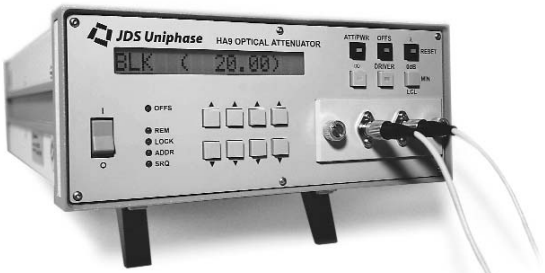
Programmable Attenuator



Key Features

- 100 dB range
- 0.01 or 0.001 dB resolution
- 0.01 dB repeatability
- Accuracy of ± 0.1 dB
- Typical polarization dependent loss (PDL) of 0.03 dB
- 1200 to 1700 nm or 750 to 1700 nm wavelength ranges
- Built-in beam block
- GPIB and RS-232 remote control
- Single-mode (SM) or multimode (MM) fiber
- SCPI compatible command set
- Optional couplers or switches
- High power input of 1000 mW
- Wavelength dependence of less than ± 0.05 dB over 1530 to 1625 nm range

Applications

- Precise optical power control
- Power meter linearity calibration
- Analog transmission tests
- Bit error rate (BER) tests
- Loss simulation in fiberoptic links
- Erbium-Doped Fiber Amplifier (EDFA) output power characterization

Safety Information

Complies to CE requirements plus UL3101-1 and CAN/CSA-C22.2 No. 1010.1

The JDS Uniphase Programmable Attenuator is a high-resolution, extended-range, programmable attenuator ideal for testing power meters and general test and laboratory work. The attenuator has a nominal resolution of 0.01 dB (0.001 dB for the HA1 series) and an extended attenuation range up to 100 dB. The standard operating wavelength is 1200 to 1700 nm (750 to 1700 nm is available for use with a reduced attenuation range of 60 dB for the HA9W attenuator).

HA attenuators are ideal for use in such demanding applications as multichannel AM systems and high bit-rate digital pulse code modulation (PCM) systems. Discrete internal optical reflections are minimized to better than 60 dB, and cavity effects are virtually eliminated. All HA attenuators are offered with high return loss (RL) and low spectral ripple for CATV AM systems.

The HA2 series Programmable Attenuator provides a **low** wavelength dependence of ± 0.05 dB and input power up to 1 W (30 dBm). The HA2 is suitable for a variety of applications including amplifier testing and dense wavelength division multiplexing (DWDM) system characterization.

The inherently linear design of these attenuators, combined with built-in calibration and offset functions, allows the user to match the display to an optical power meter over a wide power range. This feature is useful in tests requiring control of the absolute optical power source for the test device. The built-in beam blocking switch provides fast access from any attenuation setting to infinite attenuation (> 90 dB).

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Front panel access provides the option of increasing functionality through the addition of other devices, such as couplers or switches. The 5 V driver key on the front panel (connected to the 5 V driver on the back) acts as a toggle for an external or internal (if installed) switch.

The HA9 and HA1 attenuators can be fitted with a 10/90 or 50/50 coupler or a 1 x 2 switch to provide an output tap to access two inputs or outputs. All models have an SCPI/HP8156A compatible command set and can be controlled from the front panel keyboard or by the GPIB or RS-232 interfaces.

Specifications

Parameter	HA1 High Resolution	HA 9 Highly Configurable	HA9W Wide Wavelength Range	HA9P Flexcor Fiber	HA2 High Power and Wavelength Flat
Operating wavelength range	1200 to1700 nm	1200 to 1700 nm	750 to 1700 nm	980 to 1100 nm	1280 to 1670 nm
Attenuation[1]					
Range	100 dB	100 dB	60 dB	60 dB	50 dB
Resolution	0.001 dB	0.01 dB	0.01 dB	0.01 dB	0.01 dB
Repeatability[2]	± 0.01 dB	± 0.01 dB	± 0.01 dB	± 0.01 dB	± 0.01 dB
Change rate	≤ 2.5 s 0 to 100 dB	≤ 2.5 s 0 to 100 dB	≤ 1.5 s 0 to 60 dB	≤ 1.5 s 0 to 60 dB	≤ 1.5 s 0 to 50 dB
Accuracy[3]	± 0.1 dB	± 0.1 dB	± 0.1 dB	± 0.1 dB	± 0.1 dB
Insertion loss (IL)[4, 5, 6]					
Single-mode (SM)	≤ 1.5 dB	≤ 1.5 dB	≤ 5.0 dB	N/A	≤ 1.0 dB[8]
Multimode (MM), 50/125µm	N/A	≤ 2.2 dB	≤ 3.2 dB	N/A	N/A
MM, other	N/A	≤ 2.9 dB	≤ 3.9 dB	N/A	N/A
Flexcor 1060	N/A	N/A	N/A	≤ 2.5 dB	N/A
Return loss (RL)[4, 5]					
SM	N/A	≥ 45 dB	≥ 45 dB	N/A	N/A
SM, analog[7]	≥ 60 dB	≥ 60 dB	≥ 60 dB	N/A	≥ 50 dB
MM, 50/125 µm	N/A	≥ 35 dB	≥ 35 dB	N/A	N/A
MM, other	N/A	≥ 30 dB	≥ 30 dB	N/A	N/A
Flexcor 1060	N/A	N/A	N/A	≥ 60 dB	N/A
Wavelength dependence[4, 9]	N/A	N/A	N/A	N/A	± 0.05 dB (0 to 20 dB attenuation)
(1530 to 1625 nm)	N/A	N/A	N/A	N/A	± 0.10 dB (20 to 30 dB attenuation)
Maximum optical input power	200 mW	200 mW	200 mW	200 mW	1 W
Recalibration period (recommended)	2 years				
Polarization dependent loss (PDL)[4, 5]	0.03 dB typical, 0.08 dB maximum				
Beam block attenuation	≥ 90 dB				
Input voltage	100 to 240 V AC, 50 to 60 Hz				
Power consumption	100 V A maximum				
Operating temperature	0 to 40 °C				
Storage temperature	- 40 to 60 °C				
Humidity	maximum 90 % up to 40 °C				
Dimensions (W x H x D)	21.2 x 8.9 x 35.5 cm 19-inch (48.26 cm) rackmounting 2U high				
Weight	4 kg				

1. The attenuation range is a continuous function of wavelength.
2. At constant temperature, wavelength, and polarization state after half-hour warm-up.
3. Up to 60 dB of attenuation for SM and 45 dB of attenuation for MM. Maximum specification at calibrated wavelength ± 15 nm. Outside these wavelength ranges, the typical accuracy is the greater of ± 0.1 dB or ± 0.003 dB/dB.
4. Measured at 23 °C with a laser source.
5. Not including connectors, switch, or coupler (if installed).
6. Over 850 to 1600 nm. IL is typically highest at wavelength extremes.
7. Total of discrete reflections. Does not include distributed reflection in fiber.
8. From 1375 to 1670 nm, < 1.5 dB from 1280 to 1375 nm.
9. Relative to reference 0 dB setting.

Ordering Information

For more information on this or other products and their availability, please contact your local JDS Uniphase account manager or JDS Uniphase directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at sales@jdsu.com.

Sample: HA097+28KFA1

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Code	Model
01	HA1 (high resolution, 1200 to1700 nm)
02	HA2 (high power, wavelength flat)
09	HA9 (1200 to 1700 nm)
9P	HA9P (Flexcor 1060, 980 to1100 nm)
9W	HA9W (750 to 1700 nm)

Code	Fiber Type (µm)
1	50/125 (HA9 and HA9W only)
2	62.5/125 (HA9 and HA9W only)
7	9/125
8	Flexcor 1060 (HA9P only)

Code	Built-in Options
0	None
1	50/50 coupler (9/125 µm only)
8	1:2 switch (HA1 and HA9 only)
9	10/90 coupler (9/125 µm only)

Code	Return Loss
K	Standard
A	Analog

Code	ConnectorType (all ports)
FP	FC/PC
FA	FC/APC
SC	SC/PC
SU	SC/APC

Code	Port Type
1	Bulkheads on front
3	Pigtails on front

If the configurations available do not meet your performance requirements, please contact our global sales and customer service team to discuss the potential for specialized solutions.