

Agilent Technologies
E444xA Option HN8
User's and Service Guide

Agilent Technologies E444xA Option HN8

User's and Service Guide

Use this manual with the following documents:

PSA Series Spectrum Analyzers User's and Programmer's Reference Guide

PSA Spectrum Analyzers Specifications Guide



Agilent Technologies

Manufacturing Part Number: E4440-90547

Printed in USA

December 2004

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice demotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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Contents

1 Overview

Description

The Agilent Technologies PSA with Option HN8 provides a wide bandwidth IF output signal to the rear panel for RF input signals above 3.050 GHz and less than 26.5 GHz¹. The center frequency is 321.4 MHz with a bandwidth of at least 250 MHz.

Option HN8 may be used to provide wideband unpreselected IF signals to external digitizing hardware that is supported by the Agilent 89601A Vector Signal Analyzer software, such as the Agilent Infinium series oscilloscopes. This capability provides a convenient RF down converter for use in wideband vector signal analysis.

The wideband IF performance of Option HN8 is provided by replacing the PSA's normal front-end mixer with an unpreselected mixer. The new mixer can be switched in and out of the RF path so that the PSA can be returned to normal operation and achieve its published (non Option HN8) specifications. Use of this mixer will result in no front end preselection, therefore, mixer responses at unintentional local oscillator harmonics and for undesired mixer image signals will be present in the IF output signal. The user will need to filter out the undesirable mixer responses through the use of input signal filtering.

The wideband IF output of Option HN8 is provided on the same IF output connector as that used by the standard PSA 321.4 MHz IF output. This connector is located on the PSA's rear panel and is an SMA female connector.

The RF to IF conversion gain of Option HN8 is described in [Table 3-1, "PSA Option HN8 Characteristics,"](#) on page 14. The user should be cautioned that the input signal at the RF input in excess of -10 dBm with 0 dB input attenuation may result in IF gain compression.

1. The upper frequency limit is model number dependent.

The wideband mode can only be invoked after the PSA has been placed in zero-span mode. In addition, it is recommended that single sweep mode be selected. Option HN8 can only be invoked for PSA center frequencies between 3.0 GHz and 26.5 GHz¹.

CAUTION

Prior to invoking the Option HN8, the user should ensure the Auto Align routine on the PSA is turned off. Failure to turn off the Auto Align routine will result in several calibration error messages to occur, and the cal files will be corrupted.

To remove the calibration errors, switch the PSA back to the PRESelected mode and select:

[System] > Alignment > Align All Now.

Once the Auto Alignment routine is finished, disable the Auto Align routine before returning to UNPReselect mode.

Cycle power on the PSA instrument if the GPIB interface does not satisfy the instrument reset.

1. The upper frequency limit is model number dependent.

Overview
Description

2 **User Interface**

GPIB Control

Option HN8 provides a Standard Commands for Programmable Instruments (SCPI) compliant command set as described in the *PSA Series Spectrum Analyzers User's and Programmer's Reference Guide*, to change the PSA's mode from the normal mode to the wideband mode (UNPReselect). This mode change can only be invoked when the PSA is in the zero-span mode. Once in wideband mode, the PSA's center frequency, reference level, and input attenuator may be programmed as desired, within normal limits of the PSA.

Option HN8 is controllable using SPCI commands via GPIB or LAN interfaces. No front panel user keys are provided to control mode changes from normal to wideband modes. Use the following commands to control Option HN8.

Command Interface for E4440A, E4443A, and E4445A

Command Interface with FW Rev. A.04.07

To turn on the UNPReselect mode type:¹

INPut: MIXer: TYPE UNPReselect, x (where $x = 0,1,2,3,4$)

To turn off the UNPReselect mode type:¹

INPut: MIXer: TYPE PRESelected, x (where $x = 0,1,2,3,4$)

To run a query, type: **INput : MIXer : TYPE?**

Command Interface Example with FW Rev. Greater than A.04.07

To turn on the UNPReselect mode type:¹

[:SENSe]:POWer[:RF]:PRESelector UNPReselect, x (where $x = 0,1,2,3,4$)

To turn off the UNPReselect mode type:¹

[:SENSe]:POWer[:RF]:PRESelector PRESelected, x (where $x = 0,1,2,3,4$)

To run a query, type: **[:SENSe]:POWer[:RF]:PRESelector?**

1. When this command is entered via the GPIB, the front panel display will show the following message in the lower portion of the LCD window. This is not an error. This message is only cleared with a power cycle of the instrument.

Diagnostic override of Firmware Control, :DIAGnostic:LATCh

NOTE While operating the Option HN8 in UNPReselect mode, the PSA only functions as a downconverter.

NOTE Prior to using the Option HN8 in the UNPReselect mode, turn off the Auto Align routine on the PSA by selecting the front panel keys,
[System] > Alignments > Auto Align > OFF
or use the GPIB interface **:CALibration:AUTO OFF** to turn off the Auto Align routine.

CAUTION If the Auto Align routine on the PSA is not turned off while using the Option HN8, several error messages related to calibration will occur, and the cal files will be corrupted. To remove the calibration errors, switch the PSA back to the PRESelected mode and select:
[System] > Alignment > Align All Now
Once the Auto Alignment routine is finished, disable the Auto Align routine before returning to UNPReselect mode. Cycle power on the PSA instrument if the GPIB interface does not satisfy the instrument reset.

NOTE While in UNPReselect mode, amplitude measurement information will not be present on the front panel LCD and via GPIB command either, because the option HN8 signal path does not continue through the normal spectrum analyzer signal path.

The following is a simple example of how the Option HN8 may be set up to run, as well as verify the performance:

The frequency of interest occurs at 12.7 GHz, which corresponds to Band 2 ($\chi=2$).

The following sequence of commands sets up the PSA to operate in the UNPReselect Mode (assuming firmware is greater than A.04.07.) Refer to the User's and Programmer's Reference for further study.

```
:CALibration:AUTO OFF  
[:SENSe]:FREQuency:CENTer 12.7 GHZ  
[:SENSe]:FREQuency:SPAN 0 HZ  
:INITiate:CONTinuous OFF  
[:SENSe]:POWer[:RF]:PRESelector: UNPReselect,2  
:INITiate[:IMMEDIATE]
```

The instrument is now in the UNPReselect mode with a center frequency of 12.7 GHz, with an IF output of 321.4 MHz.

To return to normal operation, enter the following commands:

```
[:SENSe]:POWer[:RF]:PRESelector PRESelected, 0
```

(While the band number does not have any significance when returning to preselected mode, it is required for the PRESelect command. The number 0 is generally used.)

Command Interface for the E4446A and E4448A

Command Interface with FW Rev. A.05.06

To turn on the UNPReselect mode type:¹

```
[:SENSe]:POWer[:RF]:PRESelector UNPReselect, x (where  $x = 0,1,2,3,4$ )
```

To turn off the UNPReselect mode type:¹

```
[:SENSe]:POWer[:RF]:PRESelector UNPReselect,0  
[:SENSe]:POWer[:RF]:PRESelector PRESelected,0
```

To run a query, type: **INput : MIXer : TYPE?**

Command Interface Example with FW Rev. A.05.07 or greater

To turn on the UNPReselect mode type:¹

```
[:SENSe]:POWer[:RF]:PRESelector UNPReselect, x (where  $x = 0,1,2,3,4$ )
```

To turn off the UNPReselect mode type:¹

```
[:SENSe]:POWer[:RF]:PRESelector PRESelected, x (where  $x = 0,1,2,3,4$ )
```

To run a query, type: **[:SENSe]:POWer[:RF]:PRESelector?**

NOTE

While operating the Option HN8 in UNPReselect mode, the PSA only functions as a downconverter.

1. When this command is entered via the GPIB, the front panel display will show the following message in the lower portion of the LCD window. This is not an error. This message is only cleared with a power cycle of the instrument.

Diagnostic override of Firmware Control, :DIAGnostic:LATCh

NOTE Prior to using the Option HN8 in the UNPReselect mode, turn off the Auto Align routine on the PSA by selecting the front panel keys,

[System] > Alignments > Auto Align > OFF

or use the GPIB interface **:CALibration:AUTO OFF** to turn off the Auto Align routine.

CAUTION If the Auto Align routine on the PSA is not turned off while using the Option HN8, several error messages related to calibration will occur, and the cal files will be corrupted. To remove the calibration errors, switch the PSA back to the PRESelected mode and select:

[System] > Alignment > Align All Now

Once the Auto Alignment routine is finished, disable the Auto Align routine before returning to UNPReselect mode. Cycle power on the PSA instrument if the GPIB interface does not satisfy the instrument reset.

NOTE While in UNPReselect mode, amplitude measurement information will not be present on the front panel LCD and via GPIB command either, because the option HN8 signal path does not continue through the normal spectrum analyzer signal path.

The following is a simple example of how the Option HN8 may be set up to run, as well as verify the performance:

The frequency of interest occurs at 12.7 GHz, which corresponds to Band 2 ($\chi=2$).

The following sequence of commands sets up the PSA to operate in the UNPReselect Mode (assuming firmware is A.05.07 or greater.) Refer to the User's and Programmer's Reference for further study.

```
:CALibration:AUTO OFF
[:SENSe]:FREQuency:CENTer 12.7 GHZ
[:SENSe]:FREQuency:SPAN 0 HZ
:INITiate:CONTinuous OFF
[:SENSe]:POWer[:RF]:PRESelector: UNPReselect,2
:INITiate[:IMMediate]
```

The instrument is now in the UNPReselect mode with a center frequency of 12.7 GHz, with an IF output of 321.4 MHz.

To return to normal operation, enter the following command:

```
[:SENSe]:POWer[:RF]:PRESelector PRESelected, 0
```

(While the band number does not have any significance when returning to preselected mode, it is required for the PRESelect command. The number 0 is generally used.)

3 **Characteristics**

Nominal Characteristics

All specifications apply over 20 - 30 °C unless otherwise noted. The analyzer will meet its specifications after two hours of storage within the operating temperature range, 30 minutes after the analyzer is turned on, and after AUTO ALIGN (ALL) has been run. The user should be cautioned that the input signal at the RF input in excess of -10 dBm with 0 dB input attenuation may result in IF gain compression.

Table 3-1

PSA Option HN8¹ Characteristics

Band	Bandwidth	Conversion Loss ²
Band One 2.85 GHz to 6.6 GHz	≥ 250 MHz	2 dB ± 2 dB
Band Two 6.2 GHz to 13.2 GHz	≥ 250 MHz	2 dB ± 3 dB
Band Three 12.8 GHz to 19.2 GHz	≥ 250 MHz	7 dB ± 6 dB
Band Four 18.7 GHz to 26.5 GHz (E4440A)	≥ 250 MHz	10 dB ± 6 dB
Band Four 18.7 GHz to 26.8 GHz (E4446/48A)	≥ 250 MHz	10 dB ± 6 dB

1. For the E4446A and E4448A, the Unpreselected mode will only operate from 3 GHz to 26.5 GHz. An Unpreselected path is not available above 26.5 GHz.
2. Conversion Loss is degraded by a nominal 3 dB in the PSA E4446A and the E4448A models with Option HN8 installed.

NOTE If your instrument is equipped with other IF Output options (e.g., H70 or HB2) the HN8 IF Output Bandwidth specification will replace the other IF Output specification.

NOTE Conversion loss is the measurement from the front panel to the 321.4 MHz IF Output, with an internal attenuation setting of 0 dB. The 321.4 MHz IF Output is located in the RF path at a point where frequency response corrections are not applied. If your instrument is equipped with other IF Output option (e.g., H70 or HB2) the signal gain will be degraded by a nominal 8 dB.

CAUTION The user should be cautioned that the input signal at the RF input in excess of -10 dBm with 0 dB input attenuation may result in IF gain compression.

4 **Service, Safety and Regulatory Information**

Service

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

Cleaning Instructions

Clean the instrument cabinet using a damp cloth only.

Shipping Instructions

Always transport or ship the instrument using the original packaging if possible. If not, comparable packaging must be used. Refer to [“Contacting Agilent” on page 28](#).

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Replaceable Parts for the E444xA

The assemblies listed in [Table 4-1, “Replaceable Parts for the E4440A, E4443A and E4445A”](#) and [Table 4-2, “Replaceable Parts for the E4446A, and E4448A”](#) list the replaceable parts applicable to the PSA-Series Spectrum Analyzer with Option HN8. Refer to [“Contacting Agilent” on page 28](#) for further information.

Table 4-1 Replaceable Parts for the E4440A, E4443A and E4445A

Description	Agilent Part Number	Qty
Spacer, 8 mm	0380-1402	2
Screw, M3 × 0.5, 8 mm	0515-0372	5
Screw, M3 × 0.5, 40 mm	0515-1715	2
Termination, 50 Ω	1810-0118	1
Microwave Switch	33314-60013	2
Dual Mixer	5086-7749	1
Bracket	E4440-00020	1
Cable assy, Sloda Out to Cable from Mixer LO In	E4440-20087	1
Cable assy, Attn to Bottom Switch Port C	E4440-20090	1
Cable assy, Rythm to Bottom Switch Port 2	E4440-20091	1
Cable assy, Mixer to Bottom Switch Port 1	E4440-20092	1
Cable assy, Mixer LO In to Cable from Sloda Out	E4440-20093	1
Cable assy, Wire Harness	E4440-60077	1
Cable assy, Mixer HB Out to Top Switch Port 1	E4446-60298	1
Cable assy, 3rd Converter to Top Swtch Port C	E4440-60373	1
Cable assy, Rythm to Top Swtch Port 2	E4440-60373	1

Table 4-2 Replaceable Parts for the E4446A, and E4448A

Description	Agilent Part Number	Qty
Screw, M3 × 0.5, 18 mm	0515-0666	2
Screw, M3 × 0.5, 8 mm	0515-0372	7
Screw, M2.5 × 0.45, 6 mm	0515-1934	3
Termination, 50 Ω	1810-0118	1
Microwave Switch	33314-60013	1
Dual Mixer	5086-7749	1
Transfer Switch, 50 GHz	87222-60011	1
Bracket	E4440-00020	1
Cable assy, Mixer LO In to Cable from Sloda Out	E4440-20093	1
Cable assy, Ribbon, switch (87222) control	E4440-60071	1
Cable assy, Wire Harness	E4440-60077	1
Cable assy, Mixer “J5 HB Out” to RF Switch Port 1	E4440-60298	1
PC board, Option Driver	E4440-60358	1
Cable assy, 3rd Converter to Transfer Switch	E4440-60373	1
Cable assy, Rythm IF Out to Transfer Switch	E4440-60373	1
Bracket	E4446-00008	1
Cable assy, FELOMA to LO Out	E4446-20035	1
Cable assy, Atten B to 87222 Transfer Switch	E4446-20060	1
Cable assy, 87222 transfer Switch Out to SBTX	E4446-20063	1
Cable assy, 87222 transfer switch to Mixer HB In	E4446-20067	1

Block Diagram

Figure 4-1 Block Diagram of PSA Models E4440/43/45A with Option HN8

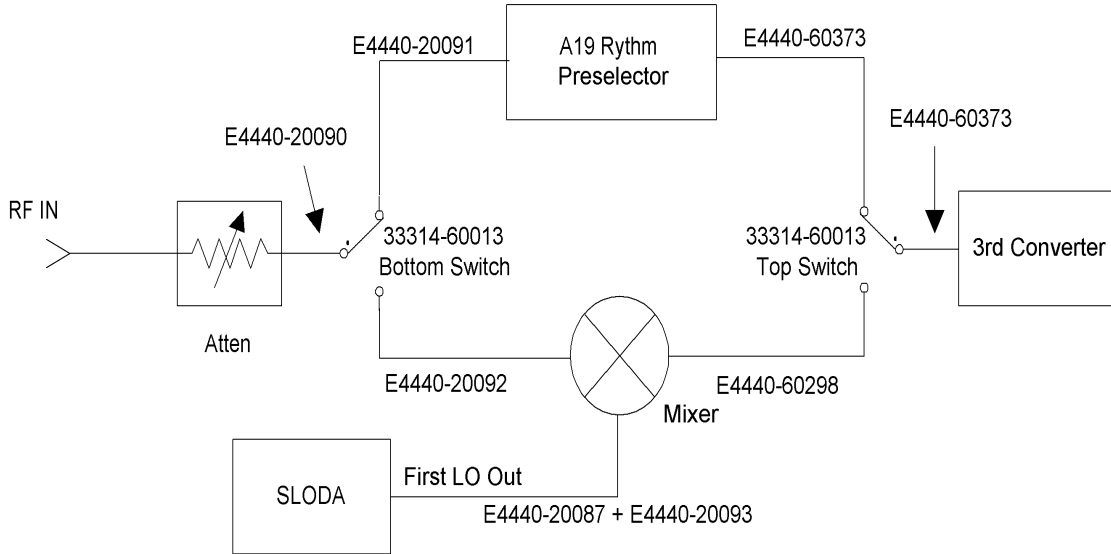


Figure 4-2 Block Diagram of PSA Models E4446/48A with Option HN8

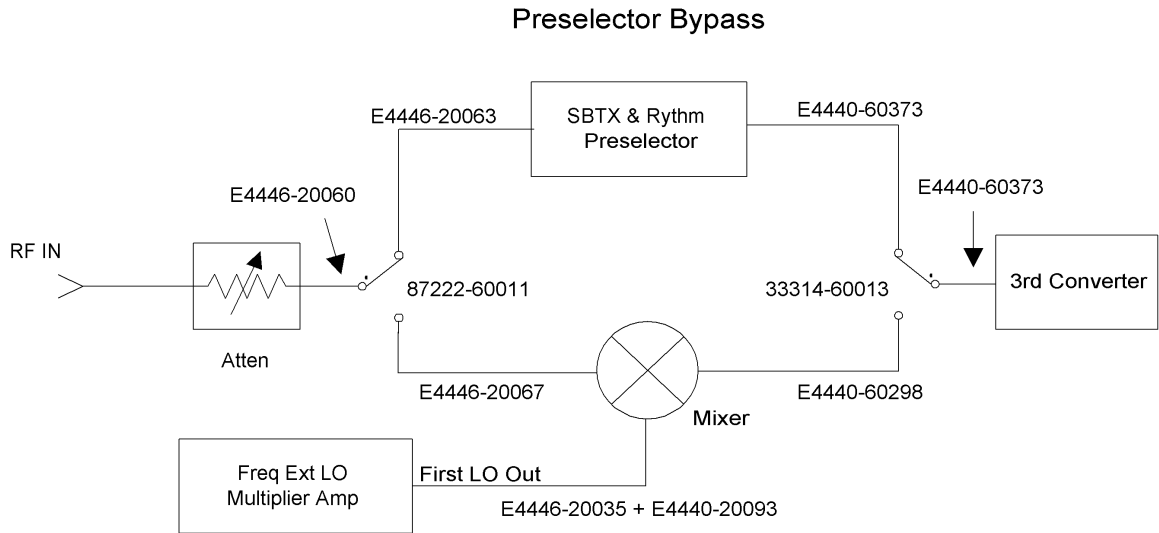
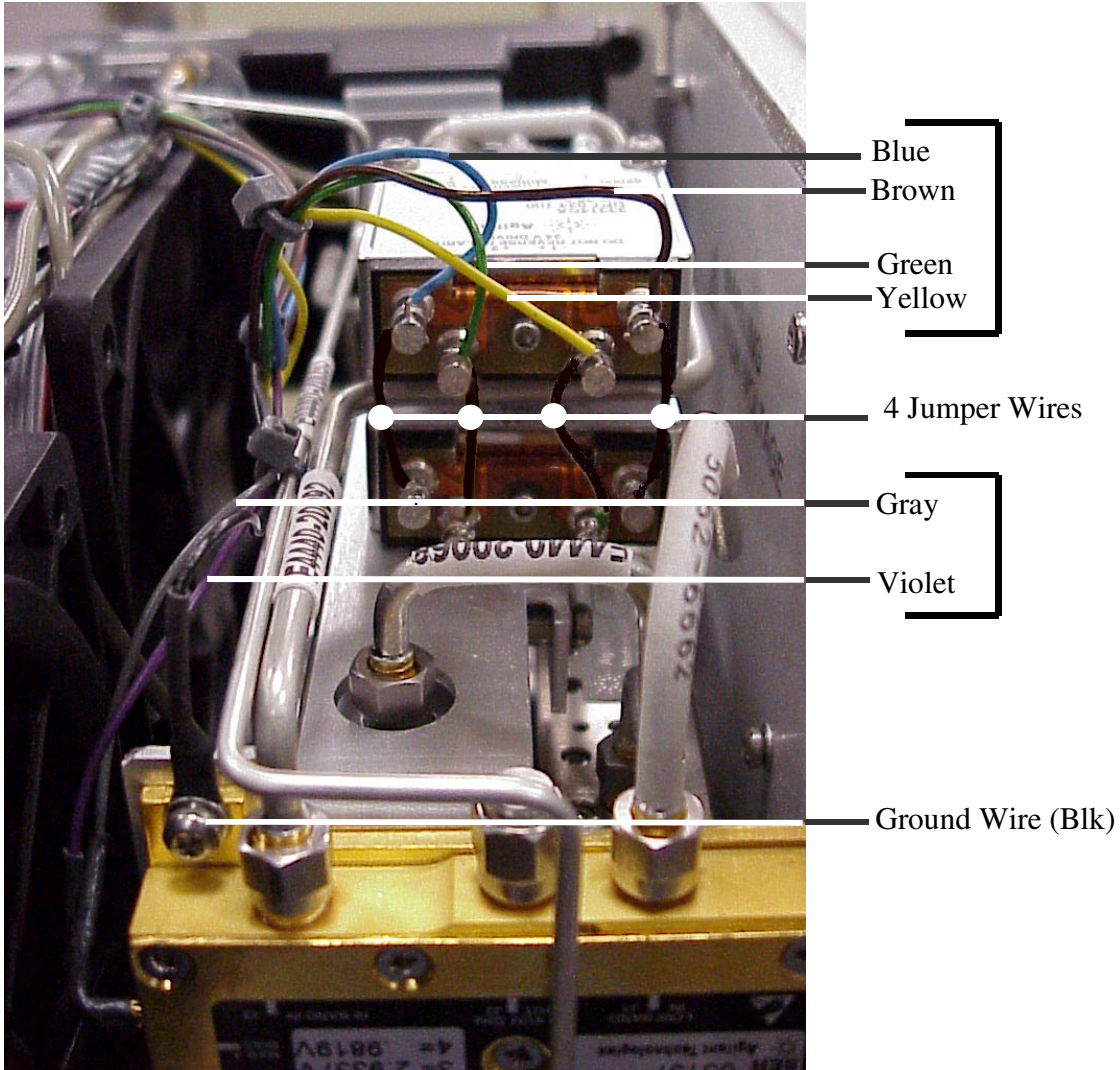


Figure 4-3 Wire Harness for PSA Models with Option HN8



While the E4446A and E4448A use only the upper RF switch of the two RF switches shown in [Figure 4-3](#), the wiring harness is connected to the same pins in the same manner. The lower RF switch is replaced using a 50 GHz RF switch.

Test Verifications

HN8 Conversion Loss Test

A -15 dBm signal is applied to the analyzer input connector at several frequencies. At each frequency the signal level at the rear panel 321.4 MHz IF Output connector is measured to determine the conversion loss or gain from the input connector to the 321.4 MHz IF output.

Equipment The table below lists the necessary equipment to verify the Conversion Loss for the HN8 Option in the PSA.

Table 4-3

Equipment Required

Equipment	Recommended Models
Signal Source \geq 26.5 GHz	83630B
Spectrum Analyzer \geq 26.5 GHz	856xEC Series
Cables	
APC 3.5 (m)(m)	8120-4921
SMA	5064-5458
Adapters	
Adapter, 3.5(f) to 3.5(f)	83059B
Adapter, Type N (m) to APC 3.5 (f) (2 required)	1250-1744

Nominal Characteristics

All specifications apply over 20 °C - 30 °C unless otherwise noted. The analyzer will meet its specifications after two hours of storage within the operating temperature range, 30 minutes after the analyzer is turned on, and after AUTO ALIGN (ALL) has been run. The user should be cautioned that the input signal at the RF input in excess of -10 dBm with 0 dB input attenuation may result in IF gain compression.

Table 4-4 PSA Option HN8 Characteristics

Band	Bandwidth	Conversion Loss¹
Band One 2.85 - 6.6 GHz	≥ 250 MHz	2 dB ± 2 dB
Band Two 6.2 - 13.2 GHz	≥ 250 MHz	2 dB ± 3 dB
Band Three 12.8 - 19.2 GHz	≥ 250 MHz	7 dB ± 6 dB
Band Four 18.7 - 26.5 GHz (E4440A)	≥ 250 MHz	10 dB ± 6 dB
Band Four 18.7 - 26.8 GHz (E4446/48A)	≥ 250 MHz	10 dB ± 6 dB

1. Conversion Loss is degraded by a nominal 3 dB in PSA E4446A and E4448A models with Option HN8 installed.

Test Procedures

1. Preset the PSA and all test equipment.
2. Run Align All Now on the PSA.
[System] > Alignments > Align All Now.
3. Issue the following command to turn on Option HN8¹:
For FW revision greater than A.04.07:
[SENSe] :POWer :RF [:PRESelect UNPReSelect,1]
4. Initialize the test equipment parameters as follows:

Table 4-5 856xEC Spectrum Analyzer Settings

Parameter	Setting
Center Frequency	3 GHz
Span	200 kHz
Resolution Bandwidth	3 kHz
Attenuation	10 dB

Table 4-6 Source Settings

Parameter	Setting
Function	CW or Sine
Level	-15 dBm
Frequency	3 GHz

1. Refer to “[Command Interface for E4440A, E4443A, and E4445A](#)” on page 8 or “[Command Interface for the E4446A and E4448A](#)” on page 10 for more information regarding specific instrument firmware revisions.

Measuring the Source Output Amplitude

1. Connect the 856xEC spectrum analyzer to the end of the 3.5 mm cable that is connected to the source. Use a Type-N (m) to 3.5 mm (f) adapter between the spectrum analyzer and the cable.
2. Press Peak Search on the 856xEC to obtain a peak amplitude value.
3. Adjust the source amplitude for a spectrum analyzer reading of -15 dBm.
4. Disconnect the 856xEC spectrum analyzer from the cable and connect the cable to the PSA RF input with a Type-N (m) to 3.5 mm (f) adapter. *Note: if the PSA has option BAB (APC3.5 input connector), use an APC 3.5 (F) to APC 3.5 (F) adapter between the PSA and the 3.5 mm cable.*

Measure the 321.4 MHz IF Out Amplitude

5. Connect the PSA rear panel 321.4 MHz IF Out to the RF Input of the 856xEC spectrum analyzer. Use the SMA cable and appropriate adapters.
6. See [Table 4-4, “PSA Option HN8 Characteristics,” on page 22](#) for the expected conversion loss values. Use [Table 4-7](#) and [Table 4-8](#) for each of the instruments.

Table 4-7

PSA Spectrum Analyzer Settings

Parameter	Setting
Center Frequency	See Table 4-9 on page 24
Span	0 Hz
Resolution Bandwidth	3 MHz
Attenuation	0 dB ¹

1. This setting will determine what the IF out level is, with respect to the input signal.

Table 4-8

856XEC Spectrum Analyzer Settings

Parameter	Setting
Center Frequency	321.4 MHz
Span	5 MHz
Resolution Bandwidth	1 MHz
Reference Level	-10 dBm
Log Scale	5 dB/Div

- View the amplitude of the 321.4 MHz Output.
Conversion loss = measured power at 321.4 MHz Output – Input pwr

***Example: Measured Power at 321.4 MHz IF out = -17 dBm.
Input Power = -15 dBm.***

Conversion Loss = -17 dBm - (-15 dBm) = -2 dB¹.

- Record the calculated Conversion Loss values in [Table 4-9](#) below.
- Set the source and 856xEC to the next frequency in [Table 4-9](#) and repeat Steps 1 thru 7.

Table 4-9 PSA Option HN8 Calculated Conversion Loss Data

Frequency	Conversion Loss Expected	Conversion Loss Calculated
3 GHz	2 dB ± 2 dB	
6 GHz	2 dB ± 2 dB	
9 GHz	2 dB ± 3 dB	
13 GHz	2 dB ± 3 dB	
14 GHz	7 dB ± 6 dB	
18 GHz	7 dB ± 6 dB	
20 GHz	10 dB ± 6 dB	
26.5 GHz	10 dB ± 6 dB	

1. For 3 GHz and 6 GHz, the equation may yield a difference with a positive sign. A positive sign indicates conversion gain.

Safety, and Regulatory Information

Warnings

WARNING The **WARNING** notice denotes a hazard. It calls attention to a procedure, practice, or the like, which if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Warnings applicable to this instrument are:

WARNING No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

WARNING If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition (in which all means for protection are intact) only.

WARNING For continued protection against fire hazard replace line fuse only with same type and rating:

- United States—F 3A/250V, Part Number 2110-0780
- Europe—F 3.15A/250V, Part Number 2110-0655

The use of other fuses or material is prohibited.

WARNING This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.

WARNING The power cord is connected to internal capacitors that may retain dangerous electrical charges for 5 seconds after disconnecting the plug from its power supply.

WARNING These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

WARNING The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.

WARNING This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

Cautions

CAUTION The CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.










Cautions applicable to this instrument are:

CAUTION Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding (by not using this cord) can cause instrument damage.

CAUTION This instrument has autoranging line voltage input; be sure the supply voltage is within the specified range.

CAUTION Ventilation Requirements: When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, forced convection must be used.

Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
ISM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.
	This symbol indicates the product meets the Australian Standards.

 **Safety
Earth
Ground**

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Contacting Agilent

By internet, phone, or fax, get assistance with all your test and measurement needs.

Online assistance: www.agilent.com/find/assist			
Americas			
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Asia Pacific and Japan			
Australia (tel) 1800 629 485 (alt) 1800 143 243 (fax) 1800 142 134	China (tel) 800 810 0189 (alt) (+86) 10800 650 0021 (fax) 800 820 2816	Hong Kong (tel) 800 930 871 (alt) (+852) 3197 7889 (fax) (+852) 2 506 9233	India (tel) 1600 112 929 (fax) 000800 650 1101
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Taiwan (tel) 0800 047 866 (alt) 00801 651 317 (fax) 0800 286 331	Thailand (tel) 1800 226 008 (alt) (+66) 2 268 1345 (fax) (+66) 2 661 3714		
Europe			
Austria (tel) 0820 87 44 11* (fax) 0820 87 44 22	Belgium (tel) (+32) (0)2 404 9340 (alt) (+32) (0)2 404 9000 (fax) (+32) (0)2 404 9395	Denmark (tel) (+45) 7013 1515 (alt) (+45) 7013 7313 (fax) (+45) 7013 1555	Finland (tel) (+358) 10 855 2100 (fax) (+358) 10 855 2923
France (tel) 0825 010 700* (alt) (+33) (0)1 6453 5623 (fax) 0825 010 701*	Germany (tel) 01805 24 6333* (alt) 01805 24 6330* (fax) 01805 24 6336*	Ireland (tel) (+353) (0)1 890 924 204 (alt) (+353) (0)1 890 924 206 (fax) (+353) (0)1 890 924 024	Israel (tel) (+972) 3 9288 500 (fax) (+972) 3 9288 501
Italy (tel) (+39) (0)2 9260 8484 (fax) (+39) (0)2 9544 1175	Luxemburg (tel) (+32) (0)2 404 9340 (alt) (+32) (0)2 404 9000 (fax) (+32) (0)2 404 9395	Netherlands (tel) (+31) (0)20 547 2111 (alt) (+31) (0)20 547 2000 (fax) (+31) (0)20 547 2190	Russia (tel) (+7) 095 797 3963 (alt) (+7) 095 797 3900 (fax) (+7) 095 797 3901
Spain (tel) (+34) 91 631 3300 (alt) (+34) 91 631 3000 (fax) (+34) 91 631 3301	Sweden (tel) 0200 88 22 55* (alt) (+46) (0)8 5064 8686 (fax) 020 120 2266*	Switzerland (French) (tel) 0800 80 5353 opt. 2* (alt) (+33) (0)1 6453 5623 (fax) (+41) (0)22 567 5313	Switzerland (German) (tel) 0800 80 5353 opt. 1* (alt) (+49) (0)7031 464 6333 (fax) (+41) (0)1 272 7373
Switzerland (Italian) (tel) 0800 80 5353 opt. 3* (alt) (+39) (0)2 9260 8484 (fax) (+41) (0)22 567 5314	United Kingdom (tel) (+44) (0)7004 666666 (alt) (+44) (0)7004 123123 (fax) (+44) (0)7004 444555		
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