | Rejection at 80 MHz: >60 dB | 0955-0306 |
| **Adapters** | | |
| Type-N (f), to APC 3.5(f) | | 1250-1745 |
| 3.5 mm (m) to 3.5 mm (m) | | 5061-5311 |
| SMA (f) to BNC (m) | | 1250-2015 |
| **Cables** | | |
| (2) BNC, 122-cm (48-in) | | 10503A |

**Table 2-10**

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| APC 3.5 mm | | HP 11500D |

**Figure 2-9 Equipment Setup**




## Procedure

1. Connect the equipment as shown in Figure 2-9.
2. Set the synthesized sweeper controls as follows:

   **Frequency**, 40, **MHz**
   **POWER LEVEL**, –10, **dBm**

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:

   **AMPLITUDE**, **More**, **Y Axis Units**, **dBm**
   **FREQUENCY**, **Center Freq**, 40, **MHz**
   **SPAN**, 1, **MHz**
   **AMPLITUDE**, –10, **dBm**

   **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: Model E7401A, Option 1DN

## Test Limits

| | Minimum | Maximum |
|---|---|---|
| Flatness ≤ 10 MHz | –2.5 dB | 2.5 dB |
| Flatness > 10 MHz | –2.0 dB | 2.0 dB |

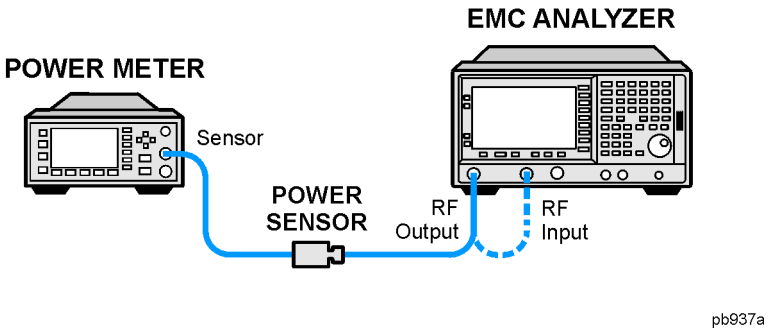
## Test Description

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.

## Required Equipment

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Meters** | | |
| Power Meter | | 438A or E4418A, E4419A |
| RF Power Sensor | Frequency Range: 100 kHz to 1.5GHz | 8482A |
| **Adapters** | | |
| Type-N (m to BNC (f) (2) | | 1250-1476 |
| **Cables** | | |
| BNC, 23-cm (9-in) | | 10502A |

**Figure 2-10 Equipment Setup**




## 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**
   **AMPLITUDE**, **More**, **Y Axis Units**, **dBm**
   **Source, Amplitude (On)**, 0, **dBm**
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.
4. Connect the power sensor to the RF Out on the analyzer as shown in Figure 2-10.
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**, **Center Freq**, 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.
8. Record the power level displayed on the power meter as the Level Flatness in Table 2-11.
9. Repeat steps 7 through 8 to measure the flatness at each center frequency setting listed in Table 2-11. The ⇑ may be used to tune to center frequencies above 500 MHz.

**Table 2-11 Tracking Generator Level Flatness Worksheet**

| Center Frequency | Level Flatness (dB) |
|---|---|
| 100 kHz | |
| 5 MHz | |
| 40 MHz | |
| 50 MHz | 0 (Ref) |
| 80 MHz | |
| 500 MHz | |
| 1000 MHz | |
| 1500 MHz | |

# Tracking Generator Level Flatness: E7402A, E7403A, E7404A, and E7405A, Option 1DN

## Test Limits

| | Minimum | Maximum |
|---|---|---|
| Flatness ≤ 10 MHz | –3.5 dBm | +3.5 dBm |
| Flatness > 10 MHz | –2.5 dBm | –2.5 dBm |

## Test Description

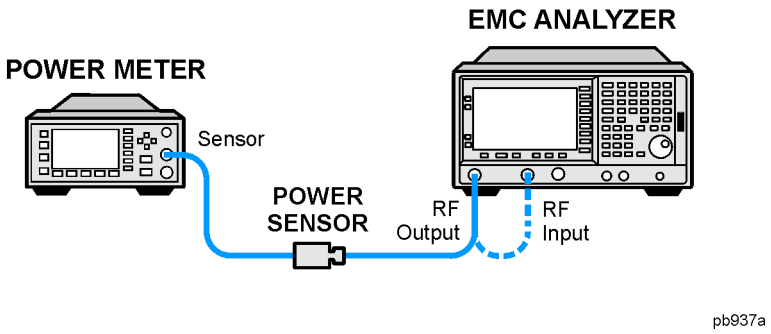
A calibrated power sensor is connected to the tracking generator output to measure the power level at 50 MHz. The power meter is set for REL mode so that future power level readings are in dB relative to the power level at 50 MHz. The tracking generator is then stepped to several frequencies throughout its range. The output power difference relative to the power level at 50 MHz is measured at each frequency and recorded.

## Required Equipment

**Table 2-12**

| Instrument | Critical Specifications (for this test) | Recommended HP/Agilent Model |
|---|---|---|
| **Meters** | | |
| Power Meter | | 438A or E4418A, E4419A |
| RF Power Sensor | Frequency Range: 100 kHz to 3.0 GHz | 8482A |
| **Adapters** | | |
| Type-N (m to BNC (f) (2) | | 1250-1476 |
| **Cables** | | |
| BNC, 23-cm (9-in) | | 10502A |

**Figure 2-11 Equipment Setup**




## 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**
   **AMPLITUDE**, **More**, **Y Axis Units**, **dBm**
   **Source, Amplitude (On)**, –20, **dBm**
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 2-11.
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**, **Center Freq**, 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 2-13 on page 104.
9. Repeat steps 5 through 7 to measure the flatness at each center frequency setting listed in Table 2-13. The ⇑ may be used to tune to center frequencies above 500 MHz.

10. Press **System**, **Alignments**, **Auto Align**, **On**.

**Table 2-13 Tracking Generator Level Flatness Worksheet**

| Center Frequency | Level Flatness (dB) |
|---|---|
| 100 kHz | |
| 5 MHz | |
| 40 MHz | |
| 50 MHz | 0 (Ref) |
| 80 MHz | |
| 500 MHz | |
| 1000 MHz | |
| 1500 MHz | |
| 2000 MHz | |
| 2300 MHz | |
| 2500 MHz | |
| 2700 MHz | |
| 3.0 GHz | |

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