



# Agilent 11970 Series Harmonic Mixers

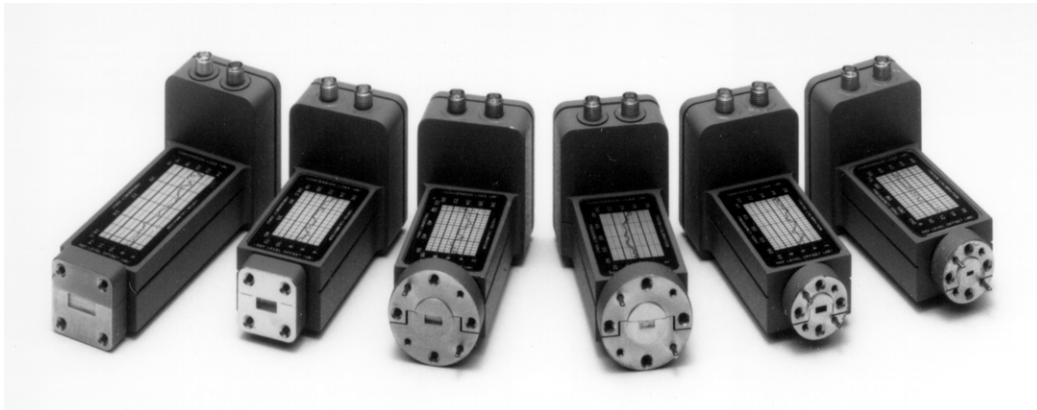
Data Sheet

For use with the Agilent E4407B, 8560E/EC Series,  
8566B, and 71000 Series Spectrum Analyzers

- Excellent frequency response
- Low conversion loss
- No bias or tuning adjustments
- High safe input level, 100 mW
- Amplitude calibrated

**18 to 110 GHz**

**11970K, 11970A,  
11970Q, 11970U,  
11970V, 11970W**



## Exceptional performance

The Agilent Technologies 11970 series harmonic mixers are general purpose mixers employing a dual-diode design to achieve very flat frequency response and low conversion loss. Each mixer is calibrated across its full band:

11970K, 18 to 26.5 GHz  
11970A, 26.5 to 40 GHz  
11970Q, 33 to 50 GHz  
11970U, 40 to 60 GHz  
11970V, 50 to 75 GHz  
11970W, 75 to 110 GHz

This series of mixers has been designed for a local oscillator frequency of 3 to 6.1 GHz. Accurate absolute amplitude measurements can be made by using the mixer's conversion loss calibration chart. The SWR of the waveguide input is typically 2.2:1 to further minimize measurement uncertainty. The combination of high gain-compression level and low conversion loss provides the maximum dynamic range for measuring input signals.



**Agilent Technologies**

### Easy to use

The excellent frequency response and low conversion loss are achieved without external dc bias or tuning stubs. Since bias and tuning stubs are not required, manual operation is simplified, and the complexity of hardware and software for automatic systems is greatly reduced. The repeatability of amplitude measurements is also enhanced. The dual-diode design of the mixers further simplifies measurements by suppressing the odd-order harmonics by more than 20 dB, which makes identification of the mixing products easier.

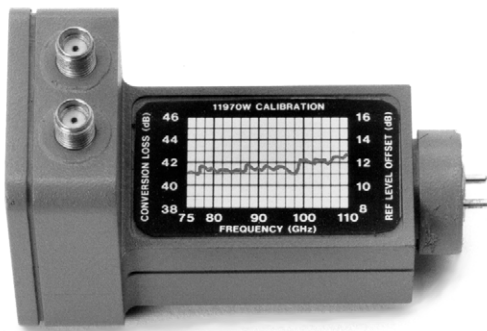


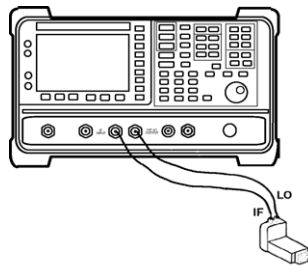
Figure 1. A conversion loss chart is attached to each mixer.

### Rugged

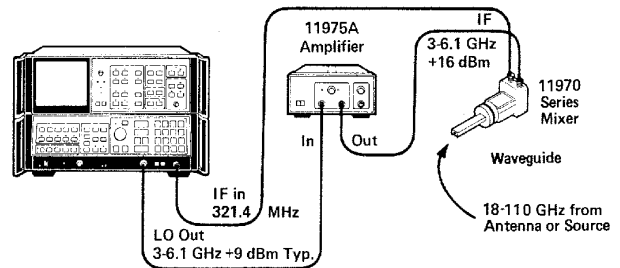
The rugged Agilent 11970 Series Mixers will survive input levels up to 100 milliwatts (+20 dBm) with no damage to the mixer diodes. They will withstand shocks up to 30 G's and the vibration required by MIL-STD 28800C, Type III, Class 3 tests.

### Frequency extension for the Agilent E4407B, 8560E/EC Series, 8566B, and 71000 Series spectrum analyzers

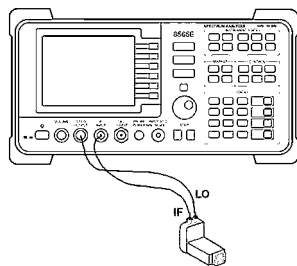
The 11970 Series Harmonic Mixers are fully compatible with the Agilent E4407B, 8560E/EC Series, 8566B, and 71000 Series Spectrum Analyzers. Accurate frequency and amplitude measurements are made directly from the spectrum analyzer's display after calibration using the mixer's calibration chart. The 11975A Microwatt Power Amplifier can be used with the 8566B Spectrum Analyzer to provide the necessary LO power of 14 to 18 dBm to the mixers. The 11975A has internal power leveling to achieve maximum measurement accuracy.



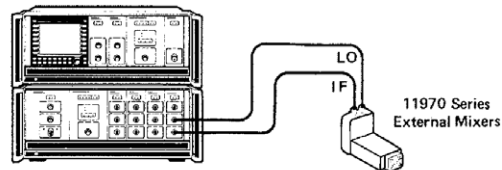
**Agilent E4407B Spectrum Analyzer**  
Extended Frequency E4407B ESA-E Series



**Agilent 8566B Spectrum Analyzer**  
Extended Frequency 8566B Spectrum Analyzer



**Agilent 8560E/EC Series Spectrum Analyzer**  
Extended Frequency 8560E/EC Series



**Agilent 71000 Series Spectrum Analyzer**  
Extended Frequency 71000 Series Spectrum Analyzer

## Specifications

<b>IF range</b>	DC to 1300 MHz
<b>LO amplitude range</b>	+14 to +18 dBm <sup>1</sup>
<b>Calibration accuracy (with IF of 321.4 MHz)</b>	
11970A/Q/U	±2.0 dB with LO amplitude range of +14.5 to +16 dBm; ±3.0 dB with LO amplitude range of +16 to +18 dBm



11970V/W	±2.6 dB with LO amplitude range of +14.5 to +16 dBm; ±3.2 dB with LO amplitude range of +16 to +18 dBm
----------	---

### Typical RF input SWR

11970A/Q/U	<2.2:1
11970V/W	<2.6:1

### Bias requirements

None

### Typical odd-order suppression

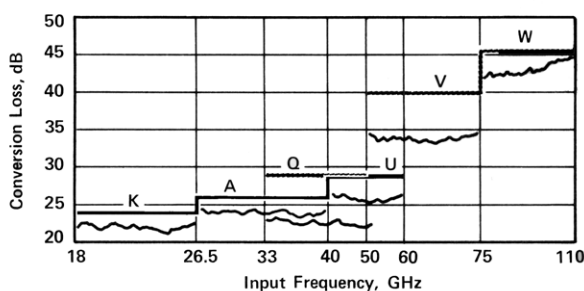
11970A/Q/U	>20 dB
11970V/W	>15 dB

### Maximum CW RF input level

+20 dBm (100 mW)

### Maximum peak pulse power

+24 dBm (250 mW) with <1 m sec pulse (average power +20 dBm)



Typical Frequency Response & Conversion Loss

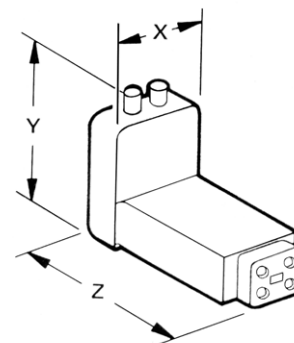
**Specifications** describe the device's warranted performance over the temperature range 0 to 55 ° C (except where noted).

**Supplemental characteristics** are typical, but non-warranted, performance parameters intended to provide information useful in applying the device. These are denoted as "typical," "nominal," or "approximately."

Agilent model number	Frequency range (GHz)	LO harmonic number	Maximum conversion loss (dB)	Spectrum analyzer noise (dBm) 1 kHz BW	Frequency response (dB)	Typical gain compression (dBm)
11970K	18–26.5	6–	24	–105	±1.9	–3
11970A	26.5–40	8–	26	–102	±1.9	–5
11970Q	33–50	10–	28	–101	±1.9	–7
11970U	40–60	10–	28	–101	±1.9	–7
11970V	50–75	14–	40	–92	±2.1	–3
11970W	75–110	18–	46	–85	±3.0	–1

### Agilent model number

Agilent model number	Flange	Weight	X	Y	Z
11970K	UG-595/U	0.17 kg	36 mm	51 mm	90 mm
	WR-42	0.36 lb	1.4 in	2.0 in	3.5 in
11970A	UG-599/U	0.14 kg	36 mm	51 mm	71 mm
	WR-28	0.32 lb	1.4 in	2.0 in	2.8 in
11970Q	UG-383/U	0.14 kg	36 mm	51 mm	76 mm
	WR-22	0.32 lb	1.4 in	2.0 in	3.0 in
11970U	UG-383/U-M	0.14 kg	36 mm	51 mm	76 mm
	WR-19	0.32 lb	1.4 in	2.0 in	3.0 in
11970V	UG-385/U	0.14 kg	36 mm	51 mm	76 mm
	WR-15	0.32 lb	1.4 in	2.0 in	3.0 in
11970W	UG-387/U	0.14 kg	36 mm	51 mm	76 mm
	WR-10	0.32 lb	1.4 in	2.0 in	3.0 in



1. The Agilent 11975A amplifier (2 to 8 GHz) or a similar amplifier can be used to provide sufficient LO power (14 to 18 dBm) to the mixers. An LO power of between 14.5 to 16 dBm at the mixer's LO input is necessary to achieve the given frequency response and spectrum analyzer amplitude accuracy specifications. When LO power varies between 14 to 18 dBm at the mixer's LO input, add ±1 dB to the frequency response and spectrum analyzer amplitude accuracy specification.

## Ordering information

<b>11970K</b>	18 to 26.5 GHz mixer
<b>11970A</b>	26.5 to 40 GHz mixer
<b>11970Q</b>	33 to 50 GHz mixer
<b>11970U</b>	40 to 60 GHz mixer
<b>11970V</b>	50 to 75 GHz mixer
<b>11970W</b>	75 to 110 GHz mixer
<b>Options:</b>	
<b>11970X-009</b>	Mixer connection kit containing three 1-meter SMA cables, wrench, and allen driver. Note: X = K, A, Q, U, V or W
<b>11970X-C01</b>	Improved EMC radiated susceptibility. Note: X = K, A, Q, U, V or W
<b>11975A</b>	2 to 8 GHz amplifier (for use with the 8566B)

## Warranty and service

For warranty and service of 5 years, please order 60 months of R-51B (quantity = 60). Standard warranty is 12 months.

<b>R-51B</b>	Return-to-Agilent warranty and service plan
--------------	---



## Agilent Email Updates

[www.agilent.com/find/emailupdates](http://www.agilent.com/find/emailupdates)

Get the latest information on the products and applications you select.

## Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

### Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

### Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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

### Online assistance:

[www.agilent.com/find/assist](http://www.agilent.com/find/assist)

### Phone or Fax

United States:  
(tel) 1 800 452 4844

Canada:  
(tel) 1 877 894 4414  
(fax) (905) 282 6495

China:  
(tel) 800 810 0189  
(fax) 1 0800 650 0121

Europe:  
(tel) (31 20) 547 2323  
(fax) (31 20) 547 2390

Latin America:  
(tel) (305) 269 7500  
(fax) (305) 269 7599

### Japan:

(tel) (81) 426 56 7832  
(fax) (81) 426 56 7840

### Korea:

(tel) (82 2) 2004 5004  
(fax) (82 2) 2004 5115

### Taiwan:

(tel) 080 004 7866  
(fax) (886 2) 2545 6723

### Other Asia Pacific Countries:

(tel) (65) 375 8100  
(fax) (65) 836 0252  
Email: [tm\\_asia@agilent.com](mailto:tm_asia@agilent.com)

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2002  
Printed in USA, March 21, 2002  
5968-1445E



**Agilent Technologies**