

Precision Step Attenuators

44x2K, 45x2K, 46x2K Step Attenuators
4412K, 4422K, 4512K, 4522K, 4612K, 4622K



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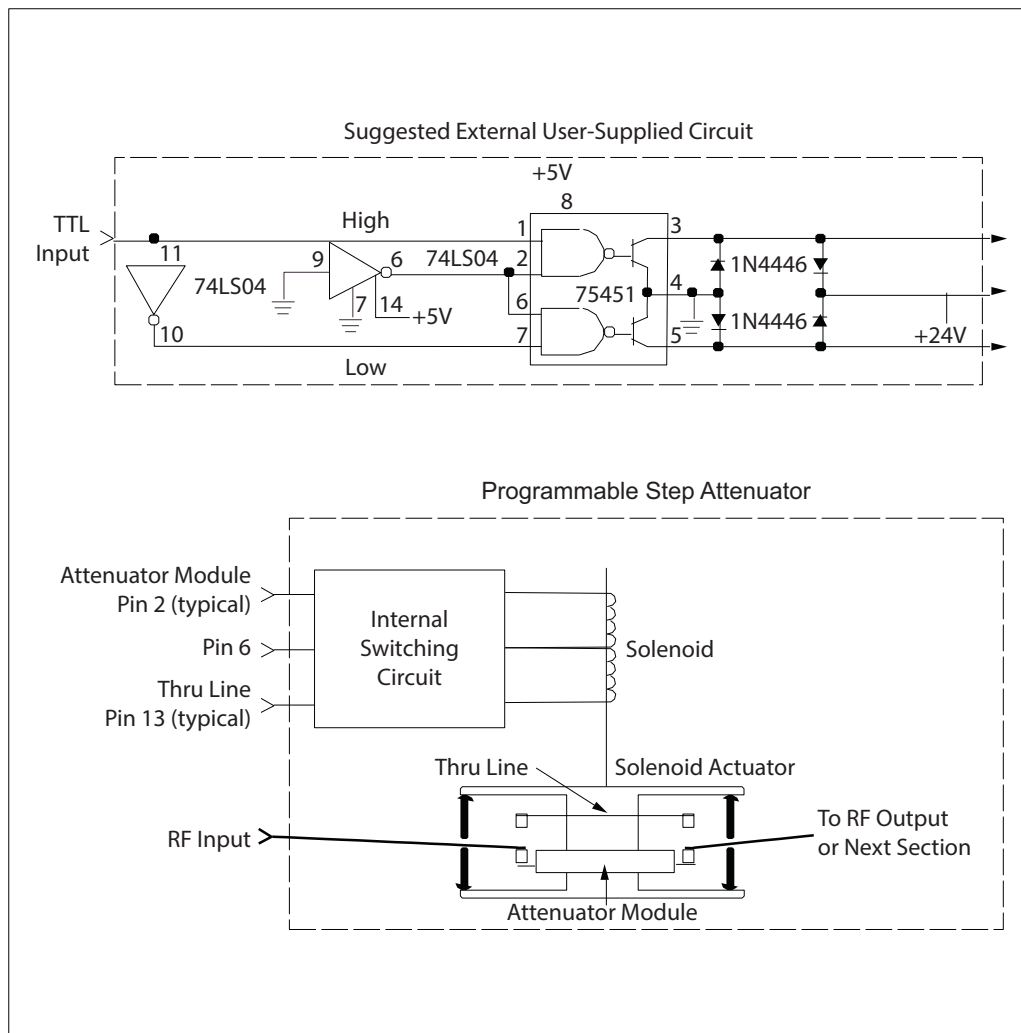
Definitions

Specifications	All specifications and characteristics apply under the following conditions, unless otherwise stated:
Warm-Up Time	After 10 minutes of warm-up time, where the instrument is left in the ON state.
Reference Signal	When using internal reference signal.
Typical Performance	Typical specifications are not tested and are not warranted. They are generally representative of characteristic performance.
Nominal Performance	Nominal specifications are design parameters; they are not tested and are not warranted.
Calibration Cycle	Calibration is within the recommended 12 month period
	All specifications in this data sheet are subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com

Introduction

Anritsu step attenuators provide attenuation from 0 – 70 dB or 0 – 110 dB in 10 dB steps. The 70 dB step attenuators (4412K, 4512K, and 4612K) have three switched attenuation sections; the 110 dB models (4422K, 4522K, 4622K) have four sections. Each section contains a precision attenuator module that is electro-mechanically switched in or out to provide the required attenuation. All models use in-line, female K Connectors™.

The step attenuators have a built-in DC switching circuit. Each attenuator section is controlled by its own driver circuit, which requires an externally applied signal of 24 V, 125 mA.



Simplified schematic of one attenuator section shows an external TTL circuit that can be used to drive the attenuator internal DC switching circuits and solenoid.

Performance

Frequency and Attenuation Ranges

Model	Frequency Range	Attenuation Range in 10 dB Steps
4412K 4422K	DC to 20 GHz	0 to 70 dB 0 to 110 dB
4512K 4522K	DC to 26.5 GHz	0 to 70 dB 0 to 110 dB
4612K 4622K	DC to 40 GHz	0 to 70 dB 0 to 110 dB

Attenuator Accuracy ($\pm$ dB)

Frequency (GHz)	Attenuation (dB)							
	10	20	30	40	50	60	70	80 – 110
DC – 8	0.3	0.5	0.6	0.7	0.8	1.0	1.1	1.4
> 8 – 12	0.4	0.5	0.7	0.9	1.0	1.3	1.5	2.0
> 12 – 20	0.5	0.6	0.8	1.1	1.2	1.4	1.7	2.2
> 20 – 26.5	0.7	0.8	1.0	1.5	1.6	1.9	2.3	2.8
> 26.5 – 40	0.9	1.0	1.2	1.7	1.9	2.3	2.6	3.2

Switching Speed (maximum)

20 ms (single switch)

Operating Voltage

20 to 30 V

Switching Control Current

125 mA @ 24 V nominal per section
(three sections in 4412K, 4512K, 4612K; four in 4422K, 4522K, 4622K)

Solenoid Coil Impedance

190 ohms $\pm$ 10 ohms

Solenoid Coil Inductance

65 mH

RF Input Power (maximum)

1 W average, 100 W peak for 10 μ s

RF Power Sensitivity

0.001 dB/W

Temperature Coefficient

< 0.001 dB/dB/ $^{\circ}$ C

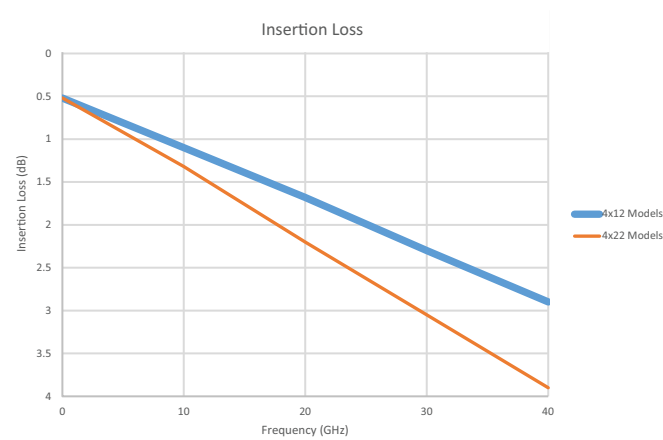
Life (minimum operations per section)

5 million

Repeatability (typical after 1 million operations)

 $\pm$ 0.03 dB to 18 GHz, $\pm$ 0.05 dB to 26.5 GHz, $\pm$ 0.08 dB to 40 GHz

Insertion Loss (maximum)



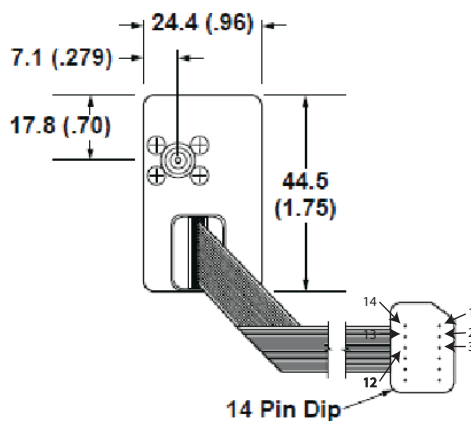
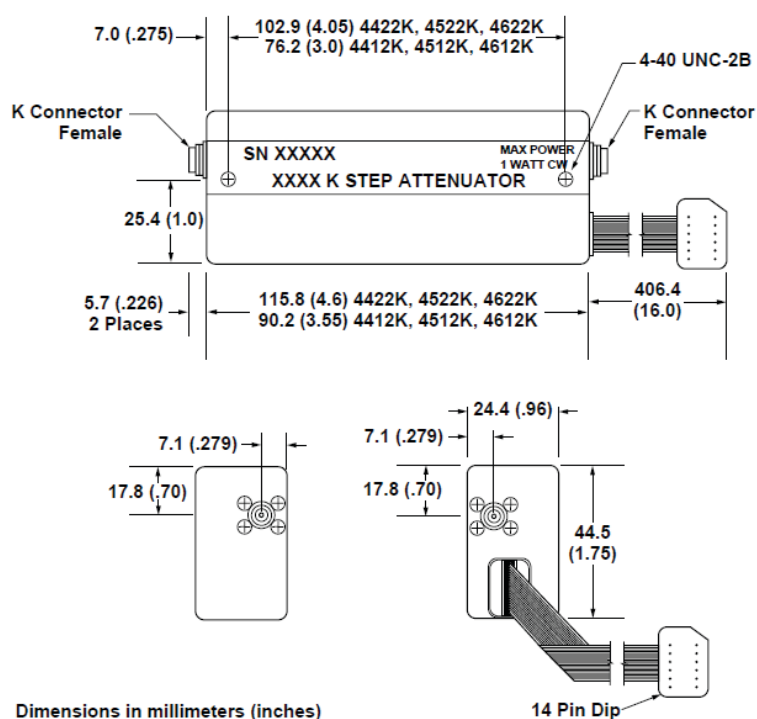
Impedance Match

Frequency	Return Loss (dB)	SWR
DC – 8	19	1.25
> 8 – 12	14	1.5
> 12 – 20	13	1.6
> 20 – 26.5	11	1.8
> 26.5 – 40	9	2.1

Mechanical

Mechanical Weight	4412K, 4512K, 4612K	170 g (6.0 oz)
	4422K, 4522K, 4622K	213 g (7.5 oz)
Mounting Position	Any	
RF Connectors	K Connectors, female, in-line	
Programming Connector	14 pin DIP	
Programming Cable Length	406 mm (16 in)	

Outline Drawing



DIP Connector Pin Assignments

Pin 1 starts at the corner that is cut diagonally and moves clockwise to pin 14.

Pin	Wire Color	Connections	
		Models 4412K, 4512K, 4612K	Models 4422K, 4522K, 4622K
1	—	—	—
2	Grey	10 dB Section Attenuator	10 dB Section Attenuator
3	Grey	40 dB Section Thru Line	40 dB Section 1 Thru Line
4	Grey	—	40 dB Section 2 Thru Line
5	Grey	20 dB Section Attenuator	20 dB Section Attenuator
6	Grey	+24 V _{dc}	+24 V _{dc}
7	—	—	—
8	—	—	—
9	Grey	40 dB Section Attenuator	40 dB Section 1 Attenuator
10	Grey	—	40 dB Section 2 Attenuator
11	Grey	20 dB Section Thru Line	20 dB Section Thru Line
12	Grey	—	—
13	Red	10 dB Section Thru Line	10 dB Section Thru Line
14	—	—	—

Note: Since the DIP connector pin assignments are identical to those used by other manufacturers, the Anritsu attenuators may be substituted in existing system designs.

Maintenance

Anritsu recommends that no maintenance other than connector cleaning be attempted by the customer. The step attenuator should be returned to Anritsu for repair and/or service when needed.

The traditional method of cleaning connectors with a cotton swab and alcohol can break the male connector pin on the precision connectors. The reason: the cotton swab has a larger diameter than the connector (that is, the area between the coupling nut wall and the center pin.) We still recommend using a cotton swab; however, you need to trim the swab before cleaning the outer conductor mating SURFACE.

Some precautions to follow when using the step attenuators:

Use a 5 inch-pound torque wrench when connecting to other devices. No other tools are recommended.

Do not disturb the connector center pin. Improper use (see above) of a cotton swab or other such probe to clean the inner connector may cause the center conductor to hinge on its bead and weaken or shear the internal connection.

Precautions

Anritsu 44X2K, 45X2K, and 46X2K-series step attenuators are high-quality, precision laboratory components and should receive the same care and respect afforded other such components. Complying with the following precautionary notes will guarantee longer component life and less equipment downtime due to connector failure. Also, such compliance will ensure that RF component failures are not due to misuse or abuse—two failure modes not covered under the Anritsu warranty.

Beware of Destructive Pin Depth on Mating Connectors

Avoid Over-Torquing Connectors

Avoid Mechanical Shock

Keep Step Attenuator Connectors Clean

Connector Care

Anritsu 44X2K, 45X2K, and 46X2K-series step attenuators are high-quality, precision laboratory components and should receive the same care and respect afforded other such components. Complying with the following precautionary notes will guarantee longer component life and less equipment downtime due to connector failure. Also, such compliance will ensure that RF component failures are not due to misuse or abuse—two failure modes not covered under the Anritsu warranty.

10100-00031 RF and Microwave Connector Care Reference Manual

Environmental

Temperature	Operating	0 °C to +70 °C
	Non-operating	-55 °C to +80 °C
Altitude	Operating	4,600 m (15,000 ft) 17.3 Hg
	Non-operating	15 km (50,000 ft)
Shock	Operating	10g, 6 ms, on 6 sides, 3 blows
	Non-operating	MIL-STD-202G, Method 204D, Test condition D Method 213B, Test condition I Method 214A, Test condition D
Humidity		
		0 to 95% relative humidity
EMC		
		Mil-Std-461, Method RE02, VDE 0871, CIS PR#2.

Options

Option C Calibration Data (4412K, 4512K, 4612K only)

Data is taken every 100 MHz from DC to 900 MHz and every 500 MHz from 1 GHz to 40 GHz.

Regulatory Compliance

European Union	RoHS Directive 2011/65/EU & Amendment 2015/863
United Kingdom	Environmental Protection SI 2012/3032; 2011/65/EU & 2015/863
Australia and New Zealand	RCM AS/NZS 4417:2012
South Korea	N/A
Canada	N/A

Warranty

Duration	Standard one-year warranty
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Notes

Training at Anritsu

Anritsu has designed courses to help you stay up to date with technologies important to your job. For available training courses, visit: www.anritsu.com and search for training and education.



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