



8401 Series

4x4, 8x8 & 16x16 Configurations

Ideal for MIMO Test Setups

Description:

Weinschel brand Butler Matrices are beamforming networks used in wireless test applications (Cellular, WiFi, Bluetooth). They transfer the signal reciprocally from any of n-input ports to any of n-output ports, with high phase accuracy, amplitude balance, low insertion loss, and high port-to-port isolation. They are designed to deliver maximum power with progressive phase shift to the output in the transmitting mode and collect signals from all beam directions with the full gain of antenna array in the receiving mode.

The Butler Matrix family includes multiple models which can be used in a variety of configurations, across cellular, WiFi, and any band within its frequency limits.

Features:

- Compact, modular microstrip design and construction
- Reciprocal signal path
- Excellent channel condition number
- Technology agnostic
- Wide frequency range (3.5 octaves)

Applications:

- RF MIMO Test for 5G, WiFi, Bluetooth
- Create ideal channel for best MIMO performance
- Addition of programmable attenuators allows easy degradation of the channel number for Throughput vs Channel Testing.
- WiFi, WiMAX, 4G/5G LTE Testing, Link Simulation
- MIMO Testing
- Multipath Simulation and Performance Evaluation
- Antenna Array Beam-forming
- Interferometer System Simulation and Testing

Specifications & Data:



16X16 Model

Part Number	F min (GHz)	F max (GHz)	Insertion Loss (dB)	VSWR	Output Phase Accuracy	RF Input Power (dBm)	Isolation (dB)	Dimension (inch)
8401-16-5	0.7	2.0	14 typ. / 18 max	2.0:1 max	± 20° max	37	20 typ. / 10 min	19 × 20 × 1.75
	2.0	6.0	18 typ. / 24 max	2.2:1 max	at 3.25 GHz		17 typ. / 10 min*	

Isolation: * 3.4 – 4.0 GHz: 17 typ. / 8 dB min // 5.6 – 6.0 GHz: 17 typ. / 8 dB min

8X8 Model

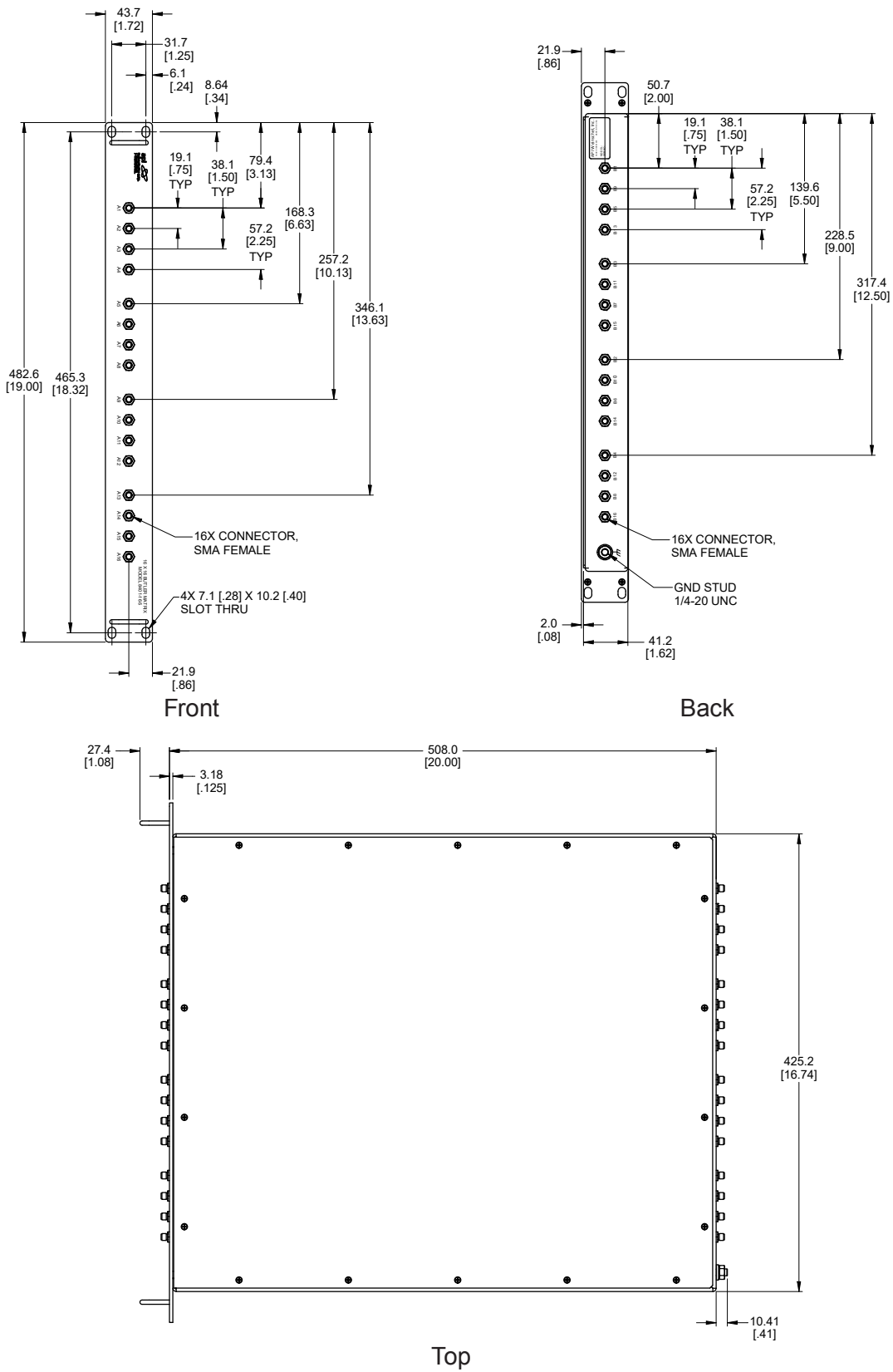
Part Number	F min (GHz)	F max (GHz)	Insertion Loss (dB)	VSWR	Output Phase Accuracy	RF Input Power (dBm)	Isolation (dB)
8401-8-6	0.5	2.5	10 typ / 14 max	1.6:1 max	±20° max at 3.4 GHz	37	20 typ / 12 min
	2.5	6.0	12 typ / 17 max	2.2:1 max			
8401-8E	2.4	7.25	13.5 typ / 16 max	1.8:1 typ 2.2:1 max	±20° max at 6.5 GHz	37	20 typ / 12 min

4X4 Model

Part Number	F min (GHz)	F max (GHz)	Insertion Loss (dB)	Max. VSWR	Output Phase Accuracy	RF Input Power (dBm)	Isolation (dB)
8401-6	0.5	2.0	7 typ / 10 max	1.7:1	±15° max at 3.25 GHz	37	25 typ / 16 min
	2.0	6.0	7 typ / 12 max	2.0:1			20 typ / 11 min
8401E	2.4	7.25	8.5 typ / 11 max	2.0:1	±15° max at 6.5 GHz	37	20 typ / 11 min

Impedance	50 Ohms
Connectors	SMA (F) all ports
Temperature Range, Operating	-20° to +70°C

8401-16-5 Outline Drawing:



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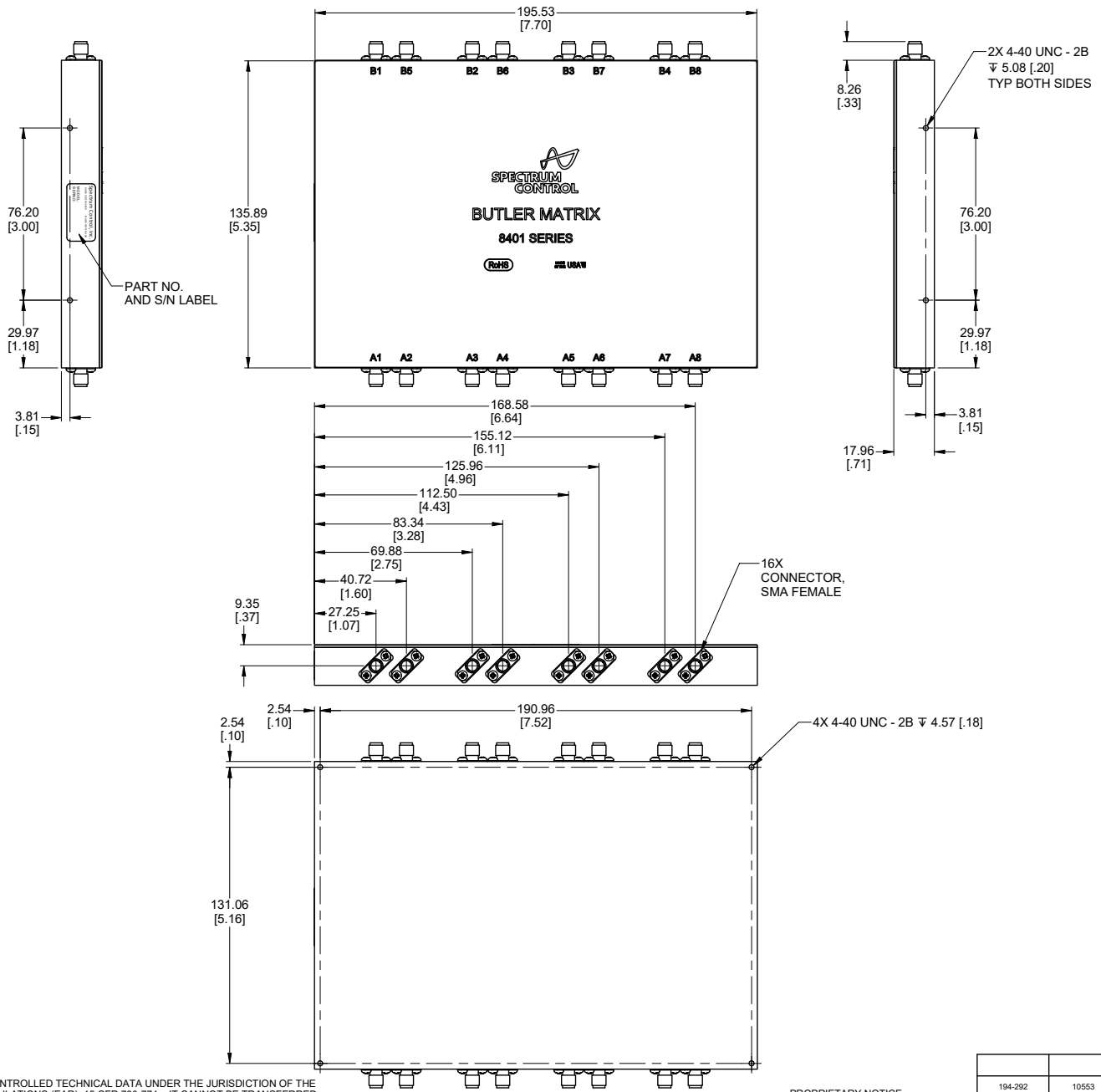
Approved for Release: August 2024

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Model 8401-8-6 Outline Drawing:



Note: Dimensions are given in mm [inches]



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PROPRIETARY NOTICE

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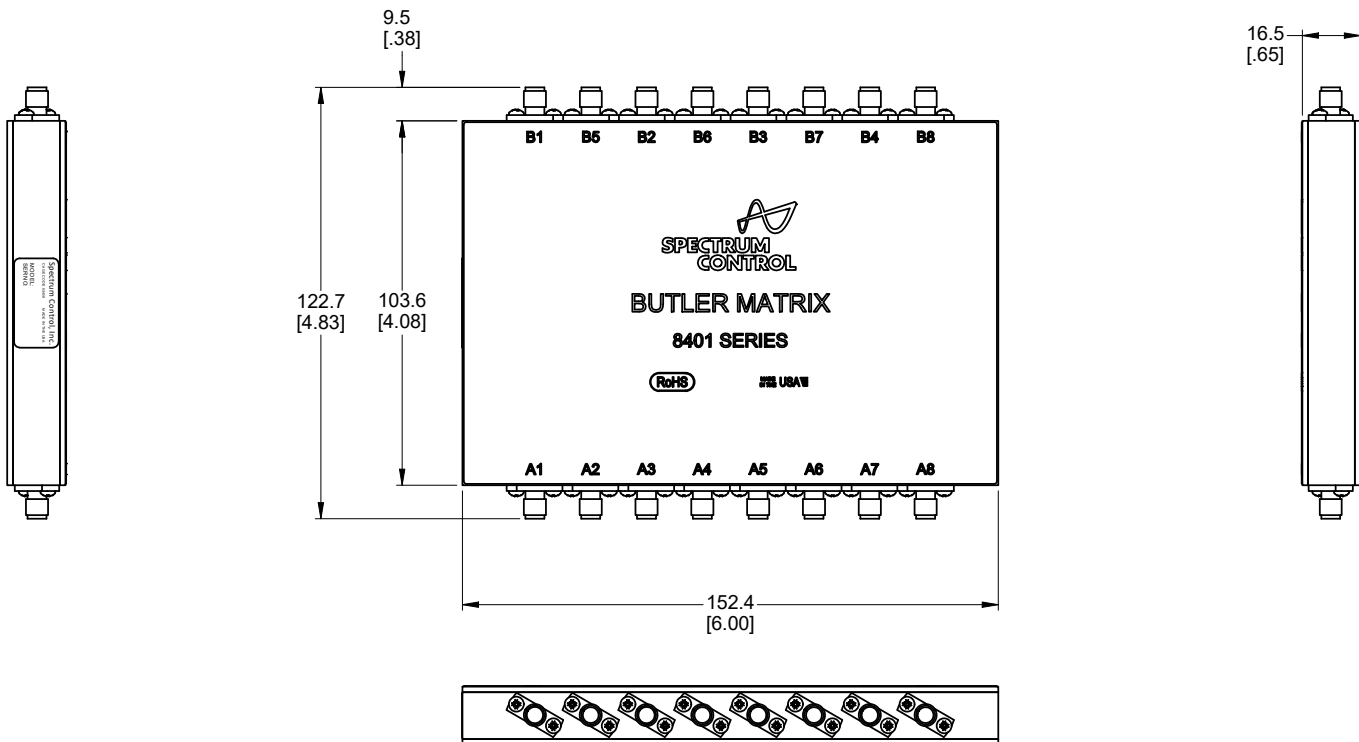
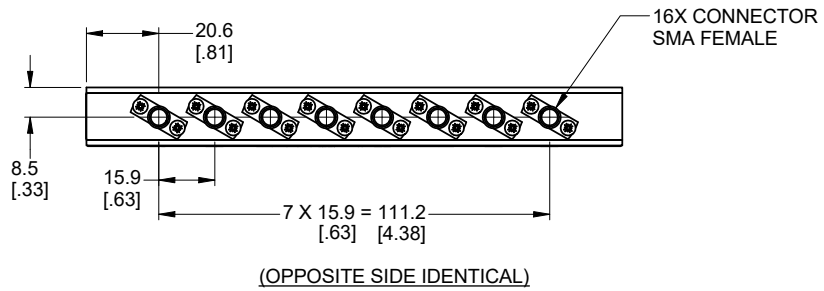
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Model 8401-8E Outline Drawing:

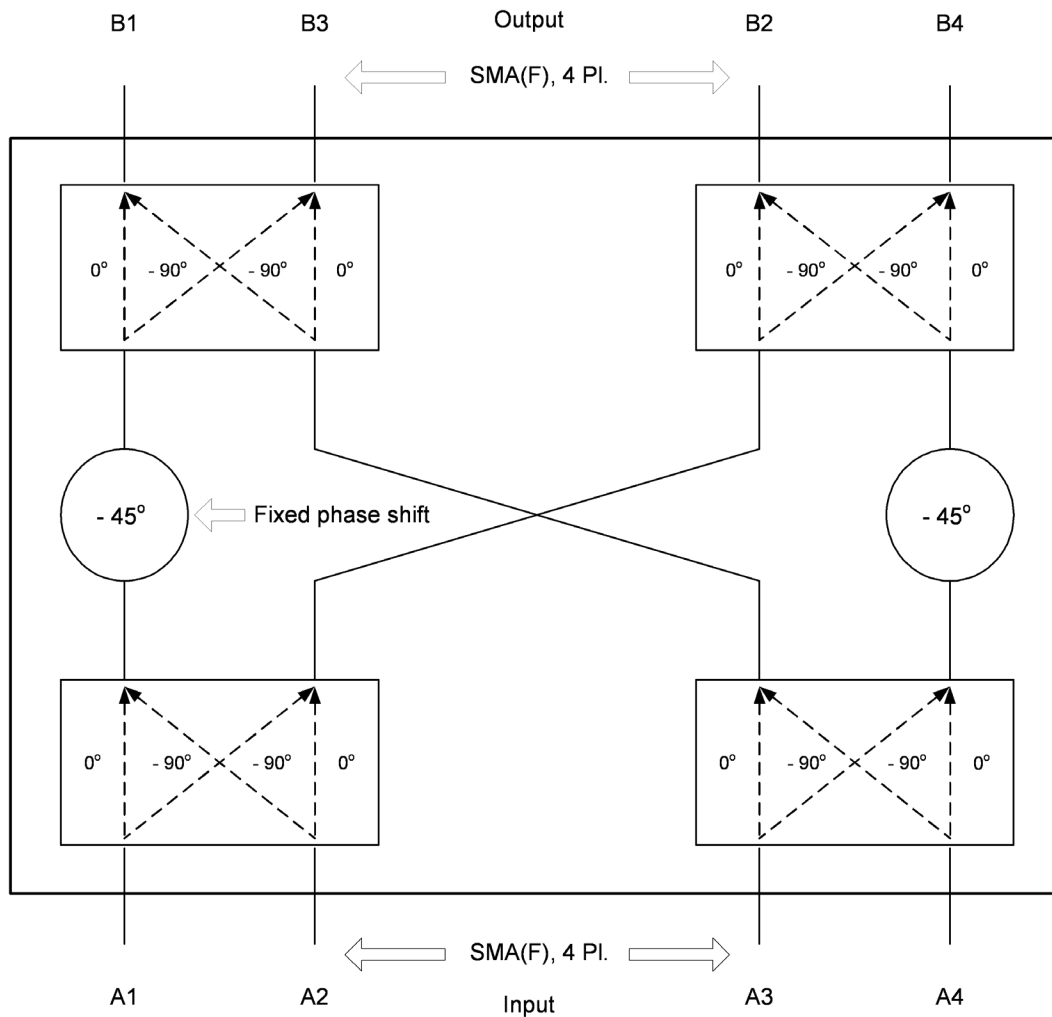
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4x4 Block Diagram:

Model 8401E & 8401-6

Functional Block Diagram



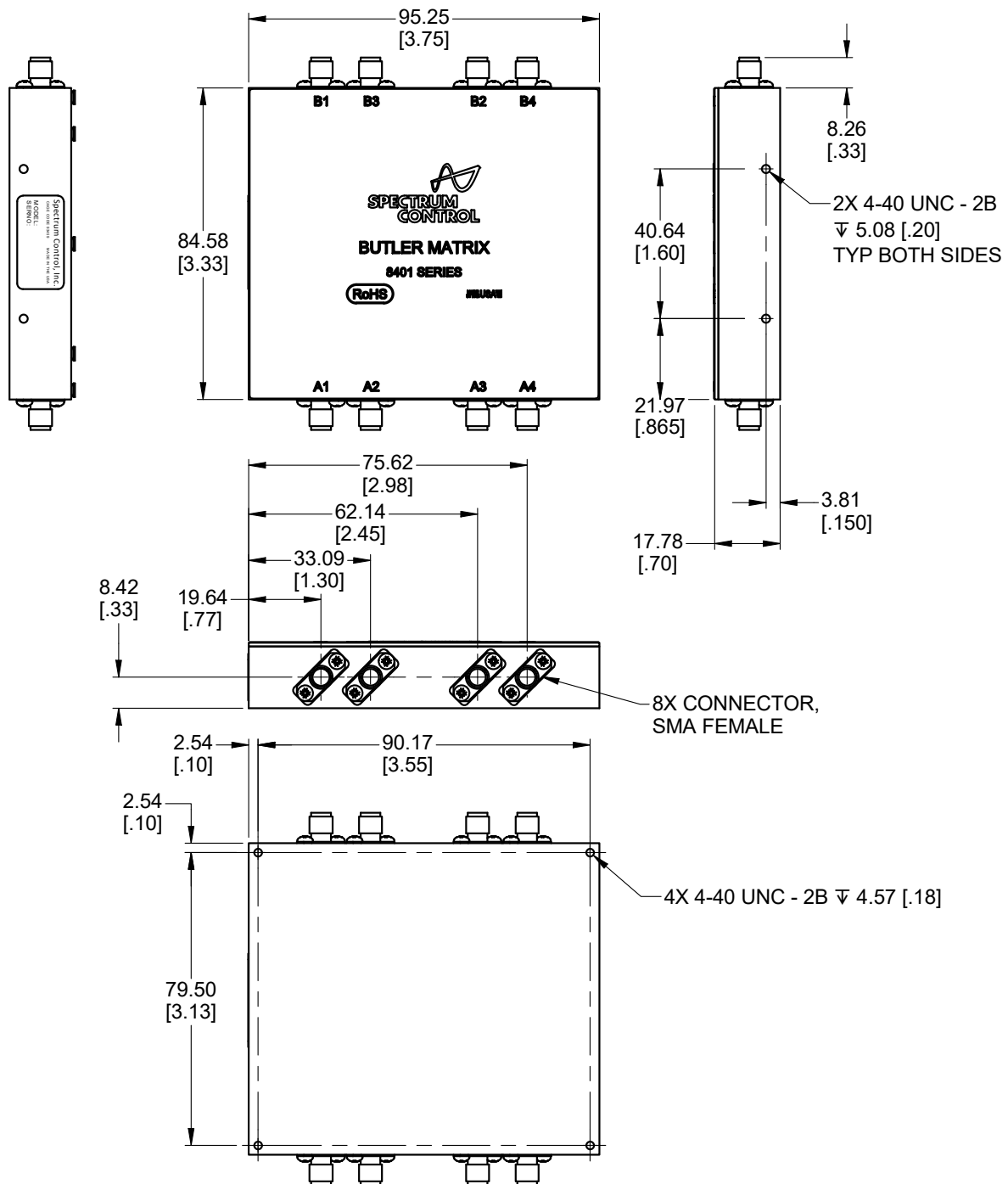
Input	B1	B3	B2	B4
A1	-45°	-135°	-90°	-180°
A2	-135°	-225°	0°	-90°
A3	-90°	0°	-225°	-135°
A4	-180°	-90°	-135°	-45°

1. Relative Phase Values indicated are measured at the frequency listed in the "Output Phase Accuracy" column in the table, relative to a 0° path.
2. Phase values will vary with frequency and are dependent on the RF path.

Model 8401-6 Outline Drawing:



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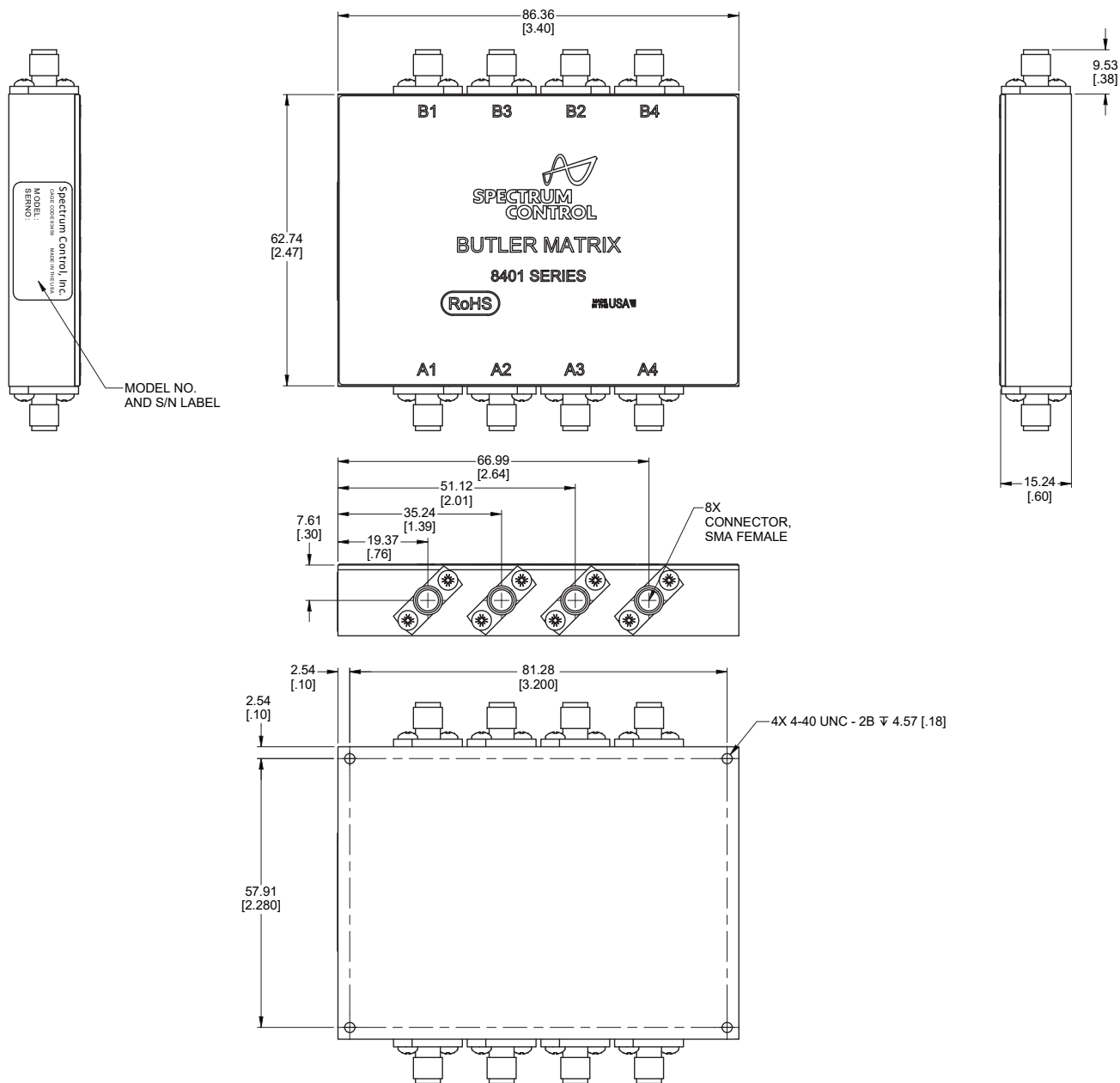
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Model 8401E Outline Drawing:



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