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Keysight Technologies

RF & Microwave Attenuators

Selection Guide

Performance you can count on
for your signal conditioning needs













KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

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Keysight RF & Microwave Attenuators

Keysight Technologies, Inc. coaxial fixed and step attenuators are designed for use in a wide variety of signal conditioning and level control applications. Attenuators are generally used to reduce signal levels, improve matching impedances of sources and loads, and measure the gain or loss of two-port devices.

Key Features

- High reliability and exceptional repeatability reduce downtime
- Excellent RF specifications optimize test system measurement capability
- Broad portfolio of attenuation and connector options provide configuration flexibility

Applications:

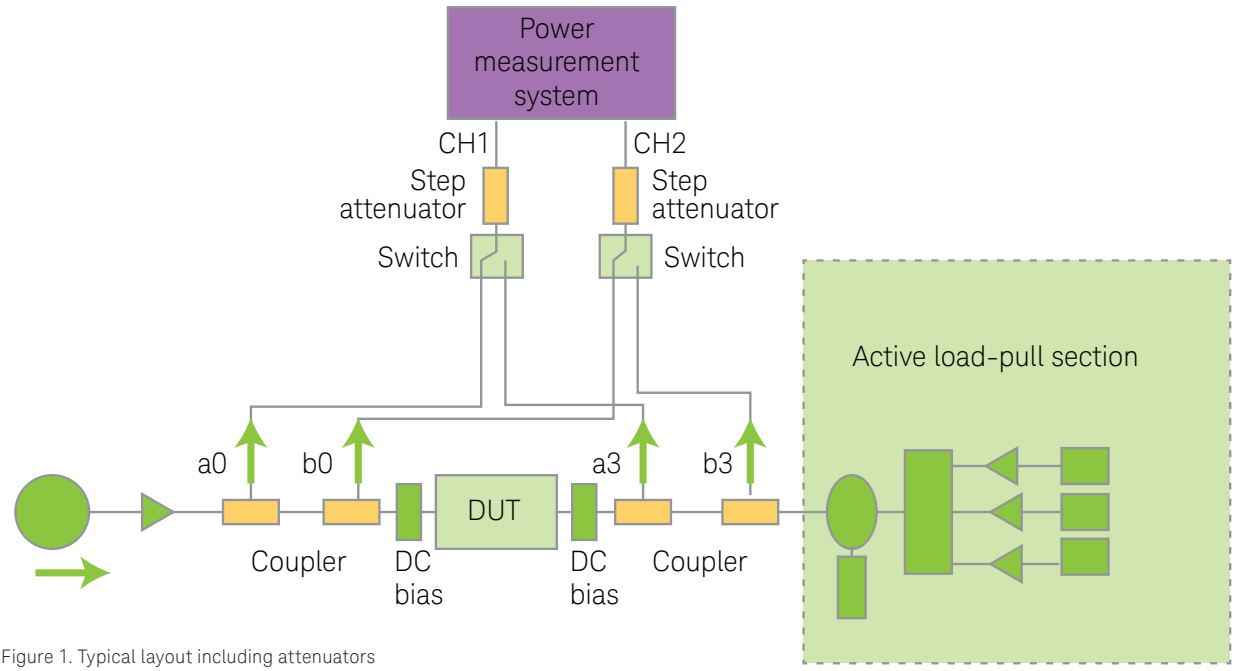


Figure 1. Typical layout including attenuators

Coaxial Fixed Attenuators

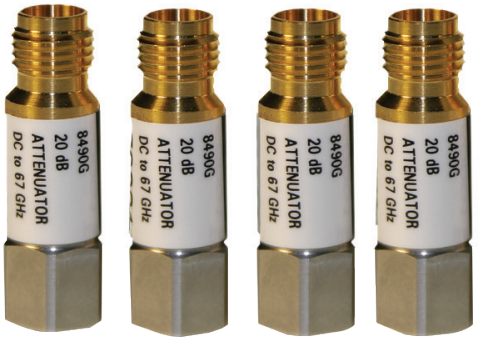




Figure 2. Coaxial fixed attenuators

Keysight coaxial fixed attenuators provide precise attenuation, flat frequency response and low SWR over broad frequency range. These attenuators are available in nominal attenuations of 3, 6, 10, 20, 30, 40, 50 and 60 dB to cater to various applications and setups.

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Model number	Frequency	Attenuation selection								Max. SWR	Max. input average power (W)	Max. input peak power (W)[1]	RF connectors
		3 dB	6 dB	10 dB	20 dB	30 dB	40 dB	50 dB	60 dB				
8491A	DC to 12.4 GHz	x	x	x	x	x	x	x	x	1.30	2	100	N (m,f)
8493A	DC to 12.4 GHz	x	x	x	x	x	-	-	-	1.30	2	100	SMA (m,f)
8491B	DC to 18 GHz	x	x	x	x	x	x	x	x	1.50	2	100	N (m,f)
8493B	DC to 18 GHz	x	x	x	x	x	-	-	-	1.50	2	100	SMA (m,f)
8498A	DC to 18 GHz	-	-	-	-	x	-	-	-	1.30	25	125	N (m,f)
8493C	DC to 26.5 GHz	x	x	x	x	x	x	-	-	1.25	2	100	3.5 mm (m,f)
8490D	DC to 50 GHz	x	x	x	x	x	x	-	-	1.45	1	100	2.4 mm (m,f)
8490G	DC to 67 GHz	x	x	x	x	x	x	-	-	1.45	1	100	1.95 mm (m,f)

1. The peak power maximum pulse width is 10 microseconds.

Manual Step Attenuators



Figure 3. Manual step attenuators

Keysight manual step attenuators offer fast, precise signal-level control up to 26.5 GHz. Unmatched attenuation repeatability of less than 0.03 dB up to 5 million cycles per section ensures low measurement uncertainty. Attenuation range of 121 dB in 1 dB step can be achieved by cascading 2 attenuators in series.

Manual Step Attenuators[1]									
Model number	Frequency	Attenuation range (dB)	Attenuation step (dB)	Insertion loss (dB) at 0 dB	Maximum SWR	Maximum input average power (W)	Maximum input peak power (W)[2]	Operating life (n million cycles/ section)	Repeatability (dB)
8494A	DC to 4 GHz	0 to 11	1	0.96	1.50	1	100	5	0.03
8495A	DC to 4 GHz	0 to 70	10	0.68	1.35	1	100	5	0.03
8496A	DC to 4 GHz	0 to 110	10	0.96	1.50	1	100	5	0.03
8494B	DC to 18 GHz	0 to 11	1	2.22	1.90	1	100	5	0.03
8495B	DC to 18 GHz	0 to 70	10	1.66	1.70	1	100	5	0.03
8496B	DC to 18 GHz	0 to 110	10	2.22	1.90	1	100	5	0.03
8495D	DC to 26.5 GHz	0 to 70	10	3.95	2.20	1	100	5	0.03 to 18 GHz 0.05 to 26.5 GHz

1. All product models listed above offer RF connector options for N(f) / SMA(f) / APC-7 except 8495D which only offer 3.5 mm (f) RF connectors.
2. The peak power maximum pulse width is 10 microseconds.

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Programmable Step Attenuators





Figure 4. Programmable step attenuators

Keysight programmable step attenuators offer fast, precise signal-level control up to 50 GHz, with switching time of less than 20 ms. Unmatched attenuation repeatability of less than 0.03 dB up to 5 million cycles per section ensures low measurement uncertainty and reduces calibration cycles when installed into test systems. Automatic GPIB/USB/LAN drive control is achieved with the 11713B/C attenuator/switch driver.

Programmable step attenuators									
Model number	Frequency	Attenuation range (dB)	Attenuation step (dB)	Insertion loss (dB) at 0 dB	Max. SWR	Max. input average power (W)	Max. input peak power (W)[1]	Operating life (n million cycles/ section)	Repeatability (dB)
8494G	DC to 4 GHz	0 to 11	1	0.96	1.50	1	100	5	0.03
8495G	DC to 4 GHz	0 to 70	10	0.68	1.35	1	100	5	0.03
8496G	DC to 4 GHz	0 to 110	10	0.96	1.50	1	100	5	0.03
8494H	DC to 18 GHz	0 to 11	1	2.22	1.90	1	100	5	0.03
8495H	DC to 18 GHz	0 to 70	10	1.66	1.70	1	100	5	0.03
8496H	DC to 18 GHz	0 to 110	10	2.22	1.90	1	100	5	0.03
8495K	DC to 26.5 GHz	0 to 70	10	3.95	2.20	1	100	5	0.03 to 18 GHz 0.05 to 26.5 GHz
8497K	DC to 26.5 GHz	0 to 90	10	2.79	1.80	1	100	5	0.03 to 18 GHz 0.05 to 26.5 GHz
84904K	DC to 26.5 GHz	0 to 11	1	1.86	2.00	1	50	5	0.03
84906K	DC to 26.5 GHz	0 to 90	10	1.86	2.00	1	50	5	0.03
84907K	DC to 26.5 GHz	0 to 70	10	1.40	1.90	1	50	5	0.03
84904L	DC to 40 GHz	0 to 11	1	2.40	2.00	1	50	5	0.03
84906L	DC to 40 GHz	0 to 90	10	2.40	2.00	1	50	5	0.03
84907L	DC to 40 GHz	0 to 70	10	1.80	1.90	1	50	5	0.03
84904M	DC to 50 GHz	0 to 11	1	3.00	3.00	1	50	5	0.03
84905M	DC to 50 GHz	0 to 60	10	2.60	2.60	1	50	5	0.03
84908M	DC to 50 GHz	0 to 65	5	3.00	3.00	1	50	5	0.03

1. The peak power maximum pulse width is 10 microseconds.

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Attenuation Control Units



Figure 5. Attenuator control unit

Attenuation control units										
Model Number	Number of channels	Frequency	Attenu-ation range (dB)	Attenua-tion step (dB)	Max insertion loss (dB) at 0 dB	Max. SWR	Max. input average power (W)	Max. input peak power (W)[1]	Operating life (n million cycles/ section)	Repeatability (dB)
J7211A	1	DC to 6 GHz	121	1, 5 and 10	2.5	1.5	1	100	5	0.03
J7211B	1	DC to 18 GHz	121	1, 5 and 10	DC to 6 GHz: 2.5 6 to 18 GHz: 5.0	DC to 6 GHz: 1.50 6 to 18 GHz: 1.90	1	100	5	0.03
J7211C	1	DC to 26.5 GHz	101	1, 5 and 10	DC to 6 GHz: 2.5 6 to 18 GHz: 4.0 18 to 26.5 GHz: 5.0	DC to 6 GHz: 1.35 6 to 18 GHz: 1.78 18 to 26.5 GHz: 2.61	1	50	5	0.03 to 18 GHz 0.05 to 26.5 GHz
J7204A	4	DC to 6 GHz	121	1	2.5	1.5	1	100	5	0.03
J7204B	4	DC to 18 GHz	121	1	DC to 6 GHz: 2.5 6 to 18 GHz: 5.0	DC to 6 GHz: 1.50 6 to 18 GHz: 1.90	1	100	5	0.03
J7205A	5	DC to 6 GHz	121	1	2.5	1.5	1	100	5	0.03
J7205B	5	DC to 18 GHz	121	1	DC to 6 GHz: 2.5 6 to 18 GHz: 5.0	DC to 6 GHz: 1.50 6 to 18 GHz: 1.90	1	100	5	0.03

1. The peak power maximum pulse width is 10 microseconds.

Interconnect Kits

- 11716A Type-N interconnect kit
- 11716C SMA interconnect kit
- 11716D 2.9 mm interconnect kit
- 11716E 3.5 mm interconnect kit
- 11716F 2.4 mm interconnect kit

11716A/C/D/E/F interconnect kits can be used to connect any two of the Keysight 8494/95/96, 84904/8M, 84904/6L, or 84904/6K attenuators in series to achieve broader attenuation ranges with 1 dB attenuation step.

Attenuator	Intercon-nection Kit
8494x, 8495x, 8496x	11716A/C
84904L, 84906L, Option 006, 106	11716D
84904L, 84906L, Option 101, 100	11716F
84904K, 84906K	11716E

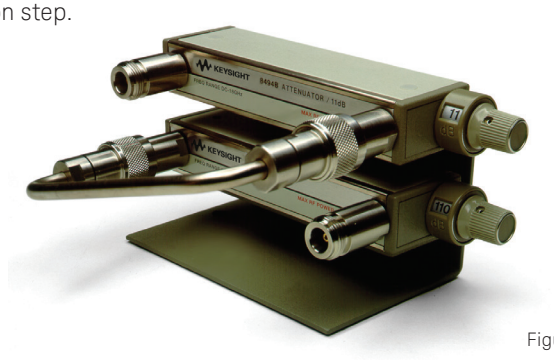


Figure 6. Two attenuators (not included) connected with an interconnect kit

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Interconnect Kits continued

Attenuator type	Frequency range	Attenuator 1	Attenuator 2	Attentuation range	Attenuation step
Manual	DC to 4 GHz	8494A	8495A	81	1
Manual	DC to 4 GHz	8494A	8496A	121	1
Manual	DC to 18 GHz	8494B	8495B	84	1
Manual	DC to 18 GHz	8494B	8496B	121	1
Programmable	DC to 4 GHz	8494G	8495G	81	1
Programmable	DC to 4 GHz	8494G	8496G	121	1
Programmable	DC to 18 GHz	8494H	8495H	81	1

Attenuator Sets



Figure 7. Coaxial fixed attenuator set

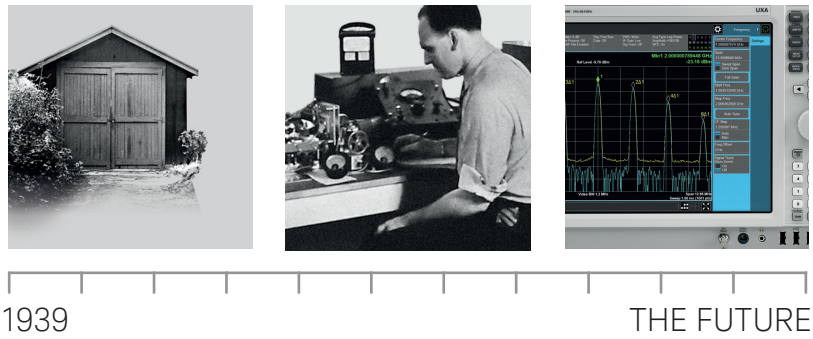
Sets of four coaxial fixed attenuators with attenuations of 3, 6, 10 and 20 dB are provided in a walnut accessory case. These sets are ideal for calibration labs or where precise knowledge of attenuation and SWR is desired.

Attenuator sets	Coaxial fixed attenuator model number	Attenuation
11581A	8491A	3, 6, 10 and 20 dB
11582A	8491B	3, 6, 10 and 20 dB
11853C	8493C	3, 6, 10 and 20 dB

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© Keysight Technologies, 2013 - 2016
Published in USA, February 1, 2016
5989-6948EN
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