

## Models 3404, 3406, 3408 & 3409

with optional TTL Interface

DC to 6.0 GHz  
1 Watt



### Features

- /// Higher Frequency range to 6 GHz.
- /// Wide Selection of Attenuation Ranges & Step Sizes
  - 0 to 15 dB in 1 dB steps
  - 0 to 55 dB in 1 dB steps
  - 0 to 55.75 in 0.25 dB steps
  - 0 to 103 dB in 1 dB steps
  - 0 to 70 dB in 10 dB steps
  - 0 to 127 dB in 1 dB steps
- /// High Quality Construction & Connectors
- /// Special Configurations Available Upon Request

### Description

The 3400 Series Programmable Step Attenuators are designed for use in automatic test equipment and OEM systems operating in the dc to 6 GHz frequency range. This series is available in many standard attenuation ranges and cell configurations. Custom designed configurations are available upon request. Each cell contains a double-pole, double-throw relay that provides a zero path or attenuated path for the RF signal.

Microstrip circuitry and special compensation techniques produce flat attenuation versus frequency characteristics. The microstrip construction, using thin-film circuit elements, ensures product uniformity. To minimize RF leakage, the 3400 Series Attenuators are provided with gold-plated contact areas and feedthrough filters at each control terminal.

### Specifications

**NOMINAL IMPEDANCE:** 50  $\Omega$   
**FREQUENCY RANGE:** dc to 6.0 GHz

MAXIMUM SWR:		
Frequency Range (GHz)	3406 & 3408	3409
dc - 3	1.30	1.40
3 - 6	1.45	1.55

### CELL CONFIGURATIONS:

Model Number	NO. Cells	Attenuation Range/Steps (dB)	Cell Increments (dB)
3404-15	4	15/1	1, 2, 4, 8
3404-55	4	55/5	5, 10, 20, 20
3404-70	4	70/10	10, 20, 20, 20
3406-55	6	55/1	1, 2, 4, 8, 16, 24
3408-55.75	8	55.75/0.25	0.25, 0.5, 1, 2, 4, 8, 16, 24
3408-103	8	103/1	1, 2, 4, 8, 16, 24, 24, 24*
3409-127	9	127/1	1, 2, 4, 8, 16, 24, 24, 24, 24**

\* 48 dB cell comprised of two 24 dB cells

\*\* 24 dB Cell Selection:

Cell No. (ON)	Attenuation (dB)
2	24 - 47
2 & 9	48 - 71
1, 2, 9	72 - 95
1, 2, 5, 9	96 - 127

### INCREMENTAL ATTENUATION ACCURACY:

Frequency Range (GHz)	Accuracy
dc - 3	$\pm 0.3$ dB or 2% whichever is greater
3 - 6	$\pm 0.4$ dB or 3% whichever is greater

### MAXIMUM INSERTION LOSS (dB):

Frequency Range (GHz)	3404-15 3404-55 3404-70	3406-55	3408-55.75 3408-103	3409-127
dc - 3	1.80	2.60	3.40	3.80
3 - 6	2.60	3.80	5.00	5.80

**MONOTONICITY:** dc to 6.0 GHz (minimum 1 dB change)

**POWER RATING:** 1 watt average to 25°C ambient temperature, derated linearly to 0.25 watt @ 70°C. 50 watts peak (5  $\mu$ sec pulse width; 1% duty cycle)

**POWER COEFFICIENT:** <0.005 dB/dB/watt

**RATED SWITCH LIFE:** 5 million cycles operations per cell @ 0 dBm

**SWITCHING TIME:** 6 msec. maximum at nominal rated voltage

**RELEASE TIME:** 5 msec maximum

**CYCLING RATE:** 5 Hz maximum per relay

**OPERATING VOLTAGE:** +12 Vdc (+13 V maximum; +9 V minimum)

**OPERATING CURRENT:** 17 mA typical per cell @ +12 V

**TEMPERATURE RANGE (Operating):** -30°C to +70°C

**TEST DATA:** Test data is available at additional cost.

## SPECIFICATIONS - Con't

**CONNECTORS:** SMA female connectors per MIL-STD-348 interface dimensions - mate nondestructively with MIL-C-39012 connectors.

**CONTROL TERMINALS:** 0.040 inch. (1 mm) diameter solderable leads.

### CONSTRUCTION:

Housing: Aluminum  
Connectors: Stainless steel body and beryllium copper contacts.

Control terminals: Brass/Copper, Silver plated

**WEIGHT (Typical):**

3404-X:	99 g (3.5 oz)
3406-X:	99 g (3.5 oz)
3408-X:	135 g (4.8 oz)
3409-X:	249 g (8.8 oz)

## CONTROL CONFIGURATION:

**Standard Unit:** One terminal is connected to case ground and the remaining terminals are provided for activation of individual cells. Attenuation is fail-safe to "0" setting in the absence of a control voltage. Application of a voltage (+) to a particular cell causes it to switch to the attenuate position.

**Units with TTL Option:** Units with this options are supplied with a very low profile connectorized TTL interface board mounted directly to the control terminals. This TTL interface option is available with a 10 pin ribbon cable connector and is supplied with a mating connector. Refer to Physical Dimensions for mating connector pin/wiring details. Two wires are specified for supply voltage and ground. The remaining wires will accept TTL control signals to activate or de-activate a particular attenuation cell. A TTL high will energize a cell to the high attenuation state, whereas a TTL low will maintain a cell in its zero attenuation state.

To order 3400 Series Attenuators with this option add -1 to basic model number for ribbon cable connector. Example: Model 3406-63 with a TTL interface would be 3406-63-1.

Note: Control is non-latching and requires a continuous control signal for the period of time in which attenuation is required.

## TTL DRIVER SPECIFICATIONS:

**INTERFACE CONNECTOR:** Option -1: 10 pin .025 square post header on .1 center, mates with Amp connector 746285-1 or equivalent

**INPUT VOLTAGE:**

$V_{IN}$ High =	+2.0V minimum +5.0V typical $V_{CC}$ maximum
$V_{IN}$ Low =	0 minimum 0.8 maximum

**INPUT CURRENT:**

$I_{IN}$ ( $V_{IN}=2.4$ V) =	55 $\mu$ A
$I_{IN}$ ( $V_{IN}=3.85$ V) =	280 $\mu$ A

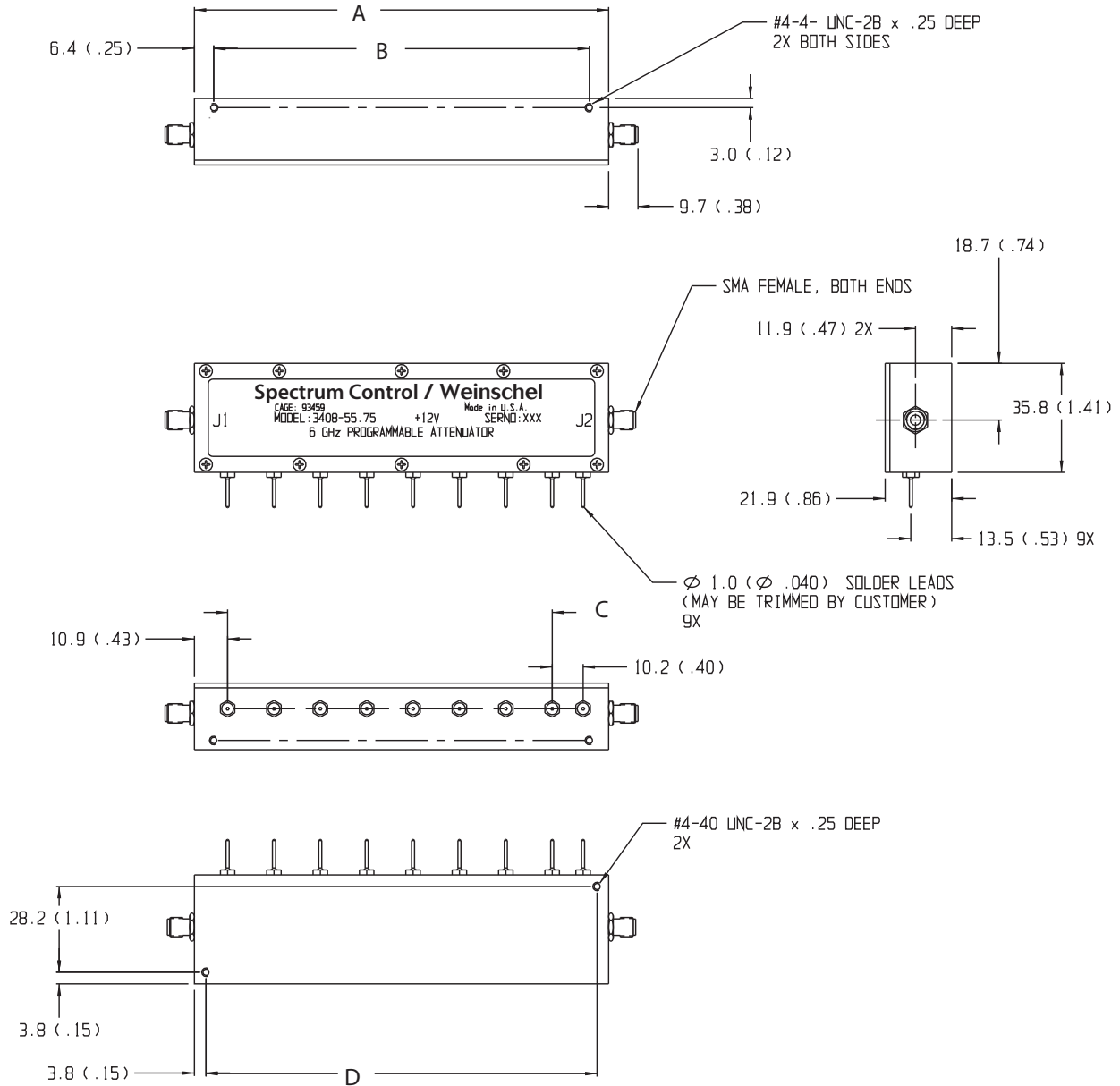
**SUPPLY CURRENT:**  $I_{CC}=25$  mA maximum per cell

**SUPPLY VOLTAGE:**  $V_{CC}=+12.0$  to  $+15$  V

**MODELS WITH BUILT-IN DRIVERS:** Most 3400s are available with an intelligent interface\driver cards. These are designed to interface with our 8210A Series Controllers which greatly simplifies computer control applications. Refer to Model 3404T, 3406T and 3408T data sheet for more information.

# Programmable Attenuators

## PHYSICAL DIMENSIONS:



Model No.	No. Cells	A	B	C	D
3409-X	9	151.4 (5.96)	123.4 (4.86)	8 EQ SPCS @ 15.20 (.60) = 121.9 (4.20)	143.8 (5.66)
3408-X	8	136.1 (5.36)	123.4 (4.86)	7 EQ SPCS @ 15.20 (.60) = 106.7 (4.20)	128.5 (5.06)
3406-X	6	105.7 (3.66)	93.0 (3.66)	5 EQ SPCS @ 15.20 (.60) = 76.0 (3.00)	98.0 (3.86)
3404-X	4	75.18 (2.96)	62.48 (2.46)	3 EQ SPCS @ 15.20 (.60) = 45.72 (1.80)	67.56 (2.66)

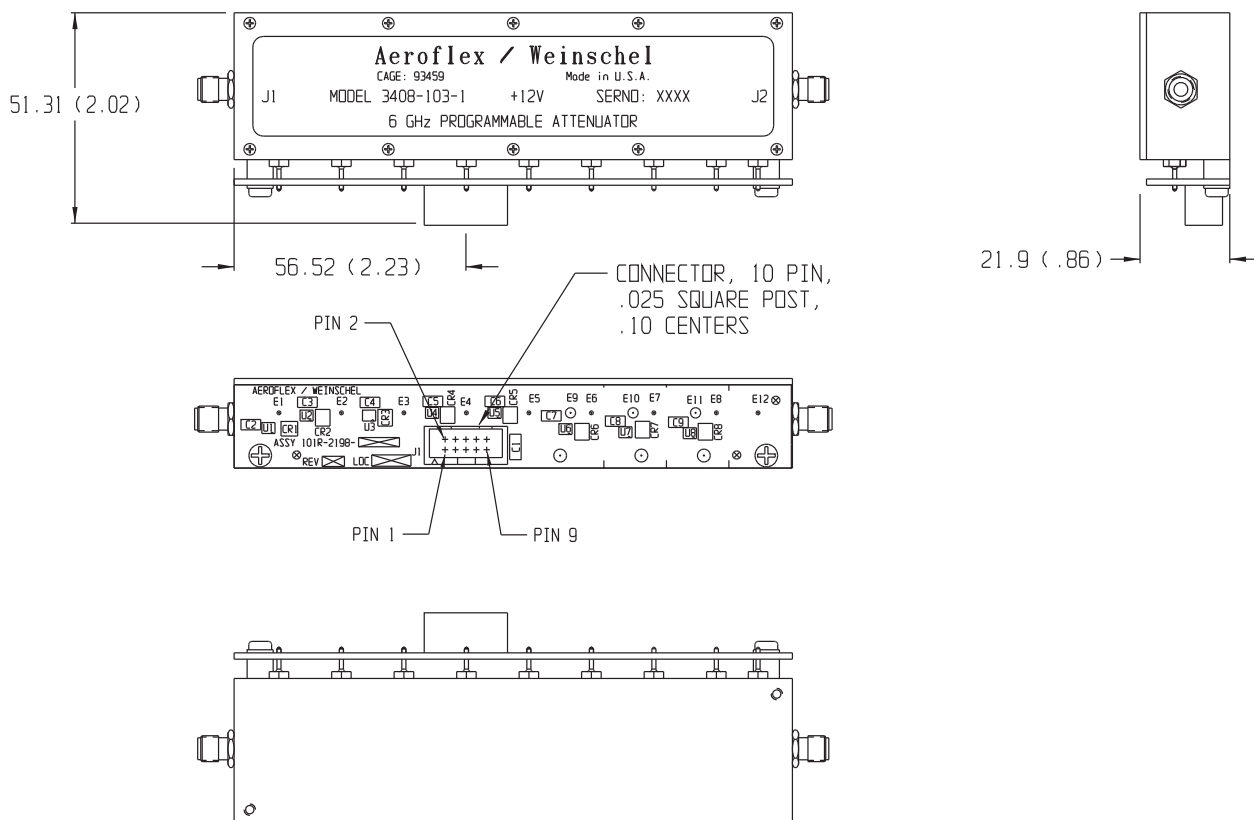
NOTE: All dimensions are given in mm (inches) and are nominal, unless otherwise specified.

# Programmable Attenuators

## PHYSICAL DIMENSIONS:

### TTL OPTION -1 (3406 & 3408)

option not available for 3409



**Control Connector J3 Pin Locations:**

TTL Conn PIN No. (J3)	3408-103-1 dB (Cell)	3408-55.75-1 dB (Cell)	3406-55-1 dB (Cell )	3404-15-1 dB (Cell)	3404-55-1 dB (Cell)	3404-70-1 dB (Cell )
1	24*	0.25	1	1	5	10
2	24	0.5	2	2	10	20
3	1	1	4	4	20	20
4	2	2	8	8	20	20
5	4	4	16	NC	NC	NC
6	8	8	24	NC	NC	NC
7	16	16	NC	NC	NC	NC
8	24*	24	NC	NC	NC	NC
9	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc	+Vcc
10	COM	COM	COM	COM	COM	COM

\* 48 dB cell comprised of two 24 dB cells

NC = Not Connected

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