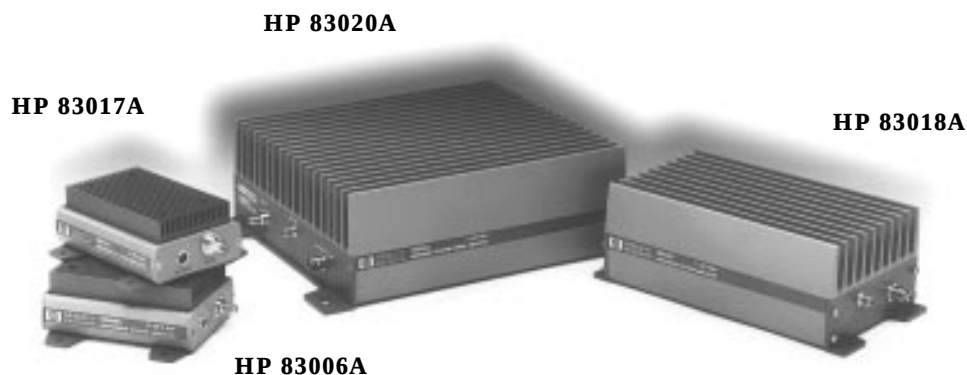


Amplifiers



HP 87415A



HP 87405A



The HP 83006/018/020/050/051A test system amplifiers offer ultra broadband performance up to 50 GHz. With excellent noise figure relative to their broad bandwidth and high gain, these products can be used to significantly reduce test system noise figure. By replacing several amplifiers with a single broadband product, test setups can be greatly simplified. And, you can place this amplification power where you need it, by using remotely-locatable HP power supplies. In addition, the HP 87415A provides octave band performance from 2 to 8 GHz. The HP 87405A preamplifier is designed for input signal preamplification of low level instruments such as the HP 859X series spectrum analyzers.

These amplifiers are supplied with a 2-meter bias cable that has a connector on one end and bare wires on the other (except for the HP 87405A). This bias cable can be used to interface with a power supply provided by the user. Or, for a complete solution, HP offers the HP 87421/422A remotely-locatable power supplies. The HP 87421A power supply is furnished with one 2-meter cable (HP 87422A, two 2-meter cables) for direct-connection to an HP amplifier as shown in the Amplifier Power Cable Cross Reference on page 28.

Amplifiers

Specifications (+20 to +30 °C)

HP Model	Frequency (GHz)	Output Power at P _{sat} (dBm / mW)	Output Power at P _{1dB} (dBm / mW) (min)	Gain (dB) (min)	Noise Figure (dB) (typ)	Detector ¹ Output/dc Connector	Bias (nom)	RF Connectors (Input/Output)
83006A	0.01 to 26.5	+18/64 typ. to 10 GHz +16/40 typ. to 20 GHz +14/25 typ. to 26.5 GHz	+13/20 to 20 GHz +10/10 to 26.5 GHz	20	13 to 0.1 GHz 8 to 18 GHz 13 to 26.5 GHz	No	+12 V @ 450 mA -12 V @ 50 mA	3.5 mm (f)
83017A	0.5 to 26.5	+20/100 typ. to 20 GHz +15/32 typ. to 26.5 GHz	+18/64 to 20 GHz (18 – 0.75Δf²) dBm (64 – 7.8Δf²) mw (20 ≤ f ≤ 26.5 GHz)	25	8 to 20 GHz 13 to 26.5 GHz	Yes/BNC (f)	+12 V @ 700 mA -12 V @ 50 mA	3.5 mm (f)
83018A	2 to 26.5	+24/250 min to 20 GHz +21/125 min to 26.5 GHz	+22/160 to 20 GHz +17/50 to 26.5 GHz	27 to 20 GHz 23 to 26.5 GHz	10 to 20 GHz 13 to 26.5 GHz	Yes/BNC (f)	+12 V @ 2 A -12 V @ 50 mA	3.5 mm (f)
83020A	2 to 26.5	+30/1000 min to 20 GHz (30 – 0.7Δf²) dBm min (1000 – 65Δf²) mw min (20 ≤ f ≤ 26.5 GHz)	+27/500 to 20 GHz +23/200 to 26.5 GHz	30 to 20 GHz 27 to 26.5 GHz	10 to 20 GHz 13 to 26.5 GHz	Yes/BNC (f)	+15 V @ 3.2 A -15 V @ 50 mA	3.5 mm (f)
83050A	2 to 50	+20/100 min to 40 GHz (19 – 0.2Δf³) dBm (80 – 3.1Δf³) mw (40 < f ≤ 50 GHz)	+15/32 to 40 GHz +13/20 to 50 GHz	23	6 to 26.5 GHz 10 to 50 GHz	No	+12 V @ 830 mA -12 V @ 50 mA	2.4 mm (f)
83051A	0.045 to 50	+12/16 min to 45 GHz min +10/10 min to 50 GHz min	+8/6 to 45 GHz +6/4 to 50 GHz	23	12 to 2 GHz 6 to 26.5 GHz 10 to 50 GHz	No	+12 V @ 425 mA -12 V @ 50 mA	2.4 mm (f)
87405A	0.01 to 3	+26/400 typ.	+4/2.5	22 min 27 max	6.5 to 2 GHz 7.5 to 3 GHz	No	+15 V @ 80 mA	N (f) N (m)
87415A	2 to 8	+26/400 typ.	+23/200	25	13	No	+12 V @ 900 mA	SMA (f)

Weight: HP 83006A, 83017A, 83050A, 83051A, 87415A: 0.64 kg (1.4 lb), HP 83018A: 1.8 kg (4 lb), HP 83020A: 3.9 kg (8.5 lb), HP 87405A: 0.27 kg (0.6 lb)

Power Cable (shipped with amplifiers): 2-meter cable with a connector on one end and bare wires on the other. See Amplifier Power Cable Cross Reference on page 28.

Power Supply Specifications

HP Model	ac Input Voltage	dc Output (nom)	Output Power	Size (H,W,D)
87421A	100 to 240 VAC 50/60 Hz	+12 V @ 2.0 A, -12 V @ 200 mA	25 W max	57, 114, 176 mm 2.3, 4.5, 6.9 in
87422A ⁴	100 to 240 VAC 50/60 Hz	+15 V @ 3.3 A, -15 V @ 50 mA +12 V @ 2.0 A, -12 V @ 200 mA	70 W max	86, 202, 276 mm 3.4, 8.0, 10.9 in

Power Cable (shipped with power supplies): 2-meter cables to connect between amplifier and power supplies. See Amplifier Power Cable Cross Reference on page 28.

¹ Detector output can be utilized for leveling output power at the test port.

² Δf = f(GHz) – 20.

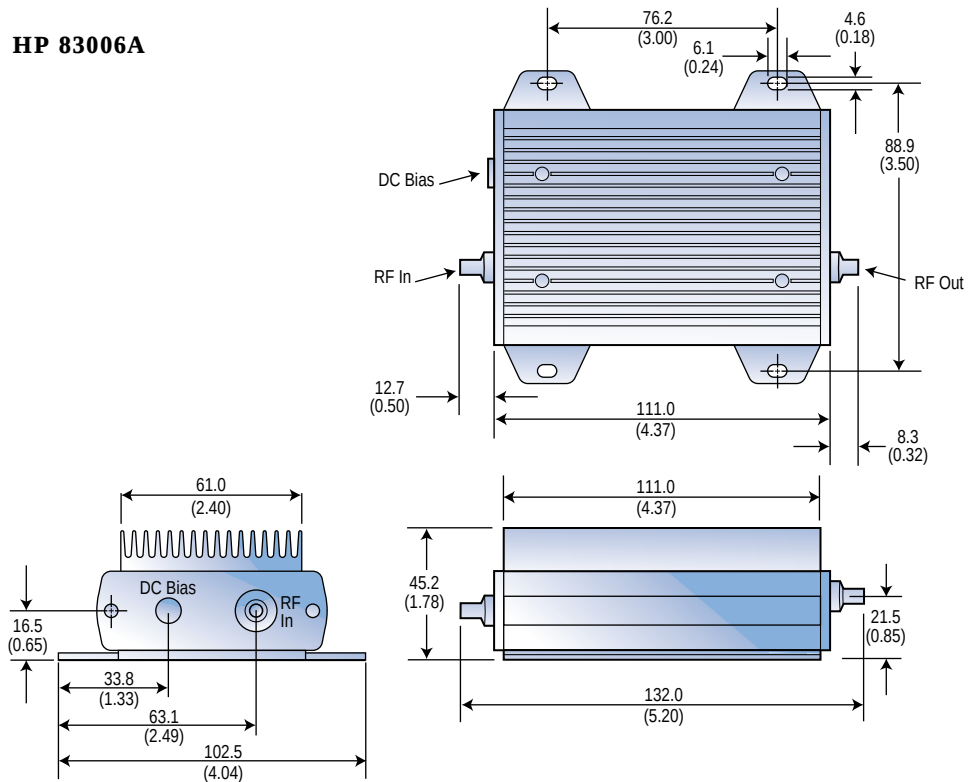
³ Δf = f(GHz) – 40.

⁴ The ±15 V output is designed to power the HP 83020A; the ±12 V output can be used to power an additional amplifier.

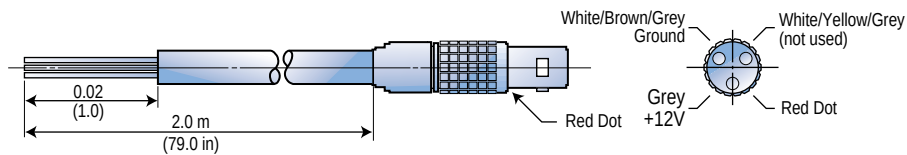
Amplifiers

Outline Drawings

HP 83006A



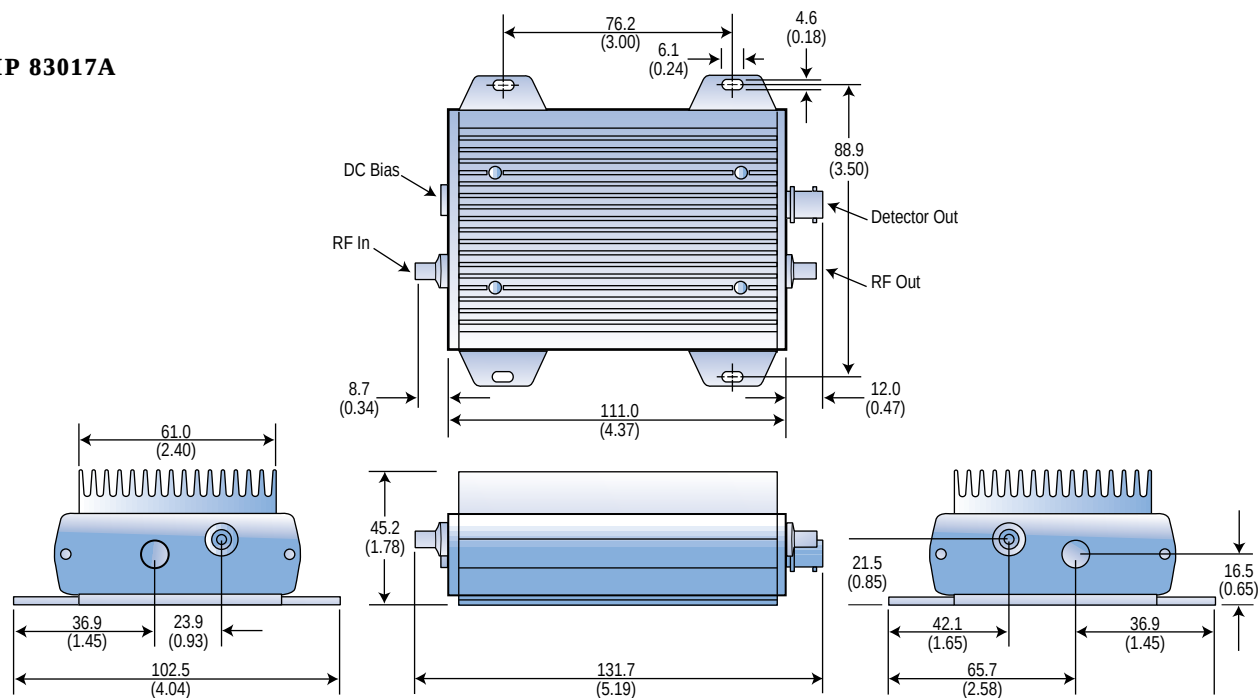
HP 83006-60004 Cable (Shipped with HP 83006A, 83017A, 83018A, 83050A, 83051A, 87415A)



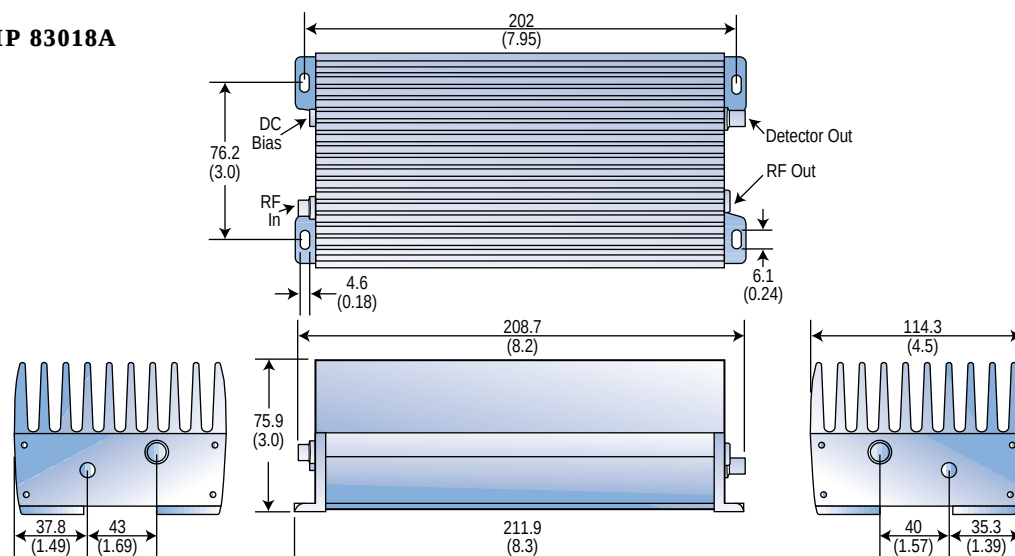
Dimensions are in mm (inches) nominal, unless otherwise specified.

Amplifiers

HP 83017A



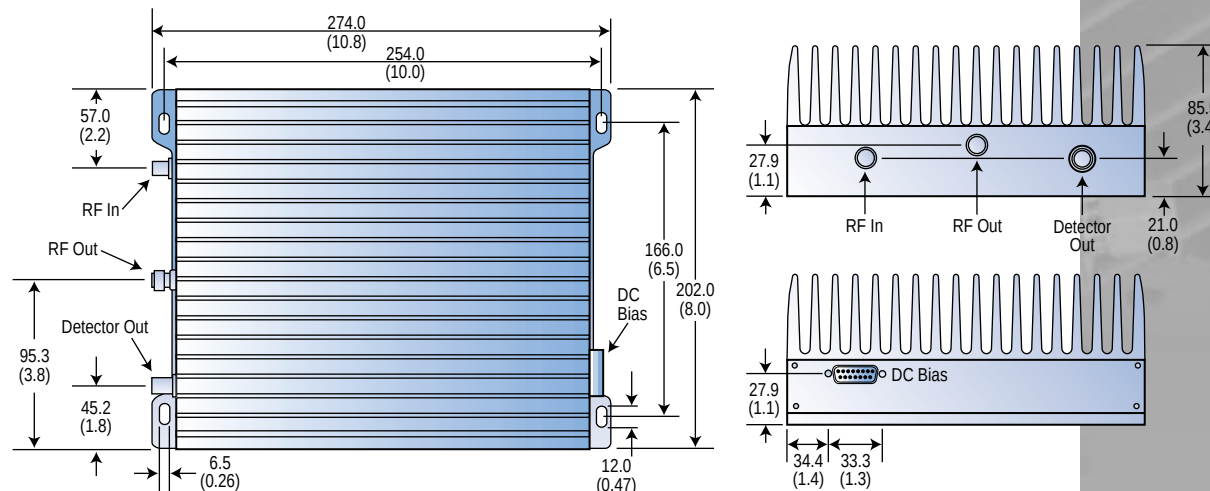
HP 83018A



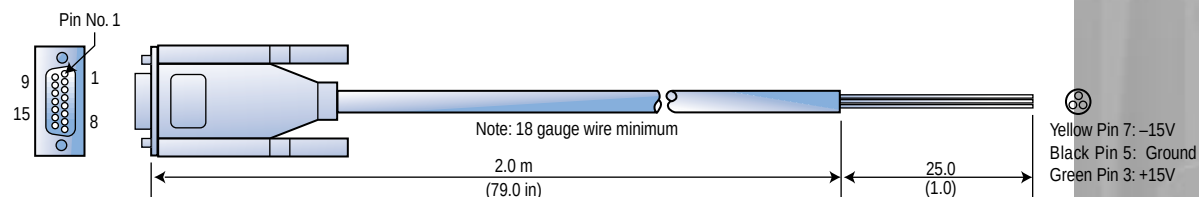
Dimensions are in mm (inches) nominal, unless otherwise specified.

Amplifiers

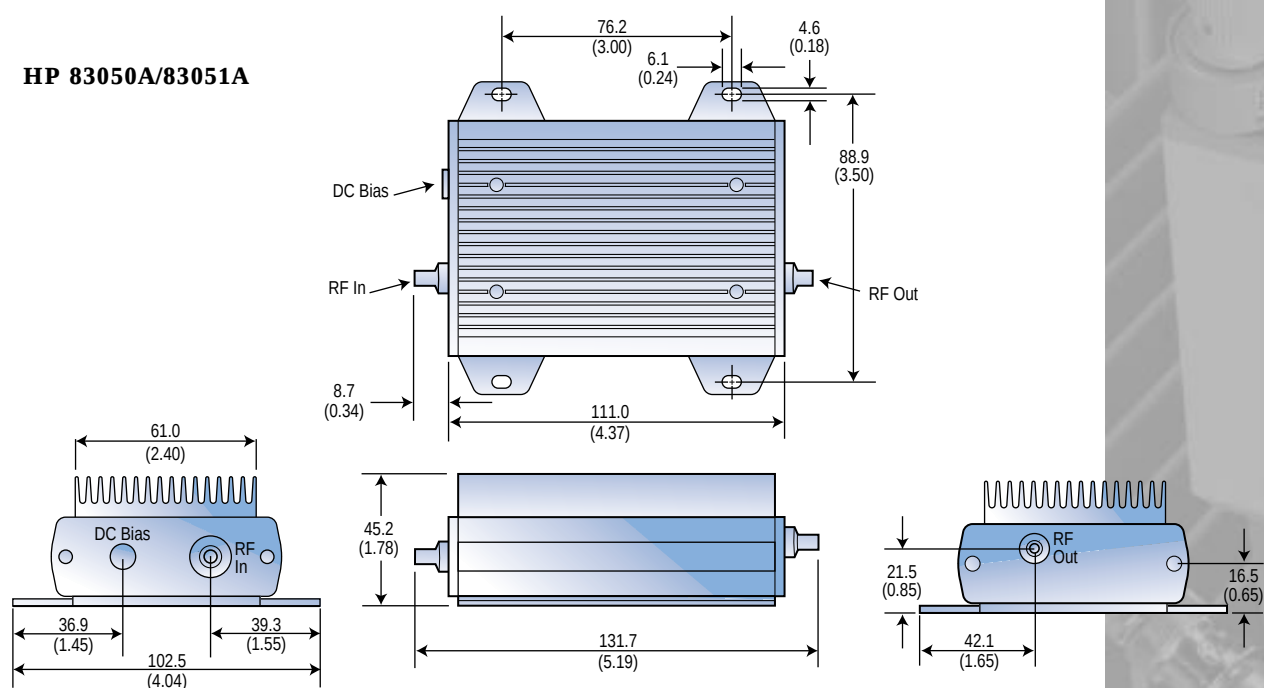
HP 83020A



HP 83020-60004 Cable (Shipped with HP 83020A)



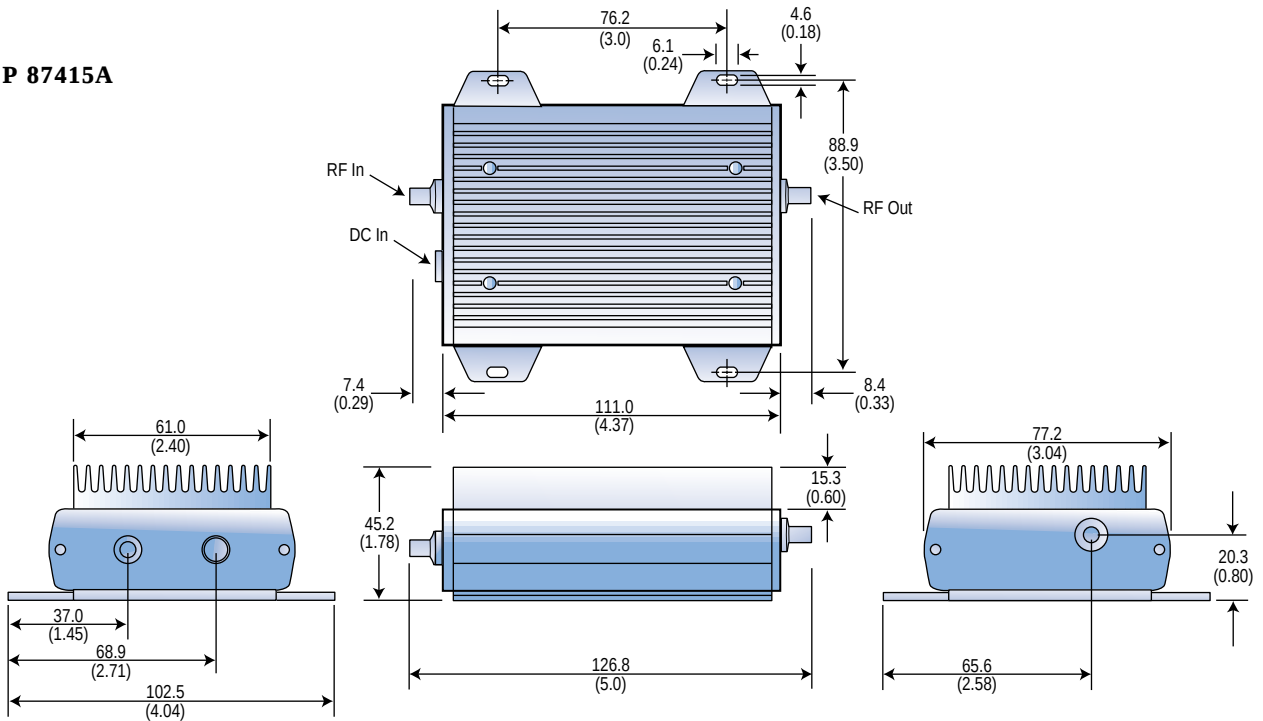
HP 83050A/83051A



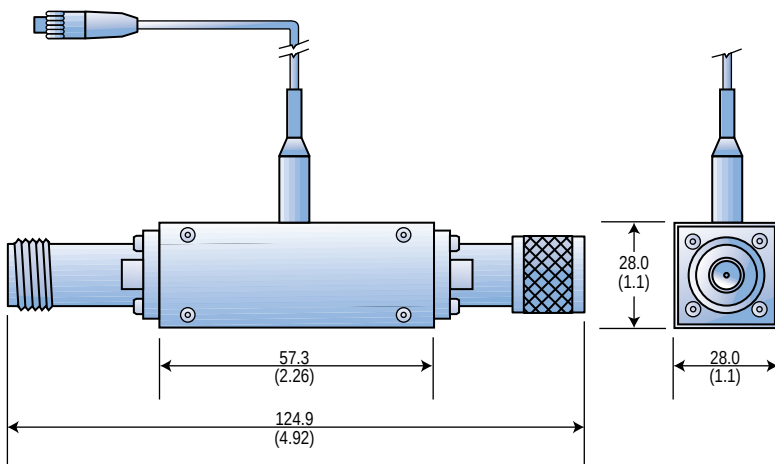
Dimensions are in mm (inches) nominal, unless otherwise specified.

Amplifiers

HP 87415A



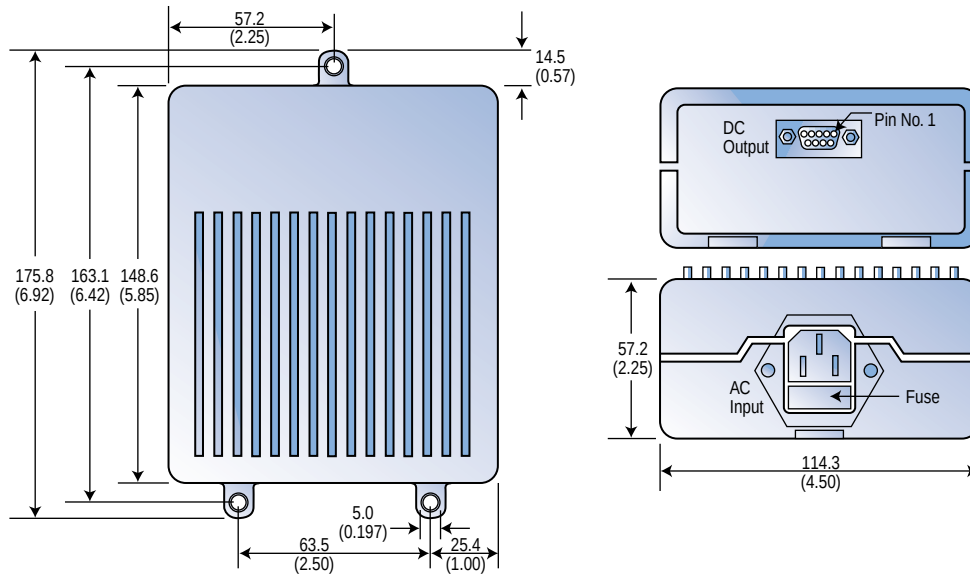
HP 87405A



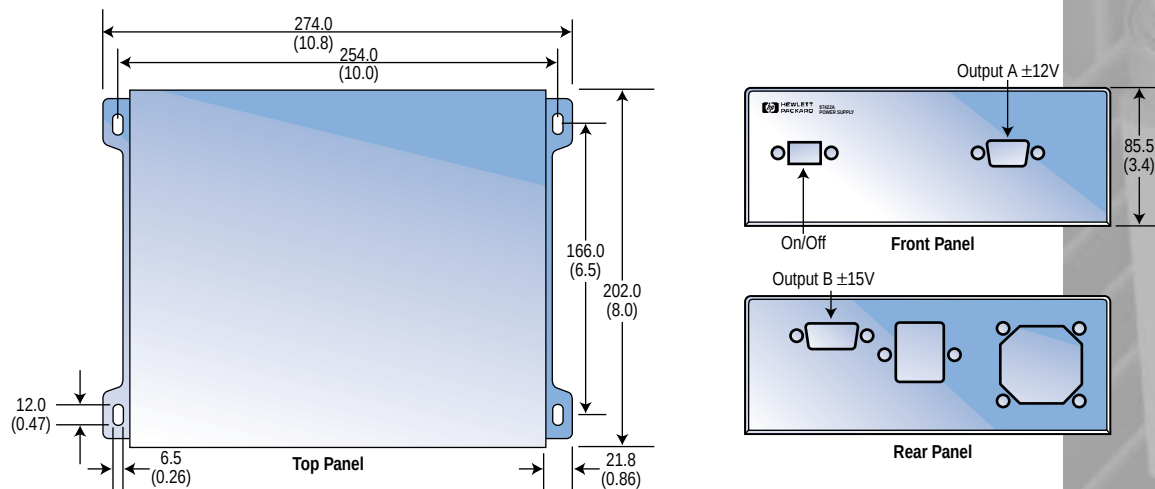
Dimensions are in mm (inches) nominal, unless otherwise specified.

Amplifiers

HP 87421A



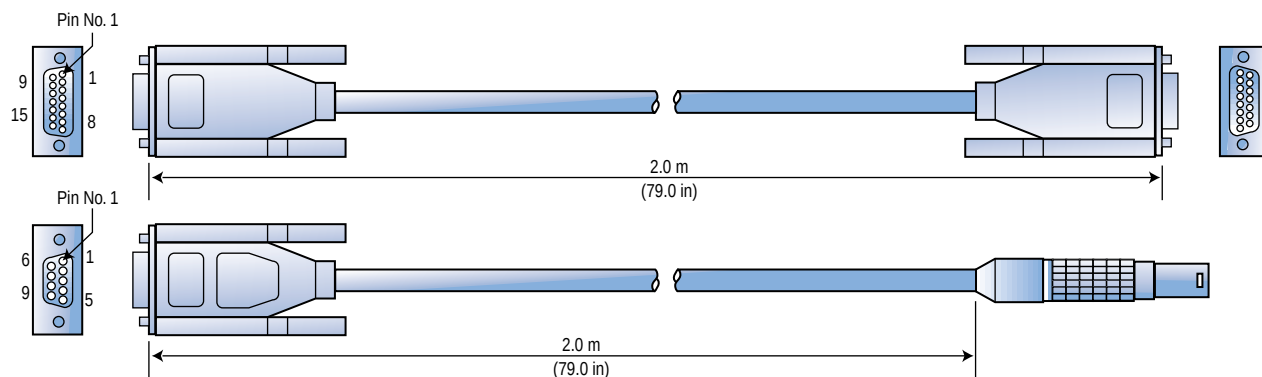
HP 87422A



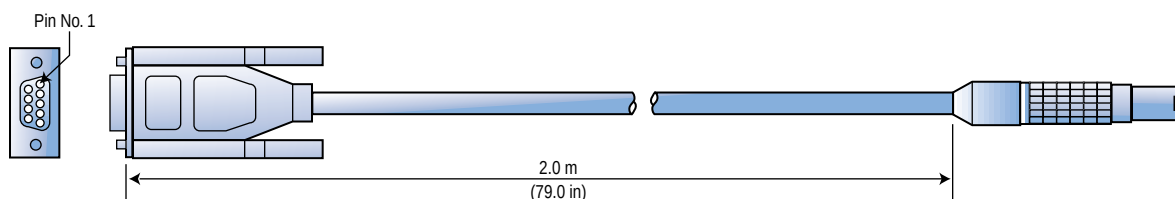
Dimensions are in mm (inches) nominal, unless otherwise specified.

Amplifiers

HP 87422-60001 and 83006-60005 Cable (Shipped with HP 87422A)



HP 83006-60005 Cable (Shipped with HP 87421A)



Dimensions are in mm (inches) nominal, unless otherwise specified.

Power Cable Cross Reference ¹

HP Model Number	HP Cable Part Number ² (supplied with amplifier)	HP Power Supply Recommended	HP Cable Part Number ³ (supplied with power supply)
83006A	83006-60004	87421A	83006-60005
83017A	83006-60004	87421A	83006-60005
83018A	83006-60004	87421A	83006-60005
83050A	83006-60004	87421A	83006-60005
83051A	83006-60004	87421A	83006-60005
87415A	83006-60004	87421A	83006-60005
83020A	83020-60004	87422A ²	87422-60001
			83006-60005
87405A	Integral cable	HP 11899A power supply or spectrum analyzer	

¹ See outline drawings for connector types.

² For use with available power supply.

³ For use with power supply for direct connection.

Amplifiers

Instrumentation Amplifiers



HP 8347A



HP 8348A



HP 8349B

The HP 8347/48/49 microwave amplifier family offers system-compatible, loss-compensation gain blocks in self-contained rack mountable or benchtop packages. Whether overcoming cable losses, driving high power amps, or driving HP millimeter-wave modules, this amplifier family features internal power supplies and bias networks to ensure simple system integration and trouble free operation.

The HP 8349B microwave amplifier's internal coupler and detector make it ideal for external leveling and system loss compensation applications with HP microwave sources. Benchtop and ATE applications will benefit from the simple drop-in system compatibility of these broadband amplifiers.

Millimeter-wave signal sources are easily configured using new or existing microwave sources with the HP 8349B as a driver for the HP 83550 series millimeter-wave source modules. The built-in source module interface on the HP 8349B ensures that proper dc bias and control signals are maintained.

The HP 8347A, 8348A and 8349B are general purpose broadband instrumentation amplifiers capable of producing power and gain to overcome systematic RF path losses, drive high-power devices, and improve measurement system performance.

Specifications

HP Model	Frequency Range	Output Power	Gain	Harmonics	Input SWR (typ)	Output SWR (typ)
8347A	Unleveled:	—	≥ 25 dB	≤ 25 dBc	2.0	2.0
	100 kHz to 2 GHz					
	2 GHz to 3 GHz					
8348A	Leveled:	≥ 20 dBm	≥ 25 dB	≤ 20 dBc	2.0	1.5
	100 kHz to 3 GHz					
	2 to 18.6 GHz					
8349B	Unleveled:	≥ 20 dBm	≥ 15 dB	≤ 20 dBc	2.8	≤ 4.8
	2 to 18.6 GHz					
	18.6 to 20 GHz					
	Leveled:					
	2 to 18.6 GHz					
	18.6 to 20 GHz					

Amplifiers

Instrumentation Amplifiers



HP 8447A



HP 8447D

HP 8447 Series Amplifiers

These low-noise, high-gain amplifiers improve the sensitivity of counters, spectrum analyzers, RF voltmeters, EMI meters, power meters, and other devices. They will also increase the maximum power available from a signal generator or sweeper.

Options

Standard connectors are BNC (f) on all amplifiers.

Option 010 – single-channel amplifier, N (f) connectors

Option 001 – dual-channel amplifier, BNC (f) connectors

Option 011 – dual-channel amplifier, N (f) connectors

Dual-channel, 50 Ω (nominal) amplifiers are ideal for dual-channel systems such as oscilloscopes or network analyzers.

Channels may also be cascaded for increased small-signal gain.

General Specifications

Weight: net, 1.56 kg (3.4 lb); shipping, 2.30 kg (5.1 lb)

Size: 85.8 H x 130 W x 216 D mm (3.4 in x 5.1 in x 8.5 in)

Power requirements: 110 or 230 Vac $\pm$ 10%, 48-440 Hz, 15 watts.

Specifications

HP Model	HP 8447A	HP 8447D
Frequency Range	0.1 to 400 MHz	100 kHz to 1.3 GHz
Typical 3 dB Bandwidth	50 kHz to 700 MHz	75 kHz to 1.7 GHz
Gain (Mean, per channel)	20 dB $\pm$ 1.0 dB at 10 MHz (20 °C to 30 °C) 20 dB $\pm$ 1.7 dB at 10 MHz (0 °C to 55 °C)	>25 dB (20 °C to 30 °C)
Gain Flatness	$\pm$ 1.8 dB (0 °C to 55 °C)	$\pm$ 1.5 dB
Across Full Frequency Range	$\pm$ 0.7 dB (20 °C to 30 °C) (Characteristic)	
Noise Figure	<7 dB	<8.5 dB
Output Power for 1 dB Gain Compression	>+6 dBm	>+7 dBm typical
Harmonic Distortion	–32 dB for 0 dBm output	–30 dB for 0 dBm output (typical)
Output for <–60 dB Harmonic Distortion	–25 dBm (Characteristic)	–30 dBm
SWR	<1.7	<2.0 input <2.2 output 1 to 1300 MHz
Reverse Isolation	>30 dB	>40 dB
Maximum DC Voltage Input	$\pm$ 10 V	$\pm$ 10 V
Options Available	001	001, 010, 011

Amplifiers

Instrumentation Amplifiers

HP 8449B Preamplifier

- 1 to 26.5 GHz frequency range
- 30 dB gain
- 10 dB noise figure
- Measure extremely low-level signals
- < -150 dBm sensitivity
- Improve measurement speed



HP 8449B

This wideband 1 to 26.5 GHz preamplifier combines high gain with low noise making it suitable for a wide variety of applications. It is useful in the laboratory as a general purpose accessory to increase the sensitivity of spectrum analyzers, counters, power meters, and other instruments.

Specifications

Frequency range: 1.0 to 26.5 GHz

Maximum safe input power: +20 dBm

Maximum dc input: +20 Vdc

Gain compression: < 1 dB for signals $\leq +7$ dBm at the output (characteristic)

Gain: 20 to 30 °C: > 26 dB (30 dB typ.)

0 to 55 °C: > 23 dB

Noise Figure

Frequency Band	Guaranteed	Typical
1.0 to 12.7 GHz	< 8.5 dB	7 dB
12.7 to 22.0 GHz	< 12.5 dB	9 dB
22.0 to 26.5 GHz	< 14.5 dB	12 dB

Third-order intercept:

+15 dBm at the output (characteristic)

Second harmonic distortion:

-30 dB for 0 dBm output (characteristic)

Gain Flatness

Band	Variation
1.0 to 26.5 GHz	+4.5 dB (0 to 55 °C)
2.0 to 22.0 GHz	+2.4 dB (20 to 30 °C, typical)

Amplitude temperature drift:

≤ 0.12 dB/°C (characteristic)

Displayed average noise level:

0 dB attenuation (characteristic)

With HP 8563E (1 Hz RBW)		With HP 8566B (10 Hz RBW)	
1.0 to 2.9 GHz	-165 dBm	1.0 to 2.5 GHz	-155 dBm
2.75 to 6.46 GHz	-168 dBm	2.0 to 5.8 GHz	-154 dBm
5.86 to 13.0 GHz	-163 dBm	5.8 to 12.5 GHz	-150 dBm
12.4 to 22.0 GHz	-160 dBm	12.5 to 18.6 GHz	-144 dBm
22.0 to 26.5 GHz	-158 dBm	18.6 to 22.0 GHz	-140 dBm

RF input/output 3.5 mm (m), 50 Ω (nominal)

Input SWR	1.0 to 2.0 GHz	2.0:1
	2.0 to 12.5 GHz	1.5:1
	12.5 to 26.5 GHz	2.0:1
Output SWR	1.0 to 26.5 GHz	2.0:1

Reverse isolation: > 75 dB

Temperature:

Operation, 0 ° to +55 °C; storage, -40 ° to +75 °C

EMI: FTZ 1046; CISPR Pub 11; MIL-STD 461C, part 7, CE03 and RE02

Power requirements: 100, 120, 220, or 240 volts (+10%), 47-63 Hz

Calibration cycle: 3 years (recommended)

Weight: 4 kg (8.8 lb)

Size:

102 H x 213 W x 297 mm D (4 in x 8.4 in x 11.74 in)

Ordering Information

HP 8449B (1 to 26.5 GHz preamplifier)

Option 907 front handle kit

Option 908 rack mount kit (half rack width)