

Southwest Microwave, Inc.

The **BEST** Performance Microwave Connectors



REVISED
CATALOG

* Typical VSWR
< 1.10 :1 to 50 GHz
(return loss > 26 dB)

* RF leakage
< -100 dB typical.



SOUTHWEST
MICROWAVE

Southwest Microwave, Inc. • Tempe, Arizona, USA • www.southwestmicrowave.com



Super SMA Connectors
 N Series Connectors
 TNC Connectors
 2.92 mm Connectors
 SSMA Connectors
 2.40 mm Connectors
 End Launch Connectors
 Adapters
 Cable Connectors
 Launch Accessories
 Installation and Tools



Founded in 1981, Southwest Microwave's initial products were applications oriented electronic perimeter intrusion detection systems and 23 GHz wireless CCTV transmission equipment. The Microwave Products Division (MPD) was established in 1987 to provide highest performance interconnect products for millimeter wave and high-power RF applications. Today, in its own 50,000 square foot custom, modern facility, with in-house RF/microwave and electrical test capabilities, Southwest Microwave MPD continues to focus on high-end products that increase customer performance.

Let the microwave transmission line experts at Southwest Microwave improve your component and system performance with connectors, adapters and cables that feature exceptionally low insertion loss, low VSWR, and low RF leakage. All MPD products have lot control and materials traceability. These connectors are very rugged and withstand severe environmental conditions.

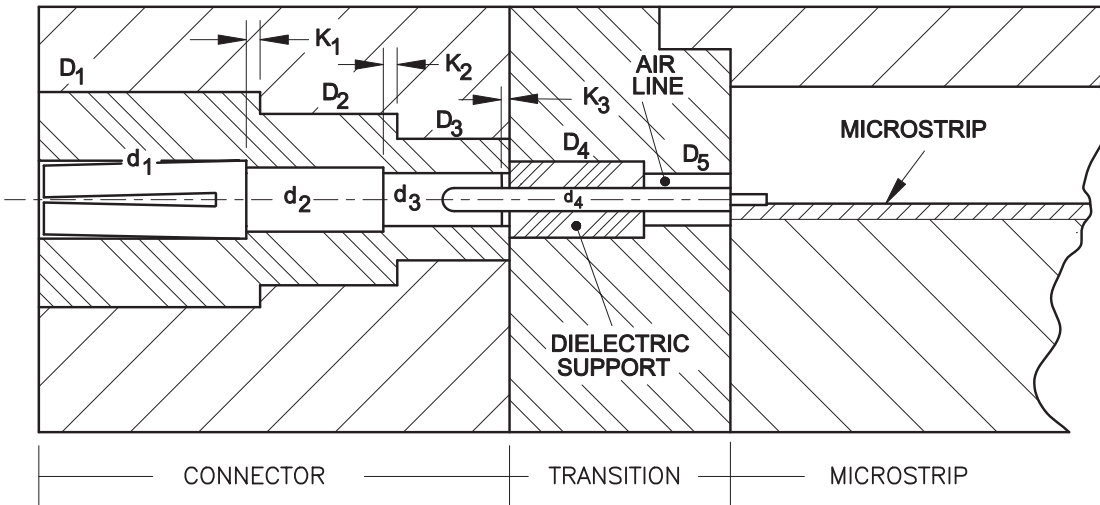
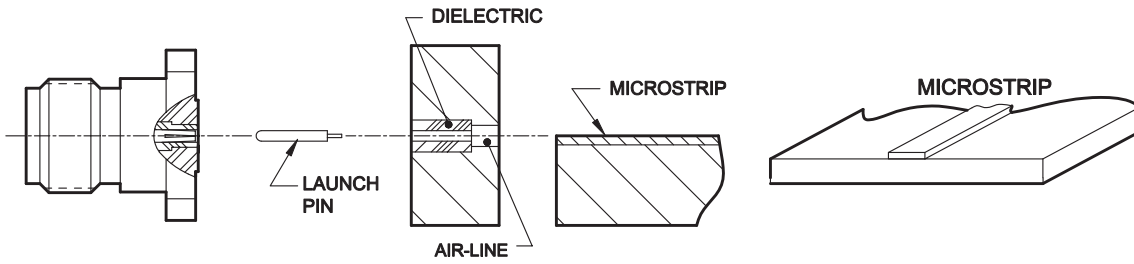
In addition to standard testing, Southwest Microwave offers Special hi-rel testing to meet the most stringent SCD and DPA requirements. Stringent quality controls assure that all parameters are met. Test Department equipment includes two HP8510C (50 GHz) and one ANRITSU 67 GHz VNA Network Analyzers.



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BEST Performance Microwave Connectors



27 GHz		Super SMA Connectors
18 GHz		N Series Connectors
18 GHz		TNC Connectors
40 GHz		2.92 mm Connectors
36 GHz		SSMA Connectors
50 GHz		2.40 mm Connectors
50 GHz		End Launch Connectors
		Adapters
		Cable Connectors
		Launch Accessories
		Installation and Tools



Compliance with European Union (EU) Directives

RoHS COMPLIANT 2002/95/EC

Reduction of Hazardous Substances (RoHS), per EU Directive 2002/95/EC.

This directive covers the use of hazardous materials, heavy metals and flame-retardants. An Annex lists applicable metals and exceptions. It is effective July 1, 2006. The materials used by Southwest Microwave, Microwave Products Division, to produce its interconnect products are in compliance with this RoHS Directive. No part number changes are applicable. (Note: Connectors produced by Southwest Microwave meet lead-free material content requirements. Lead is not used in any plating or finishes).

Due to the narrow nature of the connectors produced by Southwest Microwave, the following EU Directives do not apply, except as applicable to other firms making higher-level assemblies incorporating Southwest Microwave's connectors:

- Restrictions on Fire Retardant Chemicals, per EU Directive 2002/96/EC: Applicable to molded plastic connectors.
- Waste Electrical and Electronic Equipment (WEEE), per EU Directive 2002/96/EC: Applies to recycling and disposal of consumer and industrial equipment.

Custom Electromechanical
Switch Connectors



Custom End Launch
Connectors



Custom Flanges
Connectors and Adapters



Custom Adapters



Custom Lengths
Thread-In Connectors



Custom Lengths
Flange Mount Connectors



Approximately 50% of products by Southwest Microwave are non-catalog "Custom Connectors".
Contact Southwest Microwave or your local sales representative for application specific needs.

General Information	2	Cable Connectors	75
Low Insertion Loss	3	Field Replaceable Models	77
Just in Time / Package Standardization	4	Direct Solder Flange Mount Models	79
360° Metal-to-Metal Ground Contact	6	Flange Mount Cable Terminations	80
Super SMA Connectors (27 GHz)	7	Accessories	82
Specifications	15	Introduction/Summary	83
Model Numbers	16	Hermetic Transitions to Microchip	87
Test Data	18	Launch Pin Transitions to Microstrip	88
		Launch Pin/Tab Transitions to Stripline	92
N Connectors (18 GHz)	25	Installation and Tools	97
Specifications	27	Connector Mounting Hole Chart	98
Model Numbers	28	Hermetic Seal for Panel Mount Conn.	100
Test Data	29	Hermetic Seal for Thread-in Conn.	102
		SSMA Tools	103
 		Launch Pin and Dielectric Transitions	104
TNC Connectors (18 GHz)	31	Thread-in Installation Tools	106
Specifications	33	Pin Insertion Tools	107
Model Numbers	34		
Test Data	35		
2.92 mm Connectors (40 GHz)	36	Appendix	108
Specifications	39	S-Level and Hi-Rel Connectors	109
Model Numbers	40	Power Rating for Coaxial Connectors	113
Test Data	42	Mounting Guidelines	
Waveguide Connector Models	44	For Flange Mount Connectors	118
		Mating Microwave Connectors	121
 		RF Versus Microwave SMA Connectors	122
SSMA Connectors (36 GHz)	45	EMI/RFI Shielding Standards	124
Specifications	47	Materials Commonality in Connectors	126
Model Numbers	48	Connector Compatibility (Intermateability)	126
Test Data	49		
2.40 mm Connectors (50 GHz)	50	Model Number Index	127
Specifications	53		
Model Numbers	54		
Test Data	56		
End Launch Connectors	59		
Specifications	61		
Model Numbers	62		
Test Data	64		
Adapters	66		
18 GHz (N to SMA)	67		
27 GHz (Super SMA)	68		
33 GHz (3.5 mm to 2.40 mm)	69		
40 GHz (2.92 mm "JK")	70		
40 GHz (2.92 mm to 2.40 mm)	71		
36 GHz (SSMA to 2.40 mm)	72		
50 GHz (2.40 mm)	73		

Unless otherwise Specified all dimensions shown are in Inches.



Introduction

High Performance Microwave Connectors are Microwave Components

Microwave designers take extreme care in the design and development of their circuit and attempt to be very precise in maintaining impedance control throughout. In many cases this precise control “ends” at the launch point of their circuit. The product is then handed off to a packaging engineer who is usually concerned with the mechanical design and not informed regarding what contributes to microwave performance.

Little verification is made to determine whether an impedance controlled transmission line connector and launch are incorporated. The launch design must be compatible with the circuit geometry (50 ohm line) and optimized for low reflection losses and low RF leakage over temperature.

The Southwest Microwave connectors are designed and fabricated to guarantee consistent performance of the end product.

Meeting the mechanical requirements of MIL-PRF-39012 does not confirm that the product will perform to the electrical specifications. Manufacturers are still required to verify that specified electrical performances are met. Design latitude is permitted by Military Specifications to allow electrical performance to govern.

There are many manufacturers who claim conformance to MIL-PRF-39012 and MIL-STD-348 standards without understanding that electrical performance specification governs. Adhering to only mechanical standards gives no guarantee that the product will meet the electrical performance requirements. Therefore, the user becomes responsible to confirm the performance of the product. Unfortunately, because the configurations of many of the connectors are difficult to test, the user tends to use the products as received, without confirmed performance.

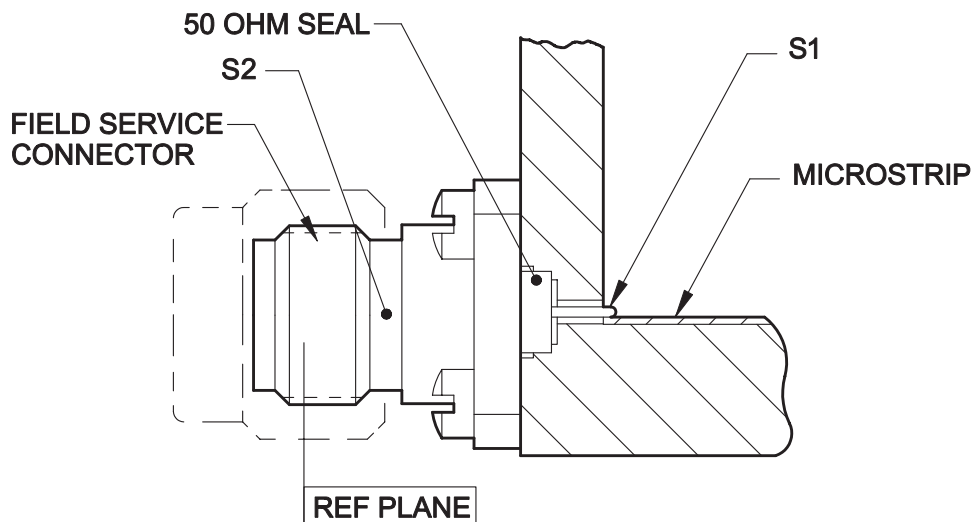
The supposed economics (price) have a propensity to camouflage true cost effectiveness. When performance is inconsistent, the user tends to look within the component circuitry to find the problem. Many times, after extensive hours of probing, a simple change in connector resolves the problem. Unfortunately for the user, the hours lost were not only costly, but also unnecessary.

Sometimes attempts are made to tune out poor connector performance, but this method has been found to be a moving target due to the extreme performance variations among lower priced units.

Southwest Microwave designs have been purposely engineered with a small protruding boss on flange mount connectors, which assures 360 degrees of metal-to-metal contact at the required surfaces. Consistent metal-to-metal contact is mandatory to achieve good electrical performance. This design is incorporated into all standard Southwest Microwave connectors.

A microwave system’s performance is as good as its weakest link. The weak link in any system should not be a low-cost, low performance, coaxial connector. This low cost connector will likely cause excessive tuning, delivery delays, rejects, and reliability problems.

Low Insertion Loss



CONNECTOR VSWR

1.10:1 (SOUTHWEST CONNECTOR)
1.30:1 (GENERIC CONNECTOR)

REFLECTION LOSS

.0099dB
.0745dB
△ LOSS = .0646dB

LAUNCH VSWR = S1	CONNECTOR VSWR = S2	VSWR MAX = S1 x S2	REFLECTION LOSS
------------------	---------------------	--------------------	-----------------

EXAMPLE # 1

1.60:1	1.30:1 (GENERIC CONNECTOR)	2.08:1	.570dB
1.60:1	1.10:1 (SOUTHWEST CONNECTOR)	1.76:1	.343dB

△ INSERTION LOSS = .227dB

EXAMPLE # 2

1.80:1	1.30:1 (GENERIC CONNECTOR)	2.34:1	.762dB
1.80:1	1.10:1 (SOUTHWEST CONNECTOR)	1.98:1	.497dB

△ INSERTION LOSS = .265dB

Note: Thus a difference of connector VSWR from 1.10:1 to 1.30:1 can result in an approximate .250dB increase in loss.

Package Standardization

Standardize on a Single Mounting Accessory Envelope

Southwest Microwave offers a wide variety of flange mount and thread-in connectors to permit designers to standardize packaging.

Overview

Many company's products are offered with a variety of connector choices. This requires that their packages be able to accommodate different types or they have different packages for each connector type which is costly for manufacturing.

With higher frequency connectors such as 2.40 mm, and 2.92 mm, other manufacturers (such as Anritsu) do not offer common packages between types. Southwest Microwave has filled in this gap as can be seen in the table on the following page.

Example

The package type is defined by the flange type and size, and the pin diameter. With the wide variety of flanges and pin sizes SMI offers, one package design can accommodate many types of connectors.

For example, designing the package for a 4 hole .500" flange with a .020" launch pin can accommodate either a 2.40 mm, 2.92 mm, SMA, N, or a TNC connector.

Features

- ▶ Similar package requirements for all connector types
- ▶ Reduce housing variations
- ▶ 2.40 mm, 2.92 mm (shown on table), Super SMA, N, TNC – all can fit the same package
- ▶ Full line of hermetic seals and launch pins available
- ▶ Thread-in with English or Metric threads





Package Standardization Mounting Accessory Envelopes

Flange size	Pin size	SMA Female	SMA Male	2.92 Female	2.92 Male	2.40 Female	2.40 Male	N Female	TNC Female
4 hole .500" square	.009"	X	X	X	X	X	X		
	.012"	X	X	X	X	X	X		
	.015"	X	X	X	X			X	X
	.018"	X	X					X	X
	.020"	X	X	X	X	X	X	X	X
4 hole .375" square	.009"	X	X	X	X	X	X		
	.012"	X	X	X	X	X	X		
	.015"	X	X	X	X	X	X		
	.018"	X	X						
	.020"	X	X	X	X	X	X		
4 hole .500 x .375"	.009"	X	X						
	.012"	X	X						
	.015"	X	X						
	.018"	X	X						
	.020"	X	X						
2 hole .625" long	.009"	X	X	X	X	X	X		
	.012"	X	X	X	X	X	X		
	.015"	X	X	X	X				
	.018"	X	X						
	.020"	X	X	X	X	X	X		
2 hole .550" long	.009"	X	X	X	X	X	X		
	.012"	X	X	X	X	X	X		
	.015"	X	X	X	X				
	.018"	X	X						
	.020"	X	X	X	X	X	X		
2 hole .500"	.009"	X	X	X	X	X	X		
	.012"	X	X	X	X	X	X		
	.015"	X	X	X	X				
	.018"	X	X						
	.020"	X	X	X	X	X	X		
Thread-in .250-36	.009"	X	X	X	X	X	X		
	.012"	X	X	X	X	X	X		
	.015"	X	X	X	X				
	.018"	X	X						
	.020"	X	X	X	X	X	X		
Thread-in M6x.75-6g	.009"			X	X	X	X		
	.012"								
	.015"								
	.018"								
	.020"								
	.036"								

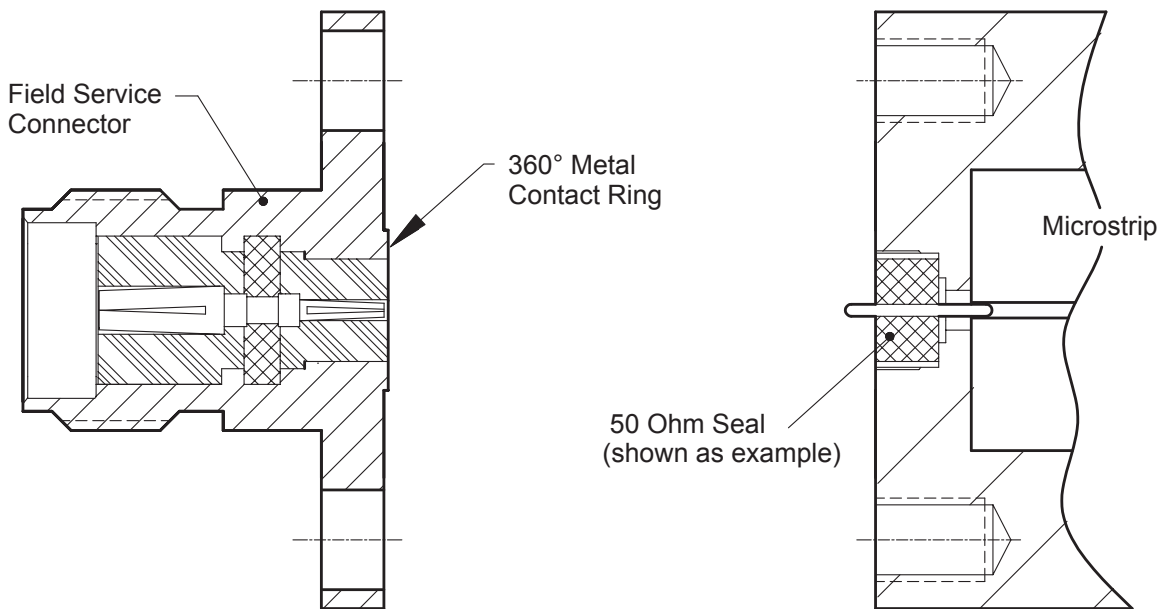
All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

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360° Metal-to-Metal Contact

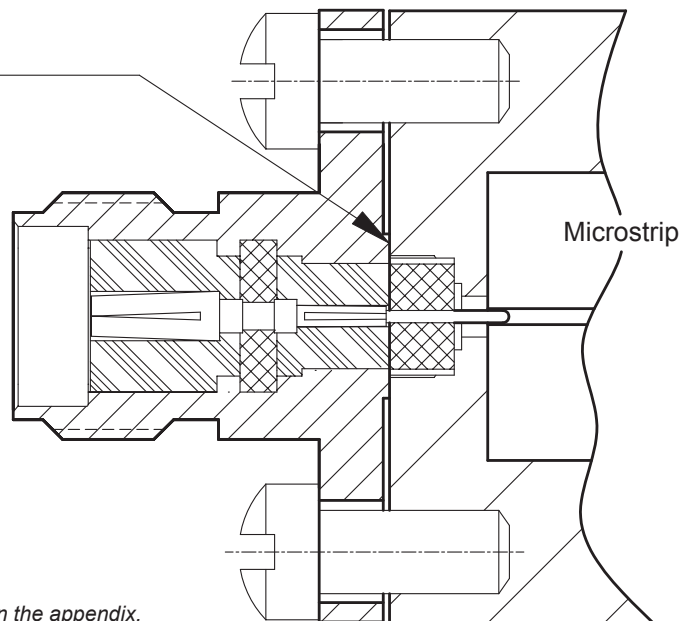
For Low VSWR and Low RF Leakage

Typical High Performance Launch Application



Proper Connector Installation *

Built-in metal contact ring provides 360° of metal-to-metal contact surface required for low VSWR and Low RF Leakage.



* See article on Proper Installation on page 118-121 in the appendix.

High Performance Thick Wall SuperSMA
In Accordance with MIL-STD-348



Index

SuperSMA Connectors (27 GHz)	Page
Interface Standards	14
Specifications	15
Model Numbers	16
Test Data	18

Adapters: SuperSMA Adapters can be found in the Adapter section.
Cable Connectors: SuperSMA Connectors can be found in the Cable Connector section.
 Unless otherwise specified, all dimensions are in inches.

High Performance SuperSMA (Thick Wall)

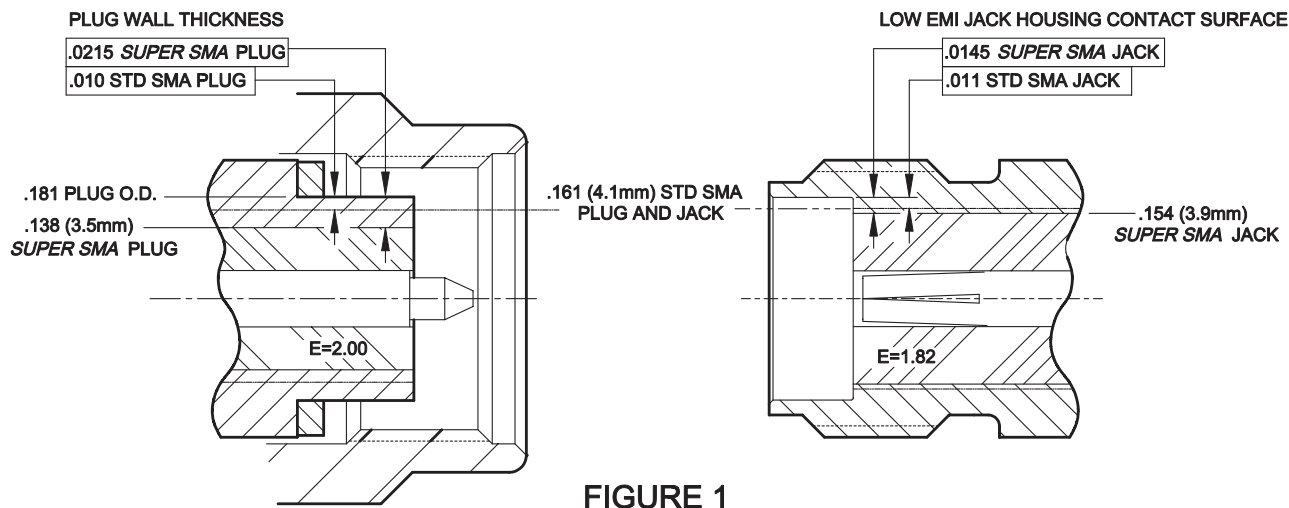
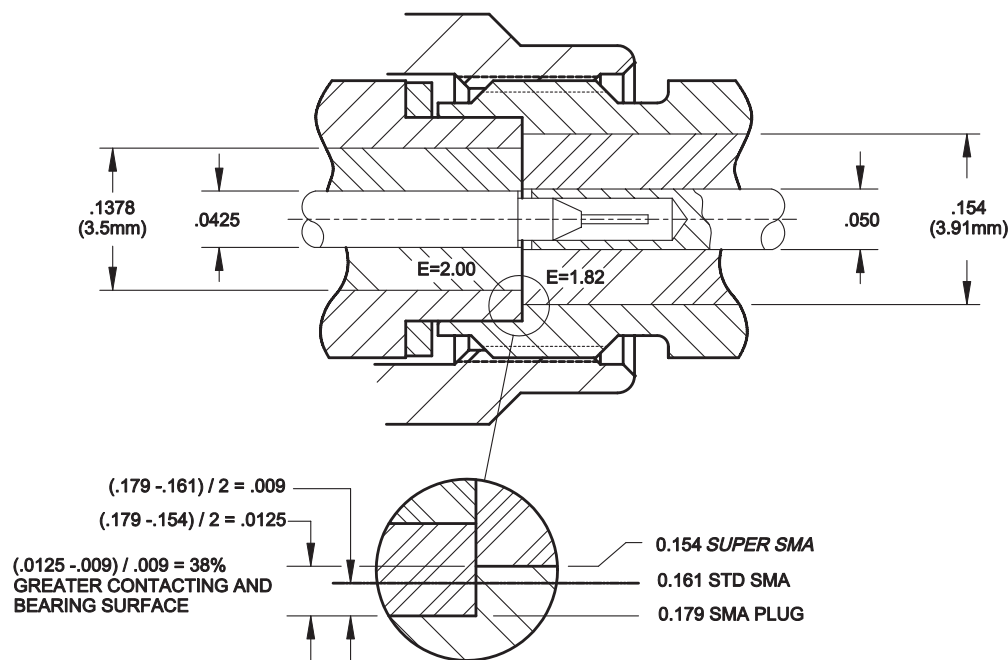


FIGURE 1

SuperSMA PLUG
 3.5mm 27.0 GHz

SuperSMA JACK
 3.91mm 27.0 GHz



Mating Interface

FIGURE 2

SuperSMA

Southwest Microwave's "Standard SMA" is referred to as "Super SMA." The Super SMA is a higher performance field service SMA connector. Super SMA utilizes the basic PTFE dielectric interface (true SMA) and features low VSWR mode free through 27 GHz and less than -100 dB RF leakage. The thick outer conductor wall also provides great durability to assure reliability in repeat mating. They enhance component performance, hence the reference to Super SMA. Super SMAs are the result of many years of experience in design and test. The Super SMA interface is in accordance with MIL-STD-348.

Super SMAs are treated as microwave components with verified improved performance over the RF connectors specified by the basic parameters of MIL-PRF-39012 and MIL-C-83517. Their improved performance is not achieved just by tighter tolerances, but also by innovations that compensate for physical parameters that contribute to VSWR and leakage. These innovations include:

- Compensation for socket slot effect, and socket taper
- Precise, matching compensation offsets in the inner and outer conductors and dielectric, when diameter changes are required.
- Center conductor is precisely set and rigidly captured to the outer conductor, which assures performance consistency from unit to unit. (No barbs or staking are used). This unique capture method also eliminates the RF leakage path typically present in lower performance SMAs where holes are drilled through the connector for injecting epoxy.
- Precise metal-to-metal contact, both at the interface and launch, provides <-100 dB RF leakages through 27 GHz. Grounding is achieved through a slightly protruding metal contact ring, which is superior to conductive gaskets (typically silver impregnated rubber) that loose resilience when thermal cycled. This protrusion also insures proper contact to the component package by compensating for irregular package and flange surfaces.
- The ID of the outer conductor is reduced (3.5 mm for Super SMA plug, 3.9 mm for Super SMA jack, where the standard SMA is 4.1 mm) and results in thicker walls for improved durability and 38% increase of bearing surface at the reference plane for reduced leakage. Another benefit is greater compatibility for mating to 3.5 mm and 2.92 mm test connectors. This design also improves system performance when mated to a "run of the mill" SMA because the slightly decreased diameters of the Super SMA help offset the inductance usually occurring at the reference plane.*

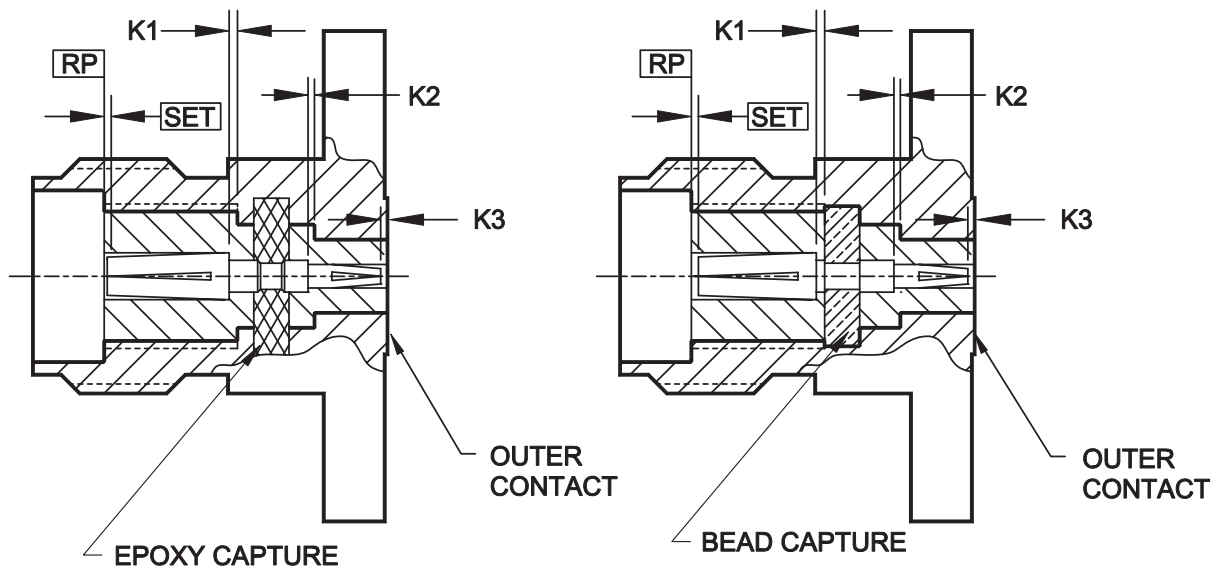
* See figures 1 & 2 on page 8. Design details and back-to-back testing data can be found on pages 18-23.

High Performance SuperSMA

Connectors from Stock

SuperSMA
STANDARD (+125°C)

EXTENDED POWER SuperSMA
HIGH TEMPERATURE (+165°C)



Inner Contact is rigidly positioned with respect to outer conductor to maintain optimum electrical compensation offsets (Ks). Contact position is not dependent upon thermally unstable PTFE fluorocarbon (TEFLON®).

Southwest Provides High Performance:

- Low VSWR (Low Reflection Loss)
- Low Insertion Loss
- Low RF Leakage

All materials meet NASA outgassing specifications.

Extended (Higher) Power SuperSMA

Southwest Microwave “Extended Power Super SMA” connectors provide the same electrical performance as our standard Super SMA plus higher power handling capabilities. Extended Power Super SMAs operate reliably at higher temperatures (to 165°C) with moderate power (160W) or at higher/extended power (250W) at 125°C. The power handling capability of a coaxial connector is primarily dependent upon controlling its temperature rise. Since Southwest Microwave’s Extended Power Super SMAs perform to 165°C, they are less affected by heat rise above ambient compared to competitive products.

“Power rating” cannot be a stand-alone rating for coaxial connectors as the controllable (measurable) parameter is “temperature,” which is affected by packaging, ambient, and other systemic factors.

The temperature rating as specified is the temperature that the connector will withstand and still meet the electrical specifications. This is not to be confused with temperature rating on MIL-PRF-39012 slash sheet, which only assures the material used will not flow and cause possible inner to outer conductor short circuits. MIL-PRF-39012 does not require electrical tests such as VSWR and insertion loss, after thermal shock or high temperature testing.

As a basic guideline, the Extended Power Super SMA will handle an additional 100W average power above our Standard Super SMA (which has been available since 1987). The recommended maximum power rating for our standard Super SMA connector is 150W CW at Ku-band (12.4-18.0 GHz), at a maximum temperature of 125°C.

Both the Standard Super SMA and the Extended Power Super SMA Series model numbers are shown on pages 16-17. The 165°C rating identifies the Extended Power versions.



SuperSMA High Temperature Capabilities

Design and Performance

Temperature Rating:

Southwest Microwave offers two versions of standard Super SMA connectors.

1) The Standard version to 125°C. 2) The Extended Power version to 165°C. Both versions have the same superior, microwave performance to 27 GHz.

Thermally Stable:

Super SMA connectors are thermally stabilized for specified temperatures. The dielectric at the mating interface is typically .003 inches below the reference plane. When heated to maximum temperature, the dielectric may grow slightly, but will remain below the reference plane and almost no growth will be experienced on the circuit/transition end. Southwest Microwave utilizes unique design features that assure minimum dielectric growth over the full temperature range. Designs used by many lower-cost suppliers inherently have growth problems that can also result in longitudinal movement of the contact. These undesired movements and growth can significantly affect results at microwave frequencies.

See Cycle Test Data on page 13.

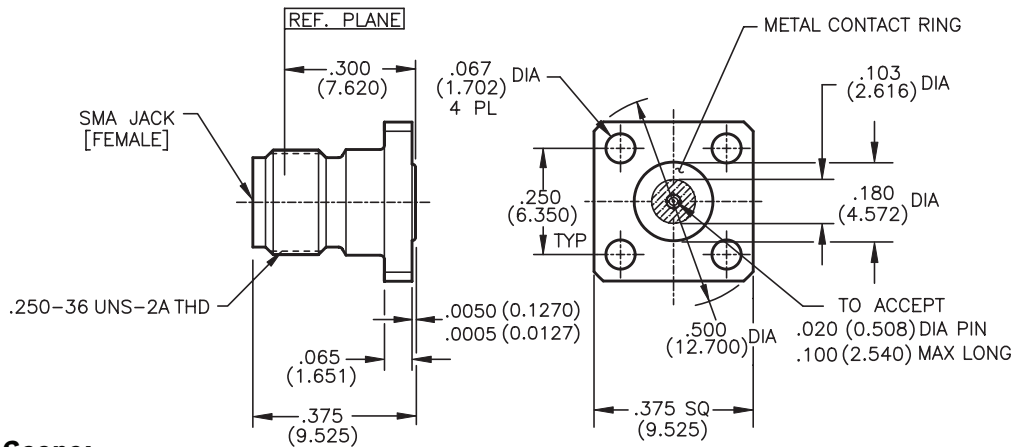
SCDs and Testing:

Both versions of standard Southwest Microwaves Super SMAs utilize materials that meet NASA outgassing specifications for space applications. For these and other applications where performance and reliability are important, Southwest Microwave recommends that specifications require electrical testing after thermal exposure, to assure that expected results are obtained. Military specifications for RF/microwave connectors such as MIL-PRF-39012 do not require electrical performance test after thermal exposure. Southwest Microwave can provide assistance on supplier-generic test procedures for use in creating Source Control Documents (SCD) or other documentation where space or high reliability applications are required.

Southwest Microwave – Setting New Standards for High Performance!

Thermal Cycle Test Data

SMI Model No. 212-10SF



1. Scope:

- To demonstrate contact and dielectric stability

2. Process:

- Six connectors were serialized. Interface contact and dielectric dimensions were recorded.
- Parts were heated to 125°C and held for 15 minutes and then cooled to 25°C.
- Dimensions were recorded again after heating & cooling.
- Testing performed in free state.

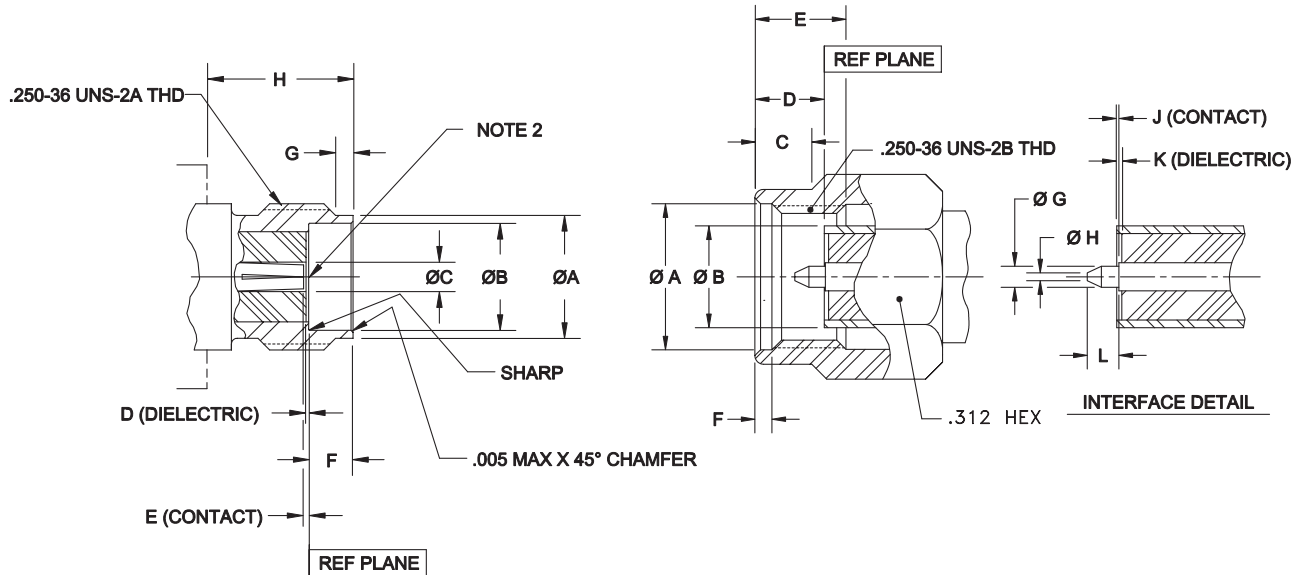
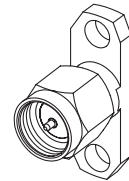
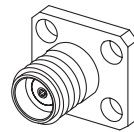
3. Dimensions:

Before Thermal			After Thermal		
Sample Number	Contact	Dielectric	Sample Number	Contact	Dielectric
1	- .001	- .002	1	- .001	- .0015
2	- .001	- .002	2	- .001	- .001
3	- .0015	- .0025	3	- .0015	- .0015
4	- .002	- .0025	4	- .002	- .0025
5	- .001	- .0025	5	- .0015	- .002
6	- .001	- .002	6	- .001	- .0015

Results:

- All dimensions stayed within specifications.
- Maximum movement on a contact was .0005 (No.5)
- Maximum movement on a dielectric was .001 (No.3)

SuperSMA Interface Standards



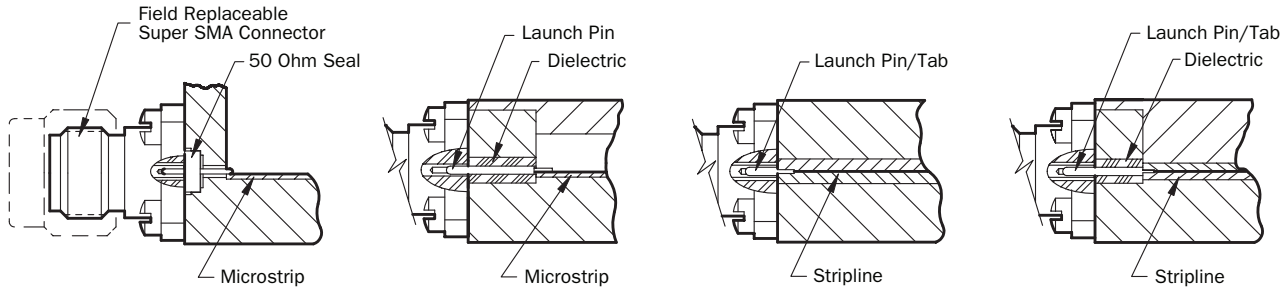
SMA Jack (Socket Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.208	(5.28)	.215	(5.46)
B	.1812	(4.605)	.1840	(4.673)
C	.049	(1.24)	.051	(1.30)
D	.000	(0.00)	.005	(0.13)
E	.000	(0.00)	.005	(0.13)
F	.075	(1.91)	.077	(1.96)
G	.020	(0.51)	.040	(1.02)
H	.218	(5.54)	—	—
	Inch	(mm)	Inch	(mm)

SMA Plug (Pin Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.255	(6.48)	.265	(6.73)
B	.1780	(4.521)	.1808	(4.592)
C	.100 Nominal (2.54)			
D	—	—	.132	(3.35)
E	.150	(3.81)	.170	(4.32)
F	.020	(0.51)	.040	(1.02)
G	.0355	(0.902)	.0368	(0.935)
H	.000	(0.00)	.015	(0.38)
J	.000	(0.00)	.005	(0.13)
K	.000	(0.00)	.005	(0.13)
L	.065	(1.65)	.085	(2.16)
	Inch	(mm)	Inch	(mm)

- Notes: 1. Interface I.A.W. MIL-PRF-39012 and MIL-STD-348, Figures 310-1 and 310-2.
2. I.D. to meet VSWR when mated with .0355 / .0368 (0.9017 mm / 0.9347 mm) Diameter Pin.

Specifications

Applications



Available Accessories:

See Launch Accessories Section.

- 50 Ohm Seal
- Launch Pin & Dielectric
- Launch Pin/Tab
- Launch Pin/Tab & Dielectric

Electrical:

- Mode Free Through 27.0 GHz
- Low VSWR: DC to 18.0 GHz.....1.10:1 max
18.0 to 27.0 GHz.....1.15:1 max
- Low RF Leakage \leq -100 dB
- Low Insertion Loss

Materials / Construction:

- Housing: Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Dielectric: Virgin PTFE Fluorocarbon Per ASTM D 1710 and ASTM D 1457
- Center Contact Capture:
High Temperature Epoxy (+125° C) – “Old” Standard Super SMA.
High Temperature Ultem 1000 (Per ASTM D 5205) (+165° C) – “New” Standard (Preferred) Extended Power Super SMA.
- Connector Interface: Per MIL-STD-348, Figs. 310-1 and 310-2
- Raised Metal Grounding Ring for 360° Metal-to-metal Contact

Environmental:

- Temperature: -55° C to +125° C “Old” Standard Super SMA.
- Temperature: -55° C to +165° C “New” Standard (Preferred) Extended Power Super SMA.



Super SMA Series DC to 27.0 GHz

* The "New" Standard (Preferred) Connectors cost the same or less than the "Old" Standard Connectors.

Jack Connectors (Female Contacts)			Rear Socket to Accept Pin Diameters												
			.009	.012	.015	.018	.020	.036							
4 Hole .500 SQ			----	212-26SF	212-01SF	212-06SF	212-03SF	----	"Old" Standard 125°C						
			212-550SF	212-500SF	212-501SF	212-506SF	212-502SF	212-503SF	"New" Standard* (Preferred) 165°C						
4 Hole .375 SQ			----	212-13SF	212-08SF	212-12SF	212-10SF	----	"Old" Standard 125°C						
			212-532SF	212-510SF	212-511SF	212-507SF	212-512SF	212-513SF	"New" Standard* (Preferred) 165°C						
4 Hole .500 x .375			----	212-29SF	212-21SF	212-23SF	212-25SF	----	"Old" Standard 125°C						
			212-551SF	212-505SF	212-531SF	212-508SF	212-536SF	212-530SF	"New" Standard* (Preferred) 165°C						
2 Hole .625L			----	214-08SF	214-01SF	214-06SF	214-03SF	----	"Old" Standard 125°C						
			214-537SF	214-500SF	214-501SF	214-516SF	214-502SF	214-503SF	"New" Standard* (Preferred) 165°C						
2 Hole .550L			----	214-11SF	214-13SF	214-15SF	214-17SF	----	"Old" Standard 125°C						
			214-538SF	214-510SF	214-511SF	214-517SF	214-512SF	----	"New" Standard* (Preferred) 165°C						
2 Hole .500L			----	214-24SF	214-26SF	214-28SF	214-30SF	----	"Old" Standard 125°C						
			214-539SF	214-520SF	214-521SF	214-518SF	214-522SF	----	"New" Standard* (Preferred) 165°C						
Thread-in			L1	L2											
			.314	.390						----	220-17SF	220-01SF	220-06SF	220-03SF	"Old" Standard 125°C
			.349	.425						----	220-09SF	220-11SF	220-13SF	220-15SF	
			L1	L2						220-507SF	220-500SF	220-501SF	220-506SF	220-502SF	220-503SF	"New" Standard* (Preferred) 165°C
.314	.390	----	220-511SF	----	----	----									
.349	.425	220-507SF	220-500SF	220-501SF	220-506SF	220-502SF	220-503SF								

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).



Super SMA Series DC to 27.0 GHz

* The "New" Standard (Preferred) Connectors cost the same or less than the "Old" Standard Connectors.

Plug Connectors (Male Contacts)		Rear Socket to Accept Pin Diameters						
		.009	.012	.015	.018	.020	.036	
4 Hole .500 SQ		----	211-10SF	211-01SF	211-06SF	211-03SF	----	"Old" Standard 125°C
		211-524SF	211-500SF	211-501SF	211-504SF	211-502SF	211-503SF	"New" Standard* (Preferred) 165°C
4 Hole .375 SQ		----	211-12SF	211-14SF	211-16SF	211-18SF	----	"Old" Standard 125°C
		211-523SF	211-510SF	211-511SF	211-505SF	211-512SF	211-513SF	"New" Standard* (Preferred) 165°C
4 Hole .500 x .375		----	211-20SF	211-22SF	211-24SF	211-26SF	----	"Old" Standard 125°C
		211-525SF	211-514SF	211-515SF	211-516SF	211-517SF	211-518SF	"New" Standard* (Preferred) 165°C
2 Hole .625L		----	213-08SF	213-01SF	213-06SF	213-03SF	----	"Old" Standard 125°C
		213-517SF	213-500SF	213-501SF	213-504SF	213-502SF	213-503SF	"New" Standard* (Preferred) 165°C
2 Hole .550L		----	213-11SF	213-13SF	213-15SF	213-17SF	----	"Old" Standard 125°C
		213-518SF	213-510SF	213-511SF	213-505SF	213-512SF	----	"New" Standard* (Preferred) 165°C
2 Hole .500L		----	213-24SF	213-26SF	213-28SF	213-30SF	----	"Old" Standard 125°C
		213-519SF	213-520SF	213-521SF	213-516SF	213-522SF	----	"New" Standard* (Preferred) 165°C
Thread-in		----	221-09SF	221-01SF	221-06SF	221-03SF	----	"Old" Standard 125°C
		221-505SF	221-500SF	221-501SF	221-504SF	221-502SF	221-503SF	"New" Standard* (Preferred) 165°C

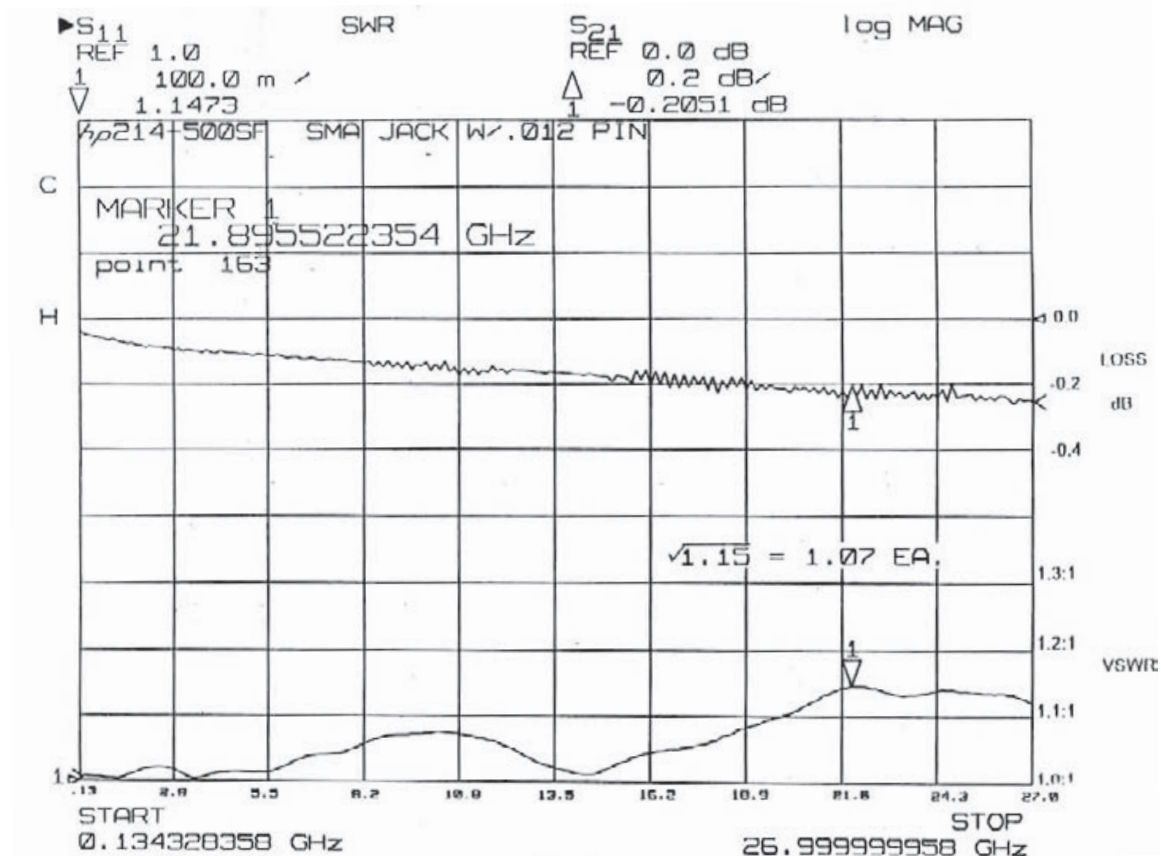
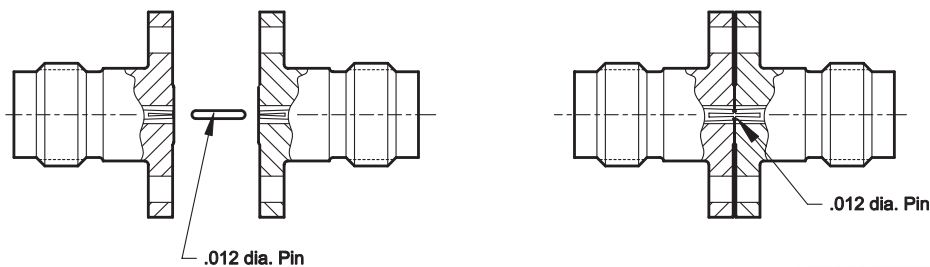
All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Typical Test Data for "New" Standard (Preferred) Models Extended Power SuperSMA

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 27.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.

Model No. 214-500SF with .012" Test Pin

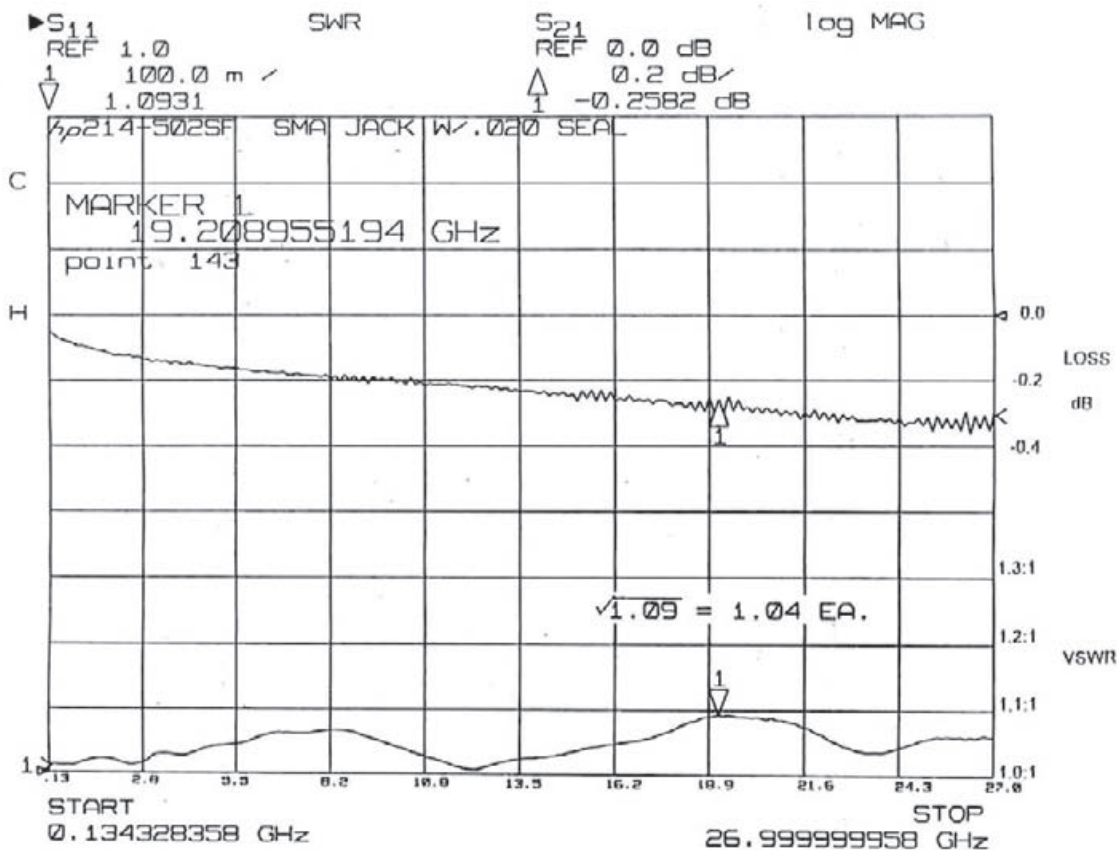
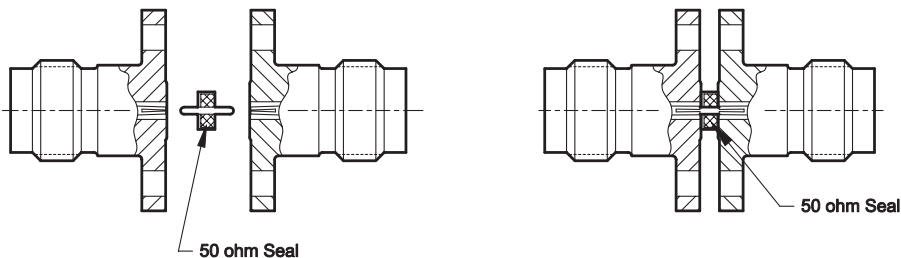


Typical Test Data for "New" Standard (Preferred) Models Extended Power SuperSMA

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors and 50 ohm seal.

Model No. 214-502SF with 290-02G **50 ohm Seal**

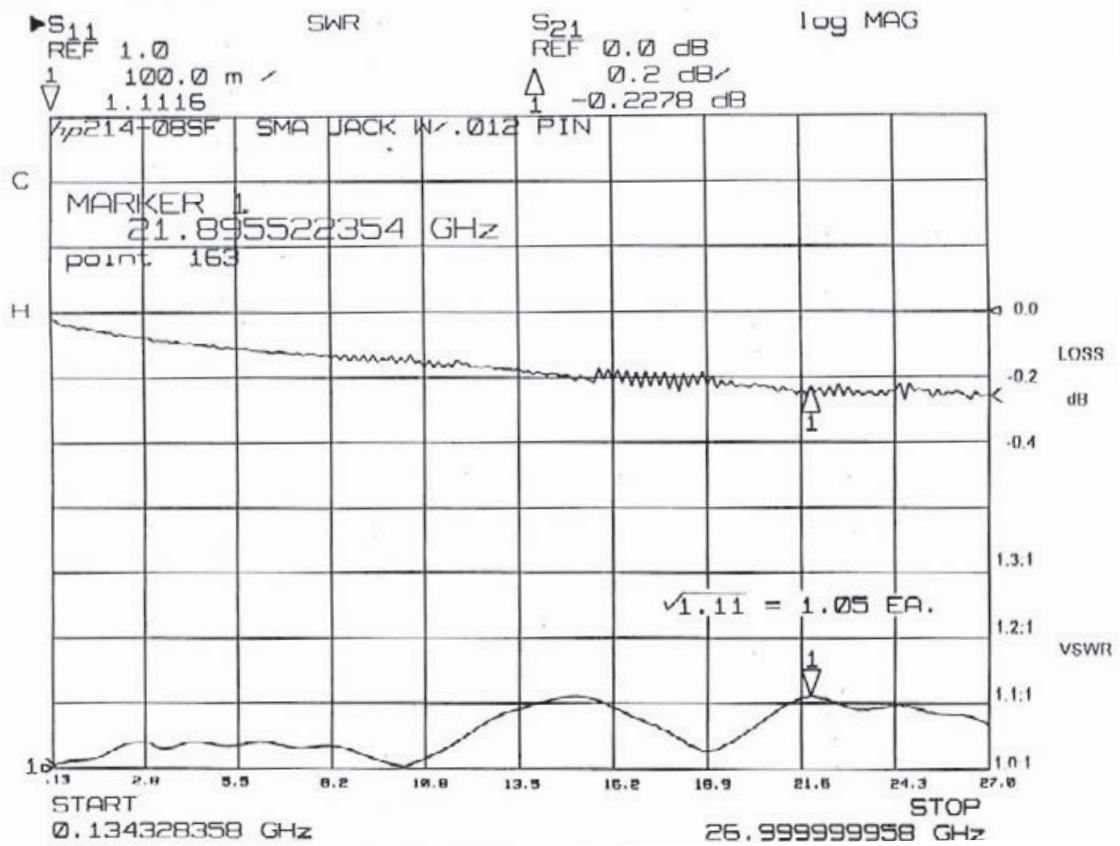
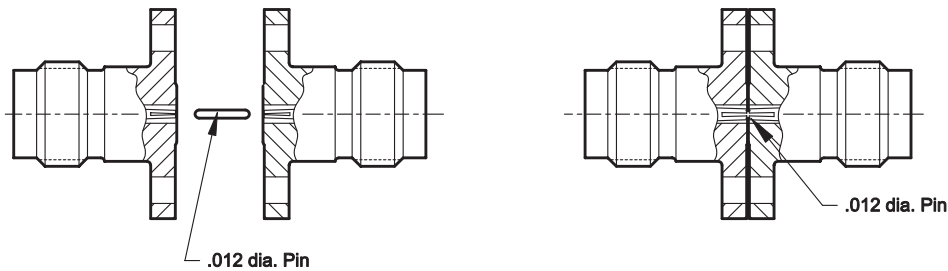


Typical Test Data for Old Standard Models

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 27.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.

Model No. 214-08SF with .012" dia. **Test Pin**

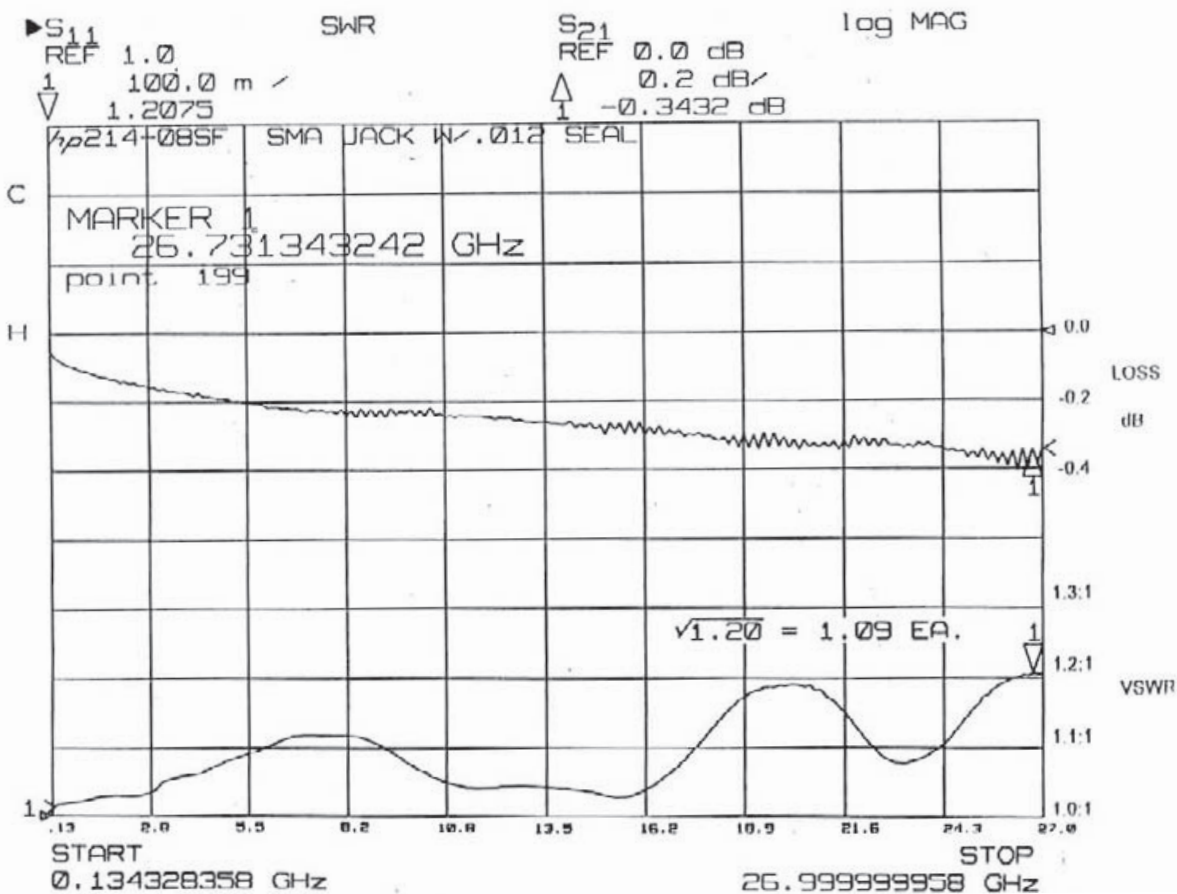
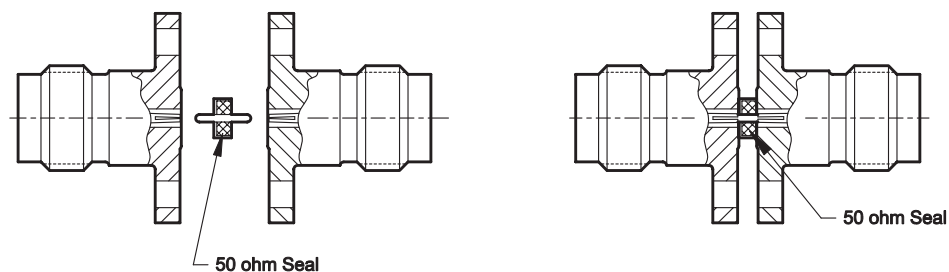


Typical Test Data for Old Standard Models

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors and 50 ohm seal.

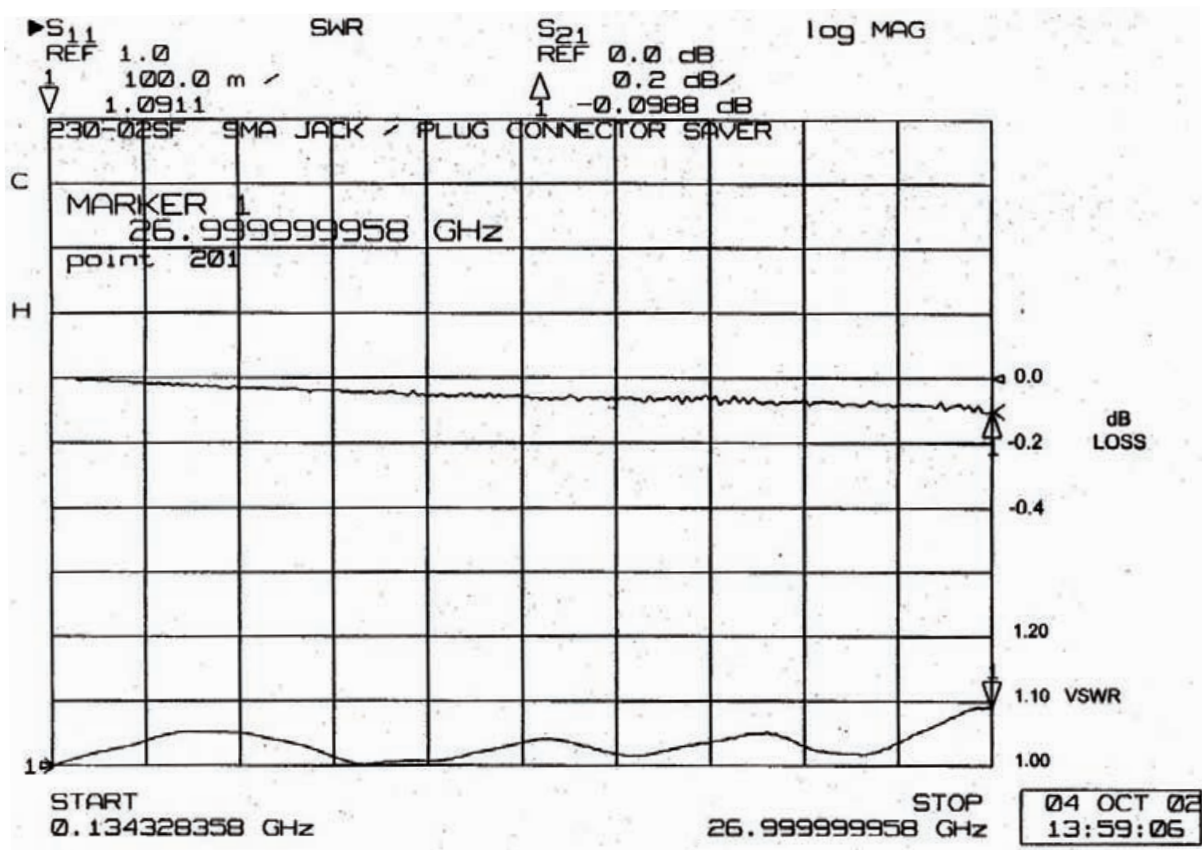
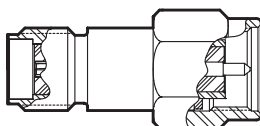
Model No. 214-08SF with .012" pin **50 ohm Seal** (290-07G)



Typical Test Data

Typical performance for single Plug-to-Jack adapter

(Looking through (2) mated interfaces)

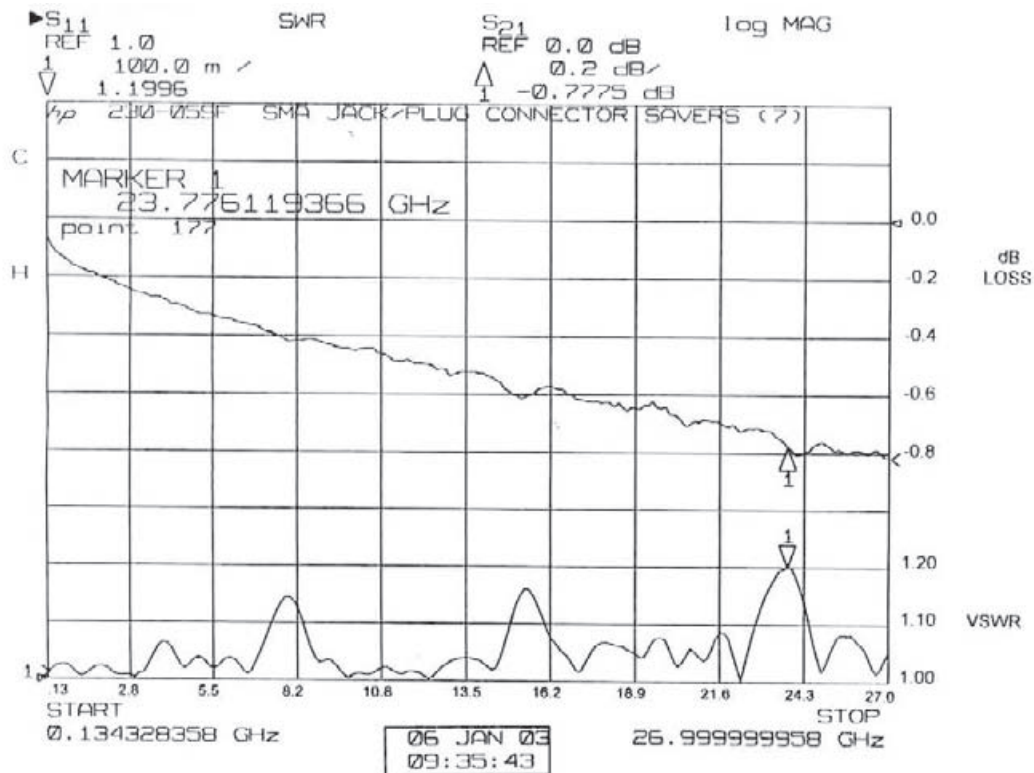
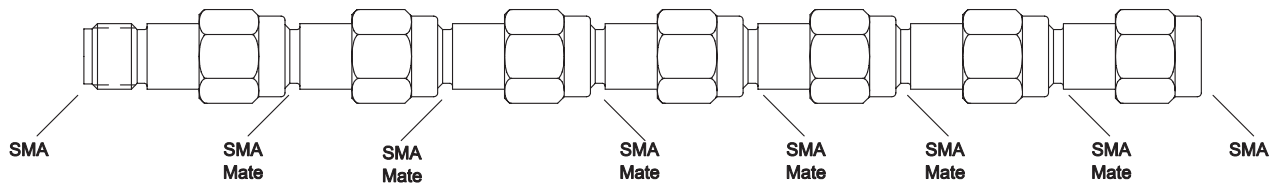


Typical Test Data

This test shows (7) adapters in series, all with identical small discontinuities phasing together @ 8.0, 16.0, and 24.0 GHz. The seventh root of the peak value will compute the value for the one unit:

$$\sqrt[7]{1.20} = 1.0264 \quad (\text{Looking through (7) SMA adapters - (8) mated interfaces})$$

Model 230-05SF



See Adapter section for additional SMA Adapter information.

Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
Installation and Tools



Notes

A large, empty rectangular box with a thin black border, intended for handwritten notes.

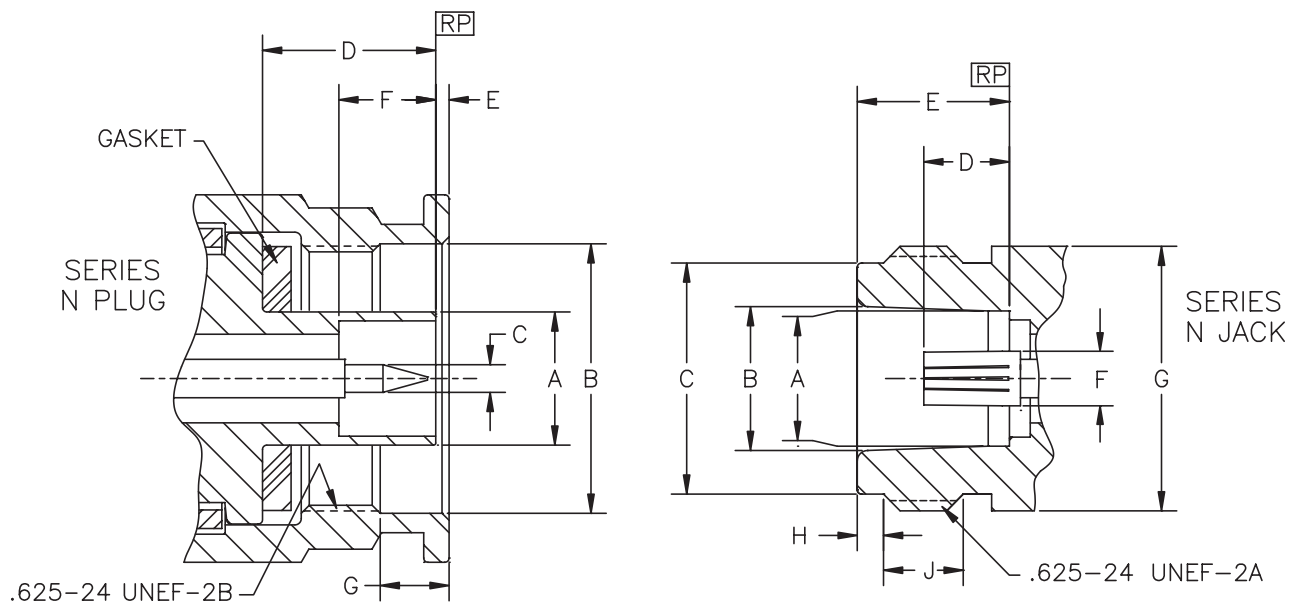


Index

<i>N Series Connectors (18 GHz)</i>	Page
Interface Standards	26
Specifications	27
Model Numbers	28
Test Data	29

Adapters: N Adapters can be found in the Adapter section.

N Series Interface Standards



N Jack (Socket Contact)

LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.317	(8.05)	.320	(8.13)
B	.336	(8.53)	.344	(8.74)
C	.054	(1.37)	.055	(1.40)
D	.192	(4.88)	.207	(5.24)
E	.357	(9.07)	.361	(9.17)
F	.120	(3.05)	.123	(3.12)
G	.620	(15.752)	.625	(15.88)
H	.055	(1.40)	.070	(1.78)
J	.175	(4.45)	.200	(5.08)
	Inch	(mm)	Inch	(mm)

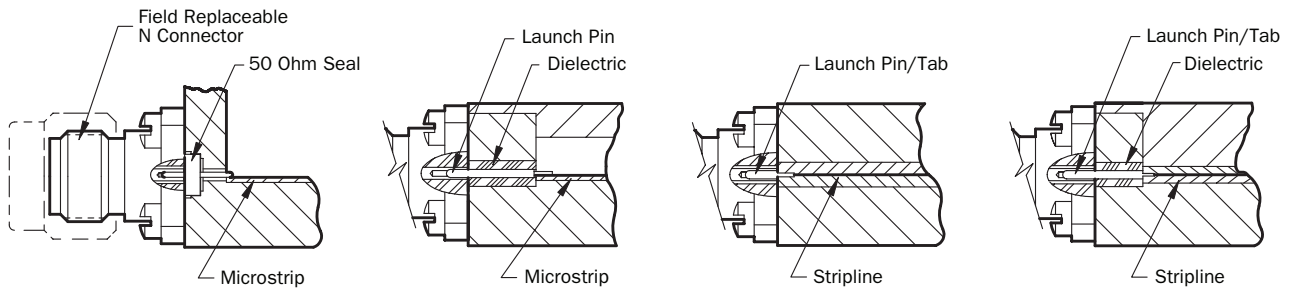
N Plug (Pin Contact)

LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.313	(7.95)	.315	(8.00)
B	.634	(16.10)	.642	(16.31)
C	.0635	(1.613)	.0660	(1.676)
D	.400	(10.16)	.410	(10.41)
E	.016	(0.41)	.060	(1.52)
F	.225	(5.71)	.230	(5.84)
G	.158	(4.01)	.168	(4.27)
	Inch	(mm)	Inch	(mm)

Note: Interface I.A.W. MIL-PRF-39012 and MIL-STD-348, Figures 304-1 and 304-2.

Specifications

Applications



Available Accessories:

See Launch Accessories Section.

- 50 Ohm Seal
- Launch Pin & Dielectric
- Launch Pin/Tab
- Launch Pin/Tab & Dielectric

Electrical:

- Mode Free Through 18.0 GHz
- Low VSWR: DC to 18.0 GHz.....1.10:1 max
- Low RF Leakage \leq -100 dB
- Low Insertion Loss

Materials / Construction:

- Housing: Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Dielectric: Virgin PTFE Fluorocarbon Per ASTM D 1710 and ASTM D 1457
- Center Contact Capture: High Temperature Ultem 1000 (Per ASTM D 5205)
- Connector Interface: Per MIL-STD-348, Figs. 304-1 and 304-2
- Raised Metal Grounding Ring for 360° Metal-to-metal Contact

Environmental:

- Temperature: -55° C to +165° C



N Series DC to 18.0 GHz

N JACK (FEMALE) 4 HOLE .500" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	312-14SF
		.020	312-15SF
		.018	312-16SF
		.015	312-17SF
N JACK (FEMALE) 4 HOLE .687" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	312-04SF
		.020	312-05SF
		.018	312-06SF
		.015	312-07SF
N JACK (FEMALE) 4 HOLE 1.0" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	312-00SF
		.020	312-01SF
		.018	312-02SF
		.015	312-03SF
N PLUG (MALE) 4 HOLE 1.0" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	311-03SF
		.020	311-04SF
		.018	311-05SF
		.015	311-09SF

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

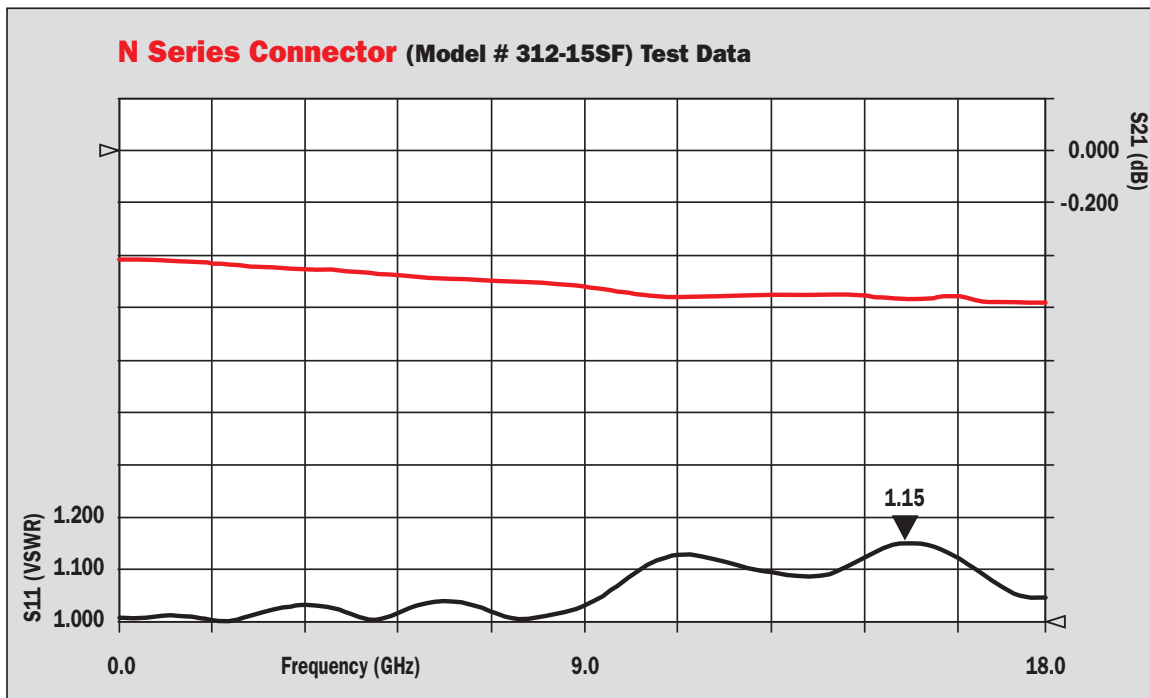
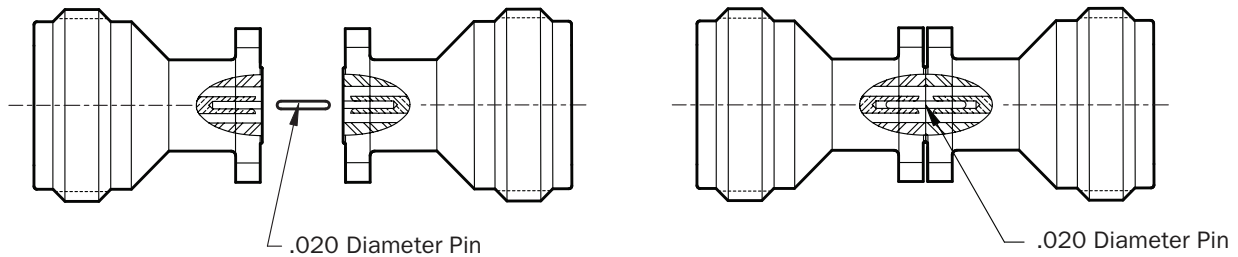
Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 18.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.



Model No. 312-15SF with .020" Test Pin

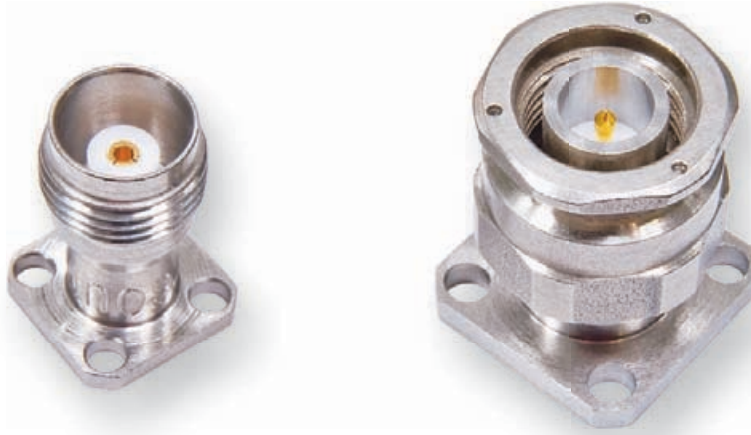


$$\sqrt{1.15} = 1.07 \text{ Maximum for each connector}$$

- Super SMA Connectors
- N Series Connectors
- TNC Connectors**
- 2.92 mm Connectors
- SSMA Connectors
- 2.40 mm Connectors
- End Launch Connectors
- Adapters
- Cable Connectors
- Launch Accessories
- Installation and Tools



Notes

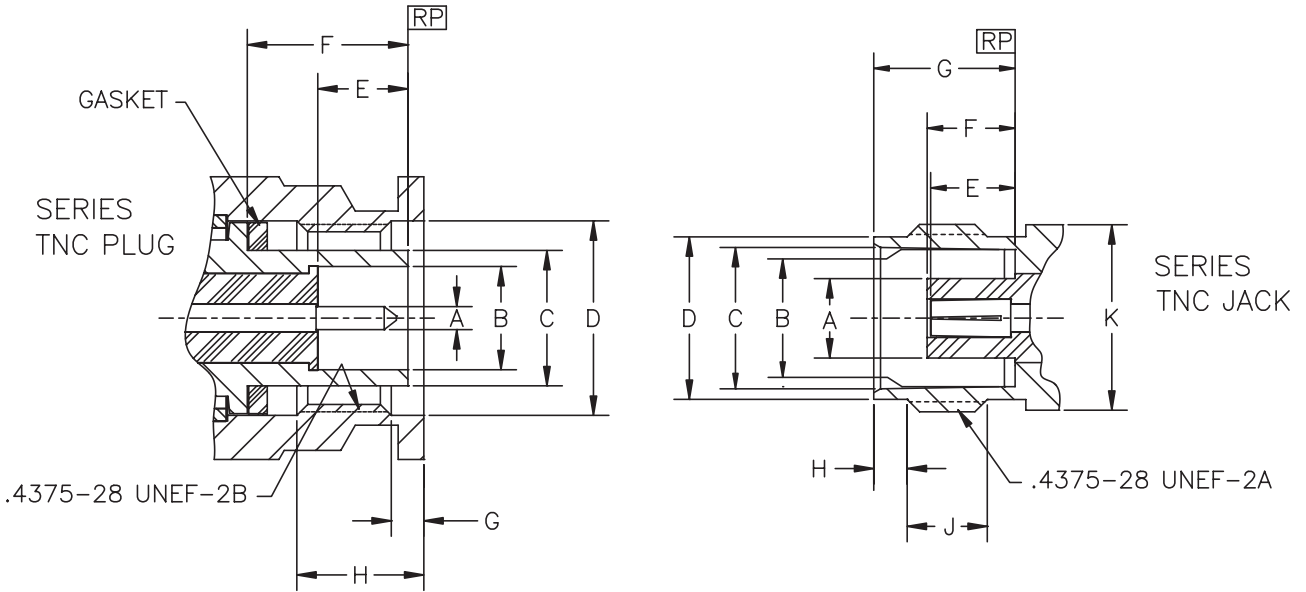


Index

TNC Connectors (18 GHz)	Page
Interface Standards	32
Specifications	33
Model Numbers	34
Test Data	35

Adapters: TNC Adapters can be found in the Adapter section.

TNC Series Interface Standards



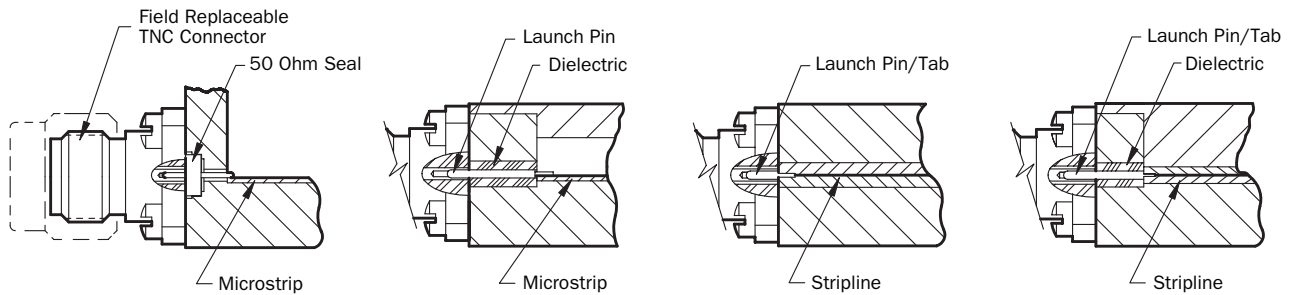
TNC Jack (Socket Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.184	(4.67)	.186	(4.72)
B	.319	(8.10)	.321	(8.15)
C	.327	(8.31)	.333	(8.46)
D	.378	(9.60)	.381	(9.68)
E	.201	(5.11)	.206	(5.23)
F	.198	(5.03)	.208	(5.28)
G	.327	(8.31)	.333	(8.46)
H	.068	(1.73)	.088	(2.24)
J	.187	(4.75)	.210	(5.33)
K	.425	(10.80)	.440	(11.18)
	Inch	(mm)	Inch	(mm)

TNC Plug (Pin Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.052	(1.32)	.054	(1.37)
B	.238	(6.05)	.242	(6.15)
C	.314	(7.98)	.318	(8.08)
D	.440	(11.18)	—	—
E	.208	(5.28)	—	—
F	.365	(9.27)	.385	(9.78)
G	.063	(1.60)	—	—
H	.265	(6.73)	.280	(7.11)
	Inch	(mm)	Inch	(mm)

Note: Interface I.A.W. MIL-PRF-39012 and MIL-STD-348, Figures 313-1 and 313-2.

Specifications

Applications



Available Accessories:

See Launch Accessories Section.

- 50 Ohm Seal
- Launch Pin & Dielectric
- Launch Pin/Tab
- Launch Pin/Tab & Dielectric

Electrical:

- Mode Free Through 18.0 GHz
- Low VSWR: DC to 18.0 GHz.....1.10:1 max
- Low RF Leakage \leq -100 dB
- Low Insertion Loss

Materials / Construction:

- Housing: Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Dielectric: Virgin PTFE Fluorocarbon Per ASTM D 1710 and ASTM D 1457
- Center Contact Capture: High Temperature Ultem 1000 (Per ASTM D 5205)
- Connector Interface: Per MIL-STD-348, Figs. 313-1 and 313-2
- Raised Metal Grounding Ring for 360° Metal-to-metal Contact

Environmental:

- Temperature: -55° C to +165° C



TNC Series DC to 18.0 GHz

TNC JACK (FEMALE) 4 HOLE .500" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	412-32SF
		.020	412-31SF
		.018	412-30SF
		.015	412-33SF
TNC JACK (FEMALE) 4 HOLE .687" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	412-36SF
		.020	412-35SF
		.018	412-34SF
		.015	412-29SF
TNC PLUG (MALE) 4 HOLE .687" SQUARE		*ACCEPTS PIN DIA.	MODEL NO.
		.036	411-01SF
		.020	411-02SF
		.018	411-03SF
		.015	411-04SF

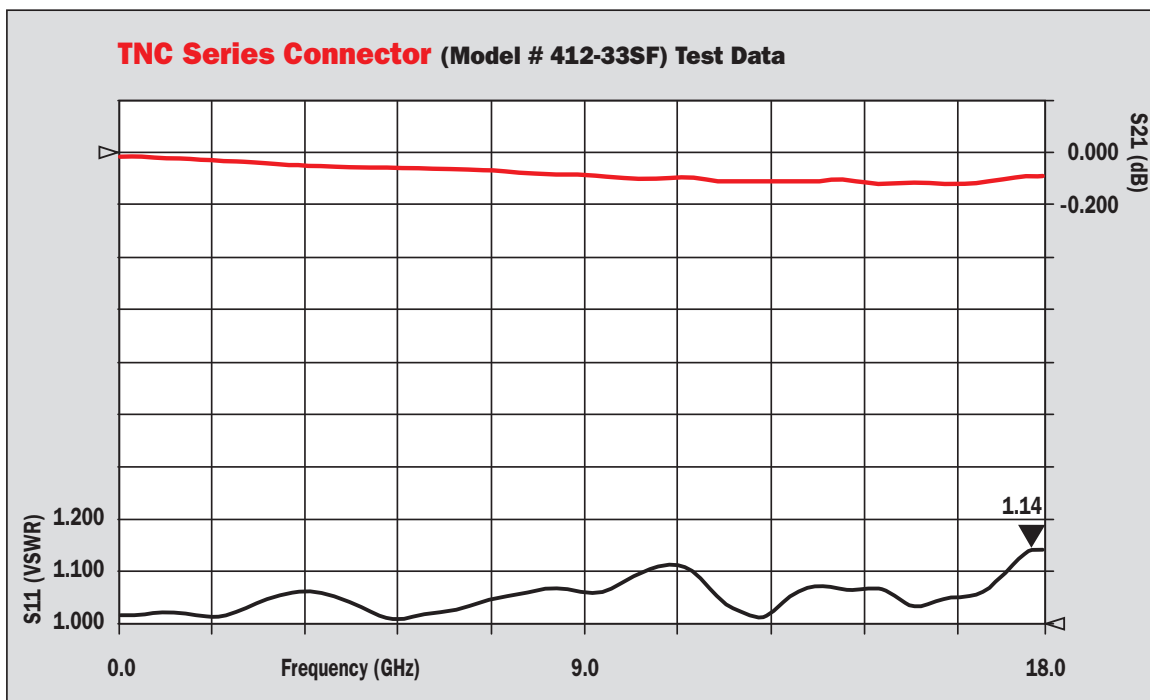
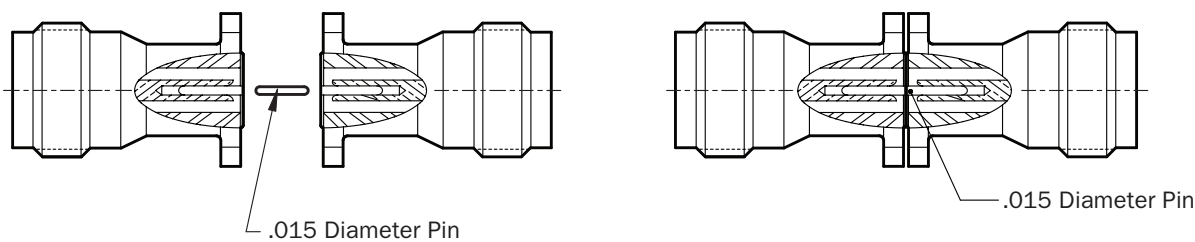
All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 18.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.

Model No. 412-33SF with **.015" Test Pin**



$$\sqrt{1.14} = 1.07 \text{ Maximum for each connector}$$



Index

2.92 mm Connectors (40 GHz)	Page
Introduction	37
Interface Standards	38
Specifications	39
Model Numbers	40
Test Data	42
Waveguide Connector Models	44

Adapters: 2.92 mm “JK” Adapters can be found in the Adapter section.

Cable Connectors: 2.92 mm “JK” Cable Connectors can be found in the Cable Connector section.

Unless otherwise specified, all dimensions are in inches.

Introduction

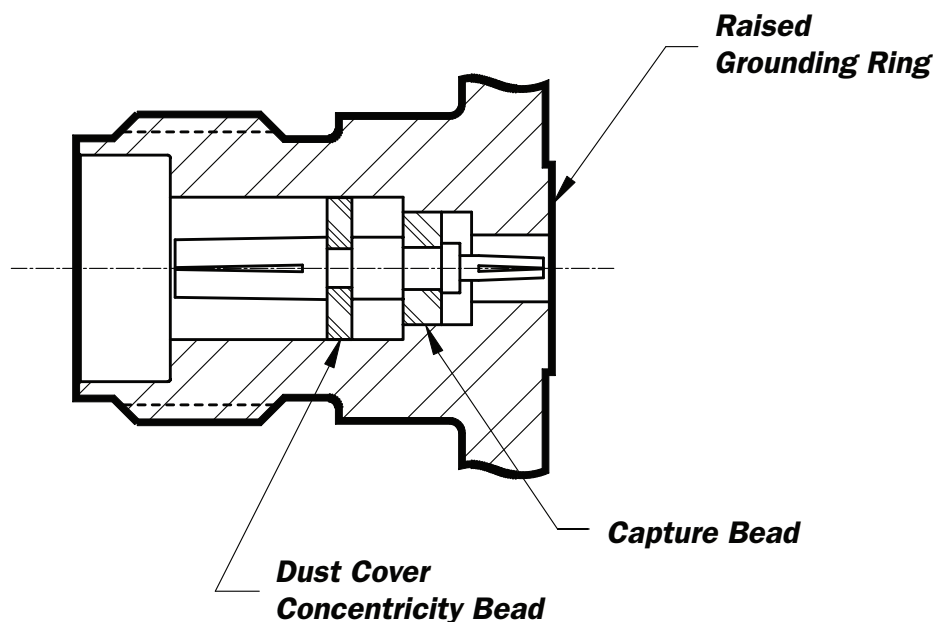
The Southwest Microwave 2.92 mm connector has been designed for field systems use up to 40.0 GHz. The “JK” Series is designed to replace Anritsu “K connector®” which are intended for laboratory test environments.

The Southwest Microwave connector is internally different from the Anritsu design, but fits into the same mounting configuration, and offers higher temperature, solvent resistance, and unitized factory assemblies.

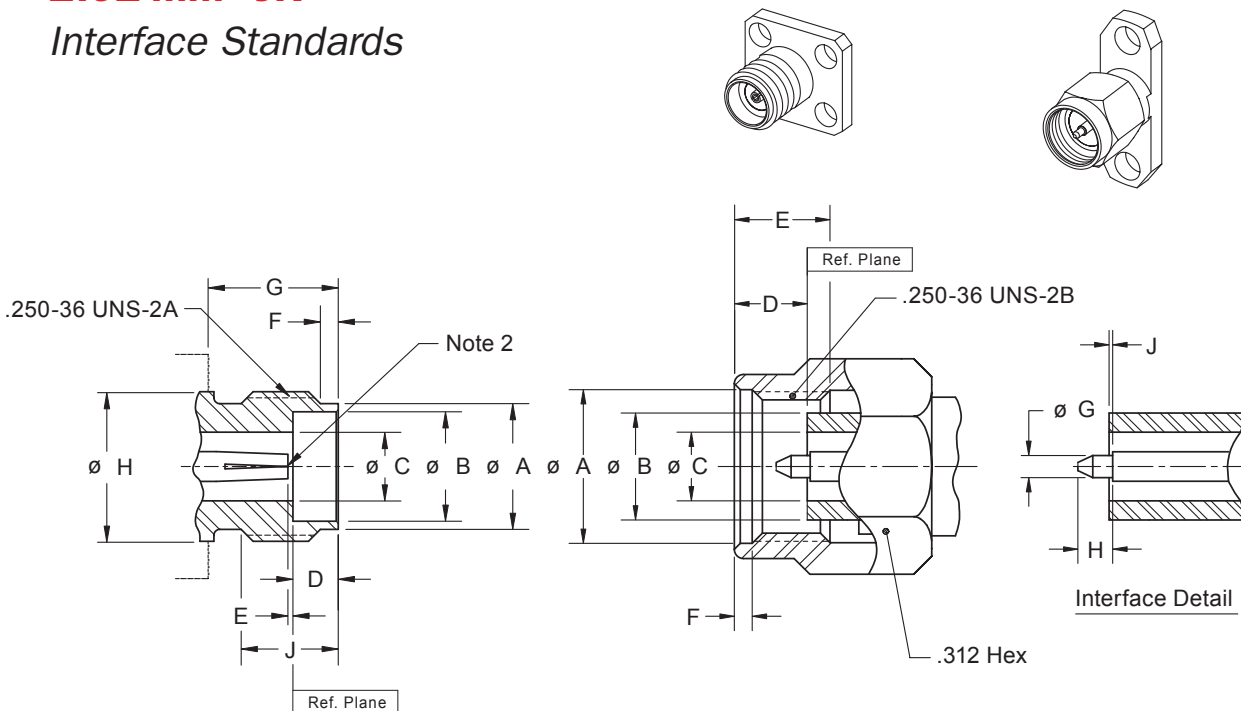
The Southwest Microwave 2.92 mm connectors incorporate a unique unitized structure as illustrated below. The integral design incorporates two beads. The primary bead captures the contact and will withstand temperatures of -65°C to +135°C. The second bead maintains the contact concentricity with the outer conductor and provides a dust (contamination) shield. Both beads are resistant to most common solvents.

These structural features provide a reliable field service connector with low VSWR by incorporating engineering proven microwave transmission line principals.

“K Connector”® is a registered trademark of the Anritsu Company.



2.92 mm "JK" Interface Standards



2.92 mm Jack (Socket Contact)

LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.206	(5.23)	.214	(5.44)
B	.181	(4.60)	.183	(4.65)
C	.1145	(2.908)	.1155	(2.934)
D	.075	(1.91)	.077	(1.96)
E	.000	(0.00)	.005	(0.13)
F	.020	(0.51)	.040	(1.02)
G	.218	(5.54)	—	—
H	—	—	.2495	(6.337)
	Inch	(mm)	Inch	(mm)

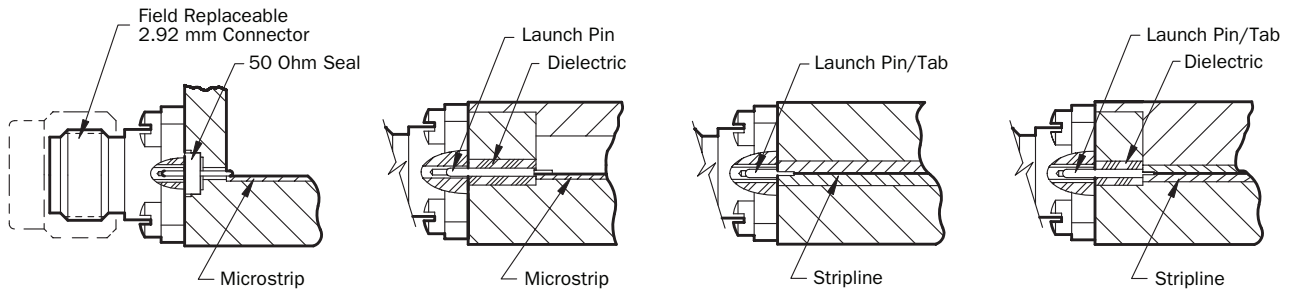
2.92 mm Plug (Pin Contact)

LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.255	(6.48)	.265	(6.73)
B	.1780	(4.521)	.1808	(4.592)
C	.1145	(2.908)	.1155	(2.934)
D	—	—	.132	(3.35)
E	.150	(3.81)	.170	(4.32)
F	.020	(0.51)	.040	(1.02)
G	.0360	(0.914)	.0368	(0.935)
H	.045	(1.14)	.055	(1.40)
J	.000	(0.00)	.005	(0.13)
	Inch	(mm)	Inch	(mm)

- Notes: 1. Interface I.A.W. MIL-PRF-39012 and MIL-STD-348, Figures 323-1 and 323-2.
2. I.D. to meet VSWR when mated with .0360 / .0368 (0.9144 mm / 0.9347 mm) Diameter Pin.

Specifications

Applications



Available Accessories:

See Launch Accessories Section.

- 50 Ohm Seal
- Launch Pin & Dielectric
- Launch Pin/Tab
- Launch Pin/Tab & Dielectric

Electrical:

- Mode Free Through 40.0 GHz
- Low VSWR: DC to 27.0 GHz.....1.10:1 max
27.0 to 40.0 GHz.....1.15:1 max
- Low RF Leakage \leq -100 dB
- Low Insertion Loss

Materials / Construction:

- Housing: Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Center Contact Capture: Rigid Two Bead Capture with Ultem 1000 Per ASTM D 5205 and KEL-F Per ASTM D 1430
- Connector Interface: Per MIL-STD-348, Figs. 323-1 and 323-2
- Raised Metal Grounding Ring for 360° Metal-to-metal Contact

Environmental:

- Temperature: -55° C to +135° C



2.92 mm "JK" Series DC to 40.0 GHz

2.92 mm JACK (FEMALE) 4 HOLE .500" SQUARE		*ACCEPTS PIN DIA. .020 .015 .012 .009	MODEL NO. 1012-05SF 1012-08SF 1012-01SF 1012-22SF														
2.92 mm JACK (FEMALE) 4 HOLE .375" SQUARE		*ACCEPTS PIN DIA. .020 .015 .012 .009	MODEL NO. 1012-16SF 1012-19SF 1012-11SF 1012-09SF														
2.92 mm JACK (FEMALE) 2 HOLE .625 LONG		*ACCEPTS PIN DIA. .020 .015 .012 .009	MODEL NO. 1014-05SF 1014-16SF 1014-01SF 1014-09SF														
2.92 mm JACK (FEMALE) 2 HOLE .550 LONG		*ACCEPTS PIN DIA. .020 .015 .012 .009	MODEL NO. 1014-15SF 1014-17SF 1014-11SF 1014-08SF														
2.92 mm JACK (FEMALE) 2 HOLE .500 LONG		*ACCEPTS PIN DIA. .020 .015 .012 .009	MODEL NO. 1014-25SF 1014-18SF 1014-21SF 1014-07SF														
2.92 mm JACK (FEMALE) THREAD-IN		*ACCEPTS PIN DIA. .020 .015 .012 .009	<table border="1"> <thead> <tr> <th>REAR THREAD</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>△ .250-36 UNS-2A REAR THREAD</td> <td>1020-02SF</td> </tr> <tr> <td>△ M6x.75-6g REAR THREAD</td> <td>---</td> </tr> <tr> <td>---</td> <td>1020-08SF</td> </tr> <tr> <td>---</td> <td>1020-01SF</td> </tr> <tr> <td>---</td> <td>1020-03SF</td> </tr> <tr> <td>---</td> <td>1020-10SF</td> </tr> </tbody> </table>	REAR THREAD	MODEL NO.	△ .250-36 UNS-2A REAR THREAD	1020-02SF	△ M6x.75-6g REAR THREAD	---	---	1020-08SF	---	1020-01SF	---	1020-03SF	---	1020-10SF
REAR THREAD	MODEL NO.																
△ .250-36 UNS-2A REAR THREAD	1020-02SF																
△ M6x.75-6g REAR THREAD	---																
---	1020-08SF																
---	1020-01SF																
---	1020-03SF																
---	1020-10SF																

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).



2.92 mm "JK" Series DC to 40.0 GHz

2.92 mm PLUG (MALE) 4 HOLE .500" SQUARE	REF. PLANE -.390 2.92mm PLUG -.312 HEX -.065 -.003 TYP. -.507	.102 DIA 4 PL MATERIAL CONTACT RING .340 TYP -.500 SQ REAR SOCKET	*ACCEPTS PIN DIA.	MODEL NO.
			.020	1011-05SF
			.015	1011-08SF
			.012	1011-01SF
			.009	1011-07SF
2.92 mm PLUG (MALE) 4 HOLE .375" SQUARE	REF. PLANE -.390 2.92mm PLUG -.312 HEX -.065 -.003 TYP. -.507	.067 DIA 4 PL MATERIAL CONTACT RING .250 TYP -.375 SQ REAR SOCKET	*ACCEPTS PIN DIA.	MODEL NO.
			.020	1011-15SF
			.015	1011-19SF
			.012	1011-11SF
			.009	1011-09SF
2.92 mm PLUG (MALE) 2 HOLE .625 LONG	REF. PLANE -.390 2.92mm PLUG -.312 HEX -.065 -.003 TYP. -.507	.102 DIA 2 PL MATERIAL CONTACT RING .625 DIA .250 TYP .481 REAR SOCKET	*ACCEPTS PIN DIA.	MODEL NO.
			.020	1013-05SF
			.015	1013-16SF
			.012	1013-01SF
			.009	1013-09SF
2.92 mm PLUG (MALE) 2 HOLE .550 LONG	REF. PLANE -.390 2.92mm PLUG -.312 HEX -.065 -.003 TYP. -.507	.102 DIA 2 PL MATERIAL CONTACT RING .550 DIA .400 REAR SOCKET	*ACCEPTS PIN DIA.	MODEL NO.
			.020	1013-15SF
			.015	1013-17SF
			.012	1013-11SF
			.009	1013-08SF
2.92 mm PLUG (MALE) 2 HOLE .500 LONG	REF. PLANE -.390 2.92mm PLUG -.312 HEX -.065 -.003 TYP. -.507	.102 DIA 2 PL MATERIAL CONTACT RING .500 DIA .355 REAR SOCKET	*ACCEPTS PIN DIA.	MODEL NO.
			.020	1013-25SF
			.015	1013-18SF
			.012	1013-21SF
			.009	1013-07SF
2.92 mm PLUG (MALE) THREAD-IN	REF. PLANE -.520 2.92mm PLUG -.312 HEX -.637 SEE CHART Δ	MATERIAL CONTACT RING .210 DIA. REAR SOCKET	*ACCEPTS PIN DIA.	Δ .250-36 UNS-2A REAR THREAD Δ M6x.75-6g REAR THREAD
			.020	1021-02SF
			.015	1021-08SF
			.012	1021-01SF
			.009	1021-09SF
				1021-10SF

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

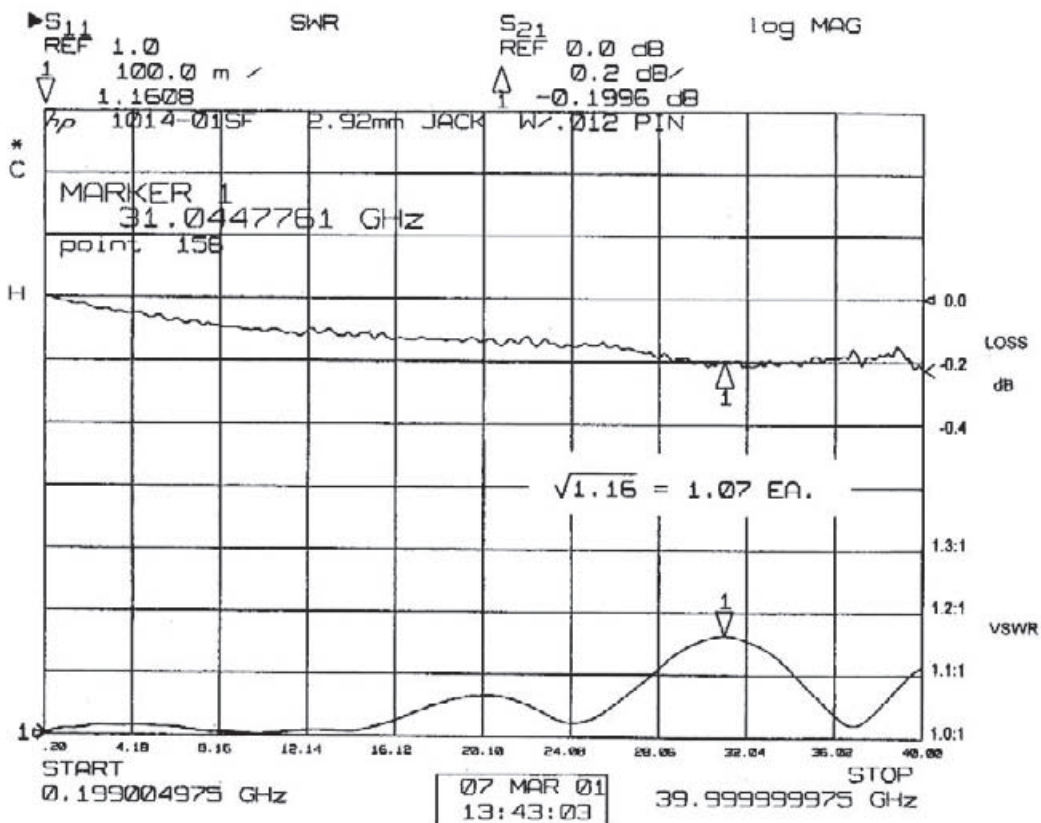
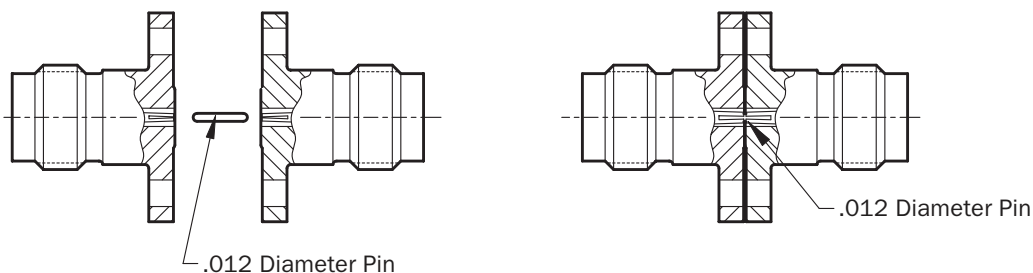
Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
Installation and Tools

Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 40.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.

Model No. 1014-01SF with .012" Test Pin

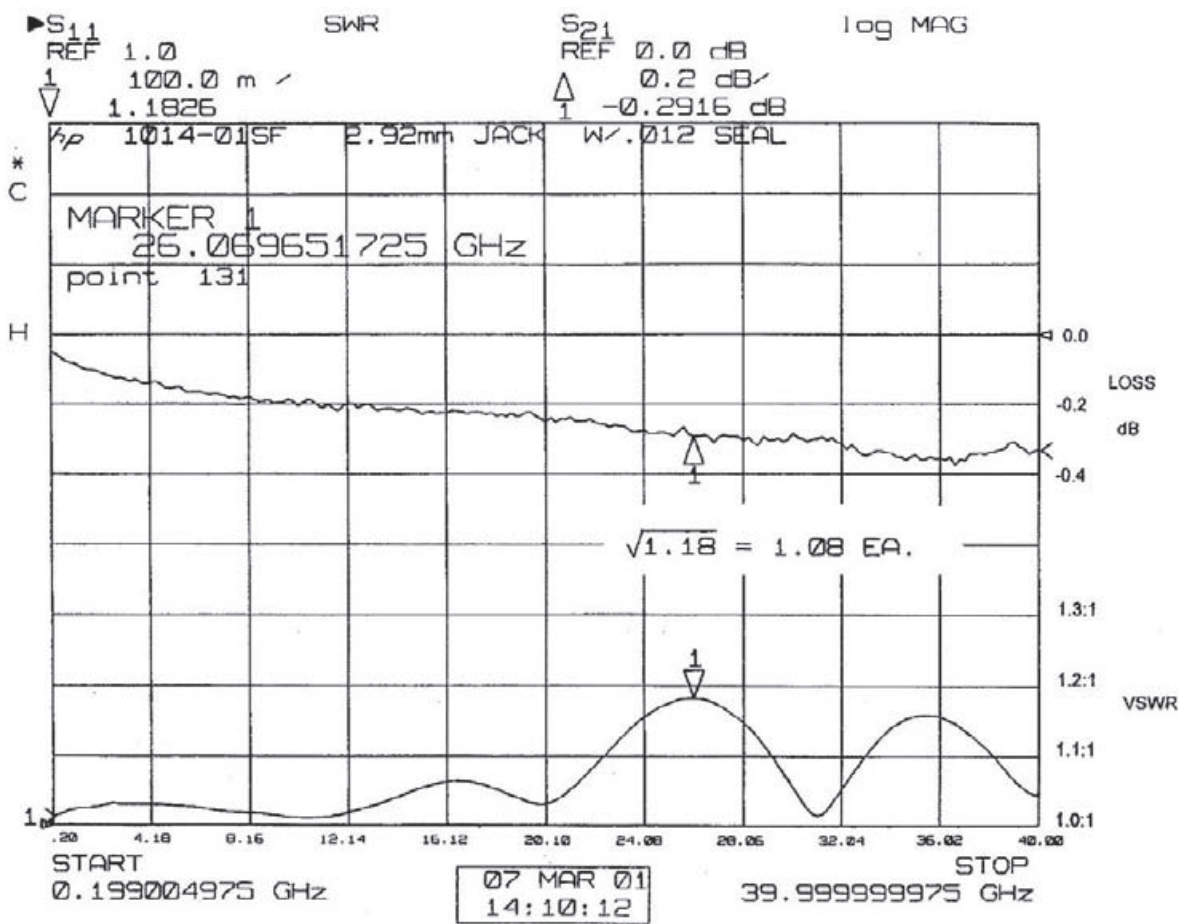
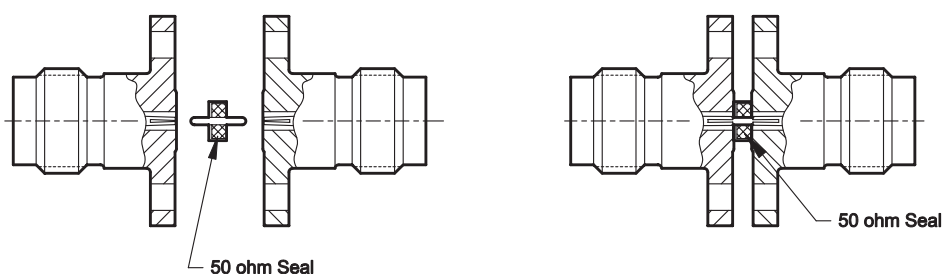


Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors and 50 ohm seal.

Model No. 1014-01SF with .012" pin **50 ohm Seal** (290-07G)

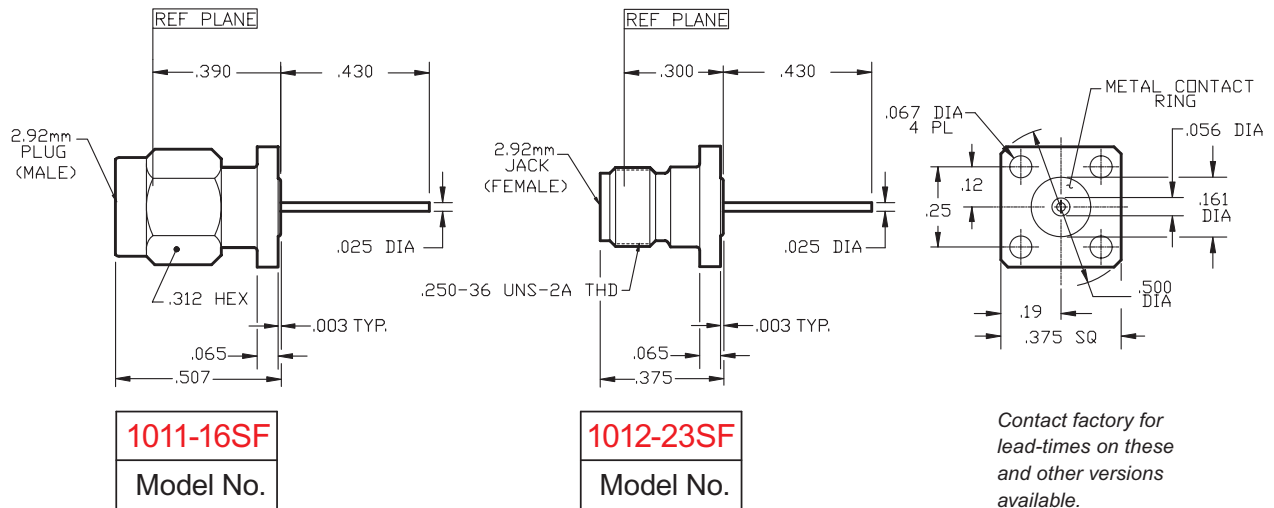


2.92 mm "JK" Series Waveguide Connectors

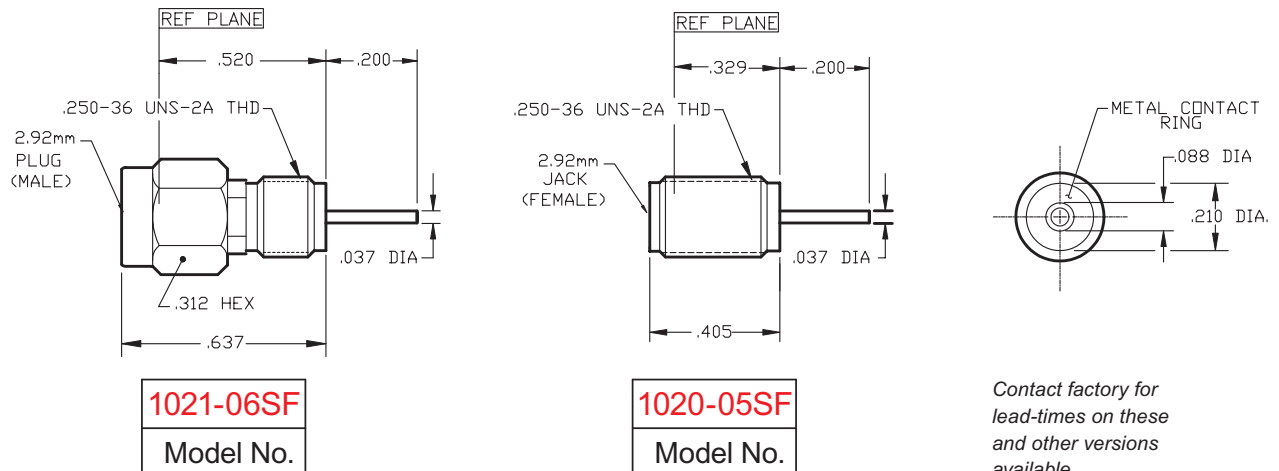
Design Summary

- DC to 40.0 GHz
- Mode Free Through 40.0 GHz.
- Low VSWR: DC to 27 GHz.....1.10:1 max.
27 to 40 GHz.....1.15:1 max.
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +135°C
- Interface in Accordance with MIL-PRF-39012 and MIL-STD-348A, figure 323-1 and 323-2

2.92 mm Panel Mount



2.92 mm Thread-In



All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).



Index

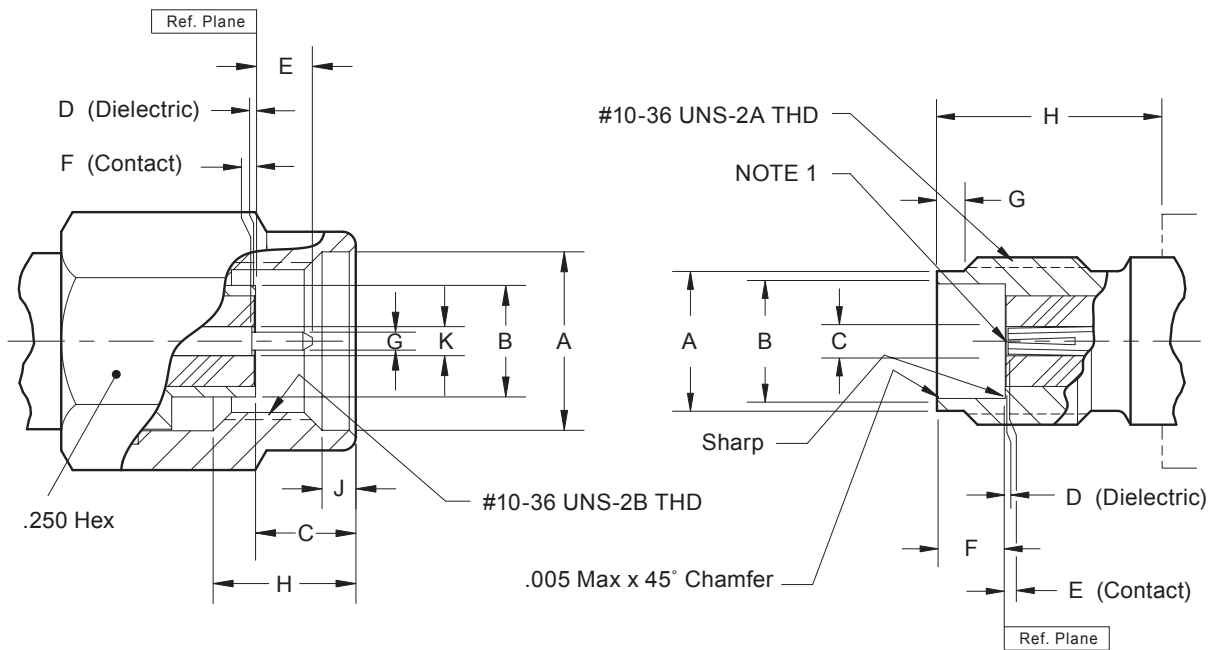
SSMA Connectors (36 GHz)	Page
Interface Standards	46
Specifications	47
Model Numbers	48
Test Data	49

Adapters: SSMA Series Adapters can be found in the Adapter section.

Cable Connectors: SSMA Series Connectors can be found in the Cable Connector section.

Unless otherwise specified, all dimensions are in inches.

SSMA Interface Standards



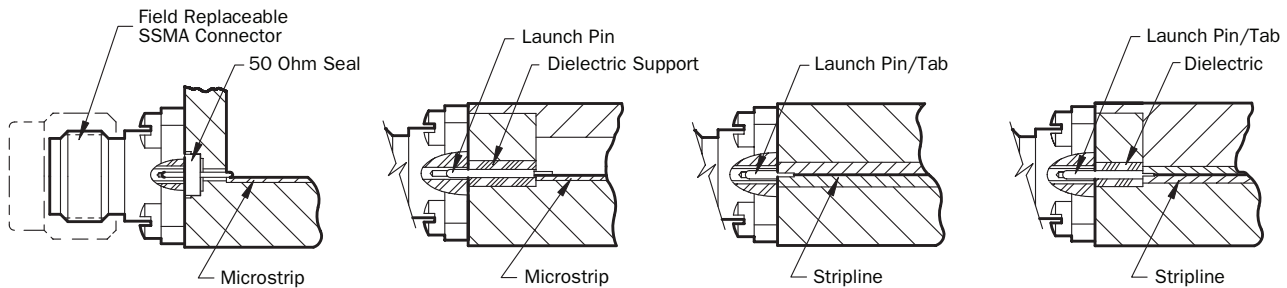
SSMA Jack (Socket Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.148	(3.76)	.155	(3.94)
B	.1272	(3.23)	.130	(3.30)
C	.0335	(0.85)	.0348	(0.88)
D	.000	(0.00)	.005	(0.13)
E	.000	(0.00)	.005	(0.13)
F	.075	(1.91)	.077	(1.96)
G	.020	(0.51)	.040	(1.02)
H	.218	(5.54)	—	—
	Inch	(mm)	Inch	(mm)

SSMA Plug (Pin Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.196	(4.98)	.202	(5.13)
B	.124	(3.23)	.126	(3.20)
C	.105	(2.67)	.125	(3.17)
D	.000	(0.00)	.005	(0.13)
E	.055	(1.40)	.065	(1.65)
F	.000	(0.00)	.005	(0.13)
G	.0195	(0.495)	.0208	(0.528)
H	.150	(3.81)	.170	(4.32)
J	.035	(0.89)	.040	(1.02)
K	.0335	(0.851)	.0348	(0.884)
	Inch	(mm)	Inch	(mm)

Note: Interface I.A.W. MIL-PRF-39012 and MIL-STD-348, Figures 319-1 and 319-2.

Specifications

Applications



Available Accessories:

See Launch Accessories Section.

- 50 Ohm Seal
- Launch Pin & Dielectric
- Launch Pin/Tab
- Launch Pin/Tab & Dielectric

Electrical:

- Mode Free Through 36.0 GHz
- Low VSWR: DC to 18.0 GHz.....1.10:1 max
18.0 to 27.0 GHz.....1.15:1 max
27.0 to 36.0 GHz.....1.25:1 max
- Low RF Leakage \leq -100 dB
- Low Insertion Loss

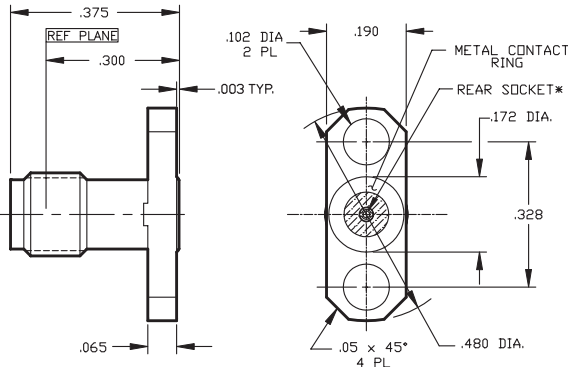
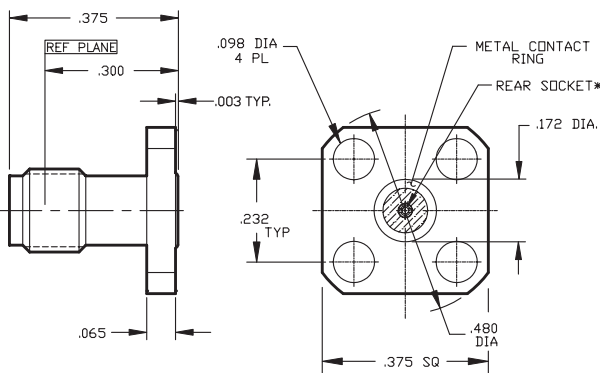
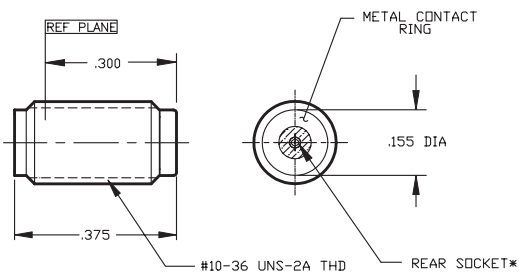
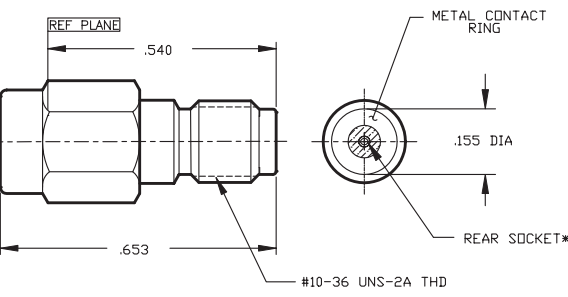
Materials / Construction:

- Housing: Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Dielectric: Virgin PTFE Fluorocarbon Per ASTM D 1710 and ASTM D 1457
- Center Contact Capture: High Temperature Ultem 1000 (Per ASTM D 5205)
- Connector Interface: Per MIL-STD-348, Figs. 319-1 and 319-2
- Raised Metal Grounding Ring for 360° Metal-to-metal Contact

Environmental:

- Temperature: -55° C to +165° C

Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
Installation and Tools

<p>SSMA JACK (FEMALE) 2 HOLE .480" Long</p>		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>114-20SF</td> </tr> <tr> <td>.018</td> <td>114-17SF</td> </tr> <tr> <td>.015</td> <td>114-16SF</td> </tr> <tr> <td>.012</td> <td>114-18SF</td> </tr> <tr> <td>.009</td> <td>114-19SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	114-20SF	.018	114-17SF	.015	114-16SF	.012	114-18SF	.009	114-19SF
*ACCEPTS PIN DIA.	MODEL NO.													
.020	114-20SF													
.018	114-17SF													
.015	114-16SF													
.012	114-18SF													
.009	114-19SF													
<p>SSMA JACK (FEMALE) 4 HOLE .375" SQUARE</p>		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>112-20SF</td> </tr> <tr> <td>.018</td> <td>112-17SF</td> </tr> <tr> <td>.015</td> <td>112-16SF</td> </tr> <tr> <td>.012</td> <td>112-18SF</td> </tr> <tr> <td>.009</td> <td>112-19SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	112-20SF	.018	112-17SF	.015	112-16SF	.012	112-18SF	.009	112-19SF
*ACCEPTS PIN DIA.	MODEL NO.													
.020	112-20SF													
.018	112-17SF													
.015	112-16SF													
.012	112-18SF													
.009	112-19SF													
<p>SSMA JACK (FEMALE) THREAD-IN</p>		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>120-04SF</td> </tr> <tr> <td>.018</td> <td>120-03SF</td> </tr> <tr> <td>.015</td> <td>120-02SF</td> </tr> <tr> <td>.012</td> <td>120-01SF</td> </tr> <tr> <td>.009</td> <td>120-05SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	120-04SF	.018	120-03SF	.015	120-02SF	.012	120-01SF	.009	120-05SF
*ACCEPTS PIN DIA.	MODEL NO.													
.020	120-04SF													
.018	120-03SF													
.015	120-02SF													
.012	120-01SF													
.009	120-05SF													
<p>SSMA PLUG (MALE) THREAD-IN</p>		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>121-02SF</td> </tr> <tr> <td>.018</td> <td>-</td> </tr> <tr> <td>.015</td> <td>-</td> </tr> <tr> <td>.012</td> <td>121-01SF</td> </tr> <tr> <td>.009</td> <td>-</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	121-02SF	.018	-	.015	-	.012	121-01SF	.009	-
*ACCEPTS PIN DIA.	MODEL NO.													
.020	121-02SF													
.018	-													
.015	-													
.012	121-01SF													
.009	-													

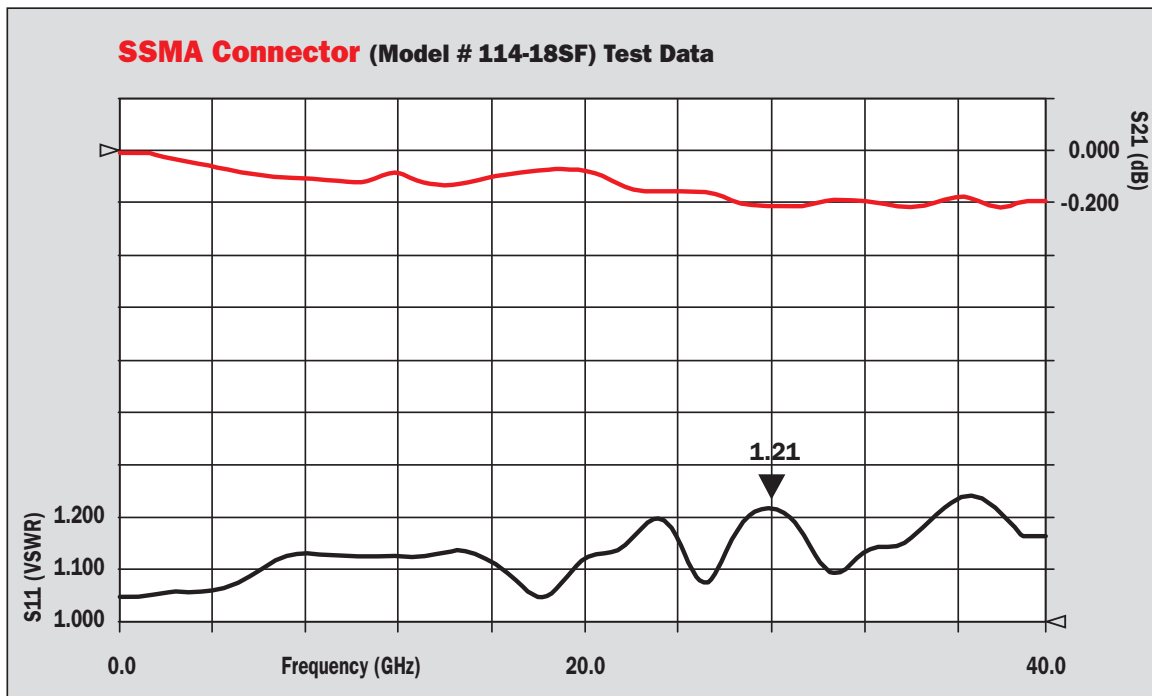
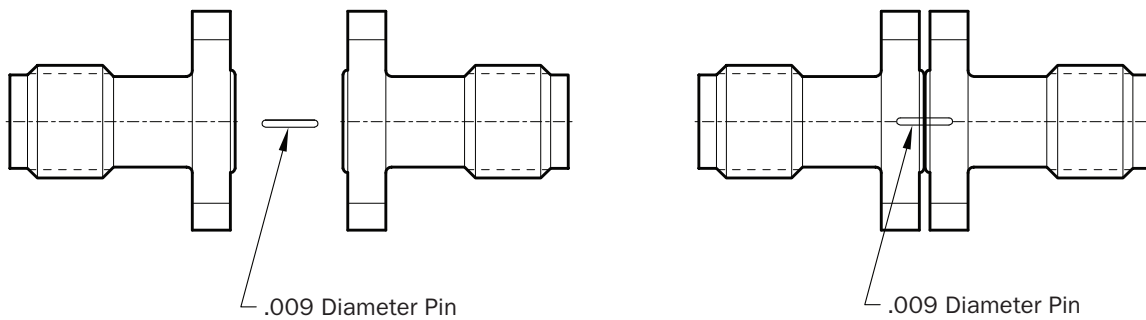
All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 40.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.

Model No. 114-18SF with .009" **Test Pin**



1.21 is the maximum for the pair of connectors and two test adapters (11430-00SF)



Index

2.40 mm Connectors (50 GHz)	Page
Introduction	51
Interface Standards	52
Specifications	53
Model Numbers	54
Test Data	56

Adapters: 2.40 mm Adapters can be found in the Adapter section.

Cable Connectors: 2.40 mm Connectors can be found in the Cable Connector section.

Unless otherwise specified, all dimensions are in inches.

Introduction

The 2.40 mm connector series is similar in construction to our 2.92 mm design. Both connector series are well suited for Commercial, Military, and Space applications.

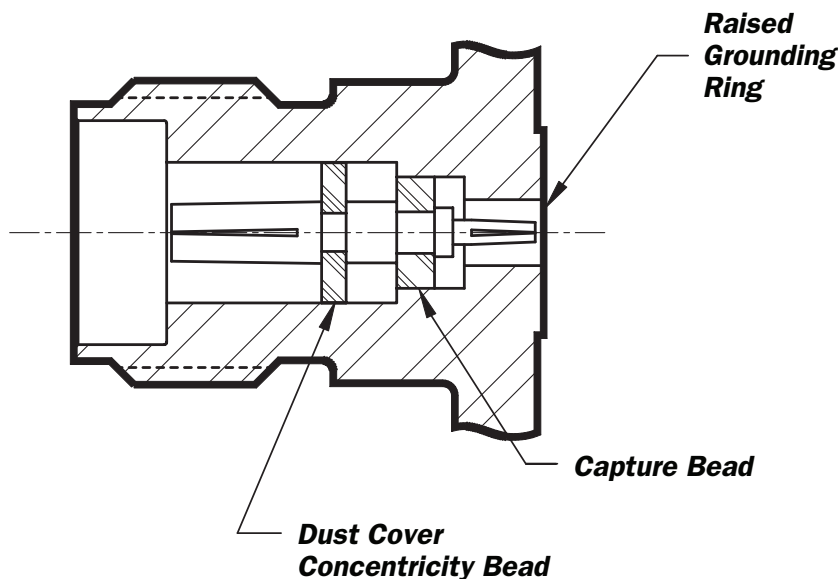
They are made of materials that will withstand high temperatures providing reliable performance under extreme environmental conditions with excellent electrical characteristics.

The Southwest 2.40 mm connector series has been designed for field systems use up to 50.0 GHz. When certain conditions are met, the connectors can be used up to 70.0 GHz. Please request the Southwest Application Note that discusses higher order moding above 55.0 GHz.

Our 2.40 mm connectors incorporate a unique unitized structure as illustrated below. The integral design incorporates two beads. The primary bead captures the contact and will withstand temperatures of -65°C to +135°C. The second bead maintains the contact concentricity with the outer conductor and provides a dust (contamination) shield. Both beads are resistant to most common solvents.

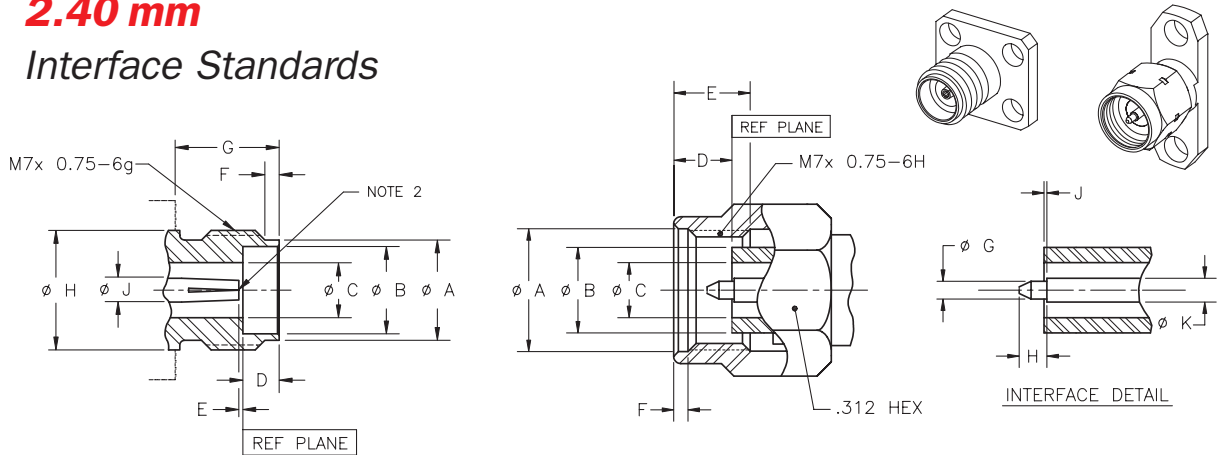
These structural features provide a reliable field service connector with low VSWR by incorporating engineering proven microwave transmission line principals.

Typical back-to-back testing is found on pages 56 and 57.



Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
Installation and Tools

2.40 mm Interface Standards

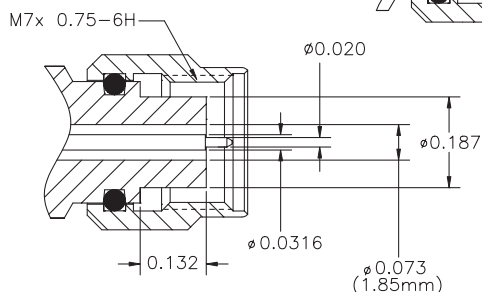
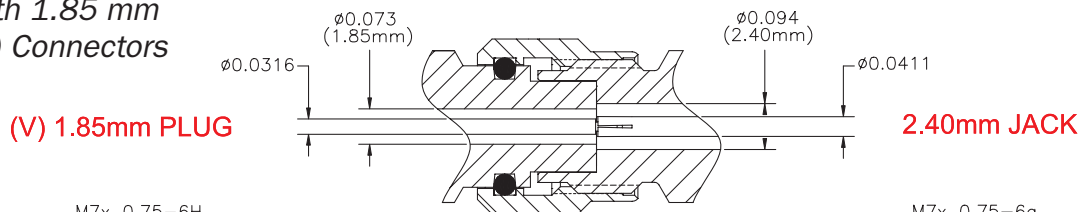


2.40 mm Jack (Socket Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.228	(5.79)	.232	(5.89)
B	.1878	(4.770)	.1888	(4.795)
C	.094	(2.388)	.095	(2.413)
D	.118	(3.00)	.122	(3.10)
E	.000	(0.00)	.005	(0.127)
F	.055	(1.40)	.065	(1.65)
G	.236	(5.99)	—	—
H	—	—	.270	(6.86)
J	.0406	(1.031)	.0414	(1.052)
	Inch	(mm)	Inch	(mm)

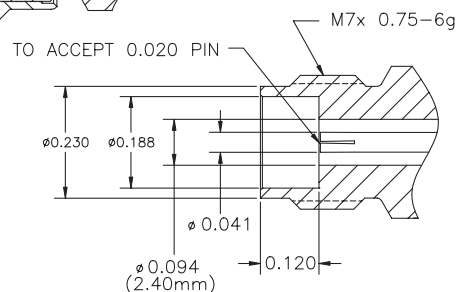
2.40 mm Plug (Pin Contact)				
LTR	Inches (Millimeters)			
	Minimum		Maximum	
A	.276	(7.01)	.280	(7.12)
B	.186	(4.725)	.187	(4.75)
C	.094	(2.388)	.095	(2.413)
D	.073	(1.85)	.096	(2.45)
E	.172	(4.370)	.182	(4.623)
F	.020	(0.51)	.030	(0.76)
G	.0196	(0.498)	.0206	(0.523)
H	.050	(1.27)	.060	(1.524)
J	.000	(0.00)	.005	(0.127)
K	.0406	(1.03)	.0414	(1.052)
	Inch	(mm)	Inch	(mm)

Notes: 1. Interface I.A.W. MIL-PRF-39012 and MIL-STD-348, Figures 324-1 and 324-2.
2. I.D. to meet VSWR when mated with .0196 / .0206 (0.498 mm / 0.523 mm) Diameter Pin.

Interface Compatibility with 1.85 mm (V) Connectors



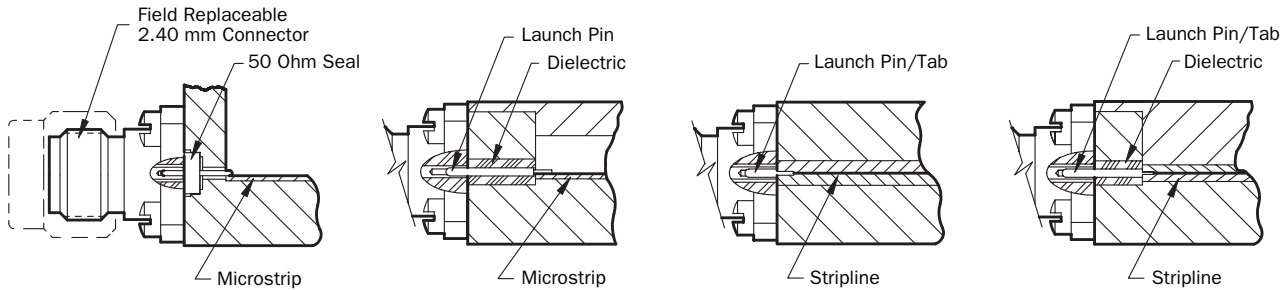
1.85 mm Connector



2.40 mm Connector

Specifications

Applications



Available Accessories:

See Launch Accessories Section.

- 50 Ohm Seal
- Launch Pin & Dielectric
- Launch Pin/Tab
- Launch Pin/Tab & Dielectric

Electrical:

- Mode Free Through 50.0 GHz
- Low VSWR: DC to 18.0 GHz.....1.10:1 max
18.0 to 40.0 GHz.....1.15:1 max
40.0 to 50.0 GHz.....1.18:1 max
- Low RF Leakage \leq -100 dB
- Low Insertion Loss

Materials / Construction:

- Housing: Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Center Contact Capture: Rigid Two Bead Capture with Ultem 1000 Per ASTM D 5205 and KEL-F Per ASTM D 1430
- Connector Interface: Per MIL-STD-348, Figs. 324-1 and 324-2
- Raised Metal Grounding Ring for 360° Metal-to-metal Contact

Environmental:

- Temperature: -55° C to +135° C



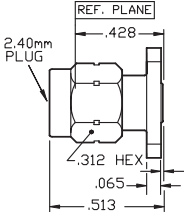
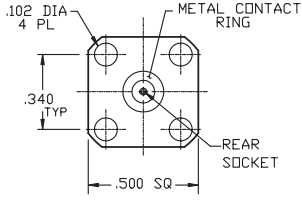
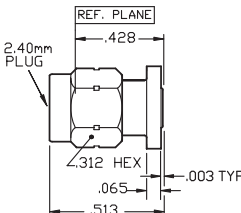
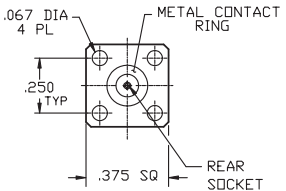
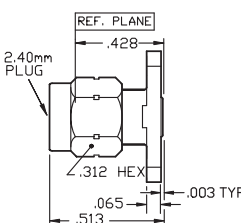
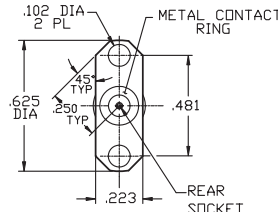
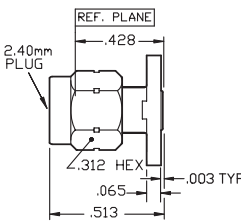
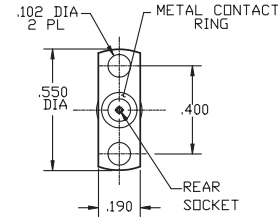
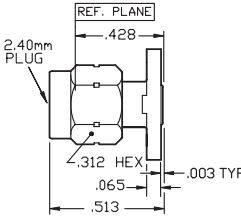
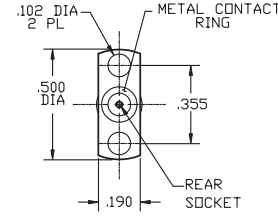
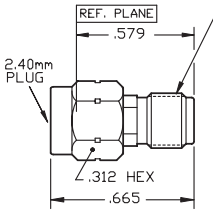
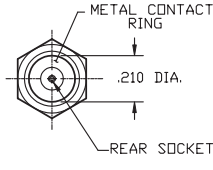
2.40 mm Series DC to 50.0 GHz

2.40 mm JACK (FEMALE) 4 HOLE .500" SQUARE		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>1412-02SF</td> </tr> <tr> <td>.012</td> <td>1412-01SF</td> </tr> <tr> <td>.009</td> <td>1412-05SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	1412-02SF	.012	1412-01SF	.009	1412-05SF				
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.012	1412-01SF													
.009	1412-05SF													
2.40 mm JACK (FEMALE) 4 HOLE .375" SQUARE		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>1412-04SF</td> </tr> <tr> <td>.015</td> <td>1412-07SF</td> </tr> <tr> <td>.012</td> <td>1412-03SF</td> </tr> <tr> <td>.009</td> <td>1412-06SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	1412-04SF	.015	1412-07SF	.012	1412-03SF	.009	1412-06SF		
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.015	1412-07SF													
.012	1412-03SF													
.009	1412-06SF													
2.40 mm JACK (FEMALE) 2 HOLE .625 LONG		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>1414-02SF</td> </tr> <tr> <td>.012</td> <td>1414-01SF</td> </tr> <tr> <td>.009</td> <td>1414-05SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	1414-02SF	.012	1414-01SF	.009	1414-05SF				
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.009	1414-05SF													
2.40 mm JACK (FEMALE) 2 HOLE .550 LONG		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>1414-08SF</td> </tr> <tr> <td>.012</td> <td>1414-07SF</td> </tr> <tr> <td>.009</td> <td>1414-09SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	1414-08SF	.012	1414-07SF	.009	1414-09SF				
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.009	1414-09SF													
2.40 mm JACK (FEMALE) 2 HOLE .500 LONG		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>1414-04SF</td> </tr> <tr> <td>.012</td> <td>1414-03SF</td> </tr> <tr> <td>.009</td> <td>1414-06SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	MODEL NO.	.020	1414-04SF	.012	1414-03SF	.009	1414-06SF				
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.009	1414-06SF													
2.40 mm JACK (FEMALE) THREAD-IN		<table border="1"> <thead> <tr> <th>*ACCEPTS PIN DIA.</th> <th>Δ .250-36 UNS-2A REAR THREAD</th> <th>Δ M6x.75-6g REAR THREAD</th> </tr> </thead> <tbody> <tr> <td>.020</td> <td>1420-02SF</td> <td>—</td> </tr> <tr> <td>.012</td> <td>1420-01SF</td> <td>—</td> </tr> <tr> <td>.009</td> <td>1420-03SF</td> <td>1420-04SF</td> </tr> </tbody> </table>	*ACCEPTS PIN DIA.	Δ .250-36 UNS-2A REAR THREAD	Δ M6x.75-6g REAR THREAD	.020	1420-02SF	—	.012	1420-01SF	—	.009	1420-03SF	1420-04SF
*ACCEPTS PIN DIA.	Δ .250-36 UNS-2A REAR THREAD	Δ M6x.75-6g REAR THREAD												
.020	1420-02SF	—												
.012	1420-01SF	—												
.009	1420-03SF	1420-04SF												

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).



2.40 mm Series DC to 50.0 GHz

2.40 mm PLUG (MALE) 4 HOLE .500" SQUARE	 	*ACCEPTS PIN DIA.	MODEL NO.
		.020	1411-02SF
		.012	1411-01SF
		.009	1411-05SF
2.40 mm PLUG (MALE) 4 HOLE .375" SQUARE	 	*ACCEPTS PIN DIA.	MODEL NO.
		.020	1411-04SF
		.015	1411-00SF
		.012	1411-03SF
		.009	1411-06SF
2.40 mm PLUG (MALE) 2 HOLE .625 LONG	 	*ACCEPTS PIN DIA.	MODEL NO.
		.020	1413-02SF
		.012	1413-01SF
		.009	1413-05SF
2.40 mm PLUG (MALE) 2 HOLE .550 LONG	 	*ACCEPTS PIN DIA.	MODEL NO.
		.020	1413-08SF
		.012	1413-07SF
		.009	1413-09SF
2.40 mm PLUG (MALE) 2 HOLE .500 LONG	 	*ACCEPTS PIN DIA.	MODEL NO.
		.020	1413-04SF
		.012	1413-03SF
		.009	1413-06SF
2.40 mm PLUG (MALE) THREAD-IN	 	*ACCEPTS PIN DIA.	Δ .250-36 UNS-2A REAR THREAD Δ M6x.75-6g REAR THREAD
		.020	1421-02SF
		.012	1421-01SF
		.009	1421-03SF
			1421-04SF

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

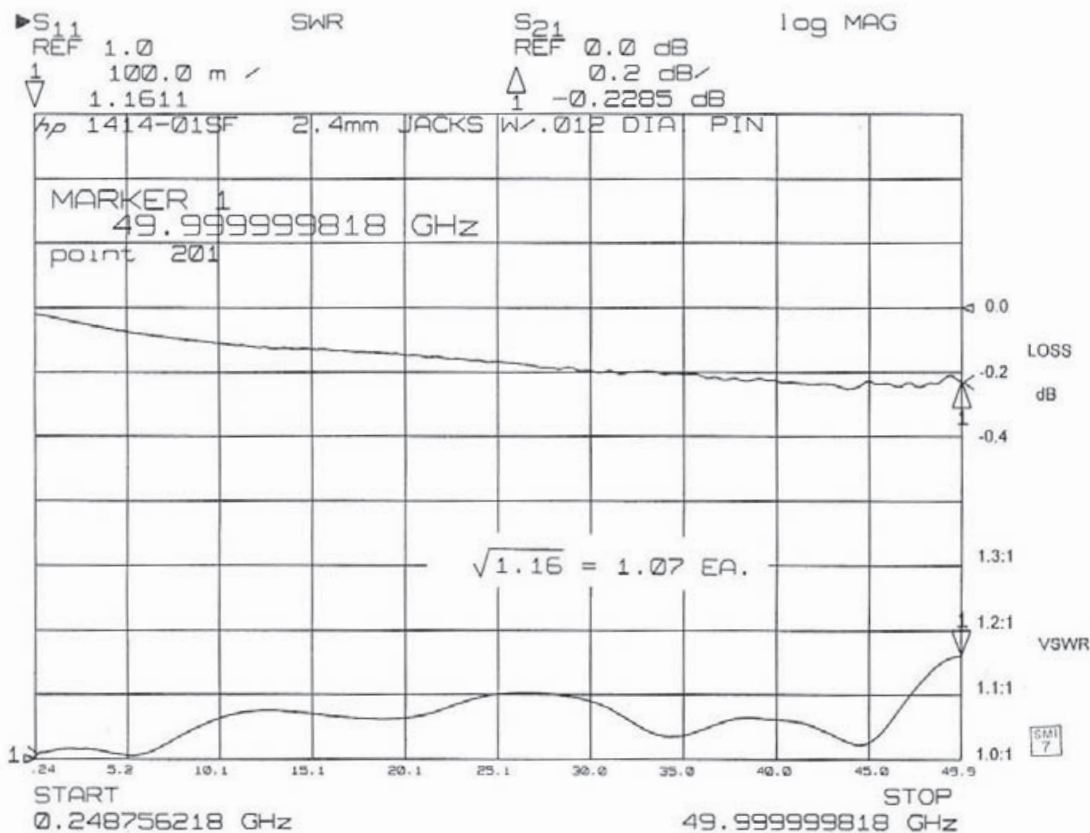
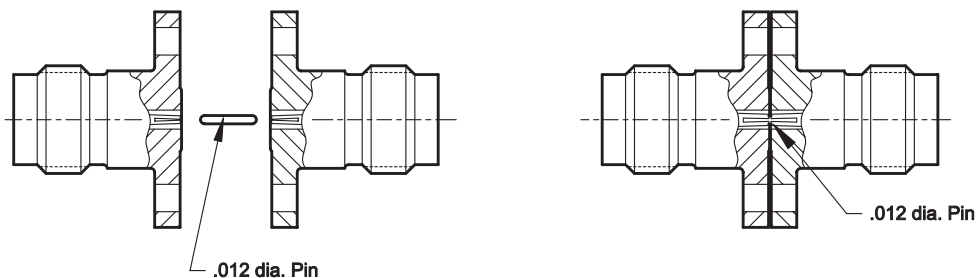
Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
Installation and Tools

Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors. Any internal mismatches within the connector will phase together when tested through 50.0 GHz. Taking the square root of the peak VSWR will provide the value for a single connector.

Model No. 1414-01SF with .012" **Test Pin**

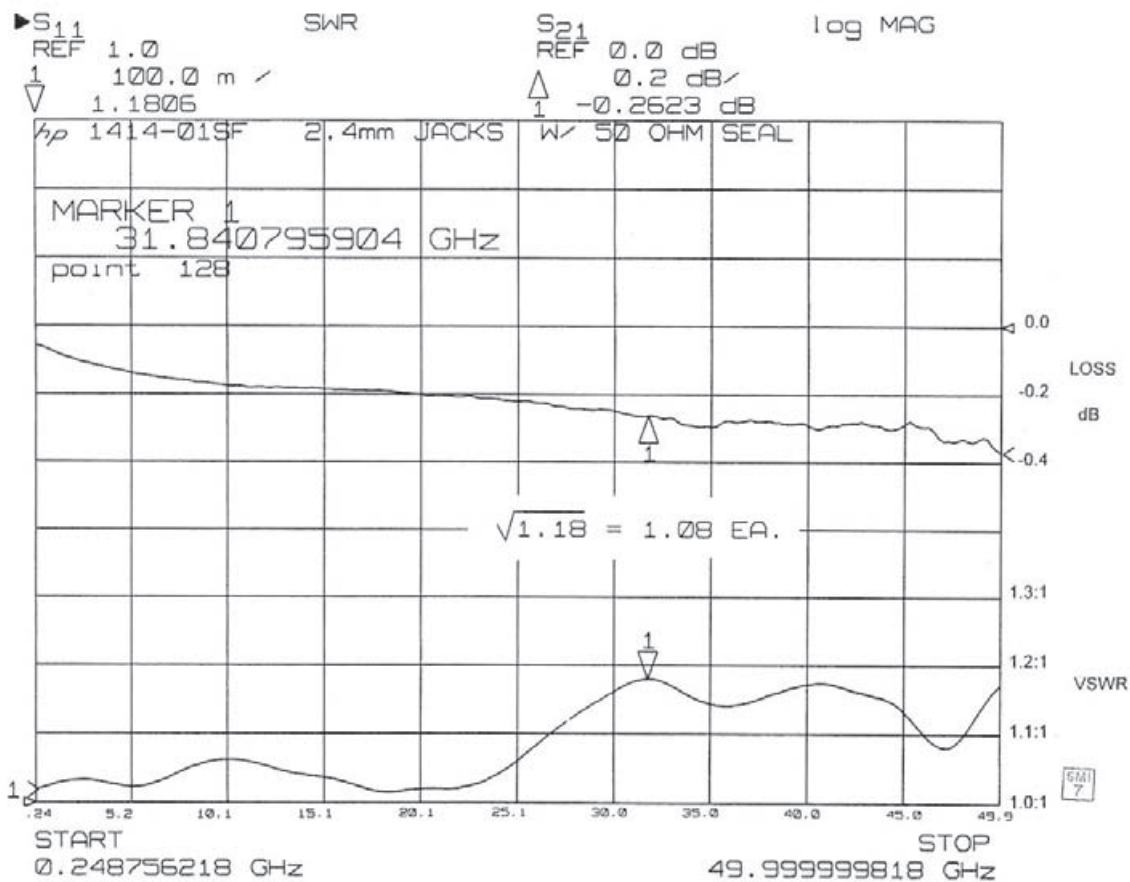
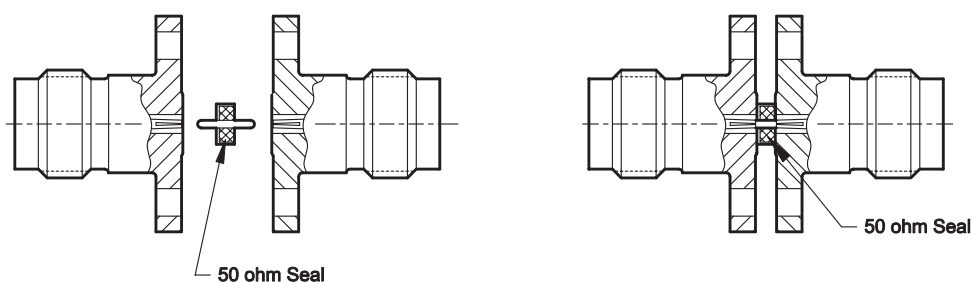


Typical Test Data

Back-to-Back Connector Testing

Back-to-back testing shows data for two connectors and 50 ohm seal.

Model No. 1414-01SF with .012" pin **50 ohm Seal** (290-07G)



- Super SMA Connectors
- N Series Connectors
- TNC Connectors
- 2.92 mm Connectors
- SSMA Connectors
- 2.40 mm Connectors
- End Launch Connectors**
- Adapters
- Cable Connectors
- Launch Accessories
- Installation and Tools



Notes



Index

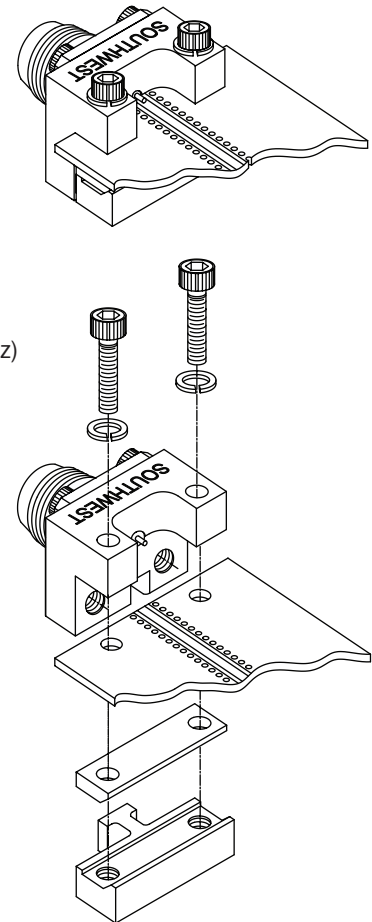
End Launch Connectors (to 50 GHz)	Page
Introduction	60
Specifications	61
Model Numbers	62
Installation Procedures	63
Test Data (Grounded Coplanar)	64
Test Data (Microstrip)	65

Introduction

Southwest Microwave's High Performance End Launch Connectors are designed to provide Low VSWR, wideband response to 50 GHz for single-layer or multi-layer printed circuit boards where the microwave layer is on top. They are ideally suited for high frequency chip set evaluation/demo boards, test fixtures and board characterization.

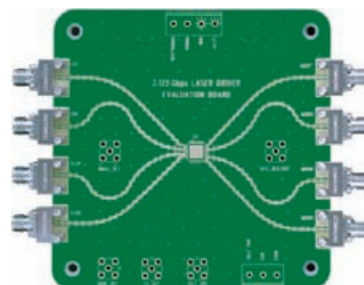
Features:

- ▶ Available in: **SMA** (27 GHz), **2.92 mm** (40 GHz) and **2.40 mm** (50 GHz)
- ▶ Multiple launch configurations to optimize match to circuit
- ▶ Optimum performance when board launch geometry is grounded coplanar (CPWG) or top ground microstrip
- ▶ Unique clamping mechanism accommodates a wide range of board thicknesses (up to .110") while providing a continuous ground connection between end launch and circuit board.
- ▶ Launch overhang that allows ground to be picked up close to the launch point
- ▶ Universal, robust & reusable
- ▶ No soldering required
- ▶ Connectors ship fully assembled (board not included)



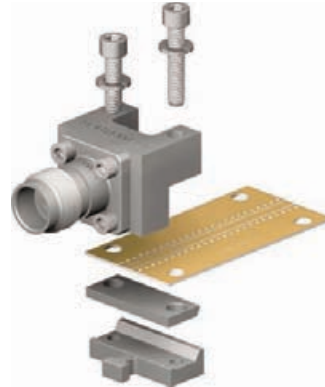
Examples of Applications

- ▶ Chip set evaluation demo boards.
- ▶ Board characterization.
- ▶ Internal board launch (not limited to perimeter board edge).
- ▶ Custom flanges available.



Specifications

Applications



Grounded Coplanar



Microstrip with Top Ground Launch

Launch Design Assistance Available.

Electrical:

- Mode Free Through:
27.0 GHz (SMA)
40.0 GHz (2.92 mm)
50.0 GHz (2.40 mm)
- Low VSWR
- Low Insertion Loss

Materials / Construction:

Connector:

- Housing: Stainless Steel, CRES Alloy UNS-S30300 Per ASTM A 582, Passivated Per ASTM A 967
- Contact: Beryllium Copper (BeCu), UNS-C17300 Per ASTM B 196/197, Gold Plated Per MIL-G-45204 or ASTM B 488
- Center Contact Capture: Rigid Bead Capture with Ultem 1000 Per ASTM D 5205
- Virgin TFE Fluorocarbon Per ASTM D 1710 and ASTM D 1457 (SMA only)
- KEL-F Per ASTM D 1430 (2.92 mm & 2.40 mm only)
- Connector Interfaces:
SMA – Per MIL-STD-348, Figs. 310-1 and 310-2
2.92 mm – Per MIL-STD-348, Figs. 324-1 and 324-2
2.40 mm – Per MIL-STD-348, Figs. 323-1 and 323-2

Transition Block & Clamp Plates:

- Housing: Brass Alloy UNS-C48500 Per ASTM-B36, Nickel Plate Per ASTM 2404B
- Transition Pin: BeCu Per UNS-C17300 Per ASTM B 196/197, Gold Plate Per MIL-G-45204 or ASTM B 488
- Dielectric: Virgin TFE Fluorocarbon Per ASTM D 1710 and ASTM D 1457,
- Fasteners: Per ANSI B18.3



End Launch Connectors

Super SMA (27 GHz)	PIN DIAMETER		DIELECTRIC DIA.	MODEL NO.	
	Dim A Board Pin	Dim B Internal	Dim C	Female	Male
	.010	.020	.0635	292-04A-5	293-01A-5
	.007	.015	.0480	292-05A-5	293-02A-5
	.007	.012	.0390	292-06A-5	293-03A-5
	.005	.009	.0290	292-07A-5	293-04A-5

2.92 mm (40 GHz)	PIN DIAMETER		DIELECTRIC DIA.	MODEL NO.	
	Dim A Board Pin	Dim B Internal	Dim C	Female	Male
	.010	.020	.0635	1092-03A-5	1093-01A-5
	.007	.015	.0480	1092-02A-5	1093-02A-5
	.007	.012	.0390	1092-04A-5	1093-03A-5
	.005	.009	.0290	1092-01A-5	1093-04A-5

2.40 mm (50 GHz)	PIN DIAMETER		DIELECTRIC DIA.	MODEL NO.	
	Dim A Board Pin	Dim B Internal	Dim C	Female	Male
	.010	.020	.0635	1492-02A-5	1493-01A-5
	.007	.015	.0480	1492-01A-5	1493-02A-5
	.007	.012	.0390	1492-03A-5	1493-03A-5
	.005	.009	.0290	1492-04A-5	1493-04A-5

Circuit Board

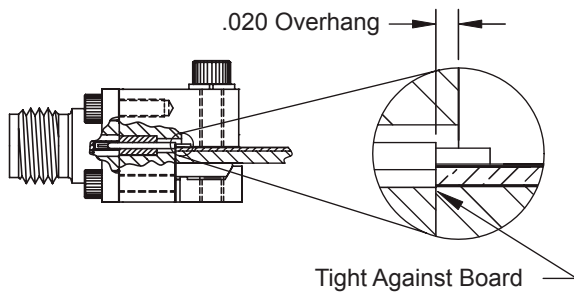
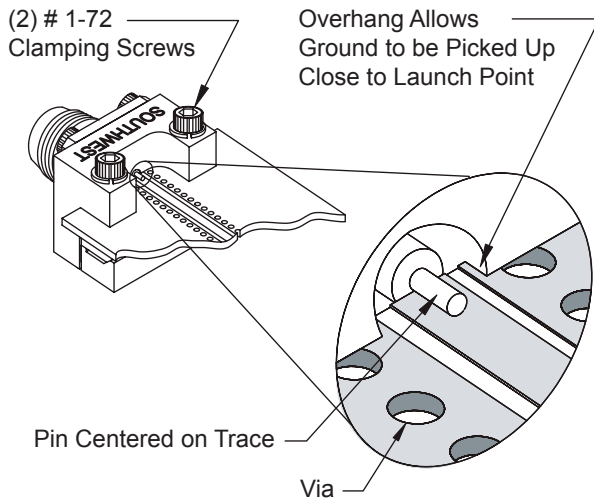
Ground Plane

Center Pin

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

End Launch Connectors

Super SMA (27 GHz), 2.92 mm (40 GHz), or 2.40 mm (50 GHz)

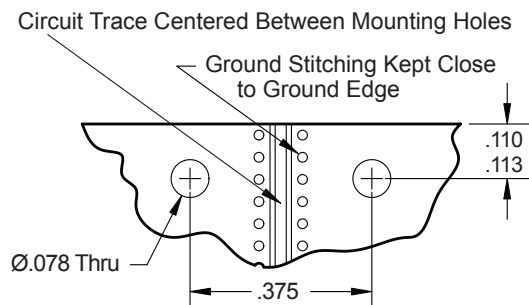


Installation Procedure

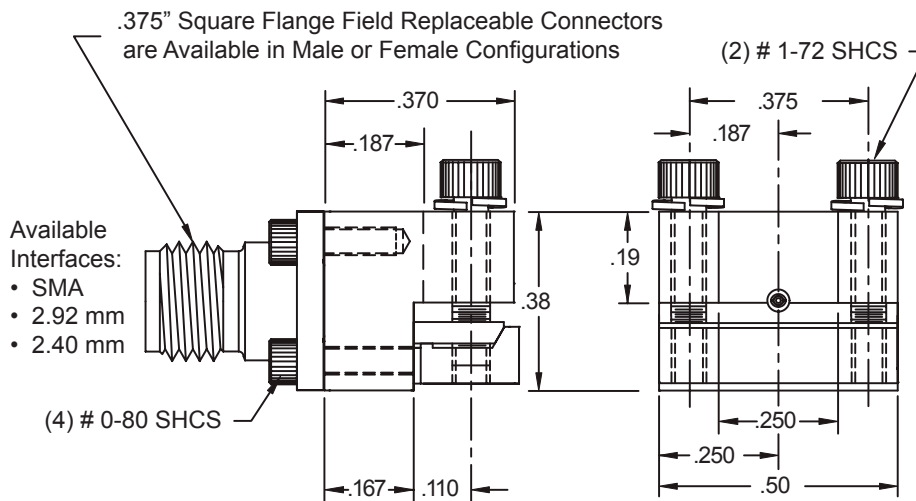
- Step 1:** Mount the end launch connector on the board in the desired position.
- Step 2:** Ensure the launch pin is centered on the trace.
- Step 3:** Ensure the transition block is tight against the board.
- Step 4:** Tighten the 1-72 mounting screws until the connector is secured.

Steps 5-7 (Optional)

- Step 5:** Solder the launch pin to the trace. (Optional) (Note: Be sure the solder flows the entire length of the launch pin/trace contact area.)
- Step 6:** Remove any excess solder. (Optional) (Note: Excess solder will affect performance.)
- Step 7:** Clean any flux or other residue from around the solder joint. (Optional)



Dimensions:



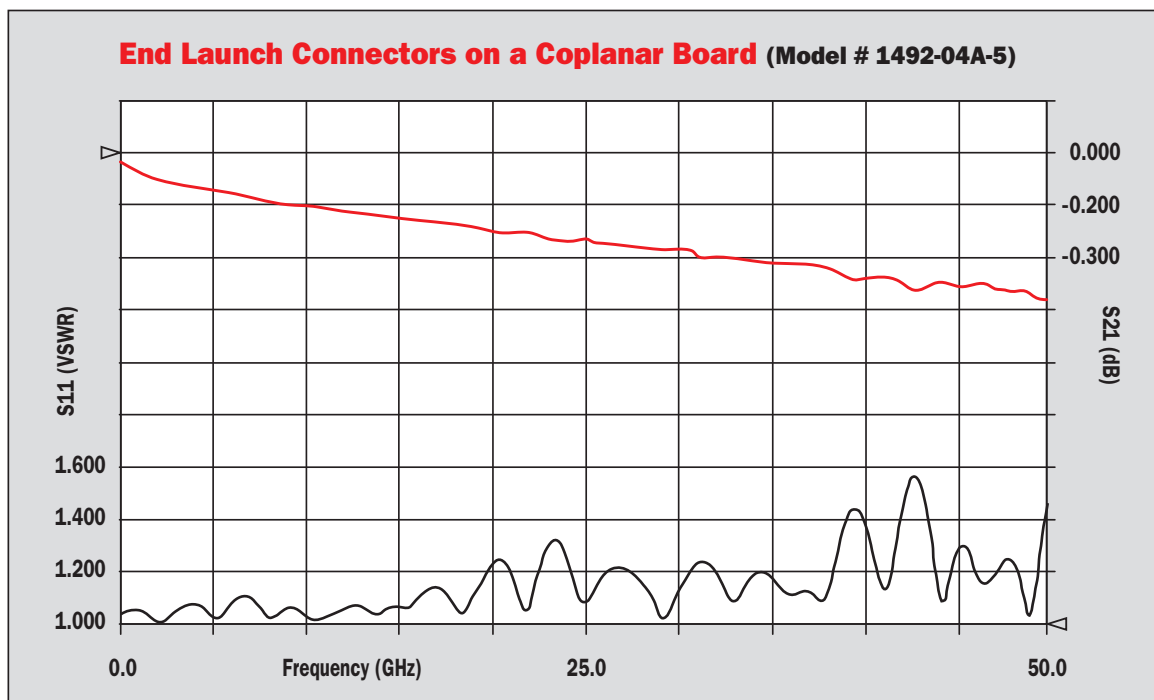
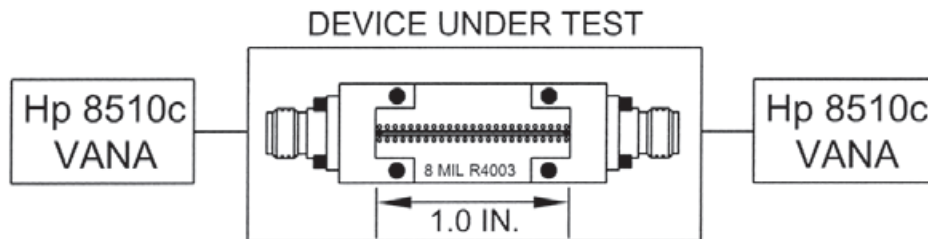
Coplanar Test Data

End Launch Connectors on a Coplanar Board

Below are test results to 50 GHz for two 1492-04A-5 end launch connectors on a .008" Rogers R04003 coplanar board. The plot shows both VSWR and insertion loss for the test board and the two connectors. Similar boards are used for the other launch geometries.



Model No. 1492-04A-5



1.58 is the maximum for two 1492-04A-5 End Launch Connectors on a SMI Microstrip test board using .008" Rogers R04003 coplanar board.

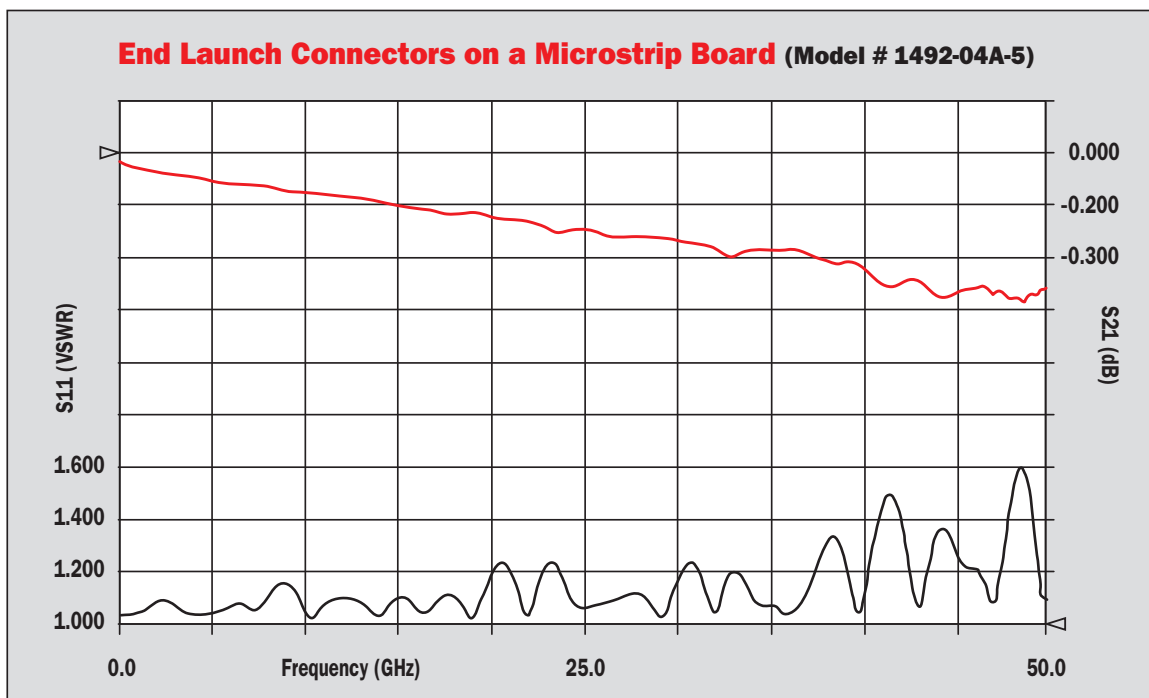
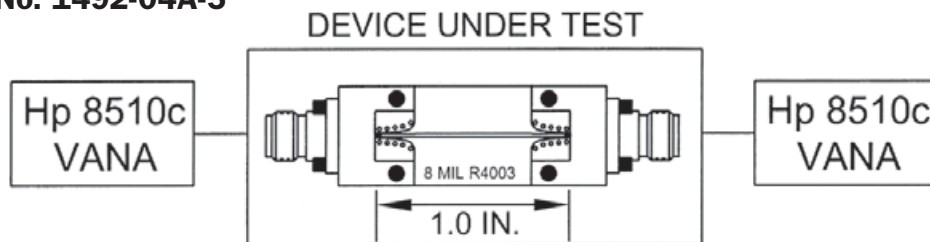
Microstrip Test Data

End Launch Connectors on a Microstrip Board

Below are test results to 50 GHz for two 1492-04A-5 end launch connectors on a .008" Rogers R04003 microstrip board with top ground launch. The plot shows both VSWR and insertion loss for the test board and the two connectors. This is not a standard test board.



Model No. 1492-04A-5



1.60 is the maximum for two 1492-04A-5 End Launch Connectors on a SMI Microstrip test board using .008" Rogers R04003 microstrip board.



Index

Adapters	Page
18 GHz (N to SMA)	67
27 GHz (Super SMA)	68
33 GHz (3.5 mm to 2.40 mm)	69
40 GHz (2.92 mm “JK”)	70
40 GHz (2.92 mm to 2.40 mm)	71
40 GHz (SSMA to 2.40 mm)	72
50 GHz (2.40 mm)	73

*Southwest Microwave Adapters are considered in-between metrology and instrument grades.
 Our adapters would best be described as “Precision Grade” which are ideally suited for production tests.*

N to Super SMA Adapters

DC to 18.0 GHz

Application:

- DC to 18.0 GHz High Performance

Features:

- Mode Free Through 18.0 GHz.
- Low VSWR:
DC to 18.0 GHz.....1.12:1 max.
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +165°C

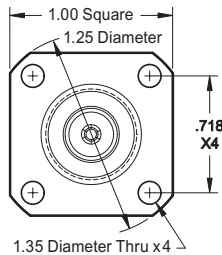
Interface:

- Per MIL-STD-348
SMA Figs. 310-1 and 310-2
N Figs. 304-1 and 304-2

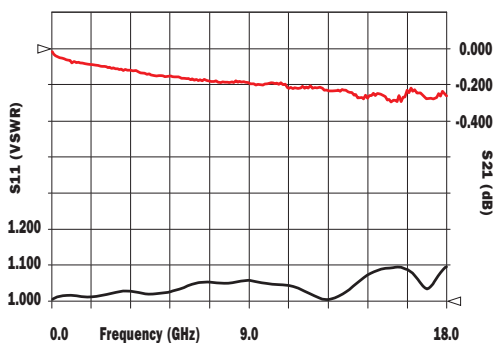
Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Dielectric:
PTFE Fluorocarbon Per ASTM D 1457
- Center Contact Capture:
Uitem 1000 Per ASTM D 5205

Models:
2311SF
2312SF



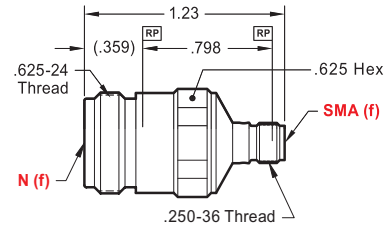
N to SMA Adapter (Model # 2320SF) Test Data



N (f) to SMA (f)
(18 GHz)



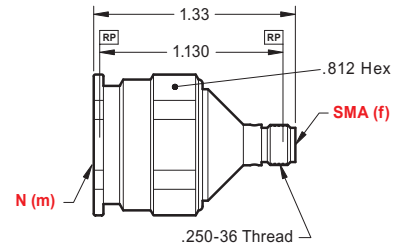
Model 2310SF



N (m) to SMA (f)
(18 GHz)



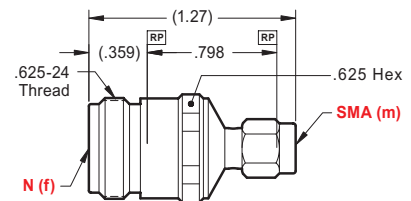
Model 2320SF



N (f) to SMA (m)
(18 GHz)



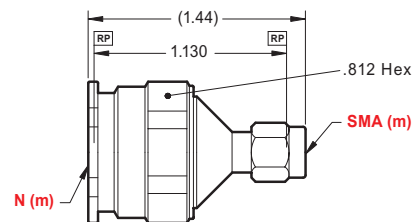
Model 2330SF



N (m) to SMA (m)
(18 GHz)



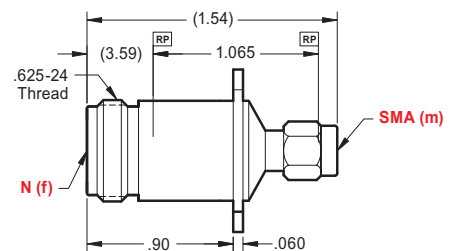
Model 2340SF



N (f) to SMA (m)
(18 GHz)



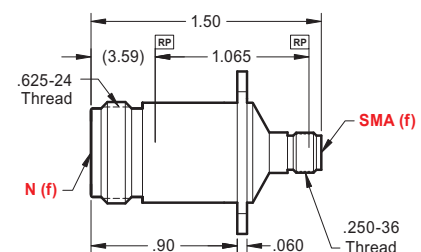
Model 2311SF



N (f) to SMA (f)
(18 GHz)



Model 2312SF



All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Super SMA Adapters

DC to 27.0 GHz

Application:

- DC to 27.0 GHz High Performance

Features:

- Mode Free Through 27.0 GHz.
- Low VSWR:
DC to 18.0 GHz.....1.10:1 max.
18.0 to 27.0 GHz.....1.15:1 max.
- Minimum VSWR Contribution When Used as Connector Savers
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +165°C

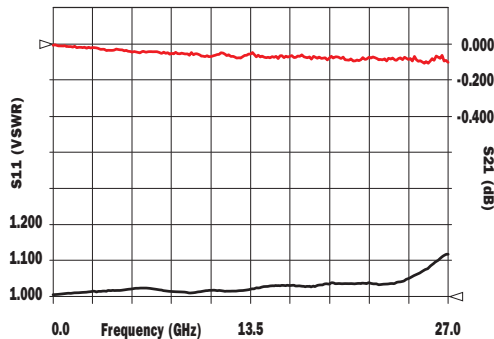
Interface:


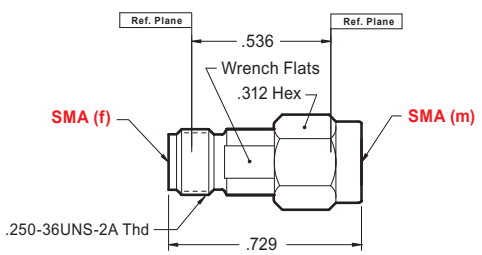

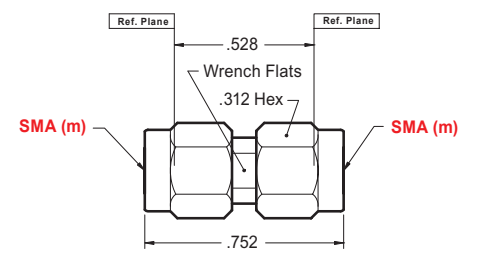

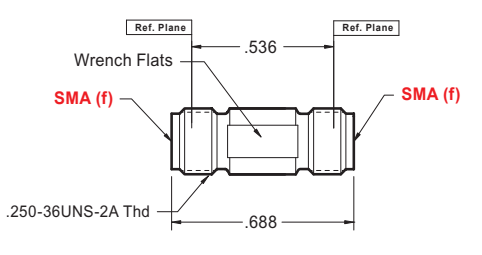

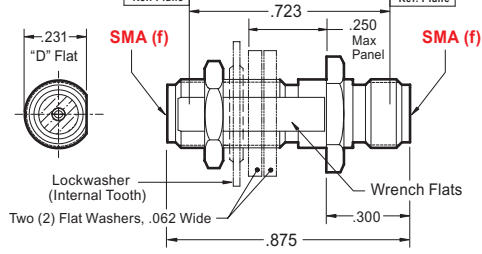
- Per MIL-STD-348
SMA Figs. 310-1 and 310-2

Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Dielectric:
PTFE Fluorocarbon Per ASTM D 1457
- Center Contact Capture:
Ultem 1000 Per ASTM D 5205

Super SMA Adapter (Model # 232-502SF) Test Data



<p>SMA (m) to (f) (27 GHz)</p>  <p>Model 230-506SF</p>	
<p>SMA (m) to (m) (27 GHz)</p>  <p>Model 231-502SF</p>	
<p>SMA (f) to (f) (27 GHz)</p>  <p>Model 232-502SF</p>	
<p>SMA (f) to (f) Bulkhead (27 GHz)</p>  <p>Model 232-510SF</p>	

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

3.5 mm to 2.40 mm

DC to 33.0 GHz

Application:

- DC to 33.0 GHz High Performance

Features:

- Mode Free Through 33.0 GHz.
- Low VSWR:
DC to 27.0 GHz.....1.10:1 max.
27.0 to 33.0 GHz.....1.15:1 max.
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +135°C

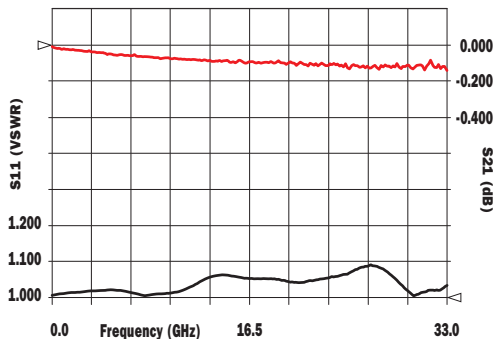
Interface:


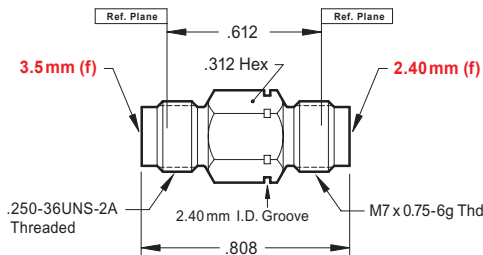

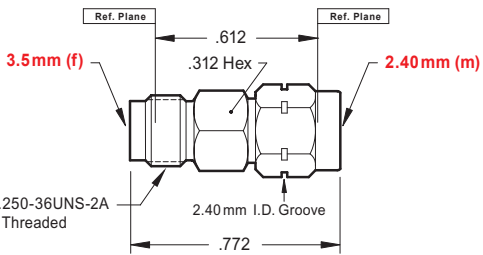

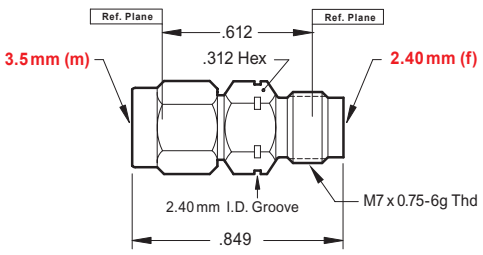

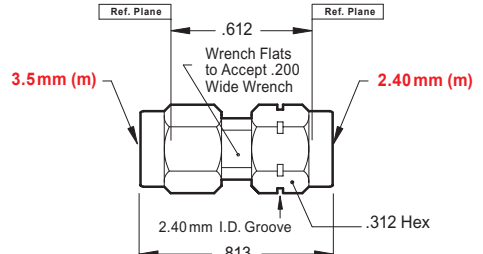
- Per MIL-STD-348
2.40 mm Figs. 324-1 and 324-2
3.5 mm Ref IEEE Std 287

Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Center Contact Capture:
Ultem 1000 Per ASTM D 5205
and KEL-F Per ASTM D 1430

3.5 mm to 2.40 mm (Model # 61420-00SF) Test Data



<p>3.5 mm (f) to 2.40 mm (f) (33 GHz)</p>  <p>Model 61410-00SF</p>	
<p>3.5 mm (f) to 2.40 mm (m) (33 GHz)</p>  <p>Model 61420-00SF</p>	
<p>3.5 mm (m) to 2.40 mm (f) (33 GHz)</p>  <p>Model 61430-00SF</p>	
<p>3.5 mm (m) to 2.40 mm (m) (33 GHz)</p>  <p>Model 61440-00SF</p>	

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).



2.92 mm "JK" Adapters

DC to 40.0 GHz

2.92 mm "JK" Adapters

DC to 40.0 GHz

Application:

- DC to 40.0 GHz High Performance

Features:

- Mode Free Through 40.0 GHz.
- Low VSWR:
DC to 27.0 GHz.....1.10:1 max.
27.0 to 40.0 GHz.....1.15:1 max.
- Minimum VSWR Contribution When Used as Connector Savers
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +135°C

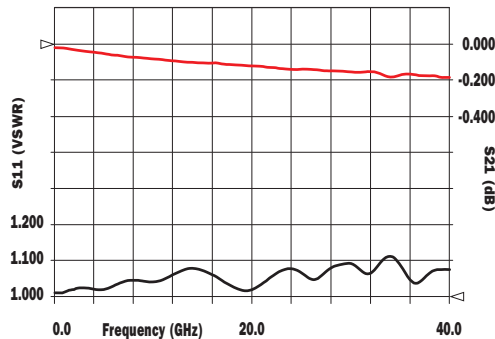
Interface:


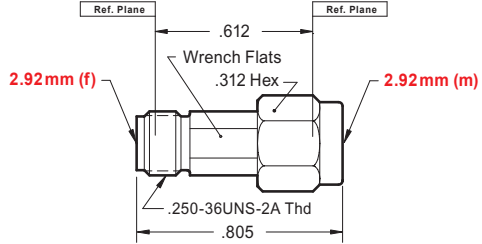

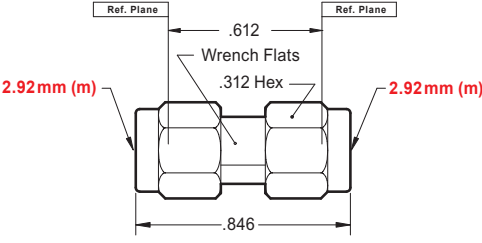

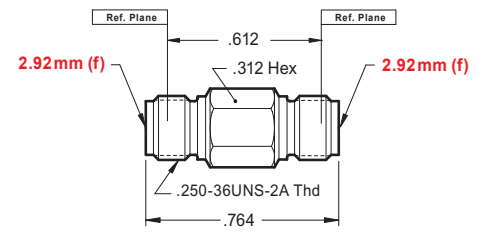

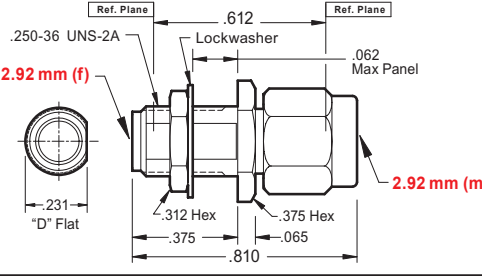

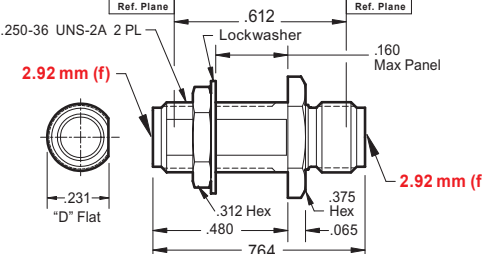
- Per MIL-STD-348
2.92 mm (SMK) Figs. 323-1 and 323-2

Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Center Contact Capture:
Ultem 1000 Per ASTM D 5205
and KEL-F Per ASTM D 1430

2.92 mm to 2.92 mm (Model # 1031-00SF) Test Data



<p>2.92 mm (f) to (m) (40 GHz)</p>  <p>Model 1030-00SF</p>	
<p>2.92 mm (m) to (m) (40 GHz)</p>  <p>Model 1031-00SF</p>	
<p>2.92 mm (f) to (f) (40 GHz)</p>  <p>Model 1032-00SF</p>	
<p>2.92 mm (f) to (m) Bulkhead (40 GHz)</p>  <p>Model 1030-10SF</p>	
<p>2.92 mm (f) to (f) Bulkhead (40 GHz)</p>  <p>Model 1032-10SF</p>	

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

2.92 mm to 2.40 mm

DC to 40.0 GHz

Application:

- DC to 40.0 GHz High Performance

Features:

- Mode Free Through 40.0 GHz.
- Low VSWR:
DC to 27.0 GHz.....1.10:1 max.
27.0 to 40.0 GHz.....1.15:1 max.
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +135°C

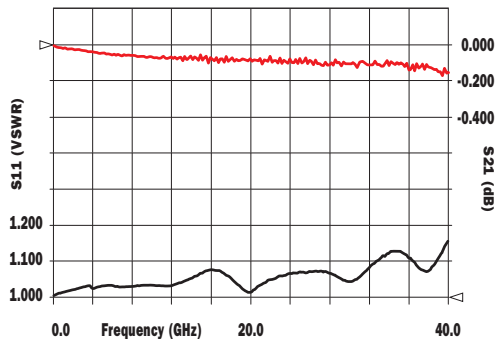
Interface:


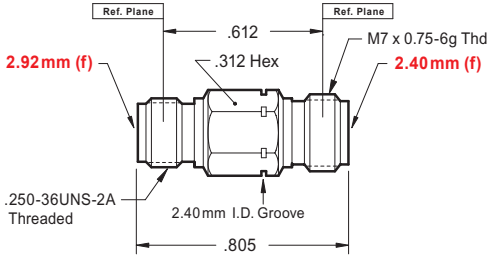

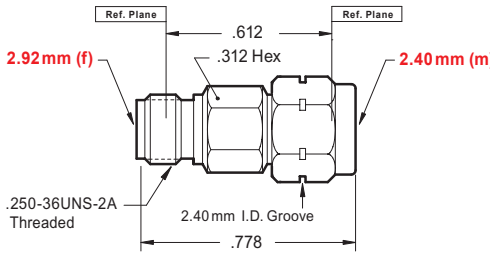

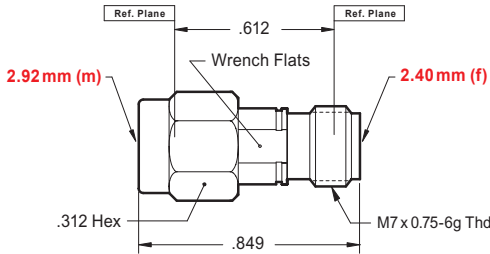

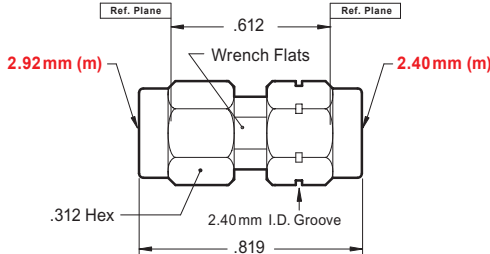
- Per MIL-STD-348
2.92 mm (SMK) Figs. 323-1 and 323-2
2.40 mm Figs. 324-1 and 324-2

Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Center Contact Capture:
Ultem 1000 Per ASTM D 5205
and KEL-F Per ASTM D 1430

2.92 mm to 2.40 mm (Model # 101430-00SF) Test Data



<p>2.92 mm (f) to 2.40 mm (f) (40 GHz)</p>  <p>Model 101410-00SF</p>	
<p>2.92 mm (f) to 2.40 mm (m) (40 GHz)</p>  <p>Model 101420-00SF</p>	
<p>2.92 mm (m) to 2.40 mm (f) (40 GHz)</p>  <p>Model 101430-00SF</p>	
<p>2.92 mm (m) to 2.40 mm (m) (40 GHz)</p>  <p>Model 101440-00SF</p>	

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

SSMA (Airline) to 2.40 mm Adapters

DC to 40.0 GHz

SSMA (Airline) to 2.40 mm

DC to 40.0 GHz

Application:

- DC to 40.0 GHz High Performance

Features:

- Mode Free Through 40.0 GHz.
- Low VSWR:
DC to 27.0 GHz.....1.10:1 max.
27.0 to 40.0 GHz.....1.15:1 max.
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +135°C

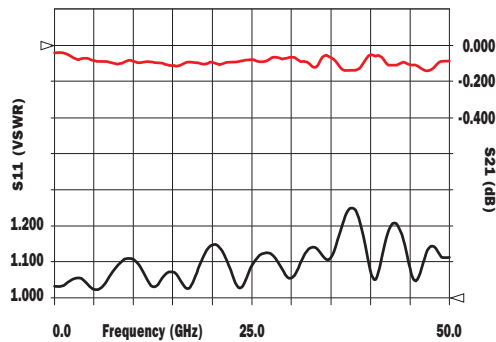
Interface:

- Per MIL-STD-348
SSMA Figs. 319-1 and 319-2
2.40 mm Figs. 324-1 and 324-2

Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Center Contact Capture:
Ultem 1000 Per ASTM D 5205
and KEL-F Per ASTM D 1430

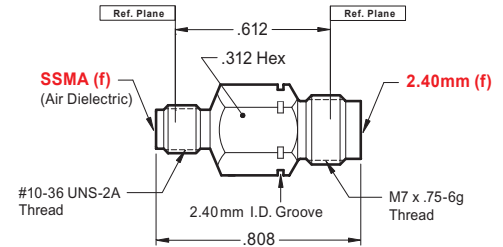
SSMA (Airline) to 2.4 mm (Model # 11430-00SF) Test Data



SSMA (f) to 2.40 mm (f) (40 GHz)



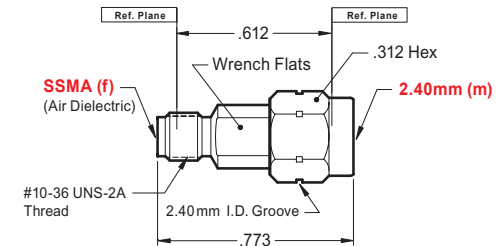
Model 11410-00SF



SSMA (f) to 2.40 mm (m) (40 GHz)



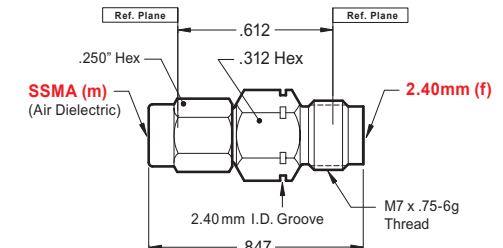
Model 11420-00SF



SSMA (m) to 2.40 mm (f) (40 GHz)



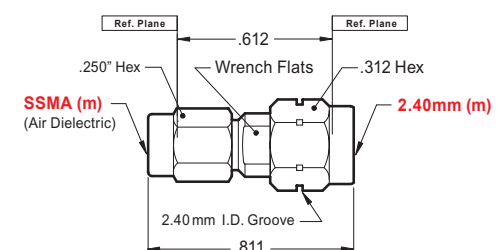
Model 11430-00SF



SSMA (m) to 2.40 mm (m) (40 GHz)



Model 11440-00SF



2.40 mm Adapters

DC to 50.0 GHz

Application:

- DC to 50.0 GHz High Performance

Features:


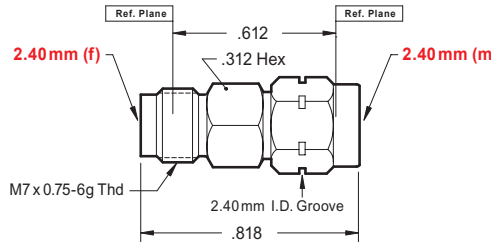

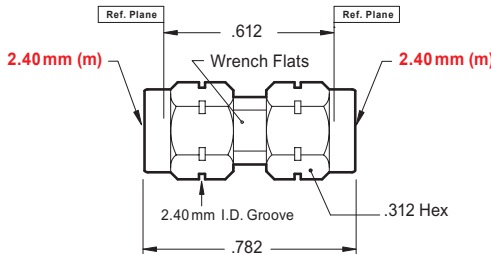

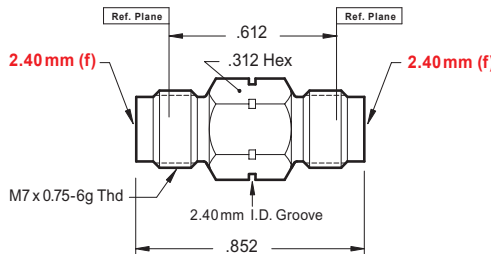
- Mode Free Through 50.0 GHz.
- Low VSWR:
DC to 27.0 GHz.....1.10:1 max.
27.0 to 40.0 GHz.....1.15:1 max.
40.0 to 50.0 GHz.....1.20:1 max.
- Minimum VSWR Contribution
When Used as Connector Savers
- Performance Consistency Unit-to-unit
- Temperature Rating -55°C to +135°C

Interface:

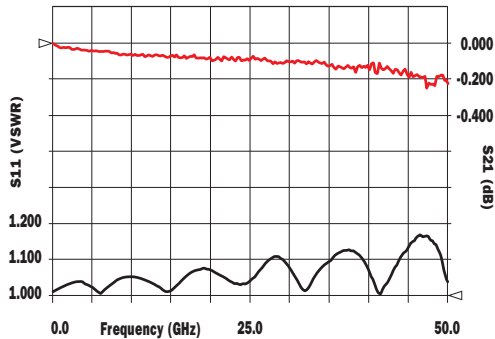
- Per MIL-STD-348
2.40 mm Figs. 324-1 and 324-2

Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu)
Gold Plated Per MIL-G-45204
- Center Contact Capture:
Ultem 1000 Per ASTM D 5205
and KEL-F Per ASTM D 1430

<p>2.40 mm (f) to (m) (50 GHz)</p>  <p>Model 1430-00SF</p>	
<p>2.40 mm (m) to (m) (50 GHz)</p>  <p>Model 1431-00SF</p>	
<p>2.40 mm (f) to (f) (50 GHz)</p>  <p>Model 1432-00SF</p>	

2.40 mm to 2.40 mm (Model # 1431-00SF) Test Data



All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
Installation and Tools



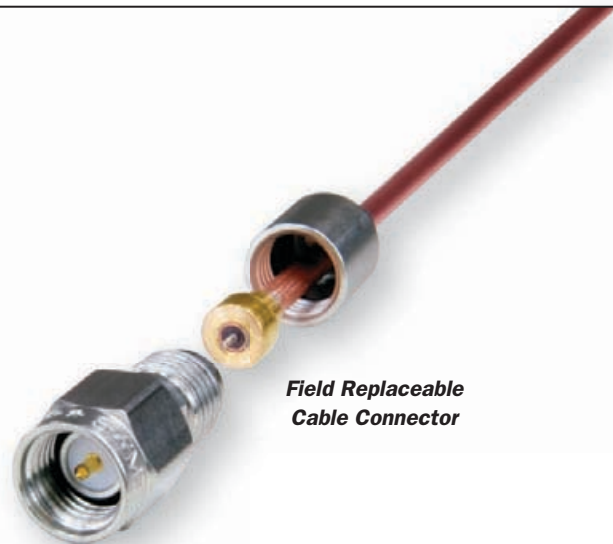
Notes



**Direct Solder
Cable Termination**



**Direct Solder Flange Mount
Cable Connector**



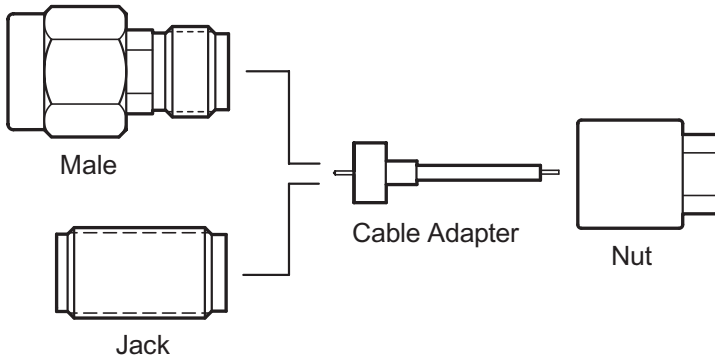
**Field Replaceable
Cable Connector**

Index

Cable Connectors	Page
Cable Connectors (Features & Benefits).....	76
Field Replaceable Models.....	77
Direct Solder Flange Mount Models.....	79
Flange Mount Cable Terminations	80
Cable Termination Test Data	81

Unless otherwise specified, all dimensions are in inches. Contact Factory for Cable Assemblies.

Field Replaceable Cable Connectors



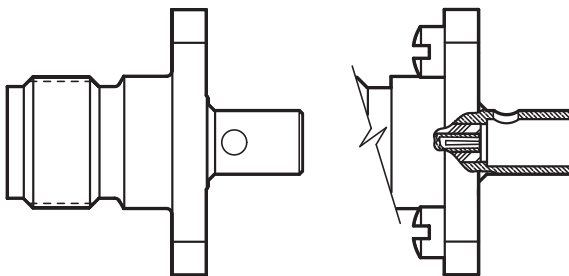
Feature

- Free-Floating center conductor - center conductor of the cable launches into the rear female socket of the connector

Benefits

- Built-in stress relief to accommodate cable center conductor movement
- Cable connectors easily replaced without unsoldering
- Interchangeability of connector types for unsurpassed flexibility
- More consistent electrical performance by eliminating the solder variable on the center conductor

Direct Solder Flange Mount Cable Connectors



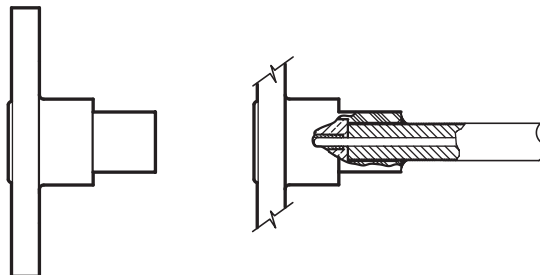
Features

- Free-Floating center conductor - center conductor of the cable launches into the rear female socket of the connector
- Inspection hole on the outer conductor

Benefits

- Built-in stress relief to accommodate cable center conductor movement
- More consistent electrical performance by eliminating the solder variable on the center conductor
- Inspection hole insures proper insertion of the cable center conductor

Direct Solder Flange Mount Terminations

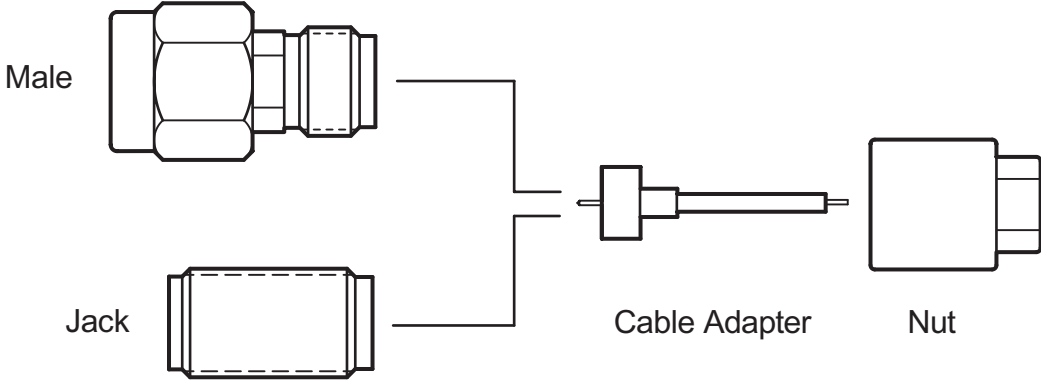


Features

- Free-Floating center conductor - center conductor of the cable launches into the rear female socket of the connector
- Inspection hole on the outer conductor

Benefits

- Built-in stress relief to accommodate center conductor movements
- More consistent electrical performance by eliminating the solder variable on the center conductor
- Inspection hole insures proper insertion of the cable center conductor

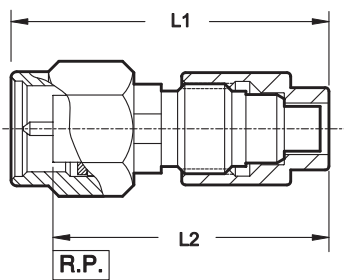
Super SMA Series Cable Connector Kits	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	201-500SF	202-500SF
	.020	.086	201-502SF	202-502SF
	.036	.141	201-503SF	202-503SF
			Male	Female
SSMA Series Cable Connector Kits	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	101-01SF	102-01SF
	.020	.086	101-02SF	102-02SF
				Male	Female
2.92 mm Series Cable Connector Kits	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	1001-03SF	1002-03SF
	.020	.086	1001-04SF	1002-04SF
				Male	Female
2.40 mm Series Cable Connector Kits	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	1401-01SF	1402-01SF
	.020	.086	1401-02SF	1402-02SF
				Male	Female
 <p>The diagram illustrates the assembly of a cable connector kit. On the left, a 'Male' connector and a 'Jack' are shown. Lines connect the 'Male' connector to the 'Cable Adapter' and the 'Jack' to the 'Cable Adapter'. The 'Cable Adapter' is then connected to a 'Nut'.</p>				

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

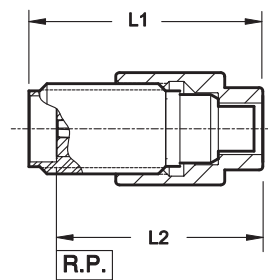
SuperSMA (27 GHz), 2.92 mm (40 GHz) & 2.40 mm (50 GHz)

General Features:

- Simplified assembly
- Eliminate screening and grading
- All Components available off-the-shelf
- Proven consistent connector to cable launch
- All connectors may be pre-tested before assembly
- All connector lots are sample tested
- Mode free to rated frequency
- Connectors may be changed or replaced after assembly from plug to jack and between series SMA, SSMA, 2.92 & 2,40 mm

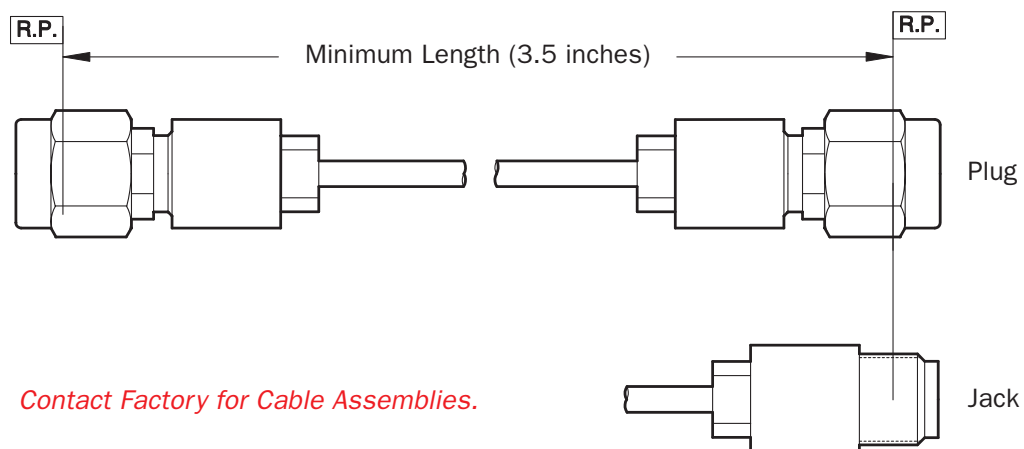


2.40 mm	.88	.80
2.92 mm	.86	.74
SSMA	.85	.74
SMA	.87	.76
Series	L1	L2

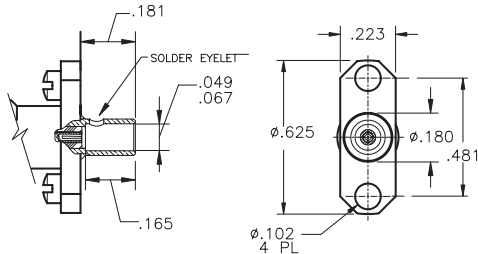
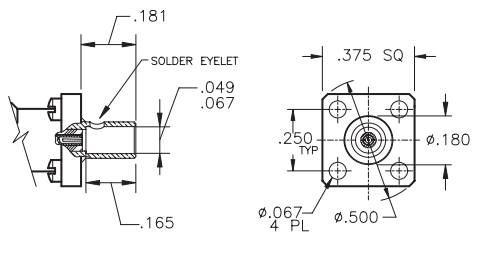
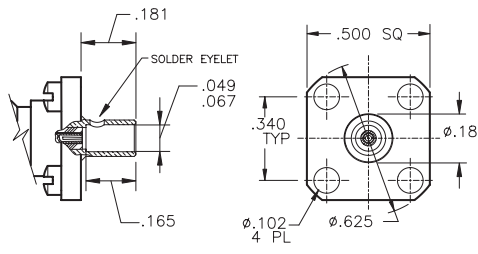
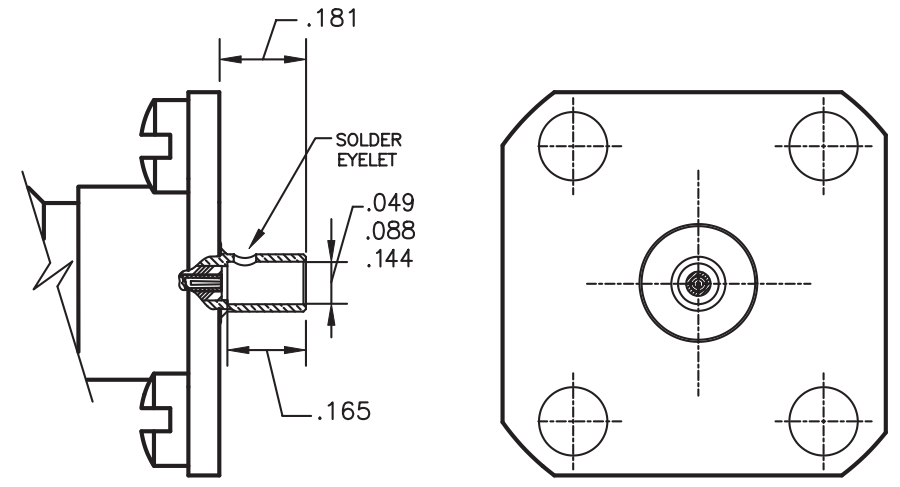


2.40 mm	.68	.56
2.92 mm	.63	.55
SSMA	.58	.50
SMA	.65	.57
Series	L1	L2

Interconnect Cable Connector Assemblies



Direct Solder Flange Mount Cable Connectors

<p>Super SMA 2 Hole .625" Long</p> 	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	21303-00SF	21403-00SF
	.020	.086	21304-00SF	21404-00SF
	.036	.141	21305-00SF	21405-00SF
			Male	Female
<p>Super SMA 4 Hole .375" Square</p> 	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	21103-01SF	21203-01SF
	.020	.086	21104-01SF	21204-01SF
	.036	.141	21105-01SF	21205-01SF
			Male	Female
<p>Super SMA 4 Hole .500" Square</p> 	Cable Center Conductor Dia.	Cable	Model No.	
	.012	.047	21103-00SF	21203-00SF
	.020	.086	21104-00SF	21204-00SF
	.036	.141	21105-00SF	21205-00SF
			Male	Female
				
<p>RoHS: The connectors themselves are RoHS compliant. Users are cautioned that lead-free solders may require temperatures that could affect materials and result in product degradation.</p>				

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

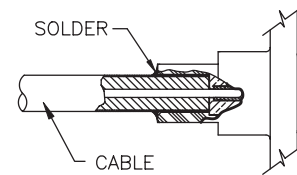
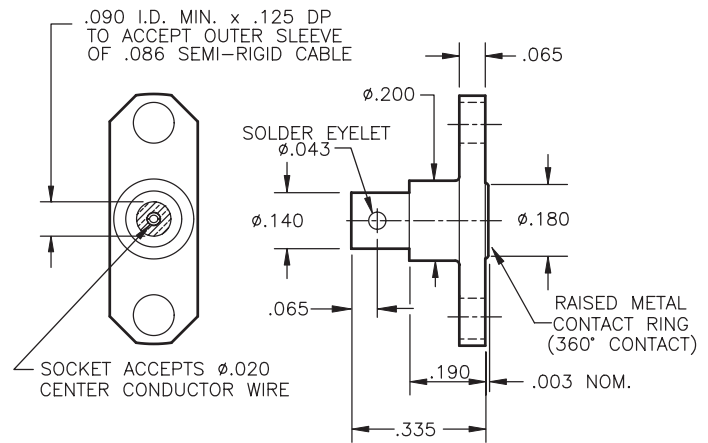
Flange Mount Cable Terminations

Application:

- DC to 40.0 GHz
- Connectivity with .086 Semi-Rigid Cable for Inner Connect Cable Assemblies.

Construction Features:

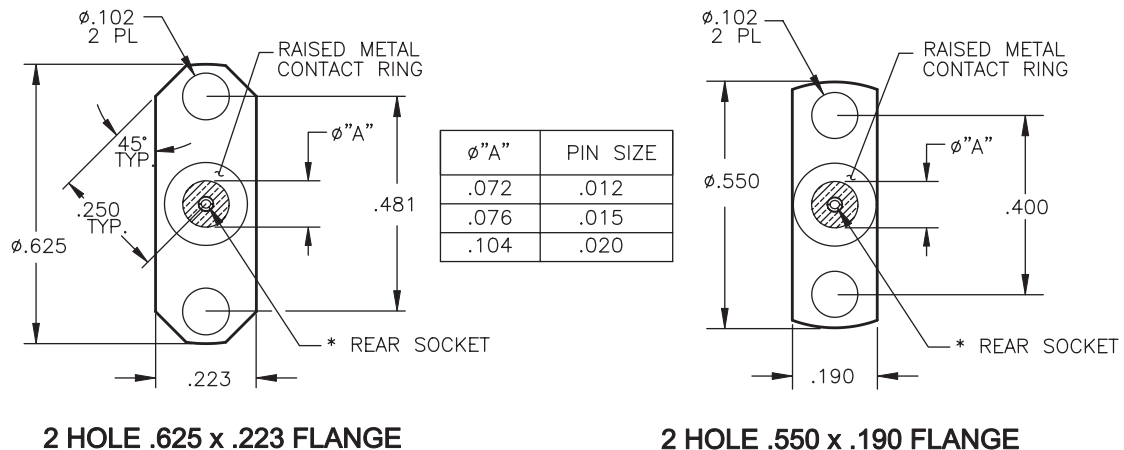
- Low VSWR 1.15:1 max 27.0 to 40.0 GHz
- Low RF Leakage ≤ -100 dB
- Housing: Unitized Stainless Steel Construction, Gold Plated Per MIL-G-45204
- Center Contact: Beryllium Copper, Gold Plated Per MIL-G-45204.
- Dielectric Insulator: PTFE Fluorocarbon
- High Temperature Ultem 1000 Capture (+165°C)
- Protruding Metal Grounding Ring for 360° Metal-to-Metal Contact



Series: Flange Mount .086 Cable Termination Connectors

Connectors Available in 3 pin sizes	MODELS		
* REAR SOCKET PIN SIZE ACCEPTANCE	.012	.015	.020
2 HOLE .625 x .223 FLANGE MOUNT	107-14G	107-13G	107-12G
2 HOLE .550 x .190 FLANGE MOUNT	108-14G	108-13G	108-12G

Flange Mount Configurations Available



Note: All dimensions shown are in inches.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

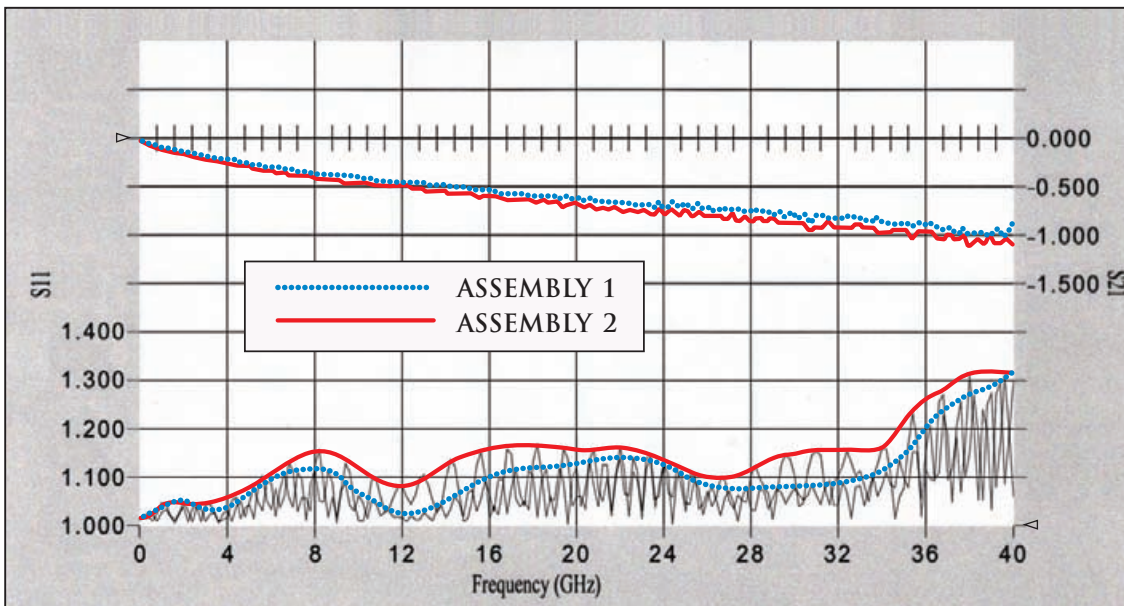
Typical Test Data

To Electrically evaluate the Flange Mount Cable terminations, a back-to-back pair was inserted in line into a reference cable assembly and tested to 40 GHz.

The data shows the reference cable (Assembly 1) and the cable assembly with the Cable Terminations added (Assembly 2) overlaid.

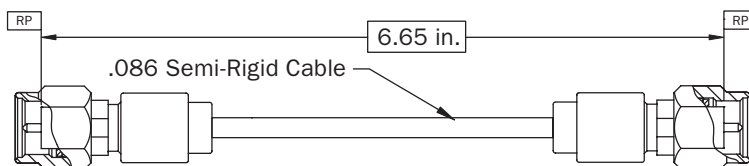
The difference is the contribution of the two added Cable terminations.

The diagrams below show the test configurations.



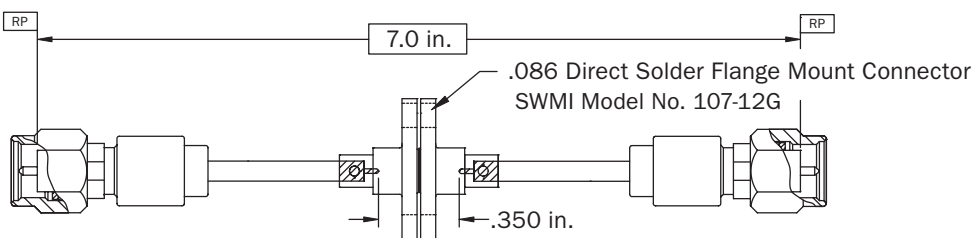
Reference Cable Assembly 1

2.92 mm Male to Male Cable Connector Assembly (SWMI Model No. 1094-04-6.65)



Reference Cable Assembly 2

Cable Assembly 1 "Split" and Reconnected with (2) Flange Mount Cable Termination Connectors.





Accessories and Application Reference



Index

Accessories	Page
Launch Accessory Introduction/Summary	83
Typical Launch Applications	86
Hermetic Transitions to Microstrip	87
Launch Pin Transitions to Microstrip	88
Launch Pin/Tab Transitions to Stripline	92

Unless otherwise specified, all dimensions are in inches.

Introduction to Microwave Launches

Concept

Detail dimensions and application references for all accessories are illustrated in this section. Also illustrated are installation, dimensions and instructions for each accessory.

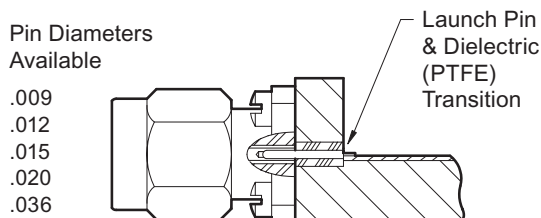
Selection Process

Design should proceed in the following order:

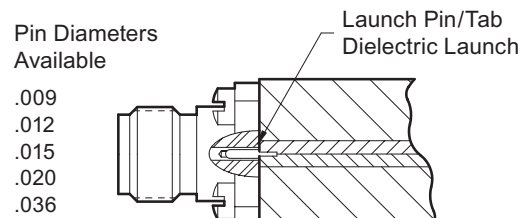
1. Select substrate material
2. Determine line width
3. Select the optimum launch accessory that will provide the best electrical performance.
4. Select the required connector that will mate with the chosen accessory and provide the best mechanical package configuration.

The connector accessories are made available so that the user may select an optimum microwave frequency launch to their circuitry.

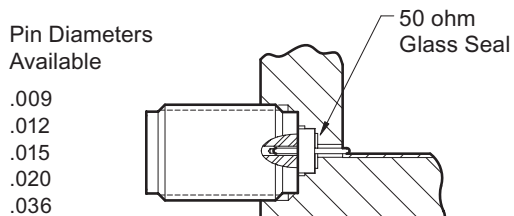
Southwest Microwave connectors and accessories are designed to be compatible with each other to assure electrical performance. Southwest Microwave **cannot** assure electrical performance when the accessories are used with a non-Southwest Microwave connector.



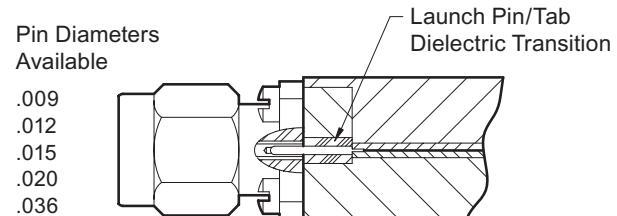
Panel Mount to Microstrip



Direct Launch to Stripline



Thread-in to Microstrip



Panel Mount to Stripline



Introduction to Microwave Launches

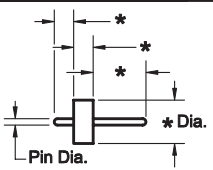
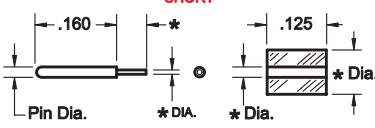
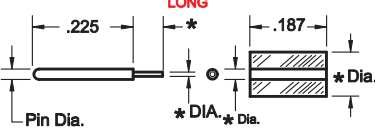
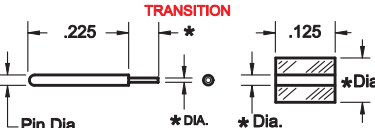
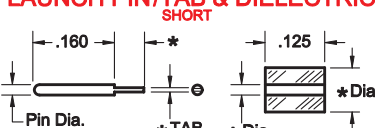
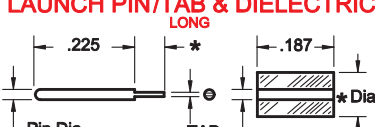
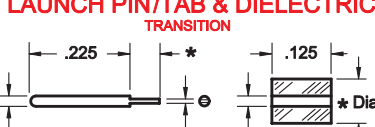

As requirements go higher in frequency (50.0 GHz and above), the lower frequency launches (2-12.0 GHz) gradually become troublesome and the launch structure becomes very sensitive to mechanical tolerances. Sometimes they work, but sometimes excessive tuning is needed or even after many hours or troubleshooting the connector itself must be replaced.

Southwest Microwave has undertaken the effort to learn our customers circuit structures so that we can provide proper transmission line step-down (diameter reductions) within the connector to a size compatible with the circuit. If the circuit is very thin (.015 or less), additional accessories are available for further reduction of the transmission line size. Southwest Microwave designs eliminate the severe transmission line mismatch at the launch point. Low reflection launches require compatible structure. Superimposing severe transmission line step-down at a complex circuit launch structure is sensitive to mechanical tolerances, which can result in narrow band operation that usually requires tuning.

Most connector suppliers have not addressed problems resulting from transmission steps. Thus, even though the user may be aware of the problem, since desired product structure is presumed as not readily available, he is faced with “making do” with what is perceived to be available. This “making do” has been going on for a long time and, unfortunately, appears to be a general rule since very little industry attention has been given to better performance for microwave and millimeter wave applications. Southwest Microwave designs eliminate the “old” need to accept less than optimum results.

Southwest Microwave provides standard products that are designed to successfully launch to higher frequency circuits. Connectors and launch accessories are available from stock. Please contact Southwest Microwave for assistance.

Accessories Summary for Transitions to Microstrip and Stripline Circuits

	PIN DIA.	.009	.012	.015	.018	.020	.036
50 OHM SEAL 	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.
	1490-13G 1490-15G	290-06G 290-07G	290-00G	290-01G	290-02G	490-00G	
LAUNCH PIN & DIELECTRIC** SHORT 		1490-12G	1090-12G	290-12G	—	290-14G	290-37G
LAUNCH PIN & DIELECTRIC LONG 		1490-11G	1090-11G	290-11G	—	290-13G	290-36G
LAUNCH PIN & DIELECTRIC TRANSITION 		1490-11P-12D	1090-11P-12D	290-11P-12D	—	290-13P-14D	290-36P-37D
LAUNCH PIN/TAB & DIELECTRIC SHORT 		1490-03G	1090-06G	290-25G	—	290-27G	290-35G
LAUNCH PIN/TAB & DIELECTRIC LONG 		1490-02G	1090-07G	290-24G	—	290-26G	290-34G
LAUNCH PIN/TAB & DIELECTRIC TRANSITION 		1490-02P-03D	1090-07P-06D	290-24P-25D	—	290-26P-27D	290-34P-35D
LAUNCH PIN/TAB 		1490-01G	1090-05G	290-09G	—	290-10G	290-33G

* Refer to pages 87, 90, 91, 94, 95 & 96 for indicated dimensions.

** Dielectric is PTFE.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

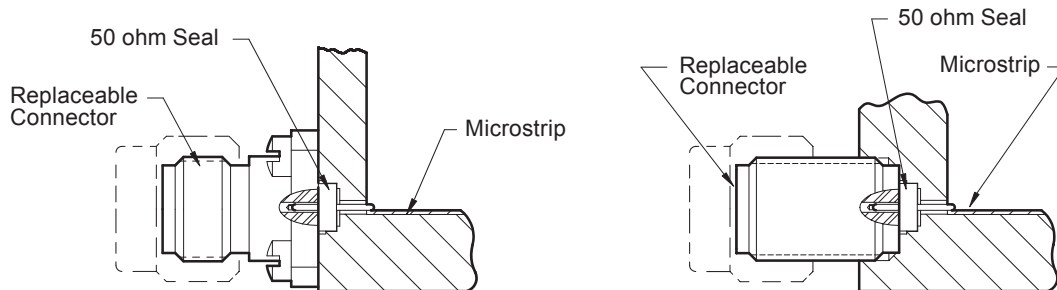
Super SMA Connectors
 N Series Connectors
 TNC Connectors
 2.92 mm Connectors
 SSMA Connectors
 2.40 mm Connectors
 End Launch Connectors
 Adapters
 Cable Connectors
 Launch Accessories
 Installation and Tools



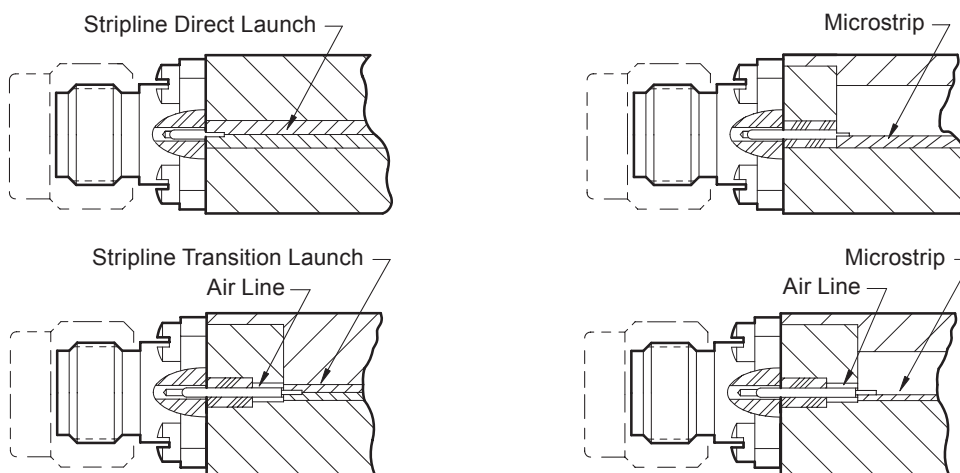
Accessories and Application Reference

Typical Launch Applications

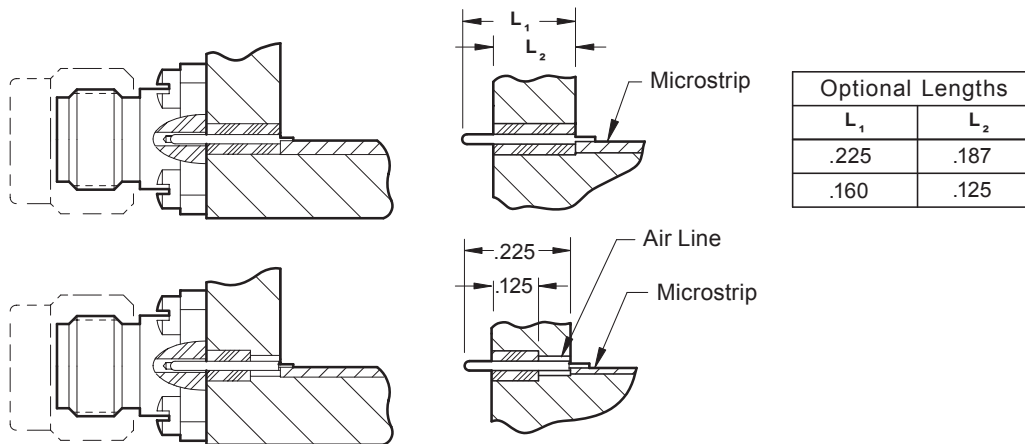
Hermetic MIC Packages



Launch Pin/Tab Transitions to Microstrip and Stripline Circuits



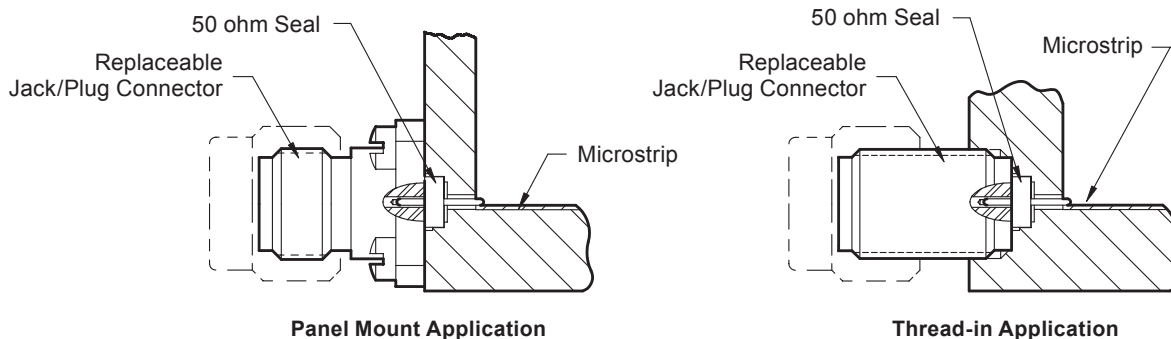
Launch Pin Transitions to Microstrip Circuits



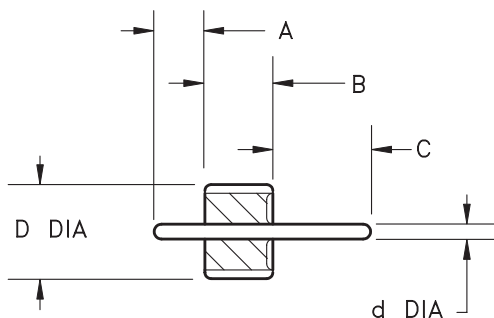
Hermetic Transitions to Microstrip Circuits

For Panel Mount and Tread-in Connectors

Hermetic MIC Packages



50 ohm Hermetic Seals



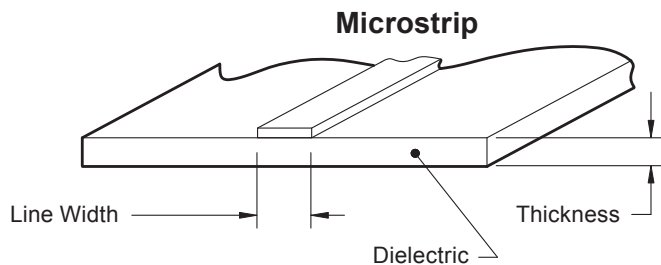
.036	.268	.098	.060	.185	490-00G
.020	.158	.050	.060	.125	290-02G
.018	.110	.072	.060	.180	290-01G
.015	.098	.050	.0625	.125	290-00G
.012	.076	.040	.055	.029	290-07G
	.076	.040	.055	.080	290-06G
.009	.068	.030	.055	.026	1490-13G
	.068	.030	.055	.120	1490-15G
d DIA	D DIA	A	B	C	MODEL NO.

Refer to pages 100-103 for recommended hole pattern, tools and fixtures.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Launch Pin Transitions to Microstrip Circuits

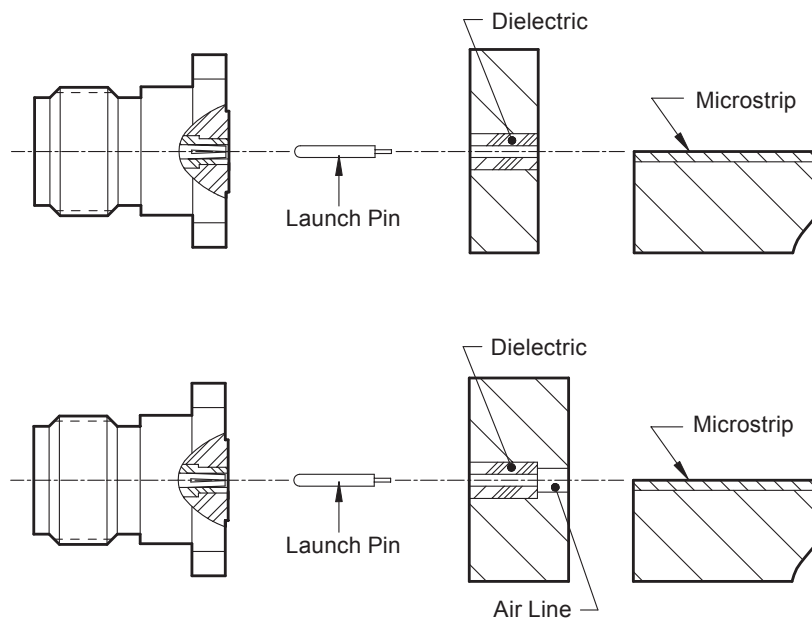
A wide variety of microstrip circuit substrates are used that range in thickness from .005 to .031 inch thickness with dielectric constants from 2.20 to 10.5.



With these choices of substrates, the 50 ohm line width will range from .005 to .110 inch wide.

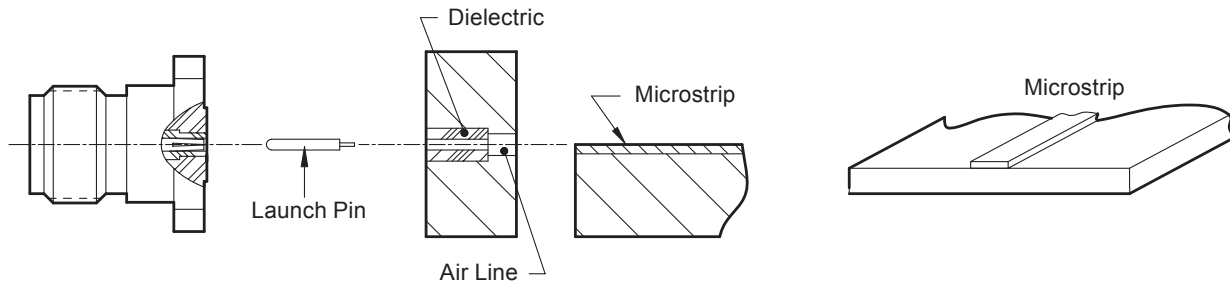
To efficiently launch from coaxial connector to microstrip, a transition compatible with the substrate thickness and line width is required. No single universal transition exists to cover the variety of microstrip configurations. Contact Southwest Microwave for assistance.

Launch Pin and Dielectric Transitions

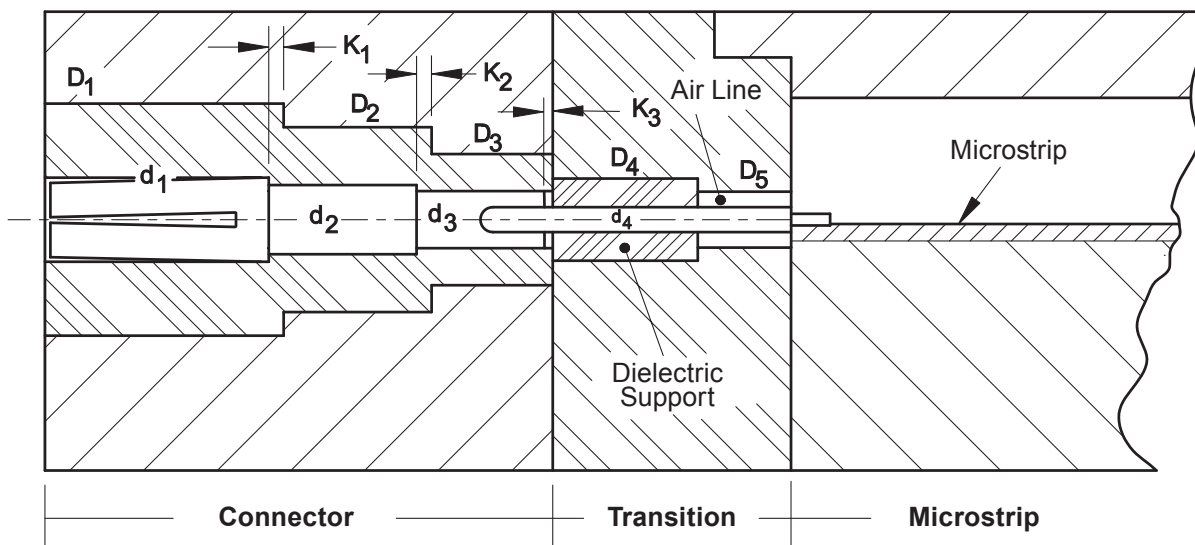


Launch Pin Transitions to Microstrip Circuits

Launch Pin and Dielectric Transitions



Broadband microwave frequency transitions can be obtained by selecting launch connectors and accessories designed to provide controlled step-transition to the circuit substrate. The designer can choose standard Southwest Microwave products to develop optimum transitions to his circuit. Extremely thin substrates require precise control of compatible transition structure.



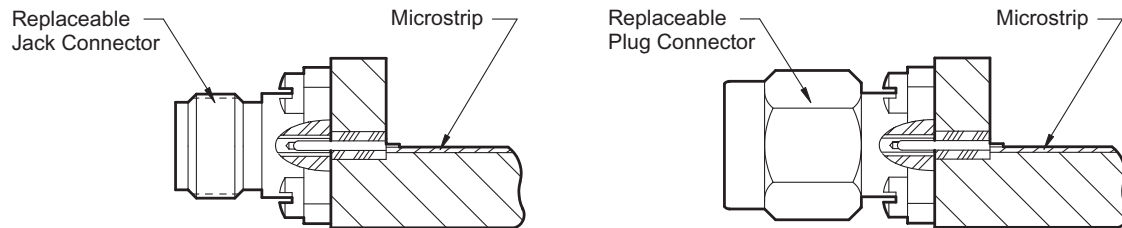


Accessories and Application Reference

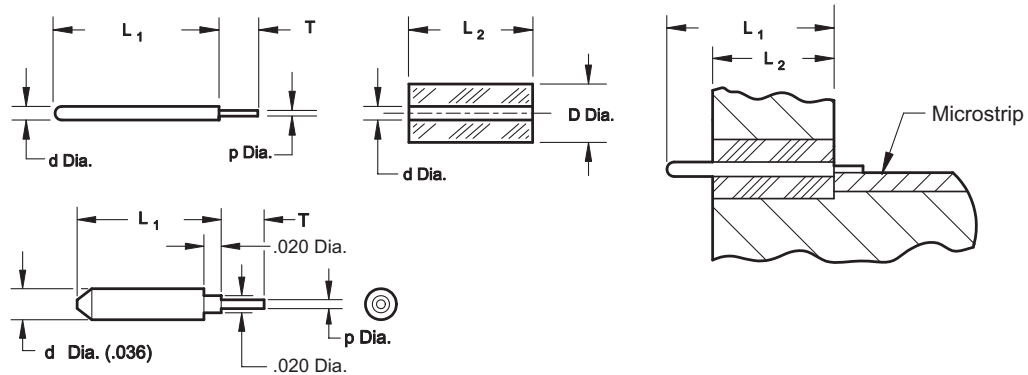
Launch Pin Transitions to Microstrip Circuits

For Panel Mount Connectors

Launch Pin and Dielectric Transition to Microstrip



Dielectric Transition



.036	.117	.050	.010	.175	.125	290-37G	290-37P	290-37D
.020	.064			.237	.187	290-36G	290-36P	290-36D
		.160	.125	290-14G	290-14P	290-14D		
.015	.048	.030	.007	.225	.187	290-13G	290-13P	290-13D
				.160	.125	290-12G	290-12P	290-12D
.012	.039	.015	.005	.225	.187	290-11G	290-11P	290-11D
				.160	.125	1090-12G	1090-12P	1090-12D
.009	.029	.015	.005	.225	.187	1090-11G	1090-11P	1090-11D
				.160	.125	1490-12G	1490-12P	1490-12D
d DIA	D Dia.	T	p Dia.	L ₁	L ₂	1490-11G	1490-11P	1490-11D
						Launch Pin & Dielectric*	Launch Pin Only	Dielectric* Only
Model Numbers								

Refer to pages 104 for recommended launch hole dimensions.

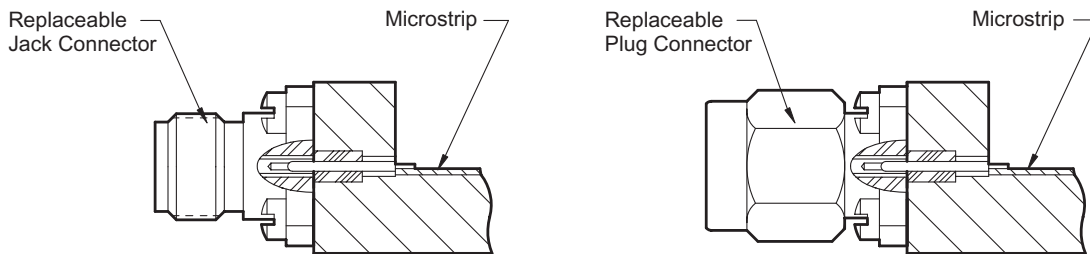
* Dielectric is PTFE.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

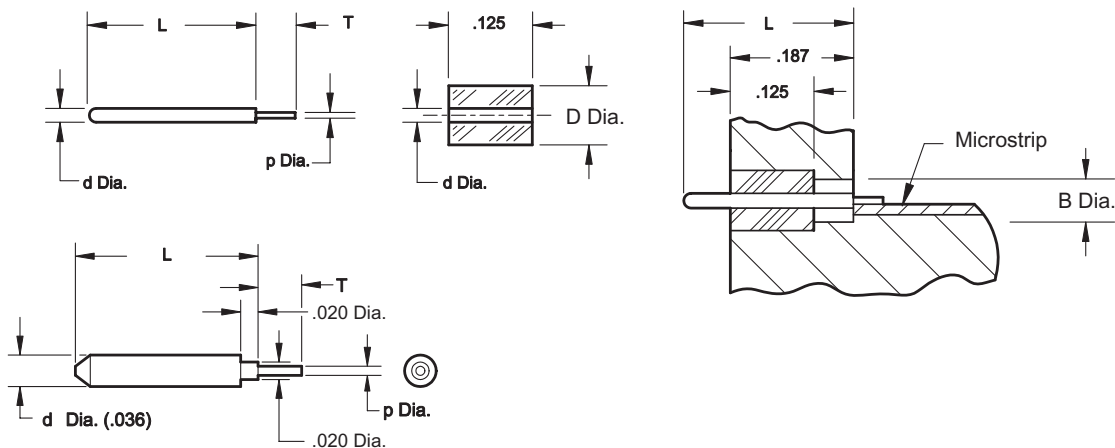
Launch Pin Step Transitions to Microstrip Circuits

For Panel Mount Connectors

Launch Pin and Dielectric Step Transition to Microstrip



Dielectric/Air Line Transition



.036	.117	.0465	.050	.010	.237	290-36P-37D	290-36P	290-37D
.020	.064				.225	290-13P-14D	290-13P	290-14D
.015	.048	.0335	.030	.007	.225	290-11P-12D	290-11P	290-12D
.012	.039				.0276	1090-11P-12D	1090-11P	1090-12D
.009	.029	.0210	.015	.005	.225	1490-11P-12D	1490-11P	1490-12D
d Dia.	D	B	T	p Dia.	L	Launch Pin & Dielectric*	Launch Pin Only	Dielectric* Only
Model Numbers								

Refer to pages 105 for recommended launch hole dimensions.

* Dielectric is PTFE.

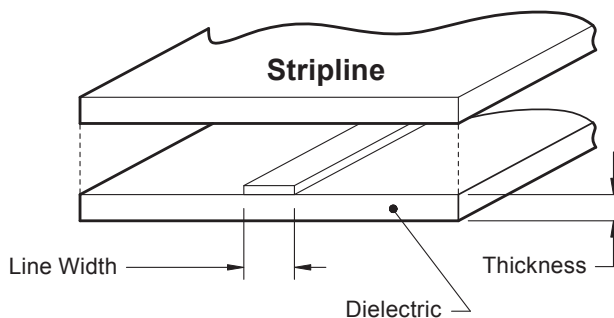
All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Launch Pin/Tab Transitions to Stripline Circuits

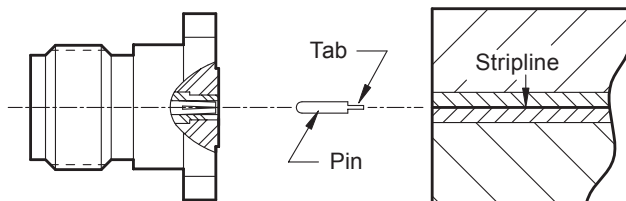
A wide variety of microwave stripline circuit substrates are used that range in thickness from .005 to .031 inch thickness with dielectric constants from 2.20 to 10.5.

With these choices of substrates, the 50 ohm line width will range from .005 to .050 inch wide.

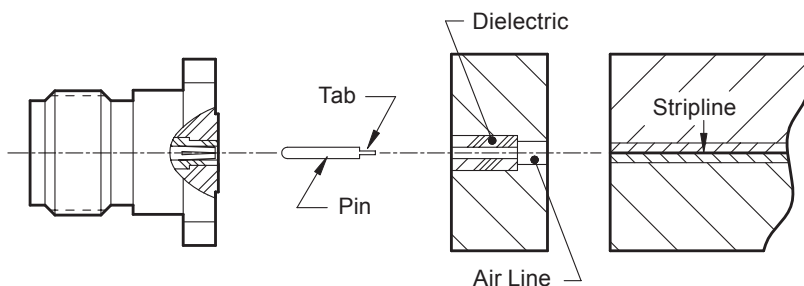
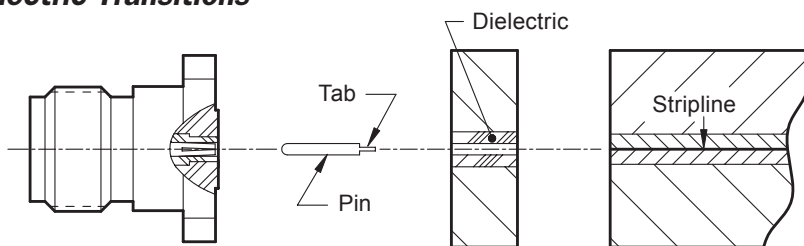
To efficiently launch from coaxial connector to the stripline, a transition compatible with the substrate thickness and line width is required. No single universal transition exists to cover the variety of stripline configurations. Contact Southwest Microwave for assistance.



Launch Pin/Tab Transitions

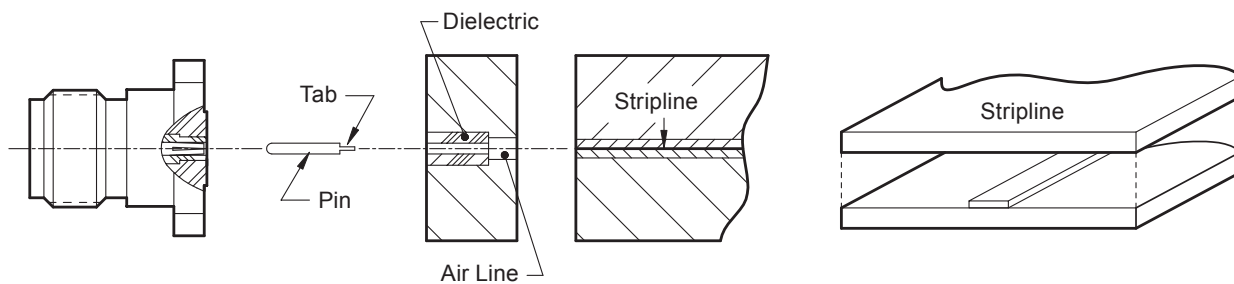


Launch Pin/Tab and Dielectric Transitions

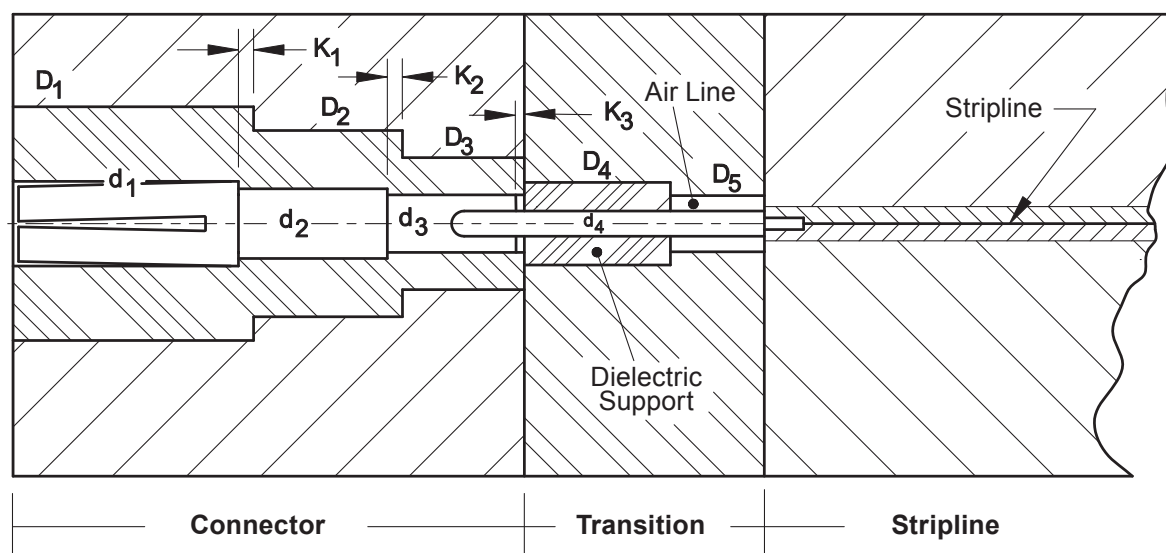


Launch Pin/Tab Transitions to Stripline Circuits

Launch Pin/Tab and Dielectric Transitions



Broadband microwave frequency transitions can be obtained by selecting launch connectors and accessories designed to provide controlled step-transition to the circuit substrate. The designer can choose standard Southwest Microwave products to develop optimum transitions to his circuit. Extremely thin substrates require precise control of compatible transition structure.



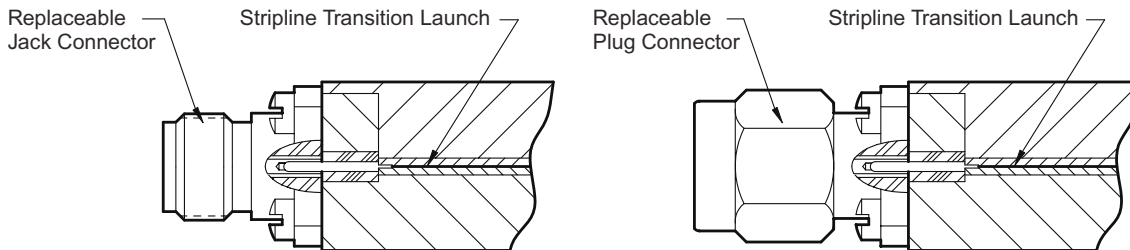


Accessories and Application Reference

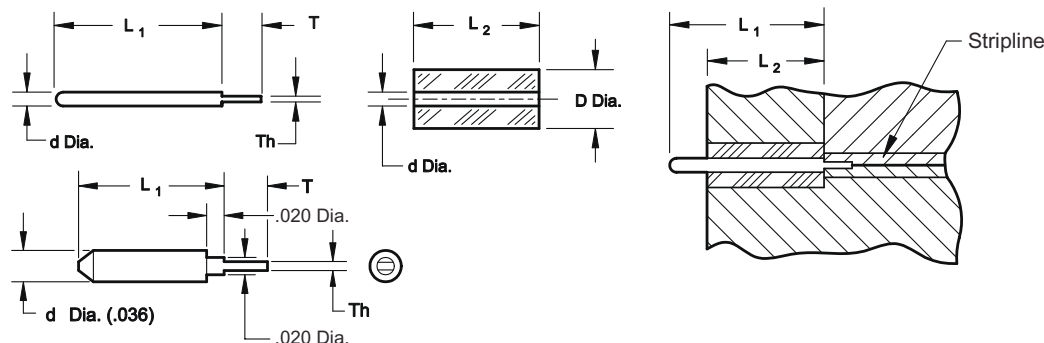
Launch Pin/Tab Transitions To Stripline Circuits

For Panel Mount Connectors

Launch Pin/Tab and Dielectric Transition to Stripline



Dielectric Transition



.036	.117	.050	.004	.175	.125	290-35G	290-35P	290-35D
				.237	.187	290-34G	290-34P	290-34D
.020	.064	.050	.004	.160	.125	290-27G	290-27P	290-27D
				.225	.187	290-26G	290-26P	290-26D
.015	.048	.040	.004	.160	.125	290-25G	290-25P	290-25D
				.225	.187	290-24G	290-24P	290-24D
.012	.039	.025	.004	.160	.125	1090-06G	1090-06P	1090-06D
				.225	.187	1090-07G	1090-07P	1090-07D
.009	.029	.015	.003	.160	.125	1490-03G	1490-03P	1490-03D
				.225	.187	1490-02G	1490-02P	1490-02D
d Dia.	D Dia.	T	Th	L ₁	L ₂	Pin/Tab & Dielectric*	Pin/Tab Only	Dielectric* Only
Model Numbers								

Refer to pages 104 for recommended launch hole dimensions.

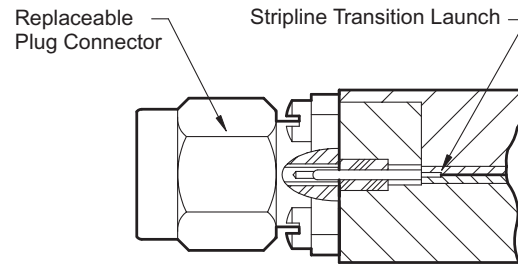
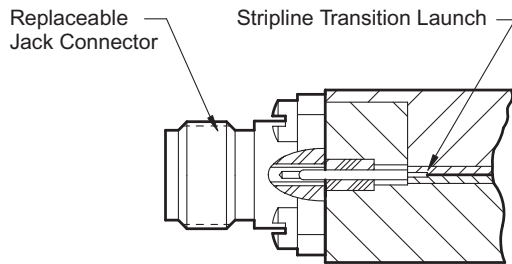
* Dielectric is PTFE.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

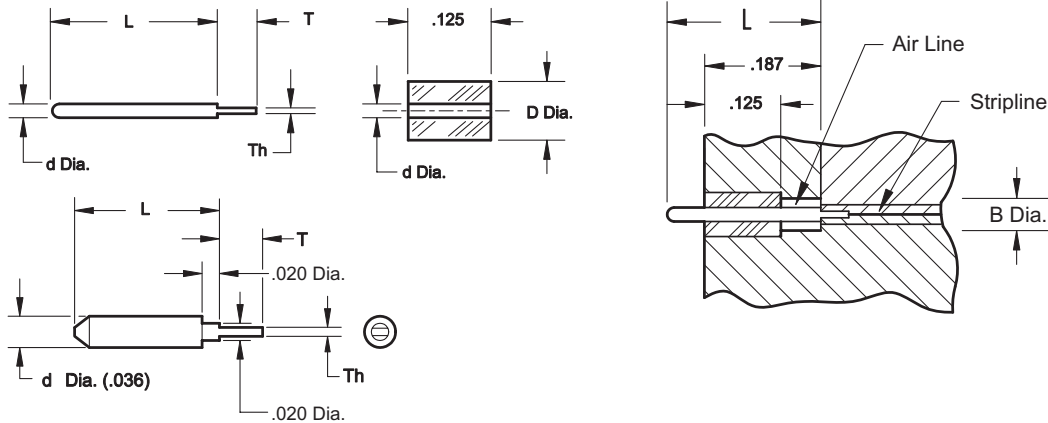
Launch Pin/Tab Step Transitions To Stripline Circuits

For Panel Mount Connectors

Launch Pin/Tab and Dielectric Step Transition to Stripline



Dielectric / Air Line Transition



.036	.117	.0465	.050	.004	.237	290-34P-35D	290-34P	290-35D
.020	.064	.0465	.050	.004	.225	290-26P-27D	290-26P	290-27D
.015	.048	.0335	.040	.004	.225	290-24P-25D	290-24P	290-25D
.012	.039	.0276	.025	.004	.225	1090-07P-06D	1090-07P	1090-06D
.009	.029	.0210	.015	.003	.225	1490-02P-03D	1490-02P	1490-03D
d Dia.	D Dia.	B	T	Th	L	Launch Pin & Dielectric*	Launch Pin Only	Dielectric* Only
Model Numbers								

Refer to pages 105 for recommended launch hole dimensions.

* Dielectric is PTFE.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

Super SMA Connectors
 N Series Connectors
 TNC Connectors
 2.92 mm Connectors
 SSMA Connectors
 2.40 mm Connectors
 End Launch Connectors
 Adapters
 Cable Connectors
 Launch Accessories
 Installation and Tools

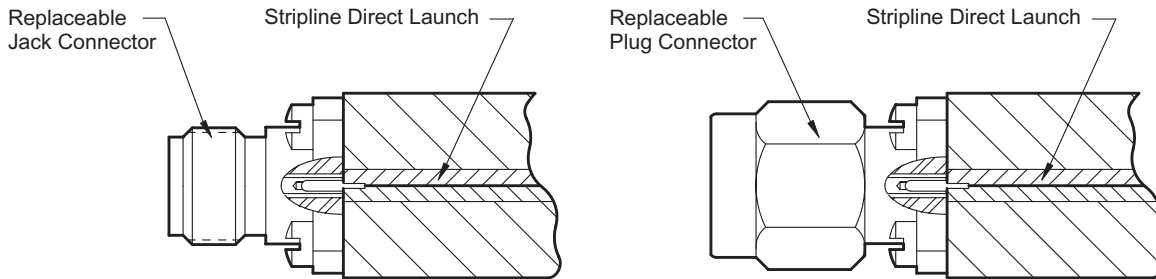


Accessories and Application Reference

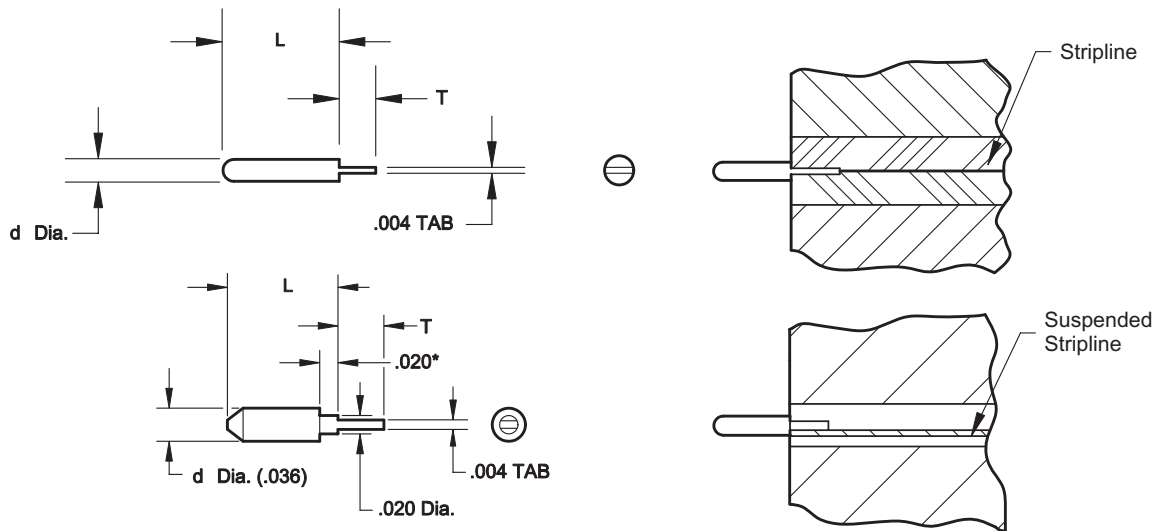
Launch Pin/Tab Direct Transitions To Stripline Circuits

For Panel Mount Connectors

Launch Pin/Tab and Dielectric Transition to Stripline

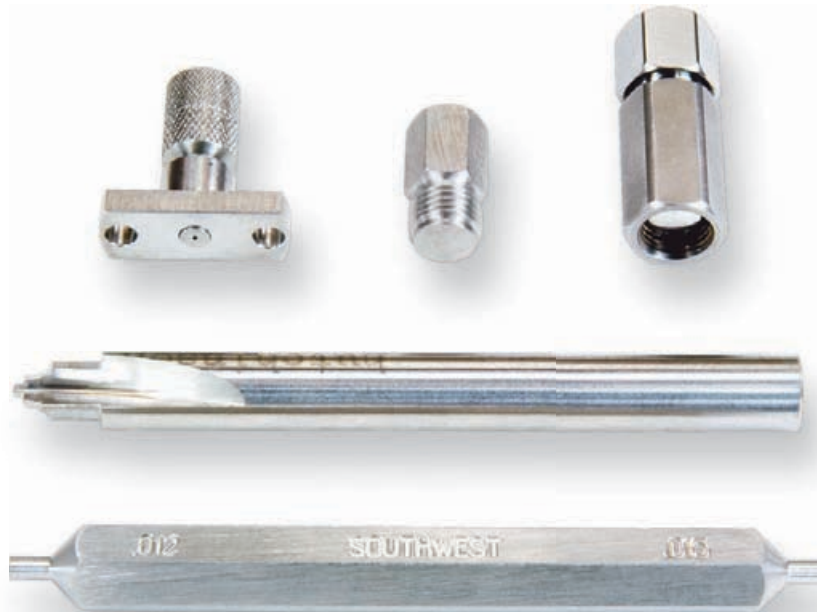


Direct Launch



.036	.075	.050	290-33G
.020	.080	.050	290-10G
.015	.085	.040	290-09G
.012	.050	.025	1090-05G
.009	.050	.015	1490-01G
d DIA	L	T	Model No.

All Southwest Microwave Models are Suitable for Space / Hi-Rel Applications (see page 109).

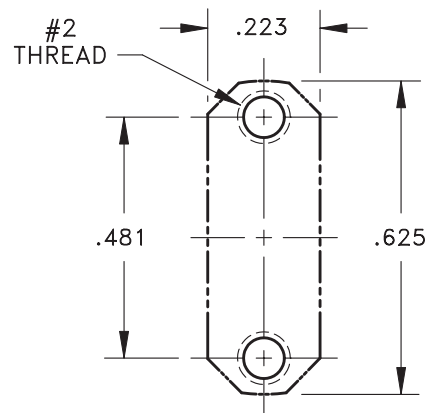
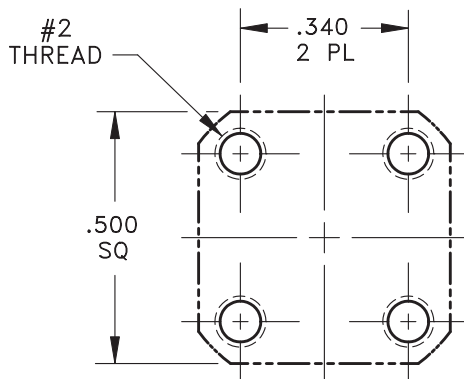
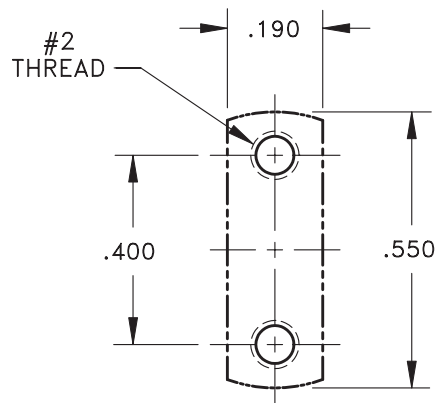
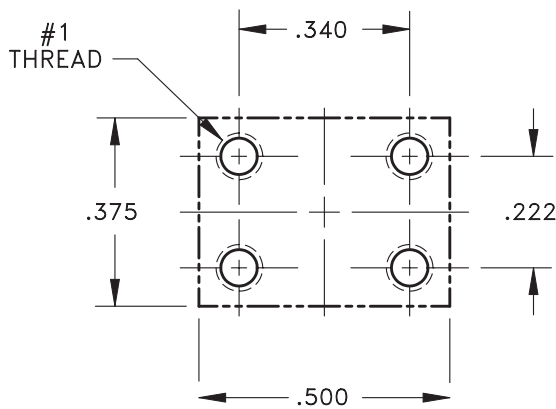
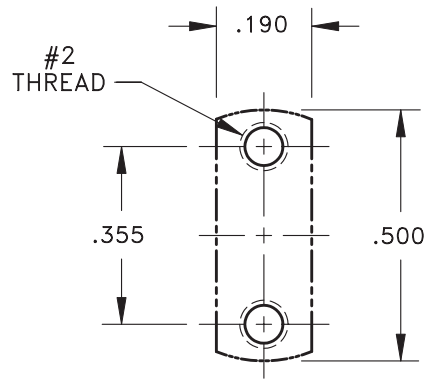
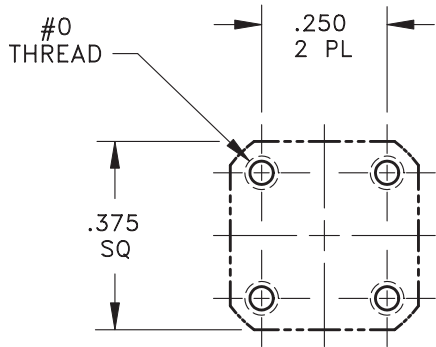


Index

<i>Installation and Tools</i>	Page
Connector Mounting Hole Chart	98
Hermetic Seal for Panel Mount Connectors	100
Hermetic Seal for Thread-in Connectors	102
SSMA Tools	103
Launch Pin and Dielectric Transitions.	104
Thread-in Installation Tools	106
Pin Insertion Tools	107

Unless otherwise specified, all dimensions are in inches.

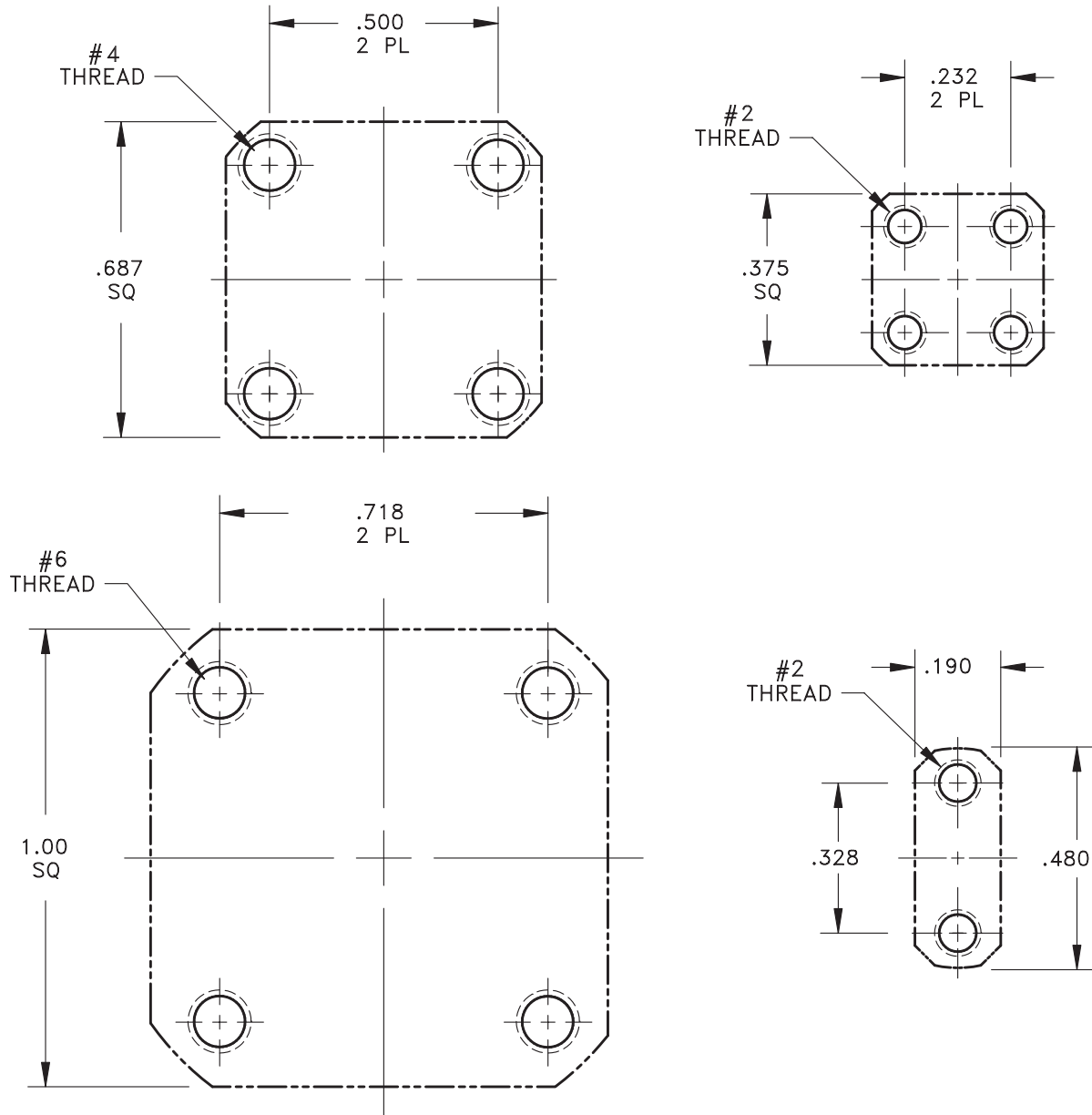
Connector Mounting Hole Chart for Panel Mount Connectors



Southwest Microwave suggests the use of
fillister head screws for mounting connectors.

**Detail Mounting Hole Chart
for Panel Mount Connectors**

Connector Mounting Hole Chart for Panel Mount Connectors



Southwest Microwave suggests the use of fillister head screws for mounting connectors.

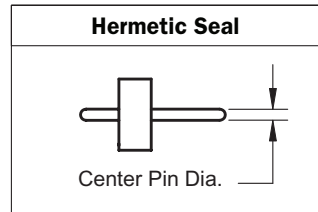
**Detail Mounting Hole Chart
for Panel Mount Connectors**

Hermetic Seal Transition for Panel Mount Connectors

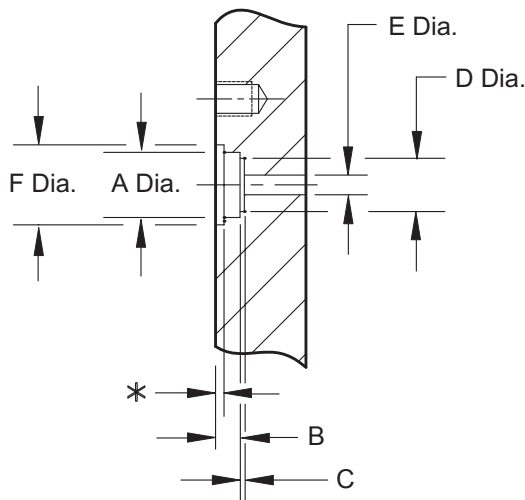
Recommended Hole Pattern, Tools and Installation Fixtures for Optimum VSWR.

* To be determined by user. Recommended "F" dia. X .025 deep to accommodate 3 solder rings .010 thick.

Surface must be plated to provide a solderable Surface.



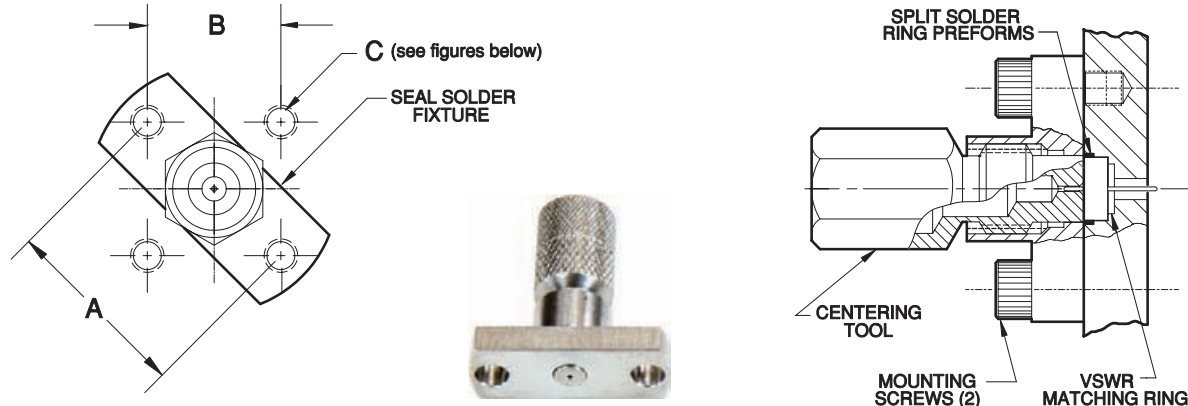
Refer to page 87 for all hermetic seal dimensions.



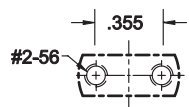
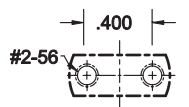
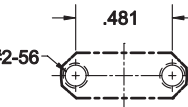
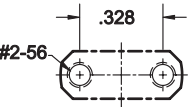
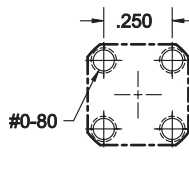
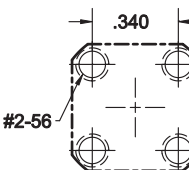
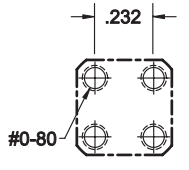
Hermetic Seal Model No.	Center Pin Dia.	A	B	C	D	E	F	C'Bore Tool Model No.
490-00G	.036	$\frac{.272}{.274}$	$\frac{.061}{.062}$	$\frac{.018}{.022}$	$\frac{.148}{.152}$	$\frac{.0823}{.0822}$	.288	T-491-1
290-02G	.020	$\frac{.161}{.160}$	$\frac{.062}{.061}$	$\frac{.010}{.009}$	$\frac{.126}{.124}$	$\frac{.0465}{.0455}$	.178	T-291-4
290-01G	.018	$\frac{.113}{.112}$	$\frac{.062}{.061}$	$\frac{.009}{.007}$	$\frac{.086}{.084}$	$\frac{.042}{.041}$	.130	T-291-3
290-00G	.015	$\frac{.102}{.101}$	$\frac{.0645}{.0635}$	$\frac{.007}{.005}$	$\frac{.080}{.078}$	$\frac{.035}{.034}$	.120	T-291-2
290-06G 290-07G	.012	$\frac{.079}{.078}$	$\frac{.057}{.056}$	$\frac{.0035}{.0025}$	$\frac{.067}{.065}$	$\frac{.028}{.027}$	.098	T-291-5
1490-13G 1490-14G 1490-15G	.009	$\frac{.072}{.074}$	$\frac{.057}{.058}$	$\frac{.006}{.008}$	$\frac{.0302}{.0322}$	$\frac{.0205}{.0211}$	.091	T-1491-1

**Hermetic Seal
installation**

Connector Mounting Hole Pattern and Installation Fixtures



Refer to page 98 & 99 for panel mount connector hole patterns.

		SSMA ONLY				
A DIM.		.355	.400	.481	.328	.328
2 HOLE FLG.	SEAL CTR. PIN DIA.	#2-56 	#2-56 	#2-56 	#2-56 	
MODEL NO.	.036	----	----	T-412-1	----	----
	.020	T-212-5	T-212-8	T-212-2	----	----
	.018	T-212-6	T-212-9	T-212-3	T-112-4	T-112-2
	.015	T-212-4	T-212-7	T-212-1	T-112-6	T-112-5
	.012	T-212-15	T-212-13	T-212-11	T-112-3	T-112-1
SOLDER TOOL	.009	T-1412-15	T-1412-13	T-1412-11	T-112-8	T-112-7
B DIM.		.250		.340		.232
4 HOLE FLG.		#0-80 		#2-56 		#0-80 

Seal installation using solder fixture

A. Center fixture and locate solder preform.

1. Bottom centering tool in fixture housing with small end protruding beyond fixture base.
2. Install preform around centering tool protrusion.
3. Hold fixture and preform upright. Align centering tool protrusion with seal counter bore in panel.
4. Secure fixture to panel with 2 mounting screws. The preform should be properly centered in the solder groove.

Note

Other soldering techniques may be utilized. Other methods should still achieve proper seal center conductor centering and position seal front surface orthogonal to connector axis to provide 360° of outer conductor contact for effective microwave performance.

B. Install and solder seal.

1. With preform located and fixture securely mounted. Remove centering tool.
2. Position seal center conductor onto tool with connector end in.
3. Reinstall centering tool, hand tighten to bottom seal in panel.
4. Apply heat to flow solder.
5. Remove fixture. 6. Clean. 7. Install connector.

**Hermetic Seal
installation**

Hermetic Seal Transition for Thread-in Connectors

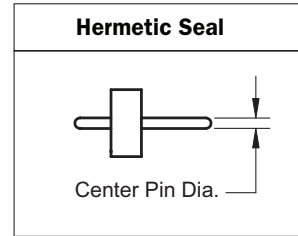
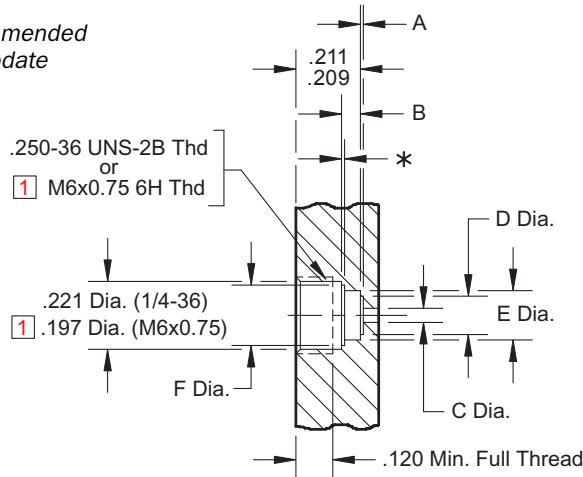
Recommended Hole Pattern, Tools and Installation Fixtures for Optimum VSWR.

* To be determined by user. Recommended "F" dia. X .025 deep to accommodate 3 solder rings .010 thick.

Surface must be plated to provide a solderable Surface.



1 Metric Thread (M6x0.75)



Refer to page 87 for all hermetic seal dimensions.

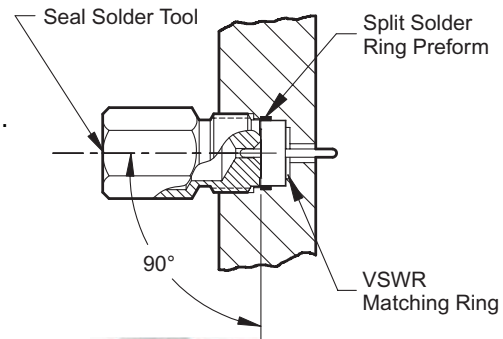
Hermetic Seal Model No.	Center Pin Dia.	A	B	C	D	E	F	C'Bore Tool Model No.	Solder Tool Model No.
290-02G	.020	.010 .009	.062 .061	.0465 .0455	.126 .124	.161 .160	.178	T-292-4	T-220-2
290-01G	.018	.009 .007	.062 .061	.042 .041	.086 .084	.113 .112	.130	T-292-3	T-220-3
290-00G	.015	.007 .005	.0645 .0635	.035 .034	.080 .078	.102 .101	.120	T-292-2	T-220-1
290-06G 290-07G	.012	.0035 .0025	.057 .056	.028 .027	.067 .065	.079 .078	.098	T-292-5	T-220-5
1490-13G 1490-15G	.009	.006 .008	.057 .056	.0205 .0211	.0302 .0322	.072 .074	.091	T-1492-1 1 T-1492-2	T-1420-5 1 T-1420-6

Seal Installation

1. Hold seal soldering tool upright.
2. Placing short end of seal center conductor into locating hole.
3. Place split solder ring preform over O.D. of seal. Let rest on tool.
4. Install into mounting hole keeping tool in upright position.
5. Solder seal into housing.
6. Remove tool and clean any residue as required.

Note:

Other soldering techniques may be utilized. Other methods should still achieve proper seal, center conductor centering, and position seal front surface orthogonal to connector axis to provide 360° of outer conductor contact for effective microwave performance.



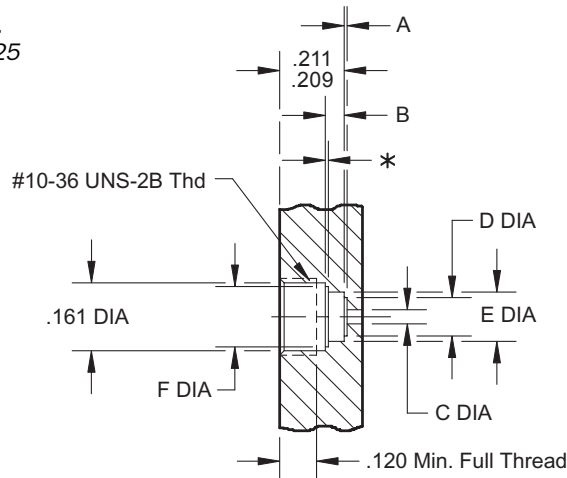
Hermetic Seal installation

SSMA Tools

Recommended Hole Pattern, Tools and Installation Fixtures for Optimum VSWR.

* To be determined by user.
Recommended "F" dia. X .025
deep to accommodate
3 solder rings .010 thick.

Surface must be plated
to provide a solderable
Surface.



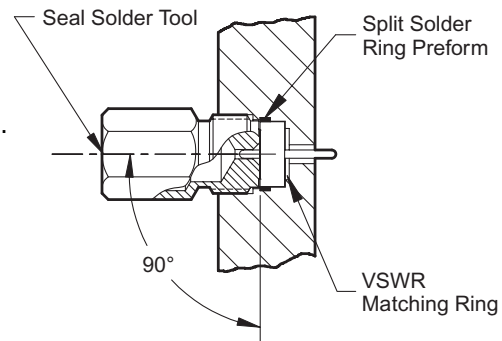
Hermetic Seal Model No.	Center Pin Dia.	A	B	C	D	E	F	C'Bore Tool Model No.	Solder Tool Model No.
290-01G	.018	$\frac{.009}{.007}$	$\frac{.062}{.061}$	$\frac{.042}{.041}$	$\frac{.086}{.084}$	$\frac{.113}{.112}$	.130	T-192-4	T-120-5
290-00G	.015	$\frac{.007}{.005}$	$\frac{.0645}{.0635}$	$\frac{.035}{.034}$	$\frac{.080}{.078}$	$\frac{.102}{.101}$	.120	T-192-3	T-120-4
290-06G 290-07G	.012	$\frac{.0035}{.0025}$	$\frac{.057}{.056}$	$\frac{.028}{.027}$	$\frac{.067}{.065}$	$\frac{.079}{.078}$	.098	T-192-1	T-120-2
1490-13G 1490-14G 1490-15G	.009	$\frac{.006}{.008}$	$\frac{.057}{.056}$	$\frac{.0205}{.0211}$	$\frac{.0302}{.0322}$	$\frac{.072}{.074}$	.091	T-192-2	T-120-3

Seal Installation

1. Hold seal soldering tool upright.
2. Placing short end of seal center conductor into locating hole.
3. Place split solder ring preform over O.D. of seal. Let rest on tool.
4. Install into mounting hole keeping tool in upright position.
5. Solder seal into housing.
6. Remove tool and clean any residue as required.

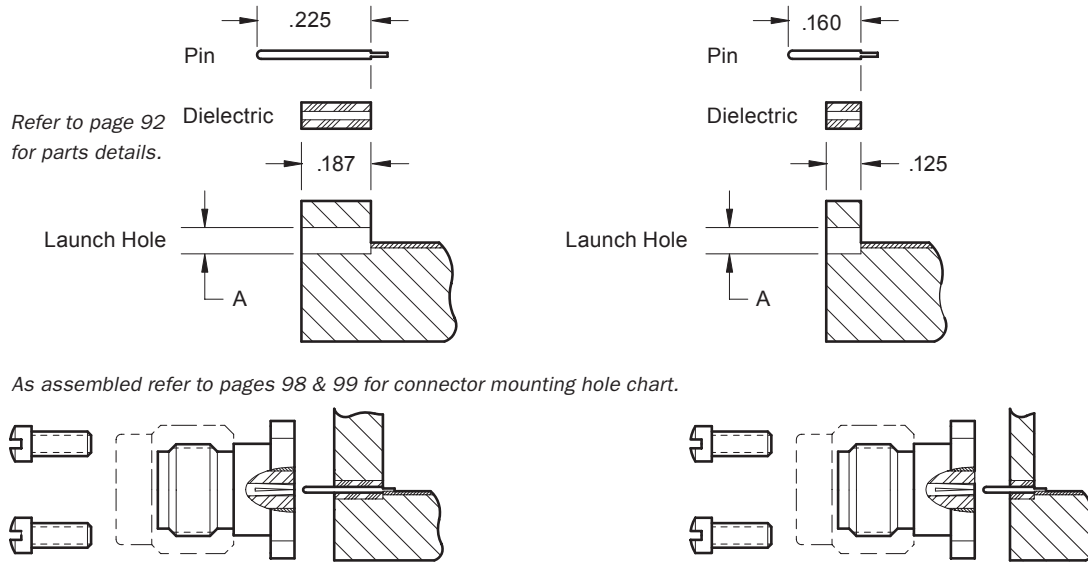
Note:

Other soldering techniques may be utilized. Other methods should still achieve proper seal, center conductor centering, and position seal front surface orthogonal to connector axis to provide 360° of outer conductor contact for effective microwave performance.

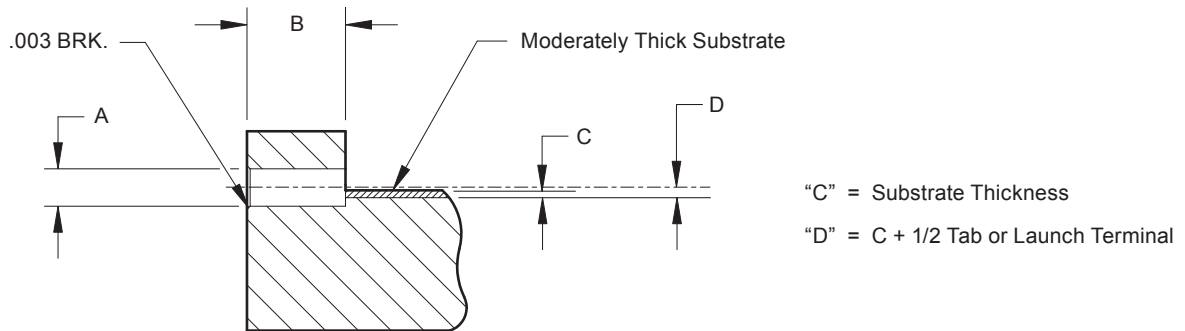


**Hermetic Seal
Installation**

Dielectric and Launch Pin or Launch Pin/Tab Transition for Panel Mount Connectors



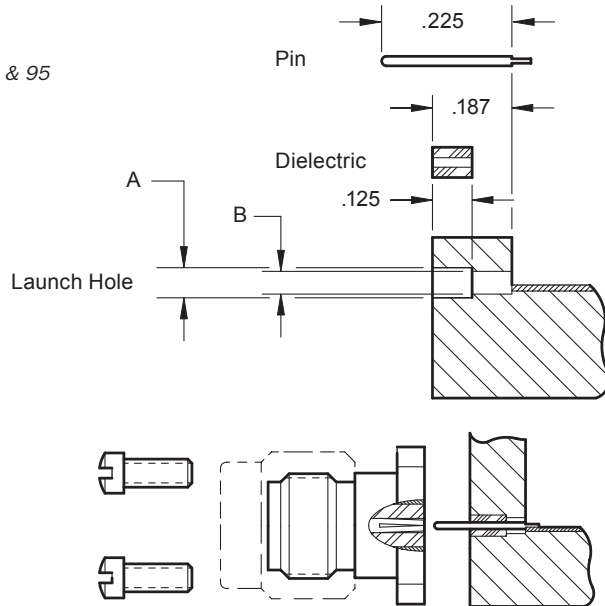
Recommended Launch Hole Dimensions



.036	.237	.116	#32	.187
.020	.160	.0635	#52	.125
.020	.225	.0635	#52	.187
.015	.160	.0492	1.25mm	.125
.015	.225	.0492	1.25mm	.187
.012	.160	.039	#61	.125
.012	.225	.039	#61	.187
.009	.160	.029	#69	.125
.009	.225	.029	#69	.187
FOR PIN DIA	FOR PIN LENGTH	A DIA (DRILL #) ±.0003	B ±.002	

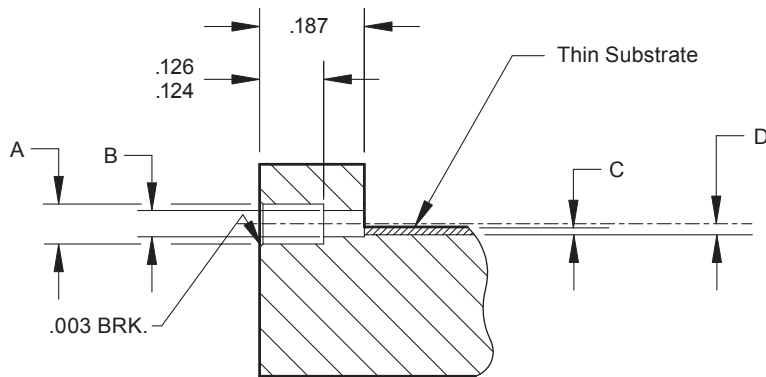
Dielectric and Launch Pin or Launch Pin/Tab Transition for Panel Mount Connectors

Refer to pages 91 & 95 for parts details.



As assembled refer to pages 98 & 99 for connector mounting hole chart.

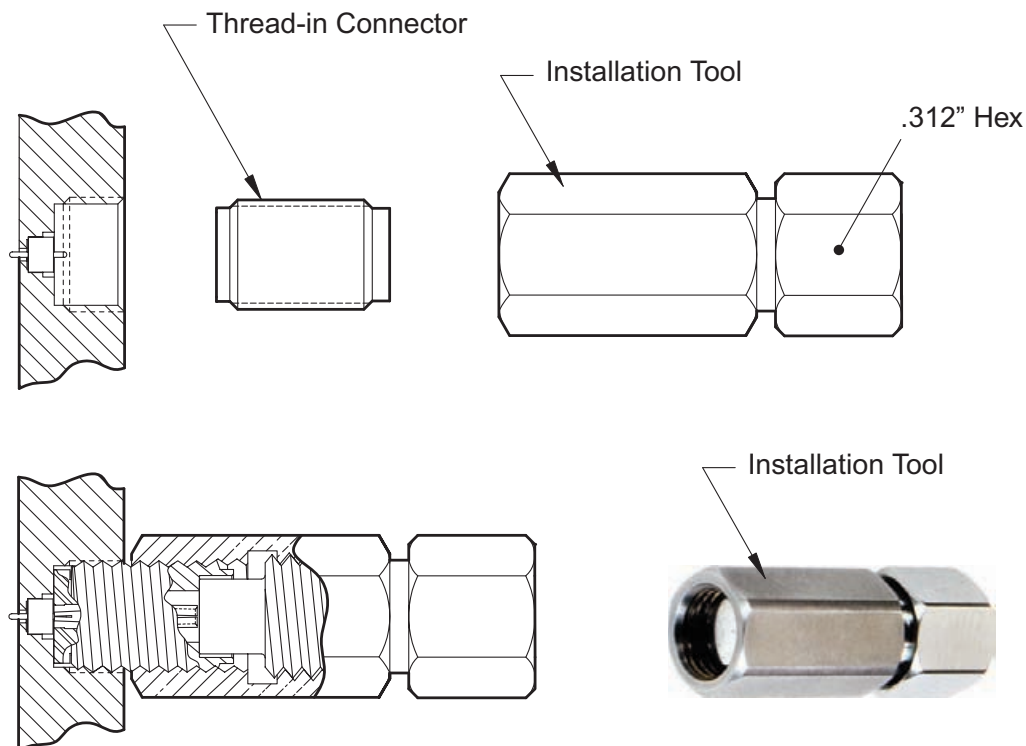
Recommended Launch Hole Dimensions



"C" = Substrate Thickness
"D" = C + 1/2 Tab or Launch Terminal

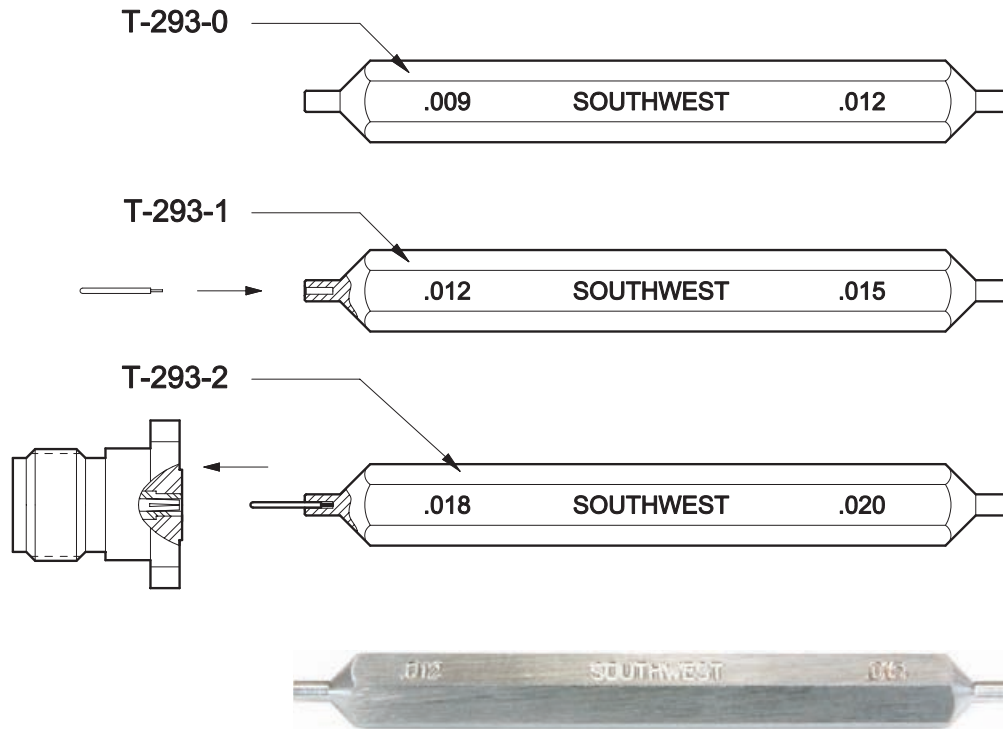
.036	.237	.116	#32	.0465	#56
.020	.225	.0635	#52	.0465	#56
.015	.225	.0492	1.25mm	.0335	0.85mm
.012	.225	.039	#61	.0276	0.70mm
.009	.225	.029	#69	.0210	#75
FOR PIN DIA	FOR PIN LENGTH	A DIA (DRILL #) ±.0003		B DIA (DRILL #) ±.0003	

Installation Accessory for Thread-in Connector Series



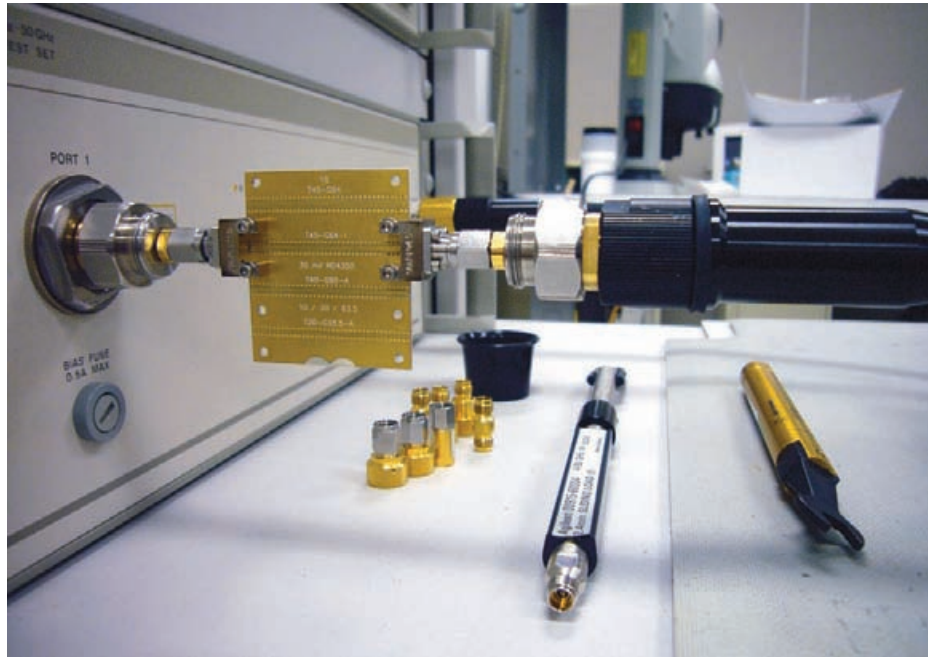
T-1420-1	2.40 mm
T-1020-1	2.92 mm, 3.5 mm and SMA
T-120-1	SSMA
Model No.	Thread-in Connector Series

Pin Insertion Tools



1. Select proper tool from the table below.
2. Insert pin into tool as illustrated (tab or small dia. first).
3. Align pin with socket contact in connector as illustrated.
4. Insert pin into contact with gentle firm pressure.
5. Remove tool. Use tweezers for next operation.
6. Set pin to desired depth and rotate to align tab if necessary.

To Accept Pin Dia.	Model #
.009	T-293-0
.012	T-293-0, -1
.015	T-293-1
.018	T-293-2
.020	T-293-2



Index

<i>Appendix</i>	Page
S-Level and Hi-Rel Connectors	109
Power Rating for Coaxial Connectors	113
Mounting Guidelines For Flange Mount Connectors	118
Mating Microwave Connectors	121
RF Versus Microwave SMA Connectors	122
EMI/RFI Shielding Standards	124
Materials Commonality in Connectors	126
Connector Compatibility (Intermateability)	126

Unless otherwise specified, all dimensions are in inches.

S-Level and Hi-Rel Connectors

For Military & Spaceflight Applications



Southwest Microwave has been delivering S-Level (Space) and Hi-Rel connectors since 1991.

Use of Southwest Microwave connectors in these applications is important to achieving final systemic results. A list of S-Level / Hi-Rel customers using Southwest Microwave connectors include:

Partial Customer List

- Anaren
- Boeing Satellite
- Boeing Defense
- EADS Astrium
- Elta Electronics
- General Dynamics
- Harris Corp.
- Hughes Space
- India Space Application Center
- JPL
- L3 Narda
- L3 Communications
- L3 Satellite Networks
- Lockheed Martin
- Miteq
- Merrimac Industries
- Motorola
- Northrop Grumman
- NASA Langley
- Space Systems / Loral
- Tecnológica
- Teledyne
- TRW Space

Features:

- ▶ COTS (commercial-off-the-shelf) connectors can be up screened for space level jobs.
- ▶ *SuperSMA*™ to 165° C, all others rated to 135° C (Max operation 165° C).
- ▶ Industry lowest VSWR and RF leakage.
- ▶ Fully space-tested connectors can be delivered in 4 to 6 weeks.
- ▶ All materials used in Southwest connectors are lot-traceable to raw material.
- ▶ All materials meet NASA's requirements for out gassing.
- ▶ Center conductors rigidly captured with hi-temp mechanical bead.
- ▶ Applications utilizing non-standard space designs in 10 to 12 weeks.



S-Level and Hi-Rel Connectors

For Military & Spaceflight Applications

Southwest Microwave

Recommended Test Plans *(see next page)*

Southwest Microwave uses MIL-PRF-39012 as a reference for interface specifications and test methods. There are additional tests SMI recommends be performed in addition to MIL-PRF-39012 to ensure proper performance during the actual usage of the connectors. The most important of these is **temperature cycling** to ensure the interface and the electrical performance are stable over the full temperature range. MIL-PRF-39012 does not require testing after temperature cycling.

COTS Considerations

Outgassing: All material used in connector assemblies meet NASA out gassing requirements. *(See page 118)*

Material Traceability: All material used in connector assemblies has traceability to raw material. This allows SMI to use any item in stock for space level applications.

Single Lot Control: SMI builds to stock in large quantities so small quantities requiring single lot control of all raw materials are usually available in stock.

Source Control Drawings (SCD): SMI has an extensive database of customer source control drawings for commercial and hi-rel applications. Due to extensive experience working with SCD's, SMI is frequently asked to contribute technical material and assistance in their creation.



Space Screening: Test plans are generated in accordance with SCD requirements and most tests are performed in-house. Tests are performed and the results recorded in accordance with the test plan. The results are then combined with material certs and lot traceability information into a document called an Acceptance Test Report (ATR).

Destructive Physical Analysis (DPA): When DPA is required, SMI works with several quality labs that provide DPA services. SMI oversees the testing and integrates the DPA results into the ATR.

Qualification Testing: SMI can perform most of these tests in-house and will coordinate with outside labs for those other tests, such as shock and vibration that require special equipment. SMI will design and build the necessary tools to facilitate these tests.

Source Inspections: SMI has hosted many source inspections in coordination with several major space and hi-rel customers, and is familiar with what is required to facilitate and streamline them.

CONNECTOR TYPE	FREQ
SuperSMA™	27 GHZ
2.92 MM	40 GHZ
2.40 MM	50 GHZ
TNC	18 GHZ
N	18 GHZ
SSMA	36 GHZ

Southwest Microwave connectors are ideal in military and space flight applications where power management and low loss interconnects are critical.

SMI connectors have the lowest VSWR in the industry, with typical VSWR of 1.10 : 1 (return loss of -26 dB) up to 50 GHz.

SMI offers the additional advantage of low RF leakage of <-100 dB typical.

SOUTHWEST MICROWAVE RECOMMENDED ACCEPTANCE TEST TABLES

TABLE I - GENERAL PRODUCT ASSURANCE (DERIVED FROM GROUP A REQUIREMENTS)

INSPECTION TYPE (VISUAL AND MECHANICAL EXAMINATION)	MIL-PRF-39012 REQUIREMENT REFERENCE PARAGRAPH	MIL-PRF-39012 TEST METHOD REFERENCE PARAGRAPH	RECOMMENDED MIL-PRF-39012 SAMPLE SIZE
MATERIAL FINISH	3.3	TABLE I	C OF C _s
DISSIMILAR METALS	3.3.1	-----	C OF C _s
MARKING	3.3.2	MIL-STD-889	100%
WORKMANSHIP	3.29	MIL-STD-130	100%
	3.30	-----	100%

TABLE II - PRODUCT PERFORMANCE ASSURANCE (DERIVED FROM GROUP B REQUIREMENTS WITH THERMAL SHOCK ADDED)

INSPECTION TYPE (DESIGN AND CONSTRUCTION TESTING)	MIL-PRF-39012 REQUIREMENT REFERENCE PARAGRAPH	MIL-PRF-39012 TEST METHOD REFERENCE PARAGRAPH	RECOMMENDED MIL-PRF-39012 SAMPLE SIZE
CONFIGURATION AND FEATURES	3.4	FIGURES	TABLE IV
CONTACT GAGING (MATING CHARACTERISTICS)	3.7	4.7.4	TABLE IV
CONTACT RETENTION	3.12	4.7.9	TABLE IV
VSWR	3.14	4.7.11	TABLE VI
INSERTION LOSS	3.27	4.7.24	TABLE VI
CONNECTOR INTERFACES	3.4.3	MIL-STD-348	TABLE IV
THERMAL SHOCK	3.20	4.7.17	100%
CONTACT GAGING (MATING CHARACTERISTICS)	3.7	4.7.4	TABLE IV
CONTACT RETENTION	3.12	4.7.9	TABLE IV
VSWR	3.14	4.7.11	TABLE VI
INSERTION LOSS	3.27	4.7.24	TABLE VI
CONNECTOR INTERFACES	3.4.3	MIL-STD-348	TABLE IV
DIELECTRIC WITHSTANDING VOLTAGE	3.17	4.7.14	100%

**NOTE: SMI RECOMMENDS TESTING BEFORE AND AFTER THERMAL SHOCK
TO ENSURE PROPER OPERATION IN SPACE ENVIRONMENTS.**



S-Level and Hi-Rel Connectors

For Military & Spaceflight Applications

NASA
Reference
Publication
1124
Revision 4

June 1997

Outgassing Data for Selecting Spacecraft Materials

Neil A. Walter
John J. Scialdone
Goddard Space Flight Center
Greenbelt, Maryland



National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771
1997

ALPHABETICAL LISTING

MATERIAL	DATA REFERENCE	MFR CODE	%TML	%VCM	%WVR	CURE TIME	CURE TEMP	ATMOS	APPLICATION
▲ GORE-TEX JOINT SEALANT W/ADH STRIP EXPANDABLE PTFE	GSC18446	WLG	0.44	0.16	0.00				GASKET-SEALANT
GORE-TEX MICROWAVE CABLE INNER INSULATION WHITE	GSFC9032	WLG	0.02	0.00	0.00				CABLE INSUL
GORE-TEX MICROWAVE CABLE OUTER INSULATION PURPLE	GSFC9035	WLG	0.04	0.00	0.00				CABLE INSUL
▲ GORE-TEX PTFE TEFLON CABLE INSULATION 3 PLY	GSC12475	WLG	0.03	0.00	0.00				CABLE INSUL
GPO/TW BLACK POLYOLEFIN SHRINK TUBING HEATGUN SHRINK	GSC19219	RTC	1.20	0.28	0.13				SHRINK TUBING
IMPAX 5M W/UHMW POLYMER - NATURAL	GSFC6470	IPY	0.22	0.03	0.01				STRUCTURAL
JF 1004 POLYETHERSULFONE/GLASS AS 80/20 BW	GSC10227	LNP	0.59	0.00	0.40				MOLD CPND
▲ JF 1008 POLYETHERSULFONE/GLASS AS 60/40 BW BLACK	GSC10242	LNP	0.49	0.00	0.32				MOLD CPND
KEL-F 81 CHLOROFLUOROCARBON CLEAR MOLD CPND	GSC19637	MMM	0.02	0.01	0.01				MOLD CPND
KEL-F BLUE SCREW INSERT MATERIAL	GSC20872	MMM	0.03	0.00	0.01				MOLD CPND
▲ UDRI-3 ACRYLIC COPOLYMER/GRAPHITE/CARBON BLACK	GSC14794	GEV	0.58	0.03	0.19				DAMPER
ULTEM 1000 CLEAR AMBER MOLD CPND UNREINFORCED	GSC13558	GEC	0.40	0.00	0.16				MOLD CPND
ULTEM 2100 BROWN GLASS REINF/POLYETHERIMIDE	GSC20240	GEC	0.51	0.01	0.34				MOLD CPND
ULTEM 2200 BROWN MOLD CPND FIBER REINFORCED	GSC17806	GEC	0.42	0.01	0.30				MOLD CPND
ULTEM 2300 BROWN	GSC19820	GEC	0.43	0.01	0.22	14D	50	E-2	MOLD CPND
ULTEM 2300 COLOR 1000 LOT UA9287	GSC21001	GEC	0.39	0.01	0.20				MOLD CPND
ULTEM D6202 GREY/BROWN MOLD CPND FILLED	GSC13561	GEC	0.37	0.00	0.16				MOLD CPND
ULTEM DL-4151 FILM FROM ULTEM 5001 RESIN	GSC19552	GEC	0.41	0.01	0.38				FILM-MOLD CPND
VARNISH STERLING THERMOPOXY T-653-LBH	GSFC4890	STV	0.70	0.02		4H	180	AIR	VARNISH
▲ VARY-FLEX EPOXY POLYAMIDE	GSC12550	SIP	0.64	0.01	0.27	24H	25	E-5	POTTING
VC-3 NYLOCK SEALING CPND	GSFC2637	NYL	3.61	0.62		24H	25	AIR	
VC-3 NYLOCK SEALING CPND	GSFC4025	NYL	3.99	0.68		40H	121	AIR	
						1H	74	AIR	THREAD SEALANT
						1H	121	AIR	THREAD SEALANT

LIST OF MATERIALS USED BY SMI:

- A) PTFE FLUOROCARBON INSULATOR
- B) VARY FLEX EPOXY POLYAMIDE
- C) *ULTEM 1000
- D) **KEL-F

*ULTEM IS A TRADEMARK OF GENERAL ELECTRIC, INC. **KEL-F IS A TRADEMARK OF 3M COMPANY.
SuperSMA IS A TRADEMARK OF SOUTHWEST MICROWAVE, INC.



Southwest Microwave, Inc.

www.southwestmicrowave.com

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Power Rating for Coaxial Connectors



**SOUTHWEST MICROWAVE, INC.
MICROWAVE PRODUCTS DIVISION**

9055 South McKemy Street
Tempe, Arizona 85284-2946
Telephone (480) 783-0201
Fax (480) 783-0360

SUBJECT: Power Rating For Coaxial Connectors

The key characteristic that determines average power handling capabilities for mated coaxial connectors is its ability to pass high current and keep heat-rise to a moderate temperature. This heating directly relates to contact resistance. Contact resistance is a function of contact surface area. Therefore, a properly formed socket contact is critical. If the connectors are long, then conductor length resistance may start to dominate.

Contact design must achieve a large surface contact area. Many low cost contacts usually provide point contact and then vary considerably from lot to lot.

High power failure is caused by the generation of heat at the contacting surfaces. When the contact resistance approaches surface resistance including skin effect, the ultimate power handling level will be approached. Application results are affected by heat-sinking of the connector plus the connector's construction and use of higher-temperature materials.

Thus, there is not an absolute power handling figure for a connector type. Results may vary from supplier-to-supplier due to design, materials and manufacturing latitudes taken by each. Therefore, achieving a desired performance from a supplier may not assure consistency, unless these critical parameters are understood and well-controlled.

Therefore, published power ratings typically are conservative.

The attached charts present expected mean power handling figures.

Rev: 2.6



Power Rating for Coaxial Connectors



**SOUTHWEST MICROWAVE, INC.
 MICROWAVE PRODUCTS DIVISION**

9055 South McKerny Street
 Tempe, Arizona 85284-2946
 Telephone (480) 783-0201
 Fax (480) 783-0360

**AVERAGE AND PEAK POWER RATINGS
 FOR
 COAXIAL CONNECTORS**

1.0 Average Power

The attached graph summarizes average power rating for some of our popular connectors. This rating is typical for the connector interface and surrounding structure. The systems rating will be dependent upon the circuit or cable the connector is attached to. In most instances, the circuit or coaxial cable becomes the limiting factor.

The limiting factor for average power rating is temperature. The temperature is directly related to the resistive losses of the device. Power handling capability of a coaxial connector is conservatively rated because typical failure occurs at the connector attachment to cable or circuitry. Impurities in the connector area such as flux or other foreign matter can also affect power handling capabilities.

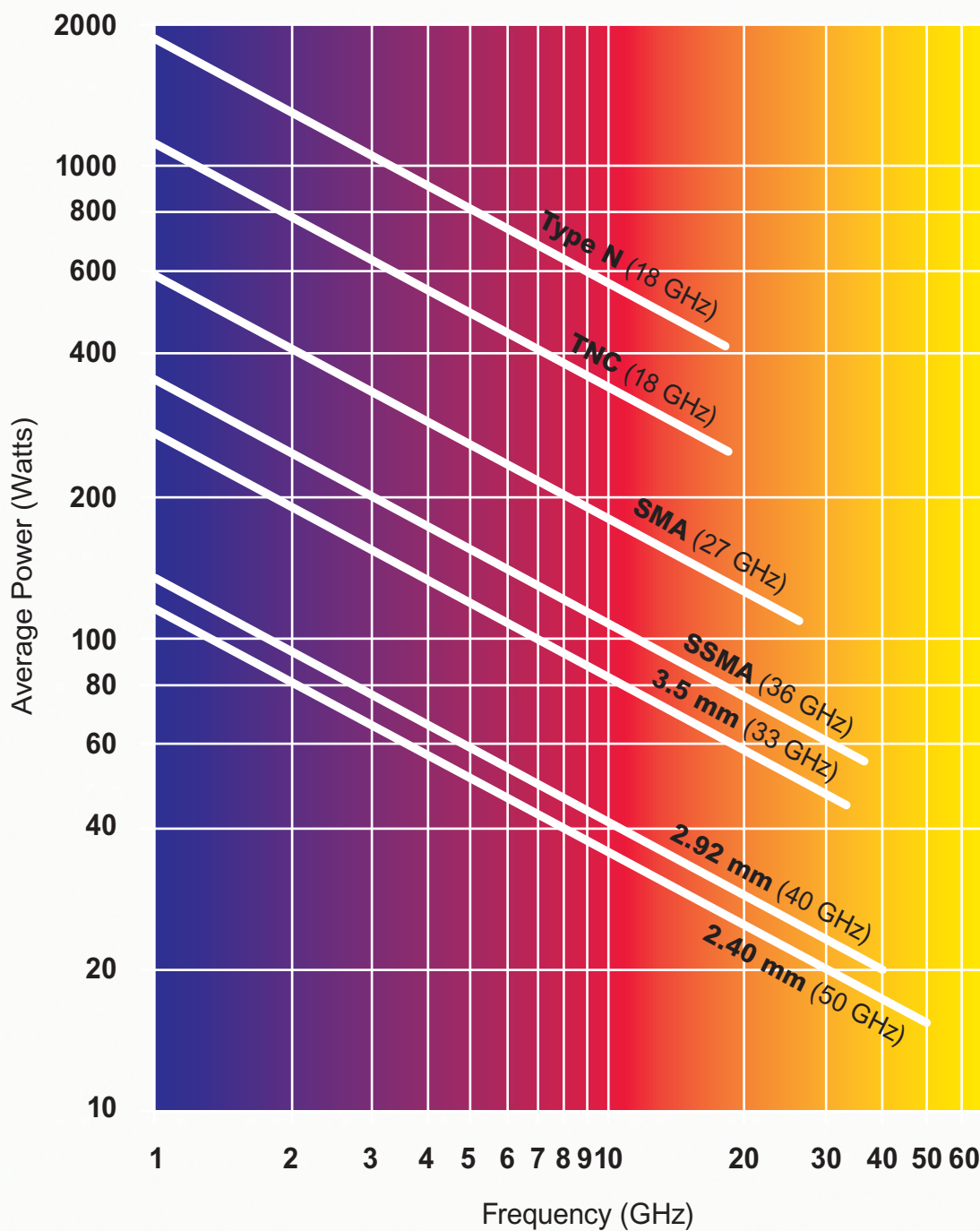
Power handling capabilities may be increased by efficiently heat sinking the connector.

The average power rating decreases with frequency because the resistive losses increase with frequency.

Power derating for altitude and temperature is provided on chart.

Power Rating for Coaxial Connectors

Coaxial Connector Average Power Handling Graph



Power Rating for Coaxial Connectors

TYPICAL AVERAGE
POWER DERATING FACTORS

TEMP °C	DERATING FACTOR	ALTITUDE X 1000 FT	DERATING FACTOR
0	1.20	0	1.0
40	1.0	20	.80
80	.80	30	.70
120	.60	40	.60
160	.40	50	.50
200	.20	60	.40
240	.05	70	.30

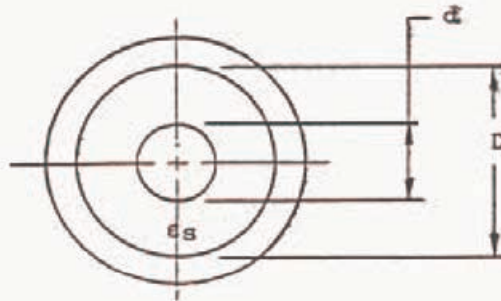
Example Calculation:

At 120°C and 60,000 Ft:
Derate average power by .60 x .40
or average power x .24

2.0 Peak Power

Peak Power limitation is due to high voltage break down. This break down is directly dependent upon the dielectric strength of the total device. This break down typically takes place where a short air path may exist. The peak power rating is not frequency dependent.

A typical calculation example:



A. Voltage Breakdown 25°C at sea level

$$E\delta = \frac{d}{2} \ln (D/d) \sim \epsilon_s$$

ϵ_s = dielectric strength
 = 25,000 volts/inch in air
 = 300,000 volts/inch in TFE Fluorocarbon (Teflon)

B. Peak Power

$$P_k P = \frac{(E\delta / \sqrt{2})^2}{Z_0} \quad \text{Perfect Load}$$

$$P_k P = \frac{(E\delta / \sqrt{2})^2}{4Z_0} \quad \text{Short or Open Circuit}$$

The above treatment covers situations for short duration pulses and is treated independently of corona initiation. Peak voltage limits at altitude becomes limited by corona figures as specified in the lead sections of the catalog.

Mounting Guidelines for Flange Mount Connectors



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INSTALLATION PROCEDURE FOR FLANGE MOUNT MICROWAVE CONNECTORS PRODUCED BY SOUTHWEST MICROWAVE

Microwave connectors by Southwest Microwave are uniquely designed to optimize transmission line parameters. This results in a cost-effective solution where higher frequency performance is important, along with repeatability and reliability.

MOUNTING CONSIDERATIONS

- Connector installation deserves the same care and attention that is provided for internal parts and the processing of circuits. The work and cost associated with precision etching, plating, semiconductor placement, etc., should be complimented by the same care in connector placement. Using inferior connectors on high performance products is not cost effective due to tuning required and performance degradation. Similarly, improper mounting may degrade the unique performance of a Southwest Microwave connector.
- Solid 360-degree metal-to-metal contact is required for both the pin-socket interface and the outer-coaxial-to-panel path. Positive electrical pathways insure a continuous coaxial transmission line. Reflection losses are minimized. This is basic microwave technology but it is sometimes ignored when only mechanical mounting is considered.
 - Never use conductive O-rings to mount connectors for microwave or millimeter wave applications. The space needed for the groove to hold the O-ring moves the O-ring away from the outer coaxial paths. Therefore, the result is not 50-ohms. Performance will be degraded for higher frequency applications.
 - These connectors are part of a microwave transmission line. If environmental or pressure sealing is required, Southwest Microwave should be contacted to assure that a proper connection is provided that will still provide 360 degree grounding and also include considerations for environmental or pressure sealing.
- Specific items to consider include:
 - Most connector flanges have slightly irregular surfaces due to bar stock cutoff, drilling of holes, etc.
 - Panels are not perfectly flat.
 - Prior to assembly, connectors should be tested back-to-back to confirm performance. If results differ in the application, then other parameters must be evaluated for cause.
 - If a hermetic seal is to be used with the connector, the seal must be installed first using the hole patterns, installation tools and fixtures as shown in Southwest Microwave's product literature. Installation dimensions and tooling varies for different seals.
 - If accessories such as pins and dielectrics are to be used with the connector, the user should determine their own choices for installation of the pins, etc. If the pin is first installed into the connectors, then it should be attached to circuit after the

Rev. A

of 1

PROPER INSTALLATION OF FLANGE MOUNT MICROWAVE CONNECTORS
 PRODUCED BY SOUTHWEST MICROWAVE, Page 2.

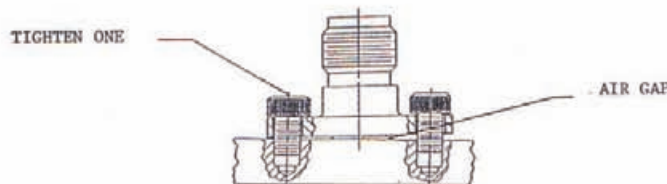
connector is mounted. Alternatively, the pin first may be soldered in place. Care must be taken to assure that the proper length of pin is available for insertion into the connector. These parameters are “application specific” and are based upon user dimensions not controlled by Southwest Microwave.

- The installer must remember that there is a raised 360-degree metal grounding ring around the center coaxial area.
 - The raised ring is intended to provide a high normal force for electrical grounding at the coaxial path.
 - The raised area does not extend outward for the entire flange. It is possible to improperly mount the connector with one side lower than the other side if you are not careful.

INSTALLATION STEPS

(Note: The user is reminded to think about the actions involved with replacing a spare tire. Lug nuts are snug in place and incremental tightening is done for opposing nuts during repetitive cycles. Eventually, all nuts are tightening evenly.)

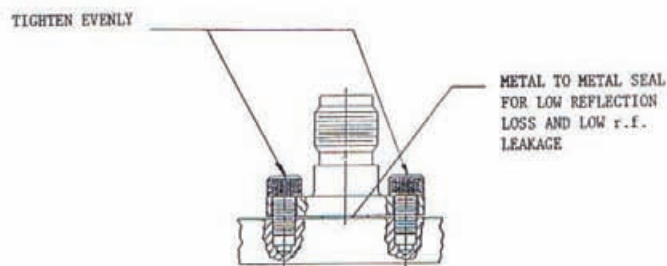
- A. First, the connector is placed in position with the rear-pin (or other accessory) properly aligned.
- B. Next, the mounting holes in the connector flange are aligned with the mounting holes in the panel or housing.
- C. The screws must be installed using minimal force. Do NOT torque-down. Initially, do NOT fully secure the screws. The screws should be “snug” but still permit very slight minor movement of the connector.
- D. It is important that the connector flange be kept parallel to the panel. It must not be cocked so that one edge is closer to the panel than the other edge. The raised 360-degree metal grounding ring must rest evenly against the panel.
 - If one side is torqued down tightly without balancing with the other side, then the opposite flange will lift up away from the panel.
 - This will cause the part of the 360-degree metal ring under the lifted side to also be lifted up and not lie flat against the panel. There will be an air gap under the raised side, preventing 360-degree grounding. The result is degraded performance.



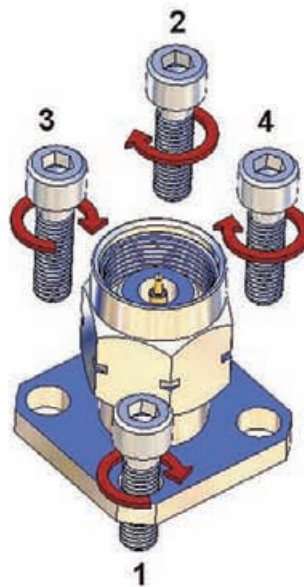
Rev. A

PROPER INSTALLATION OF FLANGE MOUNT MICROWAVE CONNECTORS
 PRODUCED BY SOUTHWEST MICROWAVE, Page 3.

- E. The screws are installed by applying force to opposite screws, until all hardware is properly secured. For connectors with more than 2 mounting screws, screws should be snugged and then incrementally tightened going from one screw to another in rotation.



For example, a possible sequence for screw-tightening a 4-hole mount connector could be the following:



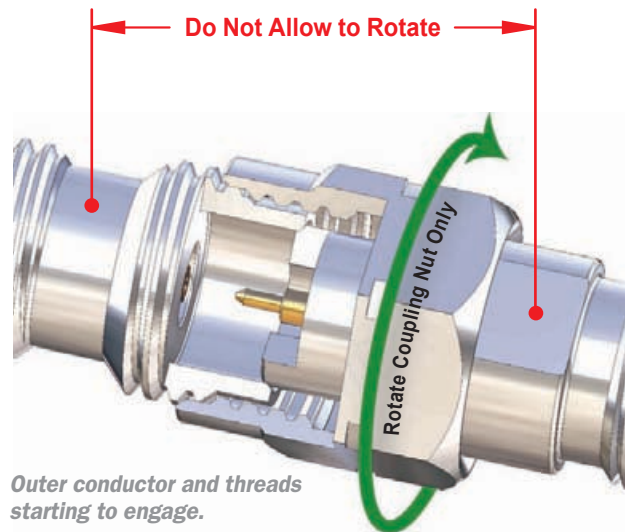
Rev. A

Proper Procedure for Mating Microwave Connectors

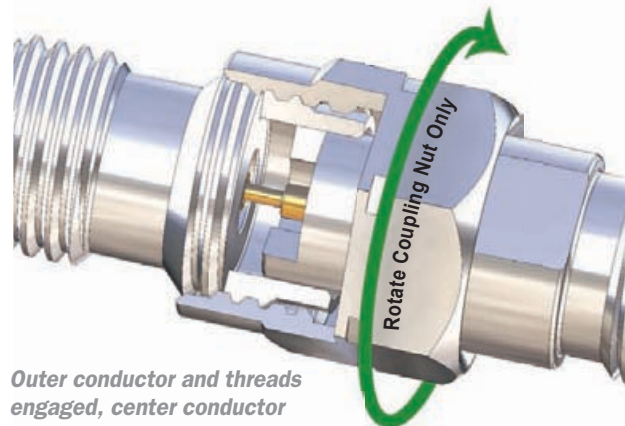


1. Engage the two mating interfaces with slight pressure.
2. Hold the body of the male connector and turn only the coupling nut.
 - The coupling nut will engage the threads of the female connector.
3. Continue turning only the coupling nut.
 - The outer conductors will engage and align the connectors to each other.
 - Then the center conductors will engage.
 - Then the outer conductors (reference planes) will come together and the coupling nut will quit turning.
4. Use a torque wrench to apply the proper torque to complete the mating.

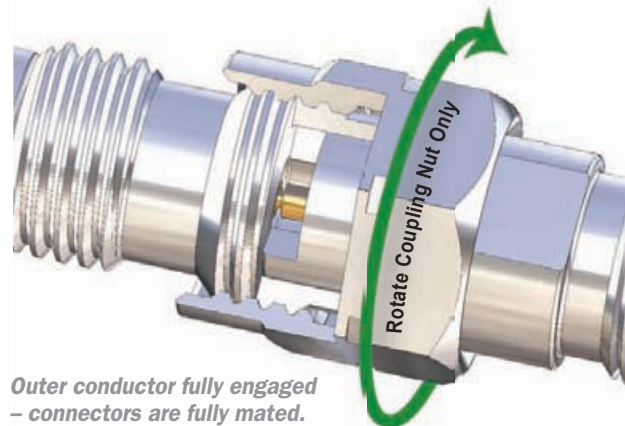
When the proper procedure for mating microwave connectors is followed, no rotational torque is applied to the center conductors. If the body of either connector is rotated, this is improper and can apply a rotational torque to the center conductor. All Southwest Microwave connectors have the center conductor rigidly captured to the outer housing. The center conductor captivation is, in most cases, accomplished with a high temperature plastic bead. This bead provides high axial retention at extended temperatures, but does not provide for any rotational resistance. Therefore proper mating is strongly recommended.



Outer conductor and threads starting to engage.



Outer conductor and threads engaged, center conductor starting to engage.



Outer conductor fully engaged – connectors are fully mated.

Issues and Opinions

by
Jim Kubota
Southwest Microwave
Tempe, Arizona

RF Versus Microwave SMA Connectors

The microwave community, for years, has been building amplifiers, switches, mixers, oscillators, antennas, and other components and subsystems using SMA connectors built to mechanical requirements MIL-C-39012 and interface dimensions per MIL-STD-348. Both specifications specify loose mechanical requirements and require no electricals after thermal cycling. Recent military programs require performance verification after environmental testing, especially temperature testing. These tests highlighted connector design deficiencies as well as poor connector selections by users.

Traditionally, an *electrical engineer* has the responsibility for the microwave component design, and the *mechanical designer* has the responsibility for the package. The packaging responsibility includes selecting the connector. Since the SMA is now the standard for miniature connectors, the designer simply calls out what appears to be mechanically convenient with no consideration for electrical performance. A *buyer* picks up the requirement for a SMA connector, calls around for competitive prices, and then places an order based on price. Then the fun begins in production where the problem of making the design requirements come together with an acceptable and consistently shippable product. *Technicians* assume the role to tune in or out the final product. The tuning process becomes an art and a means of separating good technicians from bad, instead of sorting marginal connector designs from good connector designs.

The final step is, when a technician cannot tune the device, the connector is replaced with another, finally rejecting the component.

In the last few years, a new high performance SMA connector has emerged. The new version of the SMA has been designed by microwave engineers. The original SMA connectors were designed by microwave engineers and cloned by copy houses. The copy houses place little or no emphasis on maintaining microwave performances. Thus, the products were sold by price, and the basic quality of the products deteriorated to the level of an RF connector. There was a time when well-known instrument companies provided test adapter calibration kits for SMAs. Due to the general product deterioration driven by copy houses, instrument companies no longer provide SMA test and calibration kits. The old design has become an "RF" connector, while the new design is a "Microwave" connector.

An RF connector is designed to conform mechanically. The main objective is ease of manufacture and low cost. It has straight walls on the inside of the connector housing, straight PTFE dielectric, and utilizes a barb captured contact. The flange versions have holes that are punched, which cause flanges to be deformed. Concave flanges are the result of fast production that can cause air gaps that disrupt outer conductor continuity and create a path for RF leakage.

A microwave connector is a precision machined connector designed to *enhance* the performance of microwave components. It has compensated steps in the connector

housing matched to steps in the contact. The PTFE dielectric also has machined steps to match to the connector housing and contact. The contact is retained by an epoxy capture. Epoxy capture eliminates placing the dielectric under pressure. (The barb contact method causes the dielectric to be under constant pressure). The new innovative design allows minimal growth under temperature.

The flanged versions present a metal to metal contact to the component housing and hermetic feed through. This results in lower reflection loss and low RF leakage.

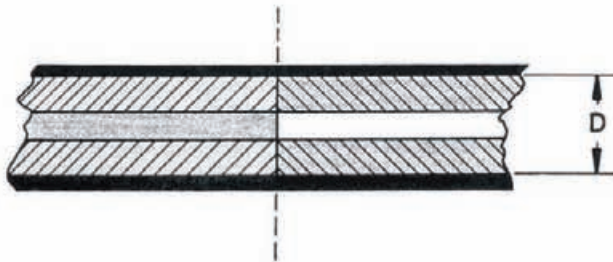
A well-designed microwave connector includes many other specifics that contribute to performance. Details which affect maintaining a practical coaxial transmission line at practical cost must be incorporated. The goal is to utilize design innovations that will enhance higher frequency performance, reliability after environment, and consistency from production lot to production lot.

Most of these details are not readily visible and therefore cannot be easily identified by visual or external inspection. Controlling interface dimension per MIL specification enhances endorsement towards RF since their limits are extremely loose and totally not acceptable for high microwave frequency use.

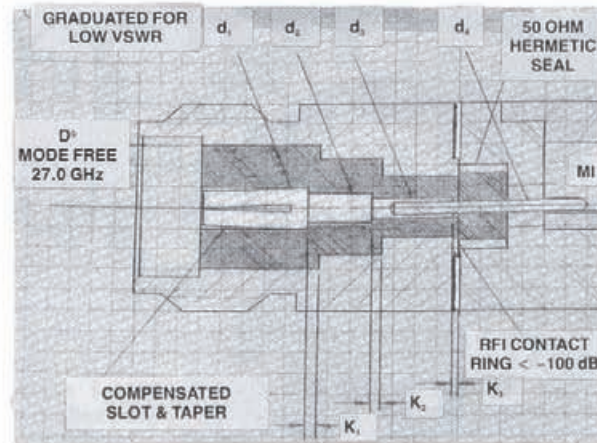
The details that microwave connector designers are concerned with are proper compensation (offset) at diameter transitions and verifying these offsets remain fixed during environment. Barbed contacts are difficult to set consistently and then move during thermal exposure.

"MICROWAVE CONNECTOR"

CONNECTOR DESIGN AND PERFORMANCE OBJECTIVE



SMOOTH, UNINTERRUPTED TRANSMISSION LINE



THE PRACTICAL DESIGN

Another key parameter is socket contact fabrication and forming. Typically socket slots are not controlled (microwave energy travels on the surface). Sockets are over crimped (conical close) causing spreading, cracking, high wear, gold flaking, etc. Meeting insertion forces with a "duck bill" flat crimp, although it may comply with MIL Specification, is not the answer.

There are many other details that must be taken into consideration. Many times it is required to call out specific program requirements which have requirements above and beyond general military specifications. This results in the most cost effective method in meeting desired goals.

Many qualified microwave engineers are sometimes misled in assessing insertion loss contribution by the connector. With most microwave components and subsystems, the coaxial launch to the microwave circuit is the most difficult to minimize VSWR (return loss). If the typical VSWR is 1.6:1 VSWR

(12.75 dB return loss), there is a quick conclusion a 1.3:1 connector would be more than adequate. This conclusion is based upon comparing the transmission loss of 1.1:1 to 1.3:1.

VSWR	Transmission Loss
1.1:1	0.010 dB
1.3:1	0.075 dB
difference 0.065 dB	

0.065 dB is within measurement accuracy of precision vector network analyzers. But if either of these connectors phases with the 1.6:1 circuit launch, the loss figures change drastically.

Connector VSWR	Launch VSWR
1.3:1	1.6:1
1.1:1	1.6:1
Combined VSWR when phased	Transmission Loss
2.08:1	0.569 dB
1.76:1	0.343 dB
0.226 dB	

0.226 increase in loss is usually significant to prevent product acceptance and loss in shipping dollars.

The price difference between an RF and microwave connector is about 20% or a \$1.00 in volume (1000). For the *cost* cautious designer, consider a \$1.00 premium to pick up performance of 0.2 dB just from the connector. How much would you pay inside your package to pick up 0.2 dB? \$10.00 to \$100.00?

If the design is stabilized and in production, how much could you save in tuning time if you replaced your "RF" SMA connectors with "Microwave" SMA Connectors? \$3.00, \$30.00, or \$300.00? If completed units are returned from the customer because insertion loss is 0.1 dB too high, the cost could soar.

If you are a project manager and are designing above 5 GHz, using a microwave connector would enhance the system and be cost effective. If purchasing makes the decision on buying connectors, they could be taught cost effectiveness between an RF — SMA vs. Microwave — SMA. ■

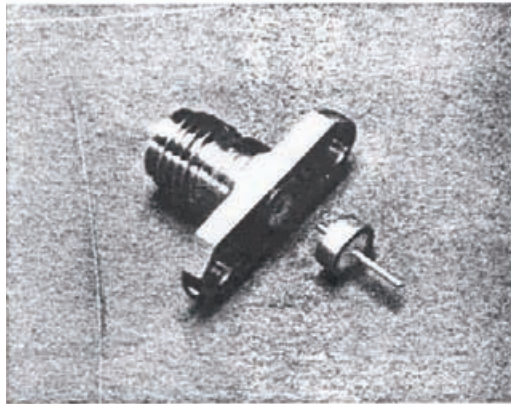
SOUTHWEST MICROWAVE

PRODUCT TECHNOLOGY

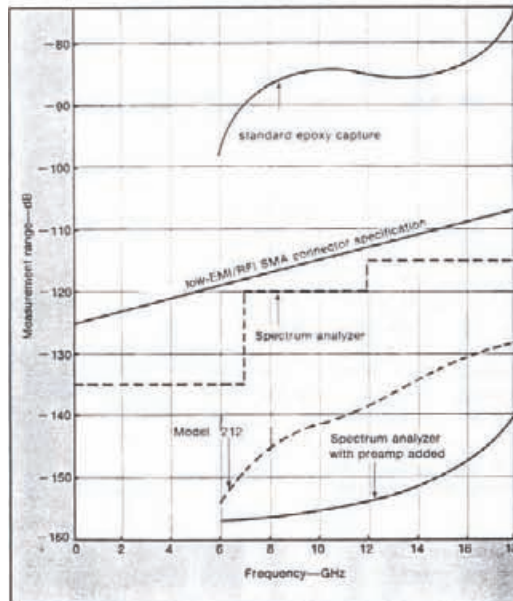
SMA connectors set new EMI/RFI shielding standards

Record low levels of RF leakage come from this new family of coaxial connectors. So low were the levels that a special test system was needed to gather specs.

Jim Kubota, Vice President, Microwave Products,



"low EMI" SMA connector that features tight 50-ohm impedance matching to ensure industry-low levels of RF leakage to 18 GHz.



2. Test system modifications were in order before the low-EMI leakage performance of the new connector line could be verified and documented.

The coaxial RF connector is one of the more obvious places to look for EMI/RFI leakage in a component or system. Most connectors are guilty of about -75- to -85-dB leakage in extreme environments. In most cases this is fine. But when a requirement calls for more thorough shielding, the simplest solution is a new line of flange-mount SMA connectors (Fig. 1). These connectors have been tested with leakage of only -128 dB at 18 GHz and -154 dB at 6 GHz.

The connectors incorporate impedance-matched 50-ohm seals with very tight pin mounting: Each connector is designed to accept a specific pin diameter, either 0.012, 0.015, or 0.020 in. The measured VSWR is less than 1.15:1 through 18 GHz. Connectors are available in two- or four-hole flange-type mounts, and can be replaced in the field without disturbing hermeticity.

The company's standard epoxy capture coaxial connectors have always exhibited good RF leakage characteristics (Fig. 2), about 15 dB better than comparable SMA types. This performance is owed to a small epoxy capture hole and a long RF leakage path created by thick connector walls. This 15-dB difference has been directly computed by using waveguide-below-cutoff theory attenuation figures.

Improving test cavity

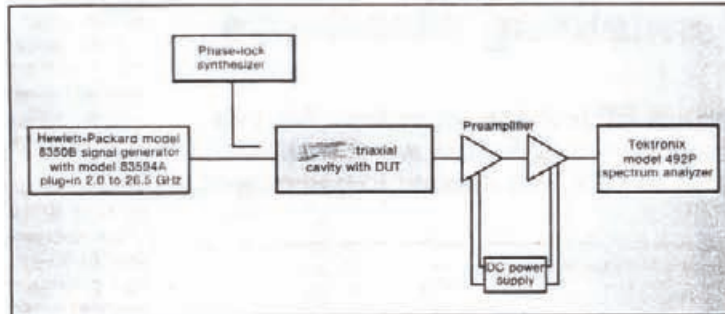
The new "low-EMI" connectors, however, required a rethinking of test strategy to measure design leakage levels previously unheard of for an SMA connector. The evidence of this rethinking is shown in the basic test system architecture of Fig. 3. The actual test fixture appears in Fig. 4. The 18-GHz triaxial test fixture is, in principle, the same one outlined in MIL-C-39012.

Several refinements were made to the military-specification test system. For example, one common 7-mm input/short-circuit section and one common 7-mm output section are employed for all connector types tested. Only the intermediate section containing the device under test is changed from test to test. The 7-mm sections behave like TE₁₁ mode filters below 18 GHz.

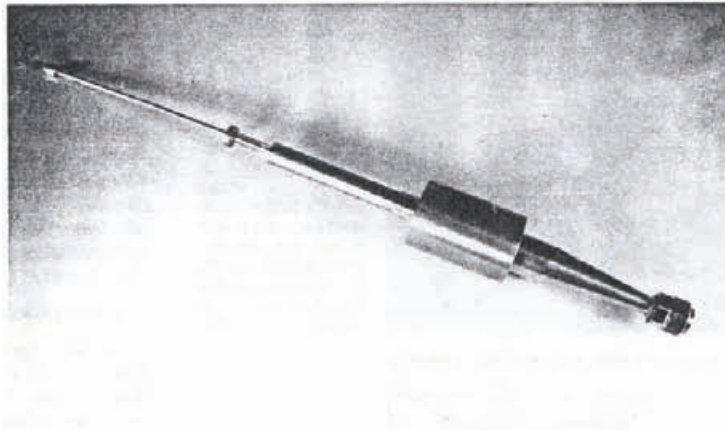
The cavity thus permits the measurement of leakage through most of the frequency range of the connector under test, up to 18 GHz. The mode filter absorbs higher-order mode resonances that previously limited the frequency range of a triaxial cavity to about 6 GHz.

PRODUCT TECHNOLOGY

EMI/RFI shielding standards



3. The key to improving the sensitivity of the 18-GHz triaxial cavity test system was the introduction of low-noise preamplifiers, which boosted the usable dynamic range of the spectrum analyzer.



4. This 18-GHz triaxial test fixture features a removable cylindrical center section which is used to hold the device under test.

for SMA connectors and about 3.5 GHz for type N connectors.

An improved detector system was also instrumental in making measurements down to -154 dB (at 6 GHz) with the triaxial test fixture. A standard portable model 494P spectrum analyzer (Tektronix, Inc., Beaverton, OR) with a catalog sensitivity specification of about -95 dB was used. The sensitivity of the analyzer was improved to better than -135 dB by means of a high-gain, low-noise preamplifier section. With a $+15$ -dBm input, the total usable leakage range was typically -155 dB down to the noise level. It does not get much better than this for low-level, broadband signal detection.

The new connectors must have good mating surfaces to meet their tested leakage specifications of -154 dB at 6 GHz, -143 dB at 8 GHz, -138 dB at 12 GHz, -132 dB at 15 GHz, and -128 dB at 18 GHz. That is, the RF leakage specification is highly dependent upon establishing a solid 360 deg. of metal-to-metal contact between connector halves. Once done, the "low-EMI" connectors promise leakage levels that lie beyond the measurement range of most engineers' test equipment.

Materials Commonality / Connector Compatibility

Materials Commonality in Connectors

Teflon™ Dielectric

N Connectors
TNC Connectors
Super SMA Connectors*
SSMA Connectors

Common Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu) Gold Plated Per MIL-G-45204

Teflon Construction:

- Dielectric: PTFE Fluorocarbon Per ASTM D 1457
- Center Contact Capture: Single Bead Capture with Ultem 1000 Per ASTM D 5205
- Temperature Rating -55°C to +165°C

* *The "New" Standard (Preferred)*
 Extended Power Super SMA
 Temperature Rating -55°C to +165°C.
The "Old" Standard Super SMA (Epoxy)
 Temperature Rating -55°C to +125°C.

Air Dielectric (Airline)

3.5 mm Connectors
2.92 mm Connectors
2.40 mm Connectors

Common Construction:

- Housing: Stainless Steel, Passivated
- Contact: Beryllium Copper (BeCu) Gold Plated Per MIL-G-45204

Airline Construction:

- Center Contact Capture: Rigid Two Bead Capture with Ultem 1000 Per ASTM D 5205 and KEL-F Per ASTM D 1430
- Temperature Rating -55°C to +135°C

Connector Compatibility (Intermateability)

Connector Type	Compatible with:
1.85 mm	2.40 mm
2.40 mm	1.85 mm
2.92 mm	3.5 mm & SMA
3.5 mm	2.92 mm & SMA
SMA	2.92 mm & 3.5 mm



Microwave Coaxial Connectors

Model Number Index

Model	Page	Model	Page	Model	Page	Model	Page
1001-**SF	77	1414-**SF	54	21204-00SF	79	290-27D	94, 95
1002-**SF	77	1420-**SF	54	21204-01SF	79	290-27G	85, 94
101-**SF	77	1421-**SF	55	21205-00SF	79	290-27P	94
1011-**SF	41, 44	1430-00SF	73	21205-01SF	79	290-33G	85, 96
1012-**SF	40, 44	1431-00SF	73	21303-00SF	79	290-34D	94
1013-**SF	41	1432-00SF	73	21304-00SF	79	290-34G	85, 94
1014-**SF	40	1490-01G	85, 96	21305-00SF	79	290-34P	94, 95
101410-00SF	71	1490-02D	94	21403-00SF	79	290-34P-35D	85, 95
101420-00SF	71	1490-02G	85, 94	21404-00SF	79	290-35D	94, 95
101430-00SF	71	1490-02P	94, 95	21405-00SF	79	290-35G	85, 94
101440-00SF	71	1490-02P-03D	85, 95	2310SF	67	290-35P	94
102-**SF	77	1490-03D	94, 95	2311SF	67	290-36D	90
1020-**SF	40, 44	1490-03G	85, 94	2312SF	67	290-36G	85, 90
1021-**SF	41, 44	1490-03P	94	232-***SF	68	290-36P	90, 91
1030-**SF	70	1490-11D	90	2320SF	67	290-36P-37D	85, 91
1031-00SF	70	1490-11G	85, 90	2330SF	67	290-37D	90, 91
1032-00SF	70	1490-11P	90, 91	2340SF	67	290-37G	85, 90
107-**G	80	1490-11P-12D	85, 91	290-00G	85, 87	290-37P	90
108-**G	80	1490-12D	90, 91	290-01G	85, 87	292-**A	62
1090-05G	85, 96	1490-12G	85, 90	290-02G	85, 87	293-**A	62
1090-06D	84, 95	1490-12P	90	290-06G	85, 87	311-**SF	28
1090-06G	85, 94	1490-13G	85, 87	290-07G	85, 87	312-**SF	28
1090-06P	94	1490-15G	85, 87	290-09G	85, 96	411-**SF	34
1090-07D	94	1492-**A	62	290-10G	85, 97	412-**SF	34
1090-07G	85, 94	1493-**A	62	290-11D	90	490-00G	85, 87
1090-07P	94, 95	201-5**SF	77	290-11G	85, 90	61410-00SF	69
1090-07P-06D	85, 95	202-5**SF	77	290-11P	80, 91	61420-00SF	69
1090-11D	90	211-**SF	17	290-11P-12D	85, 91	61430-00SF	69
1090-11G	85, 90	211-5**SF	17	290-12D	90, 91	61440-00SF	69
1090-11P	90, 91	212-**SF	16	290-12G	85, 90	T-1020-1	106
1090-11P-12D	85, 91	212-5**SF	16	290-12P	90	T-112-*	101
1090-12D	90, 91	213-**SF	17	290-13D	90	T-120-1	106
1090-12G	85, 90	213-5**SF	17	290-13G	85, 90	T-120-2, 3, 4, 5	103
1090-12P	90	214-**SF	16	290-13P	92, 91	T-1412-*	101
1092-**A	62	214-5**SF	16	290-13P-14D	85, 91	T-1420-1	106
1093-**A	62	220-**SF	16	290-14D	90, 91	T-1420-5, 6	102
112-**SF	48	220-5**SF	16	290-14G	85, 90	T-1491-1	100
114-**SF	48	221-**SF	17	290-14P	90	T-1492-*	102
11410-00SF	72	221-5**SF	17	290-24D	94	T-192-*	103
11420-00SF	72	230-***SF	68	290-24G	85, 94	T-212-*	101
11430-00SF	72	231-***SF	68	290-24P	94, 95	T-220-*	102
11440-00SF	72	21103-00SF	79	290-24P-25D	85, 95	T-291-*	100
120-**SF	48	21103-01SF	79	290-25D	94, 95	T-292-*	102
121-**SF	48	21104-00SF	79	290-25G	85, 94	T-293-*	107
1401-**SF	77	21104-01SF	79	290-25P	94	T-412-1	101
1402-**SF	77	21105-00SF	79	290-26D	94	T-491-1	100
1411-**SF	55	21105-01SF	79	290-26G	85, 94		
1412-**SF	54	21203-00SF	79	290-26P	94, 95		
1413-**SF	55	21203-01SF	79	290-26P-27D	85, 95		

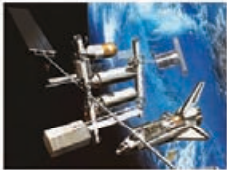
Super SMA Connectors
N Series Connectors
TNC Connectors
2.92 mm Connectors
SSMA Connectors
2.40 mm Connectors
End Launch Connectors
Adapters
Cable Connectors
Launch Accessories
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