Installation Guide

Agilent Technologies
ESG Vector Signal Generator

This guide applies to signal generator models and associated serial number prefixes listed below. Depending on your firmware revision, signal generator operation may vary from descriptions in this guide.

E4438C: US4146

Part Number: E4400-90502

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Notice

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1 Safety Information

Warnings, Cautions, and Notes

The following safety notations are used throughout this manual. Familiarize yourself with each notation and its meaning before operating the signal generator.

WARNING	***Warning* denotes a hazard. It calls attention to a condition or situation that could result in personal injury or loss of life. Do not proceed beyond a warning until the indicated conditions or situations are fully understood.**

CAUTION	*Caution* calls attention to a possible condition or situation that could result in the loss of a user's work, damage, or destruction of the signal generator. Do not proceed beyond a caution until the indicated conditions are fully understood.

NOTE	*Note* calls the user's attention to an important point or special information within the text. It provides operational information or additional instructions of which the user should be aware.

Instrument Markings

The following markings are used on the signal generator. Familiarize yourself with each marking and its meaning before operating the signal generator.

The instruction manual symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the manual.

The CE mark is a registered trademark of the European Community. If this symbol is accompanied by a year, it is the year when the design was proven.

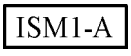
The CSA mark is a registered trademark of the Canadian Standards Association.

The C-Tick Mark is a trademark registered to the Australian Spectrum Management Agency. This indicates compliance with all Australian EMC regulatory information.

This symbol is used to mark the on position of the power line switch.

This symbol is used to mark the standby position of the power line switch.

This symbol indicates that the input power required is ac.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPER 11, Clause 4)

General Safety Considerations

WARNING **Personal injury may result if the signal generator covers are removed. There are no operator serviceable parts inside. To avoid electrical shock, refer servicing to qualified personnel.**

2 Getting Started

Checking the Shipment

1. Inspect the shipping container for damage.

   Signs of damage may include a dented or torn shipping container or cushioning material that indicates signs of unusual stress or compacting.

2. Carefully remove the contents from the shipping container and verify that your order is complete.

   The following items are shipped standard with each signal generator:

   - installation guide
   - documentation CD-ROM

     CD-ROM contents are also available in hard copy format. Refer to "ESG Documentation" on page 14 for more information.

   - service software
   - three-prong ac power cord (specific to geographic location)

3. Verify that any options ordered are included with the shipment by checking the serial number label on the rear of the signal generator and the packing literature included with the shipment.

NOTE The serial number label on the signal generator only verifies hardware/firmware options. The packing literature verifies all items shipped.

Front handles and rack mounting hardware are also available for your signal generator. Refer to "Front Handles and Rack Mount Flanges" on page 14 for more information.

Meeting Electrical and Environmental Requirements

Environment

The signal generator is designed for use in the following environmental conditions:

- indoor use
- altitudes < 15,000 feet (4,572 meters)
- 0 to 55° C temperature, unless otherwise specified
- 80% relative humidity (maximum) for temperatures up to 31° C, decreasing linearly to 50% relative humidity at 40° C

CAUTION This product is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2, per IEC 61010-1 and 664, respectively.

Ventilation

Ventilation holes are located on the rear panel and all four sides of the signal generator cover. Do not allow these holes to be obstructed, as they allow air flow through the signal generator.

When installing the signal generator in a cabinet, the convection into and out of the signal generator must not be restricted. The ambient temperature outside the cabinet must be less than the maximum operating temperature of the signal generator by 4° C for every 100 watts dissipated within the cabinet.

CAUTION Damage to the signal generator may result when the total power dissipated in the cabinet is greater than 800 watts. When this condition exists, forced convection must be applied.

Line Settings

The signal generator has an autoranging line voltage input. The available ac power source must meet the following conditions:

Voltage: 100/115 volts nominal (90-132 volts)

230/240 volts nominal (198-254 volts)

Frequency: for 100/115 volts: 50/60 Hz nominal

for 230/240 volts: 50/60 Hz nominal

Power: 200 watts maximum

CAUTION Damage to the signal generator may result if the supply voltage is not within the specified range.

Connecting the AC Power Cord

This is a Safety Class 1 Product provided with a protective earth ground incorporated into the power cord. The front panel switch is only a standby switch; it is not a line switch. The ac power cord is the disconnecting device that disconnects the signal generator mains circuits from the mains supply. Alternatively, an external switch or circuit breaker, readily identifiable and easily reached by the operator, may also be used as a disconnecting device.

Perform the following steps when connecting the ac power cord:

WARNING **Personal injury may occur if there is any interruption of the protective conductor inside or outside of the signal generator. Intentional interruption is prohibited.**

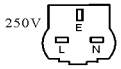
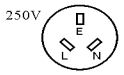
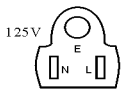
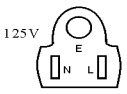
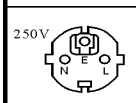
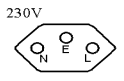
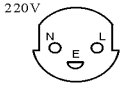
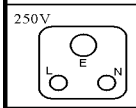
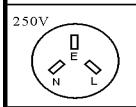
CAUTION Damage to the signal generator may result without adequate earth grounding. Always use the three-prong ac power cord supplied with the signal generator. See, "AC Power Cord Localization" on page 9 for a list of available power cords.

1. Ensure that the power cord is not damaged.
2. Install the signal generator so that one of the following items is readily identifiable and easily reached by the operator: ac power cord, alternative switch, or circuit breaker.
3. Insert the mains plug into a socket outlet provided with a protective earth grounding.

AC Power Cord Localization

The ac power cord included with the signal generator is appropriate for the final shipping destination. However, you can order additional ac power cords for use in different areas.

The following table lists the available ac power cords, illustrates plug configurations, and identifies the geographic area in which each cord is appropriate.

Plug Type [a]	Cable Part Number	Plug [b] Description	Length cm (in.)	Cable Color	For Use in Country
	8120-1351 8120-1703	Straight BS 1363A 90°	229 (90) 229 (90)	Mint Gray Mint Gray	Option 900 United Kingdom, Hong Kong, Cyprus, Nigeria, Singapore, Zimbabwe
	8120-1369 8120-0696	Straight AS 3112 90°	210 (79) 200 (78)	Gray Gray	Option 901 Argentina, Australia, New Zealand, Mainland China
	8120-1378 8120-1521	Straight NEMA 5-15P 90°	203 (80) 203 (80)	Jade Gray Jade Gray	Option 903 United States, Canada, Brazil, Colombia, Mexico,Philippines, Saudi Arabia, Taiwan
	8120-4753 8120-4754	Straight NEMA 5-15P 90°	229 (90) 229 (90)	Gray Gray	Option 918 Japan
	8120-1689 8120-1692	Straight CEE 7/VII 90°	200 (78) 200 (78)	Mint Gray Mint Gray	Option 902 Continental Europe, Central African Republic, United Arab Republic
	8120-2104 8120-2296	Straight SEV Type 12 90°	200 (78) 200 (78)	Gray Gray	Option 906 Switzerland
	8120-2956 8120-2957	Straight SR 107-2-D 90°	200 (78) 200 (78)	Gray Gray	Option 912 Denmark
	8120-4211 8120-4600	Straight IEC 83-B1 90°	200 (78) 200 (78)	Mint Gray Mint Gray	Option 917 South Africa, India
	8120-5182 8120-5181	Straight SI 32 90°	200 (78) 200 (78)	Jade Gray Jade Gray	Option 919 Israel

a. E =earth ground, L = line, and N = neutral.
b. Plug identifier numbers describe the plug only. The part number is for the complete cable assembly.

plugs

Configuring Global Settings

Adjusting the Display

You can adjust the LCD display using features such as contrast, brightness, screen saver mode, and the screen saver delay. You can also toggle features such as inverse video, display updating in remote mode, and the screen saver on or off.

Contrast and Brightness

Press [◑⇩] to decrease the display contrast.

Pressing the decrease contrast hardkey and holding it down causes the display background to gradually darken in comparison to the text on the display. The minimum contrast setting is not a completely black display. Some contrast between the background and the text will still be visible.

Press [◑⇧] to increase the display contrast

Pressing the increase contrast hardkey and holding it down causes the display background to gradually brighten in comparison to the text on the display. If the background does not appear to change, it is probably set to the maximum contrast.

Press **Utility** > **Display** > **Brightness**.

This allows for adjustment of the display's brightness.

Use the arrow keys, numeric keypad, or front panel knob to adjust the display brightness. The brightness value is set to 50 (maximum brightness) at the factory. The minimum brightness value is 1.

Inverse Video

Press **Utility** > **Display** > **Inverse Video Off On**.

This toggles between inverse video mode and normal display mode.

The normal display mode for the signal generator is dark text on a light background. Inverse video mode is light text on a dark background. Inverse video is a persistent state; it is not affected by a signal generator preset or power cycle.

Screen Saver

Press **Utility** > **Display** > **Screen Saver Off On**.

This toggles the operating mode of the screen saver.

Extend the life expectancy of the signal generator's display light by activating the screen saver. Leaving the display lit for long periods of time or turning the display on and off frequently decreases the life of the bulb. With the screen saver on, the display light is turned off after a defined period of time with no input to the front panel. The display light turns on again when any front panel key is pressed or when a remote command is sent. The screen saver is set to off at the factory.

Press **Utility** > **Display** > **Screen Saver Mode**.

This toggles the screen saver mode between light-only mode and light-and-text mode.

Adjust the screen saver mode to turn the light on, off, or to turn both the light and text on and off. Setting the mode to light-only mode turns the display light off, leaving the text visible at a low intensity. If the display remains unchanged for long periods of time, set the mode to light and text to prevent the text from burning the display. This mode turns the display light and the text off.

Press **Utility** > **Display** > **Screen Saver Delay:**.

This adjusts the amount of elapsed time before the screen saver is activated.

The screen saver delay is set to 1 hour at the factory. The current screen saver delay is displayed in the softkey label in addition to the active entry area. To change the delay, enter a new value using the numeric keypad or by rotating the front panel knob and then press **Enter**. The acceptable range of the delay value is 1 through 12 hours (1 hour increments).

The screen saver settings are persistent states; they are not affected by a signal generator preset or power cycle.

Updating the Display During Remote Operation

Press **Utility** > **Display** > **Update in Remote Off On**.

This toggles the display-update-in-remote mode on or off.

When toggled on, commands executed via the remote control bus will update the signal generator display accordingly. When toggled off, commands executed via the remote control bus will not update the signal generator's display. Update-in-remote mode is set to off at the factory.

Configuring for Remote Control

GPIB Interface Configuration

1. Press **Utility** > **GPIB/RS-232 LAN** > **GPIB Address**.
2. Use the numeric keypad to set the desired address.

   Alternatively, use the arrow keys or the front panel knob to set the desired address. If either alternative is used, step 3 is not required.
3. Press **Enter**.

The signal generator's GPIB address is set to 19 at the factory. The acceptable range of addresses is 0 through 30.

The GPIB address is a persistent state; it is not affected by a signal generator preset or by a power cycle.

LAN Interface Configuration

1. Press **Utility** > **GPIB/RS-232 LAN** > **LAN Setup**.
2. Press **Hostname**.
3. Use the labeled text softkeys and/or numeric keypad to enter the desired hostname.

   To completely delete the current hostname, press **Editing Keys** > **Clear Text**.
4. Press **Enter**.
5. Press **IP Address** and enter a desired address.

   Use the left and right arrow keys to move the cursor. Use the up and down arrow keys, front panel knob, or numeric keypad to enter an IP address. To completely delete the current address, press the **Clear Text** softkey.

NOTE To remotely access the signal generator from a different LAN subnet, you must also enter the subnet mask and default gateway. See your system administrator to obtain the appropriate values.

6. Press **Enter** > **Proceed With Reconfiguration** > **Confirm Change (Instrument will Reboot)**.

   The signal generator will reboot with the revised settings saved.

This assigns a hostname and IP address to the signal generator. The hostname and IP address are persistent states; they are not affected by an instrument preset or a power cycle.

RS-232 Interface Configuration

1. Press **Utility** > **GPIB/RS-232 LAN** > **RS-232 Setup**.
2. Press **RS-232 Baud Rate**.
3. Press the desired baud rate softkey.
4. Press **RS-232 Echo Off On**.

   This toggles the state of the SCPI echoing on the RS-232 connection. Set as desired.

5. Press **Reset RS-232**.

   This deletes the data from the RS-232 buffer, discarding any unprocessed SCPI input received over RS-232.

The RS-232 parameters are persistent states; these states are not affected by an instrument preset or power cycle.

Ordering Accessories

The following accessories are available for order when a signal generator is purchased, or at any time afterward. To order accessories, refer to "Contacting Agilent Technologies" on page 17.

Front Handles and Rack Mount Flanges

Handles can be purchased and attached to the front of the signal generator. These handles can also be purchased with a rack mount kit to facilitate rack installation. Hardware can be ordered as a kit to support either preference. Table 2-1 lists the part numbers for these kits.

Table 2-1 Front Handle and Rack Mount Flange Kits

Description	Part Number
Front Handle Kit	5063-9227
Rack Mount Kit with Handles	5063-9221

ESG Documentation

Table 2-2 lists the part numbers and descriptions for documentation available in hardcopy and CD-ROM format.

Table 2-2 Available ESG Documentation

Document Type	Description	Part Number
ESG Document Set	• set includes all items listed in this table, with the exception of the installation guide, the service guide, and documentation/Intuilink CD-ROM set	E4400-90500
Documentation/Intuilink CD-ROM Set	• PDF files of the ESG documentation set, *Installation Guide* and *Service Guide* • programming examples • Intuilink software	E4400-90501
Installation Guide	• installation instructions and requirements • operation verification procedure • safety, and regulatory information	E4400-90502
Data Sheet	• available options • warranted technical specifications and typical performance	5988-4039EN

Table 2-2 Available ESG Documentation

Document Type	Description	Part Number
User's Guide	• description of features and functions • signal generator operation tutorials • troubleshooting and optimization procedures • component test procedures and concept information • receiver test procedures and concept information	E4400-90503
Key and Data Field Reference - Volume 1	• key and data field descriptions • softkey menu maps	E4400-90504
Key and Data Field Reference - Volume 2	• key and data field descriptions *continued* • softkey menu maps	E4400-90515
Programming Guide	• remote operation and data transfer procedures • programming examples	E4400-90505
Programming Compatibility Guide	• supported SCPI commands for backwards compatibility	E4400-90543
SCPI Command Reference - Volume 1	• SCPI command descriptions	E4400-90506
SCPI Command Reference - Volume 2	• SCPI command descriptions *continued*	E4400-90535
Error Messages	• error message definitions	E4400-90507
Feature Releases	• description and dates of firmware releases • description of hardware changes	E4400-90508
Calibration Guide	• performance tests and adjustment procedures	E4400-90509
Service Guide	• assembly-level documentation • troubleshooting procedures • parts information	E4400-90511

Proper Usage and Cleaning

The signal generator cover protects against physical contact with internal assemblies that contain hazardous voltages, but does not protect against the entrance of water. To avoid damage and personal injury, ensure that liquid substances are positioned away from your signal generator.

WARNING **Personal injury may result if the signal generator is not used as specified. Unspecified use impairs the protection provided by the equipment. The signal generator must be used with all means for protection intact.**

Cleaning Suggestions

To ensure good connections, the connectors on the front and rear panels of the signal generator need to be cleaned regularly.

To prevent dust build-up that could potentially obstruct ventilation, clean the signal generator cover periodically. Use a dry cloth, or one slightly dampened with water, to clean the external case parts.

WARNING **Electrical shock may result if the signal generator is not disconnected from the mains supply before cleaning. Do not attempt to clean internally.**

Contacting Agilent Technologies

Contact information specific to your geographic location can be accessed on the internet at http://www.agilent.com/find/assist.

For the latest product and support information, application literature, and more, visit the ESG website at http://www.agilent.com/find/esg.

If you do not have access to the internet, refer to the information below to contact your nearest Agilent Technologies representative.

Table 2-3 Contacting Agilent

United States (tel) 1 800 452 4844	**Latin America** (tel) (305) 269 7500 (fax) (305) 269 7599	**Canada** (tel) 1 877 894 4414 (fax) (905) 282-6495	**Europe** (tel) (+31) 20 547 2323 (fax) (+31) 20 547 2390
New Zealand (tel) 0 800 738 378 (fax) (+64) 4 495 8950	**Japan** (tel) (+81) 426 56 7832 (fax) (+81) 426 56 7840	**Australia** (tel) 1 800 629 485 (fax) (+61) 3 9210 5947	

Asia Call Center Numbers		
Country	**Phone Number**	**Fax Number**
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

Returning a Signal Generator to Agilent Technologies

To return your signal generator to Agilent Technologies for servicing, follow these steps:

1. Gather as much information as possible regarding the signal generator's problem.
2. Call the phone number listed on the internet (http://www.agilent.com/find/assist) that is specific to your geographic location. If you do not have access to the internet, refer to the phone numbers listed in Table 2-3.

   After sharing information regarding the signal generator and its condition, you will receive information regarding where to ship your signal generator for repair.
3. Ship the signal generator in the original factory packaging materials, if available, or use similar packaging to properly protect the signal generator.

3 Operation Verification

Operation Verification

Operation verification is a series of tests that, when completed, will either ensure that the signal generator is operating correctly, or will assist in pointing to the problem area. Operation verification does not ensure performance to specifications, but should provide a level of confidence that the signal generator is operating correctly within a minimum amount of time.

Operation verification is appropriate for incoming inspection, after repair (when a full calibrated performance is not required), or whenever the integrity of the signal generator is in question.

Perform the following tests in the order they are presented. The tables referenced by the tests are located in the rear of the chapter, where they can be copied easily.

1. Power On the Signal Generator on page 21
2. Check for Error Messages on page 22
3. Frequency Range and Accuracy Check on page 23
4. Power Level Accuracy Check on page 25
5. FM Accuracy Check on page 29
6. AM Accuracy Check on page 31
7. I/Q Modulation Check on page 33

Required Equipment

- Agilent 53132A Option 050 Frequency Counter
- Agilent E4418B or E4419B Power Meter
- Agilent E9304A Power Sensor
- Agilent 8563E Spectrum Analyzer
- Agilent 8491A/B Option 006 Attenuator (6 dB)
- Agilent 8491A/B Option 010 Attenuator (10 dB)
- Agilent 8902A Measuring Receiver

Power On the Signal Generator

This procedure verifies that the signal generator powers up and that the internal instrument check identifies no errors. The internal check evaluates operation and, if a problem is detected, returns an error message.

1. Power on the signal generator by pressing the front panel power switch. The green LED will light once power is activated. Let the signal generator warm up for one hour.

NOTE For ESG signal generators with Option UNJ, or those with Option 1E5, `ERROR 514, Reference Oven Cold` occurs whenever the signal generator is first connected to ac line power. The `OVEN COLD` annunciator and the `ERR` annunciator both turn on. The `OVEN COLD` annunciator automatically clears after approximately 5 minutes. The error queue cannot be cleared, however, until the `OVEN COLD` annunciator has turned off.

2. Cycle the power to the signal generator. The green LED should again be lit and the signal generator will perform a check.

Check for Error Messages

1. Check the display to see if the ERR annunciator is turned on.
2. If the ERR annunciator is turned on, review the error messages in the queue by pressing **Utility** > **Error Info**. The first error message in the queue will be shown in the text area of the display.

   Refer to the "Error Messages" guide for further information about specific error messages.

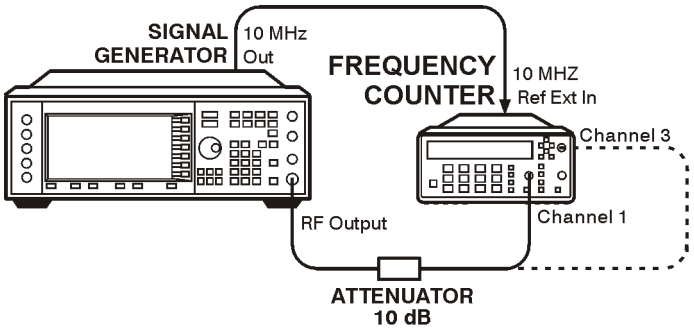
   If there is more than one error message (each message will be designated as 1 of *n*), press the **View Next Error Message** softkey until you have seen all of the messages.
3. When you have resolved all of the error messages, press **Clear Error Queue(s)** to delete the messages.
4. Cycle the power on the signal generator and then restart this procedure until the signal generator powers on without displaying the ERR annunciator.

Frequency Range and Accuracy Check

The frequency range is tested by determining the frequency accuracy relative to the timebase at the frequency limits of the signal generator.

Connect the Test Equipment

Figure 3-1 Frequency Range and Accuracy Equipment Setup



Configure the Signal Generator

1. Press **Preset**.
2. Press **Mod On/Off**. The MOD OFF annunciator is now displayed.
3. Press **Amplitude**. Enter 0 using the numeric keypad and press the **dBm** terminator softkey.
4. Press **RF On/Off**. The RF ON annunciator is now displayed.

Configure the Frequency Counter

1. For frequencies < 150 MHz, use Channel 3. Press **Freq Ratio** until CH3: is displayed.

   The input attenuation of this channel is a persistent 50Ω.

NOTE Set the gate time to > 5 seconds for maximum counter accuracy. Press **Gate & ExtArm** twice and use the arrow keys to set value.

Verify that the counter is phase-locked to the 10 MHz external reference.

Measure the Frequency Accuracy

1. Set the signal generator to each frequency listed in Table 3-1, “Frequency Accuracy,” on page 34.
2. Record the measured frequency in Table 3-1 and compare it to the corresponding limits.

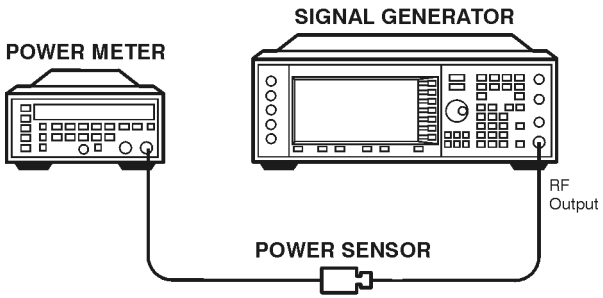
Power Level Accuracy Check

Performing this check will provide a high level of confidence that the signal generator's power level circuitry is functioning correctly. This check does not test the signal generator to warranted specifications. Test points have been reduced and the limits are degraded in order to minimize measurement time and take into account a broad range of measurement uncertainties.

In order to have the signal generator tested to warranted specifications, a complete power level accuracy performance test is required. If the complete performance test is needed and you are unable to perform it, contact your nearest Agilent Technologies service center for information concerning calibration. Refer to "Contacting Agilent Technologies" on page 17 for contact information.

Connect the Test Equipment for Setup 1

Figure 3-2 Power Level Accuracy Equipment Setup 1



Configure the Signal Generator

1. Press **Preset**.
2. Press **Frequency**. Enter 277 using the numeric keypad and press the **kHz** terminator softkey.
3. Press **Amplitude**. Enter 13 using the numeric keypad and press the **dBm** terminator softkey.
4. Press **Mod On/Off**. The MOD OFF annunciator is displayed.
5. Press **RF On/Off**. The RF ON annunciator is displayed.

Configure the Power Meter

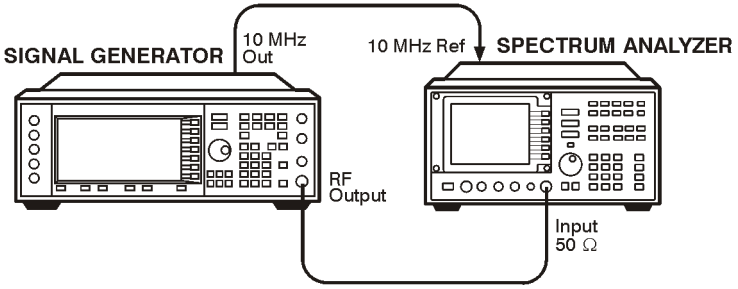
1. Zero and calibrate the power meter to the sensor's reference calibration factor.
2. Set the power meter to measure absolute log power (dBm).

Measure the Power Level Accuracy

1. Set the power levels and frequencies for the signal generator to the maximum signal generator frequency. Refer to Table 3-2, "Power Level Accuracy Setup 1," on page 35.
2. Set the power sensor's calibration factor for each frequency.
3. Record the measured power level in Table 3-2 and compare it to the corresponding limits.

Connect the Test Equipment for Setup 2

Figure 3-3 Power Level Accuracy Equipment Setup 2



Configure the Signal Generator

1. Press **Frequency**. Enter 277 using the numeric keypad and press the **kHz** terminator softkey.
2. Press **Amplitude**. Enter –15 using the numeric keypad and press the **dBm** terminator softkey.

Configure the Spectrum Analyzer

1. Preset the spectrum analyzer.
2. Set the analyzer to external 10 MHz reference.
3. Set the center frequency to 277 kHz.
4. Set the frequency span to 100 Hz. (This will result in a 1 Hz resolution bandwidth with a digital filter.)

Measure the Power Level Accuracy

1. Connect the signal generator's RF OUTPUT through the 6 dB attenuator to the spectrum analyzer's RF input.
2. Transfer the power level results for each frequency at –15 dBm from the Measured Power column in Table 3-2 to the Power Meter Reading for –15 dBm column in Table 3-3.
3. On the spectrum analyzer, select **Marker Normal Mode** and then select the **Peak Search** function. This activates the marker and sets it to the signal peak.
4. On the spectrum analyzer, ensure that the marker is at the signal peak and use the **MKR->** menu to set the marker to the reference level. If necessary, select **Peak Search** to ensure that the marker is at the signal peak.
5. With the marker at signal peak, select the **Marker Delta** function. This will set the marker to measure relative amplitude from a reference of 0 dB. If the marker does not read 0 dB, press **Marker Normal** > **Peak Search** > **Marker Delta** until the marker reads 0 dB.
6. Decrease the signal generator amplitude in 10 dB steps as indicated in Table 3-3. With each 10 dB step, select **Peak Search** to ensure that the marker is at the signal peak.
7. Measure the power levels listed in the Power Level Setting (dBm) column of Table 3-3 for the current frequency, and record the values in the Spectrum Analyzer Marker (dB) column.
8. Return the spectrum analyzer reference level and the signal generator amplitude to –15 dBm. Set the signal generator frequency and the spectrum analyzer's center frequency to the next frequency listed in Table 3-3 and repeat the process from step 3.

   Continue steps 3–8 until all of the frequencies have been measured and recorded (to the maximum signal generator frequency).

Calculate the Actual Power Level

1. Calculate and record the Actual Power Level, in Table 3-3, as the sum of the Power Meter Reading for –15 dBm and the Spectrum Analyzer Marker (dB) value.

   For example:

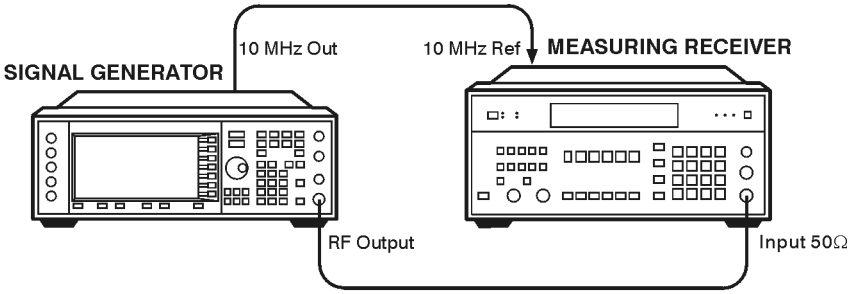
   - Power Meter Reading for –15 dBm at 2.516 MHz = –14.95 dBm
   - Spectrum Analyzer Marker (dB) at 2.516 MHz and Power Level Setting at –85 dBm = –70.17 dB
   - Actual Power Level at 2.516 MHz and –85 dBm: (–14.95) + (–70.17) = –85.12 dBm

2. Compare the calculated Actual Power Level value to the corresponding limits.

FM Accuracy Check

Connect the Test Equipment

Figure 3-4 FM Accuracy Equipment Setup



jk74c

Configure the Signal Generator

1. Press **Preset**.
2. Press **FM/ΦM** > **FM Off On**. The FM annunciator is displayed.
3. Press **FM Rate**. Enter 1 using the numeric keypad and press the **kHz** terminator softkey.
4. Press **FM Dev.** Enter 100 using the numeric keypad and press the **kHz** terminator softkey.
5. Press **Amplitude.** Enter 7 using the numeric keypad and press the **dBm** terminator softkey.
6. Ensure that the MOD ON annunciator is displayed. If it is not, press **Mod On/Off**.
7. Press **RF On/Off**. The RF ON annunciator is displayed.

Configure the Measuring Receiver

1. Reset the measuring receiver.
2. Set the measuring receiver to FM mode.
3. Turn on Peak+ detector.
4. Turn on the 300 Hz high-pass filter.
5. Turn on the 3 kHz low-pass filter.

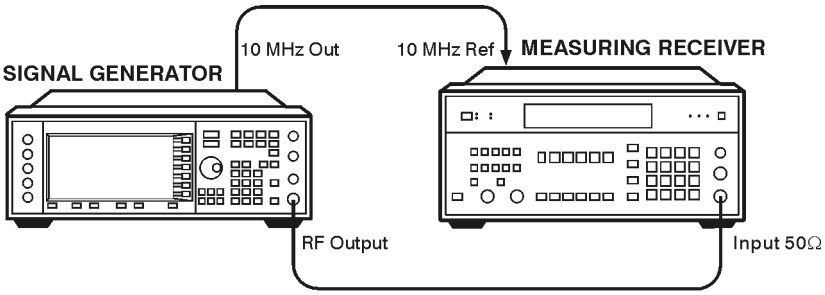
Measure the Deviations

1. Set the signal generator to the frequencies listed in Table 3-4, “FM Accuracy,” on page 44.
2. Record the deviations measured and compare them to the limits listed in Table 3-4.

AM Accuracy Check

Connect the Test Equipment

Figure 3-5 AM Accuracy Equipment Setup



jk75c

Configure the Signal Generator

1. Press **Preset**.
2. Press **AM** > **AM Off On**. The AM annunciator is displayed.
3. Press **AM Rate.** Enter 1 using the numeric keypad and press the **kHz** terminator softkey.
4. Press **Amplitude.** Enter 7 using the numeric keypad and press the **dBm** terminator softkey.
5. Ensure that the MOD ON annunciator is displayed. If it is not, press **Mod On/Off**.
6. Press **RF On/Off**. The RF ON annunciator is displayed.

Configure the Measuring Receiver

1. Reset the measuring receiver.
2. Set the measuring receiver to AM mode.
3. Turn on Peak+ detector.
4. Turn on the 300 Hz high-pass filter.
5. Turn on the 3 kHz low-pass filter.

Measure the Deviations

1. Set the signal generator to the frequencies and depths listed in Table 3-5, “AM Accuracy,” on page 44.
2. Record the AM depths measured and compare them to the limits listed in Table 3-5.

I/Q Modulation Check

1. Press **Preset**.
2. Press **I/Q** > **I/Q Calibration > Calibration Type User Full** until Full is highlighted.
3. Press **Execute Cal** to begin an I/Q calibration of the full frequency range of the signal generator. The message `I/Q Calibration in Progress` is displayed until the calibration is complete.

   To abort the I/Q calibration, press **Abort Cal**. The message `I/Q Calibration in Progress Aborting...` is displayed until the calibration is stopped completely.

NOTE The I/Q calibration is stored in non-volatile memory and remains unchanged during a preset or the power cycle of the signal generator.

Test Tables

Table 3-1 Frequency Accuracy

Frequency (MHz)	Limits		
	Lower (Hz)	Measured (Hz)	Upper (Hz)
0.25	249 999.		250 001.
0.5	499 999.		500 001.
1	999 999.		1 000 001.
10	9 999 999.		10 000 001.
50	49 999 999.		50 000 001.
100	99 999 999.		100 000 001.
500	499 999 999.		500 000 001.
1000	999 999 999.		1 000 000 001.
2000	1 999 999 999.		2 000 000 001.
3000	2 999 999 999.		3 000 000 001.
4000	3 999 999 999.		4 000 000 001.
5000	4 999 999 999.		5 000 000 001.

Table 3-2 Power Level Accuracy Setup 1

Frequency Setting	Power Level Setting (dBm)	Lower Limit (dBm)	Measured Power (dBm)	Upper Limit (dBm)
277 kHz	+13	12.1		13.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5
	–15	–15.5		–14.5
	–25	–25.5		–24.5
	–35	–35.5		–34.5
	–45	–45.5		–44.5
2.516 MHz	+13	12.1		13.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5
	–15	–15.5		–14.5
	–25	–25.5		–24.5
	–35	–35.5		–34.5
	–45	–45.5		–44.5
270.1 MHz	+13	12.1		13.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5
	–15	–15.5		–14.5
	–25	–25.5		–24.5

Table 3-2 Power Level Accuracy Setup 1

Frequency Setting	Power Level Setting (dBm)	Lower Limit (dBm)	Measured Power (dBm)	Upper Limit (dBm)
	–35	–35.5		–34.5
	–45	–45.5		–44.5
510.1 MHz	+13	12.1		13.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5
	–15	–15.5		–14.5
	–25	–25.5		–24.5
	–35	–35.5		–34.5
	–45	–45.5		–44.5
990.1 MHz	+13	12.1		13.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5
	–15	–15.5		–14.5
	–25	–25.5		–24.5
	–35	–35.5		–34.5
	–45	–45.5		–44.5
1350.1 MHz	+10	9.1		10.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5

Table 3-2 Power Level Accuracy Setup 1

Frequency Setting	Power Level Setting (dBm)	Lower Limit (dBm)	Measured Power (dBm)	Upper Limit (dBm)
	–15	–15.5		–14.5
	–25	–25.5		–24.5
	–35	–35.5		–34.5
	–45	–45.5		–44.5
1950.1 MHz	+10	9.1		10.9
	+7	6.5		7.5
	0	–0.5		0.5
	–5	–5.5		–4.5
	–15	–15.5		–14.5
	–25	–25.5		–24.5
	–35	–35.5		–34.5
	–45	–45.5		–44.5
2310.1 MHz	+10	8.8		11.2
	+7	6.0		8.0
	0	–1.0		1.0
	–5	–6.0		–4.0
	–15	–16.0		–14.0
	–25	–26.0		–24.0
	–35	–36.0		–34.0
	–45	–46.0		–44.0
2985.1 MHz	+10	8.8		11.2
	+7	6.0		8.0

Table 3-2 Power Level Accuracy Setup 1

Frequency Setting	Power Level Setting (dBm)	Lower Limit (dBm)	Measured Power (dBm)	Upper Limit (dBm)
	0	–1.0		1.0
	–5	–6.0		–4.0
	–15	–16.0		–14.0
	–25	–26.0		–24.0
	–35	–36.0		–34.0
	–45	–46.0		–44.0
3225.1 MHz	+7	6.0		8.0
	0	–1.0		1.0
	–5	–6.0		–4.0
	–15	–16.0		–14.0
	–25	–26.0		–24.0
	–35	–36.0		–34.0
	–45	–46.0		–44.0
4000 MHz	+7	5.8		8.2
	0	–1.2		1.2
	–5	–6.2		–3.8
	–15	–16.2		–13.8
	–25	–26.2		–23.8
	–35	–36.2		–33.8
	–45	–46.2		–43.8

Table 3-2 Power Level Accuracy Setup 1

Frequency Setting	Power Level Setting (dBm)	Lower Limit (dBm)	Measured Power (dBm)	Upper Limit (dBm)
Option 506				
5000 MHz	+7	5.8		8.2
	0	–1.2		1.2
	–5	–6.2		–3.8
	–15	–16.2		–13.8
	–25	–26.2		–23.8
	–35	–36.2		–33.8
	–45	–46.2		–43.8
6000 MHz	+7	5.8		8.2
	0	–1.2		1.2
	–5	–6.2		–3.8
	–15	–16.2		–13.8
	–25	–26.2		–23.8
	–35	–36.2		–33.8
	–45	–46.2		–43.8

Table 3-3 Power Level Accuracy Setup 2

Frequency Setting	Power Level Setting (dBm)	Power Meter Reading for –15 dBm	Spectrum Analyzer Marker (dB)	Lower Limit (dBm)	Actual Power Level (dBm)	Upper Limit (dBm)
277 kHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84
2.516 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84
270.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84
510.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84

Table 3-3 Power Level Accuracy Setup 2

Frequency Setting	Power Level Setting (dBm)	Power Meter Reading for –15 dBm	Spectrum Analyzer Marker (dB)	Lower Limit (dBm)	Actual Power Level (dBm)	Upper Limit (dBm)
990.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84
1350.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84
1950.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56		–54
	–65			–66		–64
	–75			–76		–74
	–85			–86		–84
2310.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56.2		–53.8
	–65			–66.2		–63.8
	–75			–76.2		–73.8
	–85			–86.2		–83.8

Table 3-3 Power Level Accuracy Setup 2

Frequency Setting	Power Level Setting (dBm)	Power Meter Reading for –15 dBm	Spectrum Analyzer Marker (dB)	Lower Limit (dBm)	Actual Power Level (dBm)	Upper Limit (dBm)
2985.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56.2		–53.8
	–65			–66.2		–63.8
	–75			–76.2		–73.8
	–85			–86.2		–83.8
3225.1 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56.2		–53.8
	–65			–66.2		–63.8
	–75			–76.2		–73.8
	–85			–86.2		–83.8
4000 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56.2		–53.8
	–65			–66.2		–63.8
	–75			–76.2		–73.8
	–85			–86.2		–83.8
Option 506						
5000 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56.5		–53.5
	–65			–66.5		–63.5
	–75			–76.5		–73.5

Table 3-3 Power Level Accuracy Setup 2

Frequency Setting	Power Level Setting (dBm)	Power Meter Reading for –15 dBm	Spectrum Analyzer Marker (dB)	Lower Limit (dBm)	Actual Power Level (dBm)	Upper Limit (dBm)
	–85			–86.5		–83.5
6000 MHz	–45		0 (Ref)	N/A	N/A	N/A
	–55			–56.5		–53.5
	–65			–66.5		–63.5
	–75			–76.5		–73.5
	–85			–86.5		–83.5

Table 3-4 FM Accuracy

Frequency (MHz)	Deviation (kHz)	Limits (kHz)		
		Lower	Measured	Upper
500.001	100 kHz	96.48		103.52
750	100 kHz	96.48		103.52
1000	100 kHz	96.48		103.52

Table 3-5 AM Accuracy

Frequency (MHz)	Depth (%)	Limits (%)		
		Lower	Measured	Upper
200	30	27.5		32.5
200	90	84.5		95.5
300	30	27.5		32.5
300	90	84.5		95.5
501	30	27.5		32.5
501	90	84.5		95.5
750	30	27.5		32.5
750	90	84.5		95.5
1000	30	27.5		32.5
1000	90	84.5		95.5

4 Regulatory Information

Statement of Compliance

This product has been designed and tested in accordance with IEC Publication 61010, *Safety Requirements for Electronic Measuring Apparatus*, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products. For any assistance, contact Agilent Technologies. (Refer to “Contacting Agilent Technologies” on page 17.)

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name:	Agilent Technologies, Inc.
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA

Declares that the products

Product Name:	ESG Vector Signal Generator
Model Number:	E4438C
Product Options:	This declaration covers all options of the above products.

Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.

Santa Rosa, CA, USA 6 December, 2001

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

Rev. A

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrerordnung -3.GSGV Deutschland).

Table 4-1 German Noise Requirements

Acoustic Noise Emission/Geraeuschemission	
LpA < 70 dB	LpA < 70 dB
Operator position	am Arbeitsplatz
Normal position	normaler Betrieb
per ISO 7779	nach DIN 45635 t.19

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