

Keysight Technologies

87405B Preamplifier 10 MHz to 4 GHz



Technical Overview

Features

- 22 dB Gain
- 5 dB Noise Figure
- Probe-power bias connection via probe port from Keysight's spectrum analyzers
- Compact Size

Benchtop/General Purpose Use

Used alone on the bench, the Keysight Technologies, Inc. 87405B Preamplifier can be added to any application in which additional gain and low noise are required.

The Keysight 87405B preamplifier brings reliable gain and low noise figure to measurement systems to improve overall system performance and reduce systematic errors. With its compact and portable size, this preamplifier can be powered directly from the instrument's probe-port which eliminates the need for a separate power supply and makes it an excellent choice for use in the field. The 87405B is designed for use with a variety of Keysight instruments such as the PSA, ESA, and MXA spectrum analyzers. The 87405B is the recommended preamplifier for use with the 8594E noise figure measurement solution. The rugged Type-N connectors stand up to the multiple connect and disconnects needed in field applications for reliable, repeatable measurements.

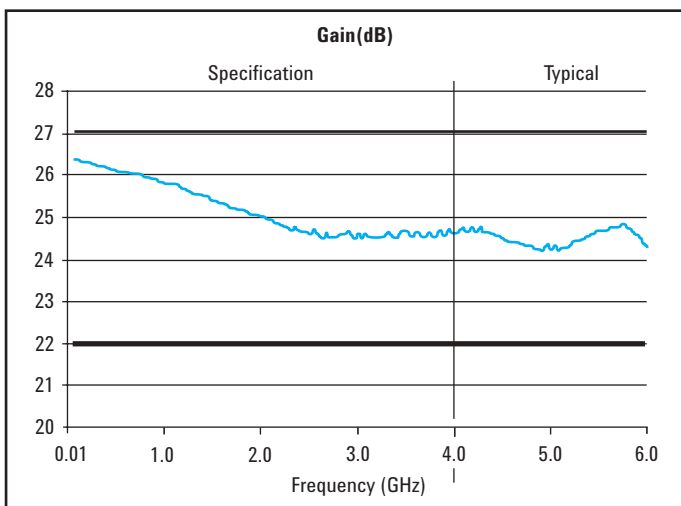
Improve Noise Figure Measurements

Add a preamplifier to noise figure measurement systems to significantly lower system noise figure. The noise figure of the system is dominated by the noise figure of the preamplifier.

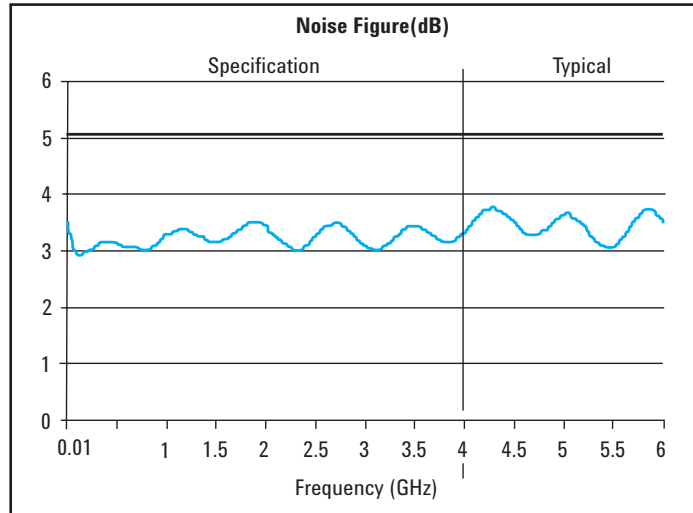
$$F_{\text{new}} = F_{\text{pa}} + \frac{F_{\text{sys}} - 1}{G_{\text{pa}}}$$

Where F and G are noise figure and preamplifier gain, both in linear terms.

$$NF_{\text{sys}} = 10 \log (F_{\text{sys}}) \text{ in dB}$$

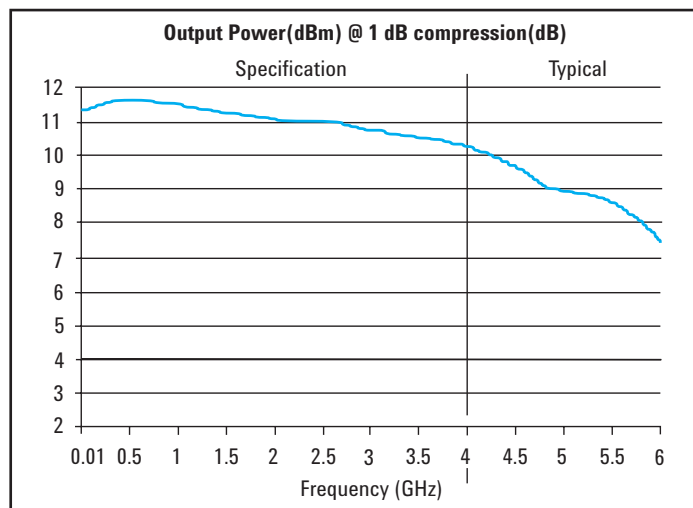


For systems having a single preamplifier, where the gain of the preamplifier is greater than or equal to the spectrum analyzer noise figure, the system noise figure approximately equals the noise figure of the pre-amplifier.



Increase Sensitivity and Speed

Adding preamplifiers to measurement systems can improve sensitivity for measuring low-level signals. Boost the sensitivity of your Keysight spectrum analyzer 15 to 25 dB by using the 87405B preamplifier. Alternatively, better sensitivity can be traded for measurement speed. Spurious tests often require narrow resolution bandwidths to reduce the noise floor of the analyzer, allowing low-level signal detection. An analyzer with low noise figure allows you to use a wider resolution bandwidth, yet achieve the same sensitivity. Sweeptimes can improve one hundred times for each decade increase in bandwidth. The 87405B preamplifier has gain and noise figure characteristics that optimize dynamic range and sensitivity.



87405B Product Specifications



Frequency range	10 - 4000 MHz
Small signal gain	22 - 27 dB min-max
Gain flatness	±1.5 dB 10 - 4000 MHz
Output power	8 dBm at 4 GHz (1 dB compression pt.)
Noise figure	5 dB 10 - 4000 MHz
Third order intercept (TOI)	15 dBm typical
Harmonics	30 dBc typical (@ +4 dBm output power)
Input VSWR	1.5:1 10 - 1000 MHz 1.7:1 1000 - 2000 MHz 2.1:1 2000 - 3000 MHz 2.2:1 3000 - 4000 MHz
Output VSWR	1.9:1 10 - 4000 MHz
Impedance	50 ohms nominal
Reverse isolation	40 dB typical
Survival input	+10 dBm typical power (max)
Power dissipation	1.6 W nominal
Temperature	(operating) 0 to +55 °C (storage) -40 to +70 °C

Specifications describe the instrument's warranted performance over the temperature range 0 °C to +55 °C (unless otherwise noted). All specifications apply after the instrument's temperature has been stabilized after one hour continuous operation. Typical characteristics are intended to provide information useful in applying the instrument by giving typical but nonwarranted performance parameters. These are denoted as "typical" or "nominal" and apply over the temperature range 0 °C to +55 °C.

Caution: *Electrostatic Discharge (ESD) can damage or destroy electronic components. It is recommended that this preamplifier, like other electronic components, be installed and operated at a static-free workstation or in an environment where precautions against ESD have been implemented.*

EMC

IEC 61326:1997	
EN 61326:1997	
CISPR 11:1997	
This ISM device complies with Canadian ICES-001.	
AC line harmonic current emissions	IEC/EN 61000-3-2
Line voltage interrupt (1 cycle, 100%)	IEC/EN 61000-4-11
Surge test (1.2 x 50 us, 0.5/1 kV)	IEC/EN 61000-4-5
Electrical fast transients	IEC/EN 61000-4-4
Radiated emissions	CISPR 11, Class A
Radiated immunity (3 V/m, 80-1000 MHz)	IEC/EN 61000-4-3
Conducted emissions	CISPR 11, Class A
Conducted immunity (3 V, 0.15-80 MHz)	IEC/EN 61000-4-6
ESD (4 kV contact, 8 kV air discharge)	IEC/EN 61000-4-2

General Specifications

Bias voltage and current	15 ±6% Vdc @ 105 mA nominal
Connectors	RF Type N(f) in, N(m) out DC Probe Power Connector (f)
Weight	Net 233 g, shipping 546 g

Environmental Information

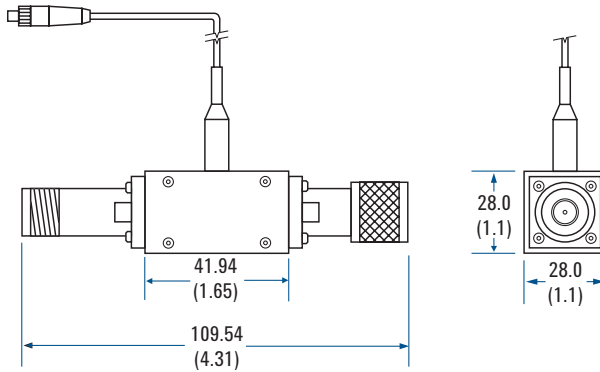
Moisture resistance	65 °C at 95% RH for 10 days per Mil-Std-883C method 1004.5
Altitude, non-operating	15,000 meters per Mil-Std-883C method 1001-C

Reliability

Random vibration 5.2 G (rms) to 2000 Hz	per Mil-Std-883C method 2026-11A
Shock 1500 G (peak), 0.5 ms per	Mil-Std-883C method 2002.3-B
Operating temperature (0 to +55 °C)	Class B2/B1 HPETM 757
Storage temperature (-40 to +70 °C)	Class B HPETM 757
5 Day Op. humidity cycle (40C/95% RH)	Class A2, B1, B2 HPETM 758, 4.6
Product safety evaluation	CSA 61010-1

Mechanical Dimensions

87405B Preamplifier 10 MHz to 4 GHz

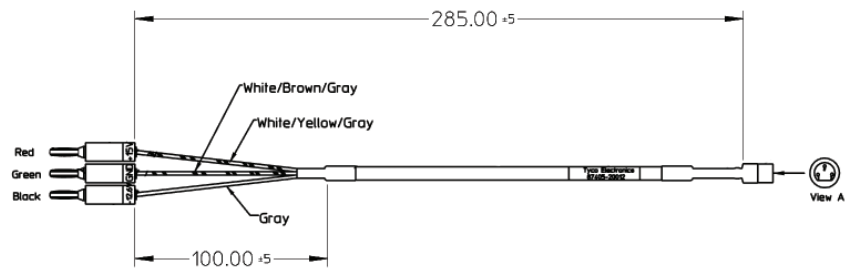



General specifications

Weight: Net 233 g, shipping 546 g.

Cable nominal length is 460 mm (18.11 inches). Note: Dimensions are in mm (inches) nominal, unless otherwise specified.

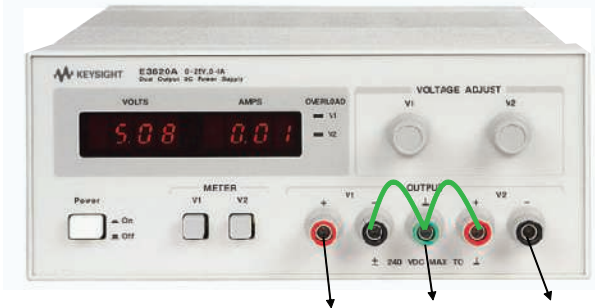
Option 001 Cable-Power Probe Connector to Banana Plugs



View A	Pin	Wire Colour	Voltage	Current	Plug Jacket Color
View A Ground  +15V -12.6V	3	Gray	-12.6V±20%	75mA	Black
	2	White/Brown/Gray	GND		Green
	1	White/Yellow/Gray	+15V±20%	150mA	Red

Powering Up Your Preamplifier

Preamplifier biasing connection with Keysight E3620A



Set V1 to +15V

Set V2 to -12.6V

Connects to Red banana plug of the biasing cable.

Connects to Green banana plug of the biasing cable.

Connects to Black banana plug of the biasing cable.

Connect V1-, GND and V2+ together as shown in above green wires.

Ordering Information

87405B Preamplifier 10 MHz to 4 GHz

87405B Option 001 Cable

Recommended Power Supply

E3620A 50W Dual Output Power Supply

E3630A 35W Triple Output Power Supply

E3631A 80W Triple Output Power Supply

E3646A 60W Dual Output Power Supply

E3647A 60W Dual Output Power Supply

E3648A 100W Dual Output Power Supply

E3649A 100W Dual Output Power Supply

Related Literature

Noise Figure Measurement Accuracy, Application Note, literature number 5952-3706E

myKeysight

myKeysight

www.keysight.com/find/mykeysight

A personalized view into the information most relevant to you.

Keysight Assurance Plans

www.keysight.com/find/AssurancePlans

Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.



www.keysight.com/find/mta

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	0800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-06-23-14)