Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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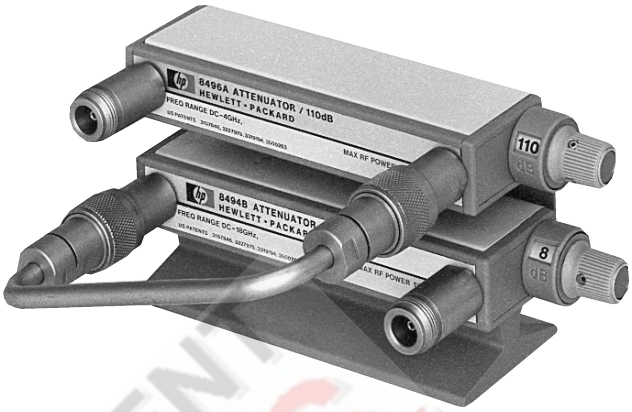
HP 8495D

HP 8495K



HP 11716A

Programmable and Manual Step Attenuators DC–1000 MHz

Manual

HP 355C (0–12 dB, 1 dB steps)
HP 355D (0–120 dB, 10 dB steps)

Programmable

HP 355E (0–12 dB, 1 dB steps)
HP 355F (0–120 dB, 10 dB steps)

The manual and programmable HP 355 C/D/E/F attenuators offer exceptional attenuation accuracy to 1 GHz; +0.1 dB to 1 kHz, 0.25 dB to 500 MHz, 0.35 to 1 GHz. They feature BNC (f) RF connectors, with optional type-N (Option 001) and TNC (Option 005) also available. To achieve 1 dB steps to 132 dB range, serially connect two attenuators using a standard UG-491A/U BNC (m)-to-BNC (m) adapter. Programmable HP 355 E/F models feature a 7-pin connector (supplied). To protect your transistor driver against transients during the switching cycle, order Option 007 to install a protective diode between each solenoid and driver.

Programmable and Manual Step Attenuators DC–26.5 GHz

HP 8494A/B/G/H (0–11 dB, 1 dB steps)
HP 8495A/B/D/G/H/K (0–70 dB, 10 dB steps)
HP 8496A/B/G/H (0–110 dB, 10 dB steps)
HP 8497K (0–90 dB, 10 dB steps)

The HP 8494/95/96/97 family of step attenuators offer fast, precise signal level control in three frequency ranges, dc to 4 GHz, dc to 18 GHz and dc to 26.5 GHz. They feature exceptional repeatability and reliability in a wide range of frequency, attenuation and connector options.

Attenuation repeatability is specified to be less than 0.03 dB (0.05 dB, 18-26.5 GHz) for 5 million cycles per section. This assures low measurement uncertainty and high user confidence when designed into automatic test systems. Electromechanical step attenuators offer low SWR, low insertion loss and high accuracy required by high-performance test and measurement equipment.

Precision plated leaf-spring contacts remove attenuator sections (miniature tantalum nitride thin-film T-pads on sapphire and alumina substrates) from the signal path. Unique process controls and material selection ensure unmatched life and contact repeatability.

Programmable Models

Miniature drive solenoids in the programmable models keep switching time, including settling, down to less than 20 milliseconds. Once switched, strong permanent magnets hold the solenoids (and attenuation value) in place. Current interrupts automatically disconnect solenoid current, simplifying driver circuit design and minimizing heat dissipation. Programming is done through a 12-pin Viking socket or optional ribbon cables with DIP plugs.

To simplify connecting programmable attenuators to the drive circuit, each unit is supplied with a 5-ft. cable assembly. With an HP 11713A attenuator driver, 87130A attenuator driver, or an HP 70611A driver for MMS-based systems, automatic drive control is easy using the Hewlett-Packard Interface Bus (HP-IB) automated system.

HP 11716A/B/C Attenuator Interconnect Kits

Quickly and conveniently connect 1 dB step and 10 dB step attenuators together to achieve greater dynamic range with 1 dB steps. The 11716A/B/C interconnect kits contain a rigid RF cable, mounting bracket, and necessary hardware to connect any pair of HP 8494/95/96/97 attenuators in series (see photo above). Attenuators must be ordered separately.

Key Literature

New *RF & Microwave Test Accessories Catalog,* p/n 5964-9527E

Ordering Information

HP 11716A Interconnect Kit (Type-N)
HP 11716B Interconnect Kit (APC-7)
HP 11716C Interconnect Kit (SMA)
HP 11717A Attenuator/Switch Rackmount Support Kit

HP 355 Series, 8494/5/6/7 Series Specifications

HP Model (Switching Mode)	Frequency Range (GHz)	Attenuation Range (dB)	Maximum SWR	Insertion Loss @ 0 dB	Attenuation Accuracy	Power Rating, Minimum Life	Solenoid Voltage Speed Power	Size, Shipping Weight	Connector Options
355C (Manual) **355E (Programmable)**	dc to 1	0 to 12 1 dB steps	1.2 to 250 MHz 1.3 to 500 MHz 1.5 to 1 GHz	0.11 dB + 1.39 dB/GHz	±0.1 dB @ 1000 Hz ±0.25 dB: dc to 0.5 GHz ±0.35 dB: dc to 1.0 GHz	0.5 W avg. 350 W peak 0.5 million cycles per section	— 15 to 18 V <65 ms 3.0 W	70 mm W x 67 mm H x 152 mm D (2.75 in x 2.6 in x 6 in) 1.4 kg (3 lb)	BNC (f) See Note 1
355D (Manual) **355F (Programmable)**	dc to 1	0 to 120 10 dB steps	1.2 to 0.25 GHz 1.3 to 0.5 GHz 1.5 to 1 GHz	0.11 dB + 1.39 dB/GHz	±0.3 dB @ 1000 Hz ±1.5 dB to 90 dB, and ±3 dB to 120 dB @ 1 GHz	0.5 W avg. 350 W peak 0.5 million cycles per section	— 15 to 18 V <65 ms 3.0 W	70 mm W x 67 mm H x 152 mm D (2.75 in x 2.6 in x 6 in) 1.4 kg (3 lb)	BNC (f) See Note 1
8494A (Manual) **8494G (Programmable)**	dc to 4	0 to 11 1 dB steps	1.5	0.6 dB + 0.09 dB/GHz	±0.2 dB: 1 to 2 dB ±0.3 dB: 3 to 6 dB ±0.4 dB: 7 to 10 dB ±0.5 dB: 11 dB	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	73 mm W x 43 mm H x 159 mm D (2.9 in x 1.7 in x 6.2 in) 0.9 kg (2 lb) 79 mm W x 43 mm H x 168 mm D (3.1 in x 1.7 in x 6.6 in) 0.9 kg (2 lb)	001 002 003 See Note 2
8494B (Manual) **8494H (Programmable)**	dc to 18	0 to 11 1 dB steps	1.5 to 8 GHz 1.6 to 12.4 GHz 1.9 to 18 GHz	0.6 dB + 0.09 dB/GHz	**dc to 12.4 GHz** ±0.3 dB: 1 to 2 dB ±0.4 dB: 3 to 4 dB ±0.5 dB: 5 to 6 dB ±0.6 dB: 7 to 10 dB ±0.7 dB: 11 dB **dc to 18 GHz** ±0.7 dB: 1 to 5 dB ±0.8 dB: 6 to 9 dB ±0.9 dB: 10 to 11 dB	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	73 mm W x 43 mm H x 159 mm D (2.9 in x 1.7 in x 6.2 in) 0.9 kg (2 lb) 79 mm W x 43 mm H x 168 mm D (3.1 in x 1.7 in x 6.6 in) 0.9 kg (2 lb)	001 002 003 See Note 2
8495A (Manual) **8495G (Programmable)**	dc to 4	0 to 70 10 dB steps	1.35	0.4 dB + 0.07 dB/GHz	±1.7% of setting or 0.4 dB, whichever is greater	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	73 mm W x 43 mm H x 130 mm D (2.9 in x 1.7 in x 5.1 in) 0.9 kg (2 lb) 79 mm W x 43 mm H x 141 mm D (3.1 in x 1.7 in x 5.5 in) 0.9 kg (2 lb)	001 002 003 See Note 2
8495B (Manual) **8495H (Programmable)**	dc to 18	0 to 70 10 dB steps	1.35 to 8 GHz 1.5 to 12.4 GHz 1.7 to 18 GHz	0.4 dB + 0.07 dB/GHz	±3%: dc to 12.4 GHz ±4%: dc to 18 GHz % in dB from atten. setting	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	73 mm W x 43 mm H x 130 mm D (2.9 in x 1.7 in x 5.1 in) 0.9 kg (2 lb) 79 mm W x 43 mm H x 141 mm D (3.1 in x 1.7 in x 5.5 in) 0.9 kg (2 lb)	001 002 003 See Note 2
8495D (Manual) **8495K (Programmable)**	dc to 26.5	0 to 70 10 dB steps	1.25 to 6 GHz 1.45 to 12.4 GHz 1.6 to 18.0 GHz 1.8 to 26.5 GHz	0.5 dB + 0.13 dB/GHz	±0.3 dB at 6 GHz 10 dB attenuation to ±2.8 dB at 26.5 GHz 90 dB attenuation	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	52 mm W x 43 mm H x 159 mm D (2.1 in x 1.7 in x 6.2 in) 0.9 kg (2 lb) 52 mm W x 43 mm H x 168 mm D (2.1 in x 1.7 in x 6.6 in) 0.9 kg (2 lb)	004 3.5 mm See Note 2
8496A (Manual) **8496G (Programmable)**	dc to 4	0 to 110 10 dB steps	1.5	0.6 dB + 0.09 dB/GHz	±1.7% of setting or 0.4 dB, whichever is greater	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	73 mm W x 43 mm H x 159 mm D (2.9 in x 1.7 in x 6.2 in) 0.9 kg (2 lb) 79 mm W x 43 mm H x 168 mm D (3.1 in x 1.7 in x 6.6 in) 0.9 kg (2 lb)	001 002 003 See Note 2
8496B (Manual) **8496H (Programmable)**	dc to 18	0 to 110 10 dB steps	1.5 to 8 GHz 1.6 to 12.4 GHz 1.9 to 18 GHz	0.6 dB + 0.09 dB/GHz	±3%: dc to 12.4 GHz ±4%: dc to 18 GHz % in dB from atten. setting	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	— 20 to 30 V <20 ms 2.7 W	73 mm W x 43 mm H x 159 mm D (2.9 in x 1.7 in x 6.2 in) 0.9 kg (2 lb) 79 mm W x 43 mm H x 168 mm D (3.1 in x 1.7 in x 6.6 in) 0.9 kg (2 lb)	001 002 003 See Note 2
8497K (Programmable)	dc to 26.5	0 to 90 10 dB steps	1.25 to 6 GHz 1.45 to 12.4 GHz 1.6 to 18.0 GHz 1.8 to 26.5 GHz	0.4 dB + 0.09 dB/GHz	±0.3 dB at 6 GHz 10 dB attenuation to ±2.8 dB at 26.5 GHz 90 dB attenuation	1 W avg. 100 W peak 10 μs max. 5 million cycles per section	5 V or 24 V	52 mm W x 43 mm H x 143 mm D (2.1 in x 1.7 in x 5.6 in) 0.9 kg (2 lb)	004 3.5 mm See Note 2

How to Order the HP 8494/5/6/7 Series Attenuators

Each order must include basic model number, suffix letter, and connector option.

Ordering example: HP 8494 **A** Option **001**

4	**A**	**001**
4 (1 dB step, 11 dB max)	**A** (Manual, dc to 4 GHz)	**001** (N female)
5 (10 dB step, 70 dB max)	**B** (Manual, dc to 18 GHz)	**002** (SMA female)
6 (10 dB step, 110 dB max)	**D** (Manual, dc to 26.5 GHz)*	**003** (APC-7)
7 (10 dB step, 90 dB max)	**G** (Programmable, dc to 4 GHz)	**004** (3.5 mm female)*
	H (Programmable, dc to 18 GHz)	
	K (Programmable, dc to 26.5 GHz)*	

*Option 004 is only available on D and K models.

Note 1: 355C/D/E/F connector options (BNC (f) standard):
Option 001 N(f)
Option 005 TNC(f)
Option 007 Transistor protection (355E/F only)
Option UKS Commercial Calibration Certificate

Note 2: 8494/5/6/7 orders must specify connector option. See ordering example.
Option 001 N(f)
Option 002 SMA(f)
Option 003 APC-7
Option 004 3.5 mm (HP 8495D/K, 8497K only)
Option UK6 Commercial Calibration Test Data with Certificate
Option UKS Commercial Calibration Certificate