



Model 150
Model 151
Model 152
Programmable Step Attenuators

dc to 18.0 GHz
dc to 4.0 GHz
dc to 26.5 GHz

For OEM & System Use



Description

The Model 150, 151 and 152 Programmable Step Attenuators represent the widest variety of programmable attenuators available. This attenuator design is the result of an extensive development program and offers long reliable operation with exceptional accuracy and repeatability. These attenuators can provide programmable adjustments of RF signal levels in precise steps of 1 dB, 5 dB, 10 dB, or with custom steps available. Each attenuator consists of a cascaded assembly of switched attenuator cells (Figure 1). The attenuator elements located in the attenuator cell are created by a thin-film process which provides exceptional long-term stability, low power and temperature coefficients. This series of uses a reed switching structure that provides rapid switching together with low insertion loss. Other features include:

- /// 3, 4, and 5 Cell Configurations
- /// Broadband Frequency Coverage
- /// High Accuracy and Repeatability
- /// Long Life, 5 Million Cycles Per Cell

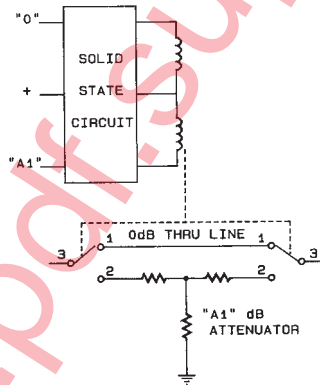


Figure 1. Cell Schematic

PROGRAMMABILITY: In each programmable step Attenuator, solenoids are used to switch the internal resistor card of each cell into and out of the circuit. The switching is activated by the application of a negative control voltage to the desired pin located in the control connector. Once the cell is switched, the solenoid is magnetically latched into position and is able to withstand extreme shock and vibration. Internal circuitry is included to interrupt the coil current after switching is complete. This reduces power dissipation even if power is continuously applied. The switching time for each cell is rated at 20 msec maximum which includes the contact settling time.

BROADBAND ACCURACY & LOW SWR: The use of Weinschel Corporation's proprietary thin-film resistor process provides these programmable step attenuators with a high degree of accuracy and the lowest possible SWR uncertainty (refer to specifications for actual values). This thin film process permits the construction of circuits which are truly distributed and without stray reactances, even at the higher microwave frequencies.

RELIABILITY: Each programmable step attenuator is composed of 3 to 5 (4 in most models) cells. As with all mechanical designs, usable life becomes a primary concern to the user. With this in mind Weinschel Corporation backs all these attenuators with a rated switch life of 5 million operations per cell. Standardized testing is also performed on each programmable step attenuator over its operating frequency range by a computer controlled Weinschel Corporation Attenuation Measurement System which is traceable to NIST standards.

ENVIRONMENTAL: These Model 150 Programmable Step Attenuators have undergone an extensive environmental qualification program and have been subjected to temperature, shock, vibration, and humidity conditions per MIL-STD-202F. These programmable step attenuators operate within these specifications at an ambient temperature of -20° to +75°C. Operating beyond these limits will adversely affect the accuracy and could damage the internal circuitry.

For additional information on the 150 Series, visit our website @ www.weinschel.com/programmable.htm



150 Series Cell Configurations...

ATTN Value	Cells No.	Cell 1		Cell 2		Cell 3		Cell 4		Cell 5	
		Bypass	ATTN Element	Bypass	ATTN Element	Bypass	ATTN Element	Bypass	ATTN Element	Bypass	ATTN Element
11 dB	4	0 dB	1 dB	0 dB	4 dB	0 dB	2 dB	0 dB	4 dB	---	---
15 dB	4	0 dB	1 dB	0 dB	8 dB	0 dB	2 dB	0 dB	4 dB	---	---
31 dB	5	0 dB	1 dB	0 dB	8 dB	0 dB	2 dB	0 dB	16 dB	0 dB	4 dB
55 dB	4	0 dB	5 dB	0 dB	10 dB	0 dB	20 dB	0 dB	20 dB	---	---
62 dB	5	0 dB	2 dB	0 dB	32 dB	0 dB	4 dB	0 dB	16 dB	0 dB	8 dB
70 dB	4	0 dB	10 dB	0 dB	20 dB	0 dB	20 dB	0 dB	20 dB	---	---
	3	0 dB	10 dB	0 dB	40 dB	0 dB	20 dB	---	---	---	---
75 dB	4	0 dB	5 dB	0 dB	40 dB	0 dB	20 dB	0 dB	10 dB	---	---
90 dB	4	0 dB	10 dB	0 dB	30 dB	0 dB	20 dB	0 dB	30 dB	---	---
110 dB	4	0 dB	10 dB	0 dB	40 dB	0 dB	20 dB	0 dB	40 dB	---	---
Conn PIN #	Round Ribbon	5 13	6 2	9 3	10 9	7 11	8 5	11 4	12 10	3 8	4 7
Wire Color	Round 3/4 Cell	Violet	Yellow	Orange	Blue	Black	Green	Brown	White	---	---
	Round 5 Cell	Black	White	Green	Orange	Blue	WHT/BLK	RED/BLK	GRN/BLK	ORN/BLK	BLU/BLK
	Ribbon	Orange	Yellow	Blue	Brown	Purple	Black	Gray	White	Orange	yellow

Table provides standard attenuation ranges, increments, and cell configurations for all Weinschel Corporation Programmable Step Attenuators (Models 150, 151, 152, & 152A)

Specifications

NOMINAL IMPEDANCE: 50 Ω

FREQUENCY RANGE: Model 151: dc to 4 GHz
 Model 150: dc to 18 GHz
 Model 152: dc to 26.5 GHz

OPERATIONAL VOLTAGE: + 24V Nominal (+20V minimum to +30V maximum) or +5V Nominal (+4V minimum* to +7V maximum)

*Minimum operating voltage derated to +4.25 V @ 55°C and further derated to +4.5 V @ 75°C

POWER RATING: 1 watt average, 100 watts peak

TEMPERATURE: -20° to +75°C operating
 -55° to +85°C nonoperating

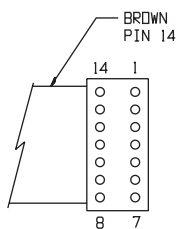
TEMPERATURE COEFFICIENT: < 0.0001 dB/dB/°C

POWER SENSITIVITY: < 0.001 dB/dB/ Watt

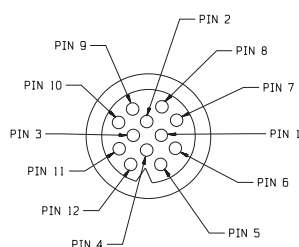
RATED SWITCH LIFE: 5 million cycles per cell

RF INPUT CONNECTORS: Rugged female 3.5 mm connectors which mate nondestructively with SMA male connectors per MIL-STD-39012.

CONTROL CONNECTOR: 12 pin Viking TKP12-101 connector with 5' cable or 14 conductor 16" ribbon cable with connector (shown below):



Ribbon Cable Models



Round (Viking) Cable Models

SWITCHING SPEED: 20 msec (includes settling time)

CONTROL PULSE WIDTH: 20 msec (minimum)

SWITCHING CURRENT: 125 mA @ +24V per cell
 300 mA @ +5V per cell

REPEATABILITY: ± 0.01 typical to 18 GHz
 ± 0.05 dB typical to 26.5 GHz

VIBRATION: MIL-STD-202F, Method 204D Cond B

ALTITUDE: MIL-STD-202F, Method 105C Cond B, 50,000 Ft.

SHOCK: MIL-STD -202F, Method 213B Cond B, except 10G, 6 msec

HUMIDITY: MIL-STD-202F, Method 103B, Cond. B (96 Hrs. @ 95%, RH)

EMC: Radiated interference is within the requirements of MIL-STD-461 method RE02, VDE 0871 and CISPR Publication II.

VOLTAGE/CONNECTOR OPTIONS:

VOLTAGE	MODEL(S)
+ 24 V with Viking Connector	150-XX, 151-XX, 152-XX, 152A-XX
+ 24 V with Ribbon Cable	150-XX-1, 151-XX-1, 152-XX-1, 152A-XX-1
+ 5 V with Viking Connector	150-XX-2, 151-XX-2, 152-XX-2, 152A-XX-2
+ 5 V with Ribbon Cable	150-XX-3, 151-XX-3, 152-XX-3, 152A-XX-3


MAXIMUM SWR (50 Ω Characteristic Impedance):

APPLICABLE MODELS	Frequency (GHz)		
	dc-4	4-18	18-26.5
151-11, 151-15, 151-31, 151-62, 151-75, 151-110	1.50	---	---
150-11, 150-15, 150-31, 150-62, 150-75, 150-110	1.50	1.90	---
151-70 (3 cell)	1.35	---	---
150-70 (3 cell)	1.35	1.70	---
152A-70 (3 cell)	1.40	1.70	1.80
152-55, 152-70, 152-90	1.40	1.60	1.80

MAXIMUM INSERTION LOSS (dB):

APPLICABLE MODELS	Frequency (GHz)		
	dc-4	4-18	18-26.5
151-11, 151-15, 151-75, 151-110	0.90	---	---
150-11, 150-15, 150-75, 150-110	0.90	2.20	---
151-31, 151-62 (5 cell)	1.10	---	---
150-31, 150-62 (5 cell)	1.10	2.60*	---
151-70 (3 cell)	0.70	---	---
150-70 (3 cell)	0.70	1.60	---
152A-70 (3 cell)	0.90	2.00	2.98
152-55, 152-70, 152-90	0.90	2.00	2.98

*4-12.4 is 1.80, 12.4-18 is 2.60

ATTENUATION ACCURACY (±dB with respect to 0 dB reference):
Model 150/151/152-11 & 150/151/152-15:

Frequency Range (GHz)	Attenuation Setting (dB)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
dc-4	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5
4-12.4	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
12.4-18	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
18-26.5	0.5	0.6	0.7	0.8	0.9	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1

Model 150/151-75:

Frequency Range (GHz)	Attenuation Setting (dB)														
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
dc-4	0.2	0.2	0.4	0.4	0.5	0.5	0.7	0.7	0.9	0.9	1.1	1.1	1.2	1.2	1.4
4-12.4	0.3	0.3	0.6	0.6	0.9	0.9	1.2	1.2	1.5	1.5	1.8	1.8	2.1	2.1	2.1
12.4-18	0.4	0.4	0.8	0.8	1.2	1.2	1.6	1.6	2.0	2.0	2.4	2.4	2.8	2.8	2.8

Model 150/151-31:

Frequency Range (GHz)	Attenuation Setting (dB)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
dc-4	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5
4-12.4	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7
12.4-18	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.

Frequency Range (GHz)	Attenuation Setting (dB)														
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
dc-4	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8
4-12.4	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.1	1.0	1.0	1.0	1.0	1.1	1.1
12.4-18	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3

Model 150/151-62:

Frequency Range (GHz)	Attenuation Setting (dB)															
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
dc-4	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6
4-12.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8
12.4-18	0.5	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.2	1.2

Frequency Range (GHz)	Attenuation Setting (dB)														
	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62
dc-4	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.2
4-12.4	1.0	1.0	1.1	1.1	1.3	1.4	1.4	1.4	1.5	1.6	1.6	1.6	1.8	1.8	1.8
12.4-18	1.4	1.4	1.6	1.6	1.8	1.8	2.0	2.0	2.0	2.2	2.2	2.2	2.4	2.4	2.4

Model 150/151-70, 150/151-110, 152A-70:

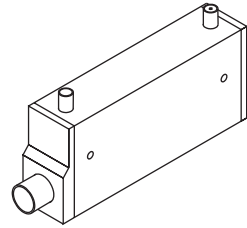
Frequency Range (GHz)	Attenuation Setting (dB)										
	10	20	30	40	50	60	70	80	90	100	110
dc-4	0.2	0.3	0.5	0.7	0.9	1.0	1.2	1.4	1.6	1.7	1.9
4-12.4	0.4	0.7	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.0
12.4-18	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.0
18-26.5	0.6	0.7	0.9	1.5	1.6	2.2	2.9	---	---	---	---

Model 152-55:

Frequency Range (GHz)	Attenuation Setting (dB)										
	5	10	15	20	25	30	35	40	45	50	55
dc-4	0.2	0.3	0.4	0.4	0.4	0.6	0.6	0.7	0.7	0.8	1.0
4-12.4	0.3	0.4	0.5	0.5	0.5	0.7	0.8	0.9	0.9	1.0	1.3
12.4-18	0.4	0.4	0.5	0.5	0.5	0.8	1.0	1.1	1.1	1.2	1.6
18-26.5	0.5	0.5	0.6	0.6	0.6	0.9	1.2	1.4	1.4	1.5	2.0

Model 152-70 & 152-90:

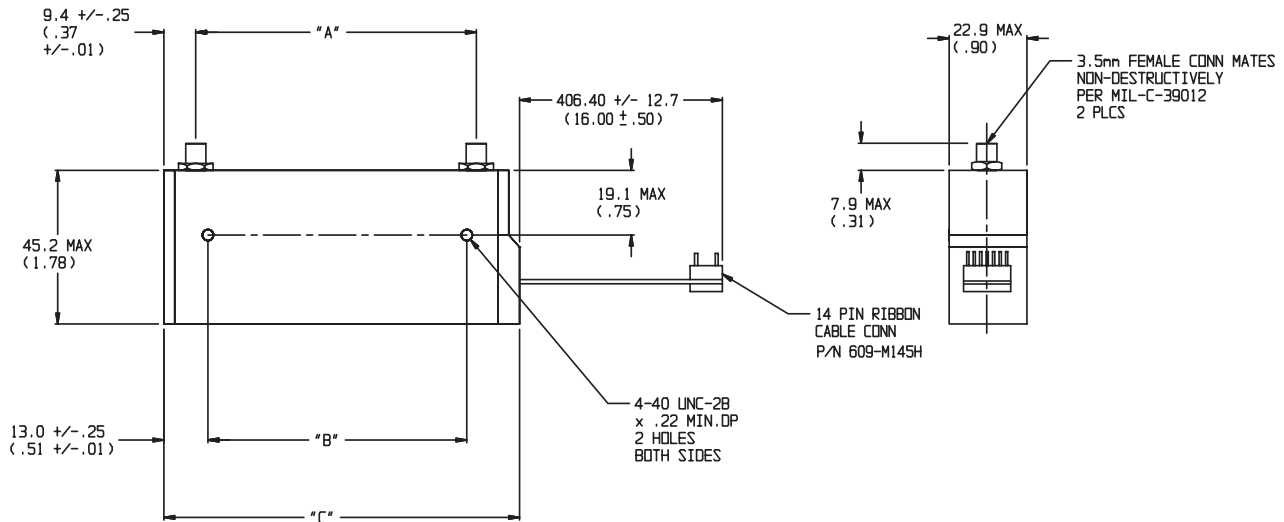
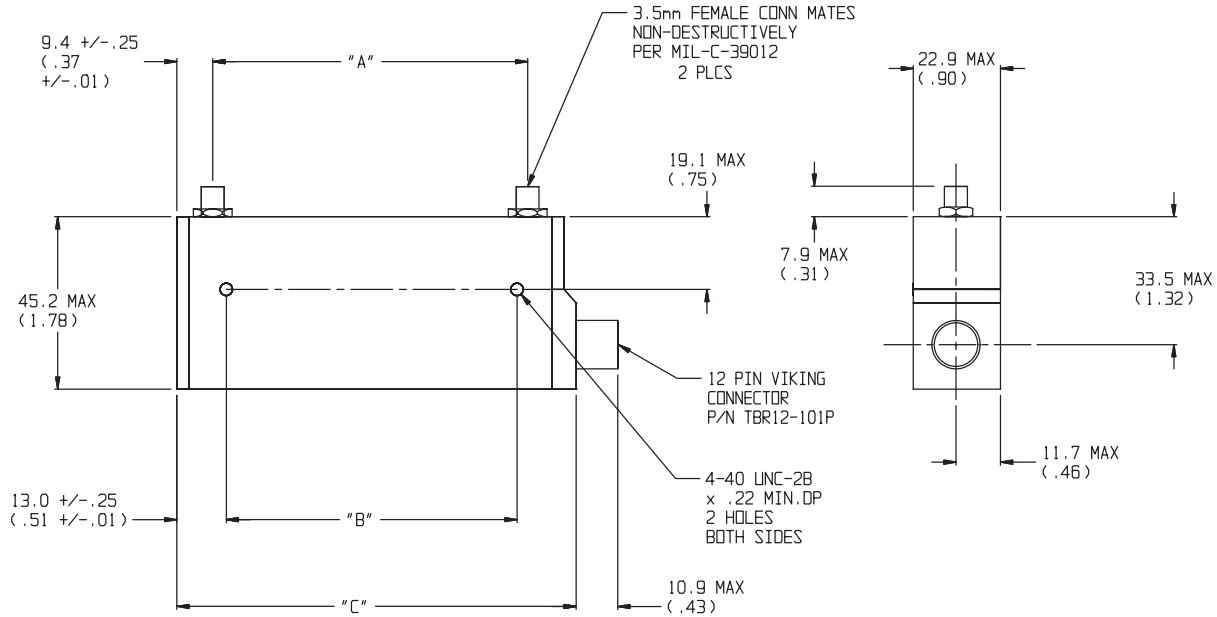
Frequency Range (GHz)	Attenuation Setting (dB)								
	10	20	30	40	50	60	70	80	90
dc-4	0.3	0.5	0.6	0.7	0.8	1.0	1.1	1.1	1.2
4-12.4	0.4	0.5	0.7	0.9	1.0	1.3	1.5	1.6	1.7
12.4-18	0.5	0.6	0.8	1.1	1.2	1.4	1.7	1.8	2.1
18-26.5	0.5	0.6	0.9	1.4	1.5	1.8	2.3	2.4	2.8





PHYSICAL DIMENSIONS:

Models 150, 151, & 152:



DIM	A	B	C
3 cell	82.6 (3.25)	76.2 (3.0)	104.6 (4.12)
4 cell	110.7 (4.36)	103.6 (4.06)	133.6 (5.25)
5 cell	136.9 (5.39)	129.8 (5.11)	159.5 (6.28)

NOTE: All dimensions are given in mm (inches) and are maximum, unless otherwise specified.



150 Series Ordering Guide...

Frequency Range/ Voltage/Connector	NO. Cells	Attenuator Range/Step Size								
		11/1 dB	15/1 dB	55/5 dB	31/1 dB	62/2 dB	70/10 dB	75/5 dB	90/10 dB	110/10 dB
dc-4 GHz/+24 V/ Viking Connector	4 3 5	151-11	151-15	N/A			151-70	151-75	N/A	151-110
dc-18 GHz/+24 V/ Viking Connector	4 3 5	150-11	150-15	N/A			150-70	150-75	N/A	150-110
dc-26.5 GHz/+24 V/ Viking Connector	4 3	N/A	N/A	152-55		NA	152-70 152A-70-2	N/A	152-90	N/A
dc-4 GHz/+24 V/ Ribbon Cable	4 3 5	151-11-1	151-15-1	N/A			151-75-1 151-70-1	N/A	151-110-1	
dc-18 GHz/+24 V/ Ribbon Cable	4 3 5	150-11-1	150-15-1	N/A			150-70-1	150-75-1	N/A	150-110-1
dc-26.5 GHz/+24 V/ Ribbon Cable	4 3	152-11-1	152-15-1	152-55-1	N/A	N/A	152-70-1 152A-70-1	N/A	152-90-1	N/A
dc-4 GHz/+5 V/ Viking Connector	4 3 5	151-11-2	151-15-2	N/A			151-70-2	151-75-2	N/A	151-110-2
dc-18 GHz/+5 V/ Viking Connector	4 3 5	150-11-2	150-15-2	N/A			150-70-2	150-75-2	N/A	150-110-2
dc-26.5 GHz/+5 V/ Viking Connector	4 3	N/A	N/A	152-55-2	N/A	N/A	152-70-2 152A-70-2	N/A	152-90-2	N/A
dc-4 GHz/+5 V/ Ribbon Cable	4 3 5	151-11-3	151-15-3	N/A	N/A		151-75-3 151-70-3	N/A	151-110-3	
dc-18 GHz/+5 V/ Ribbon Cable	4 3 5	150-11-3	150-15-3	N/A			150-70-3	150-75-1	N/A	150-110-3
dc-26.5 GHz/+5 V/ Ribbon Cable	4 3	N/A	N/A	N/A	N/A	N/A	152-70-3 152A-70-3	N/A	152-90-3	N/A

ACCESSORIES

OPTIONAL CALIBRATION DATA: Calibration Data is available at an additional cost for all programmable step attenuator models. This calibration data is generated using a computer controlled Weinschel Attenuation Measurement System. Standard calibration data can be provided in 250 MHz steps for all dc-4 GHz models and in 500 MHz steps for dc-18 and dc-26.5 GHz models. The measurements are traceable to NIST Standards.

MODELS WITH BUILT-IN TTL/CMOS INTERFACE/ DRIVER CIRCUIT: Weinschel Corporation now offers new versions of the 150 series with built-in TTL/CMOS interfaces. This new generation of intelligent attenuators will greatly simplify as well as provide an economical solution to 150 series driver problems. Refer to Model 150T, 151T, and 152T data sheet for more information.