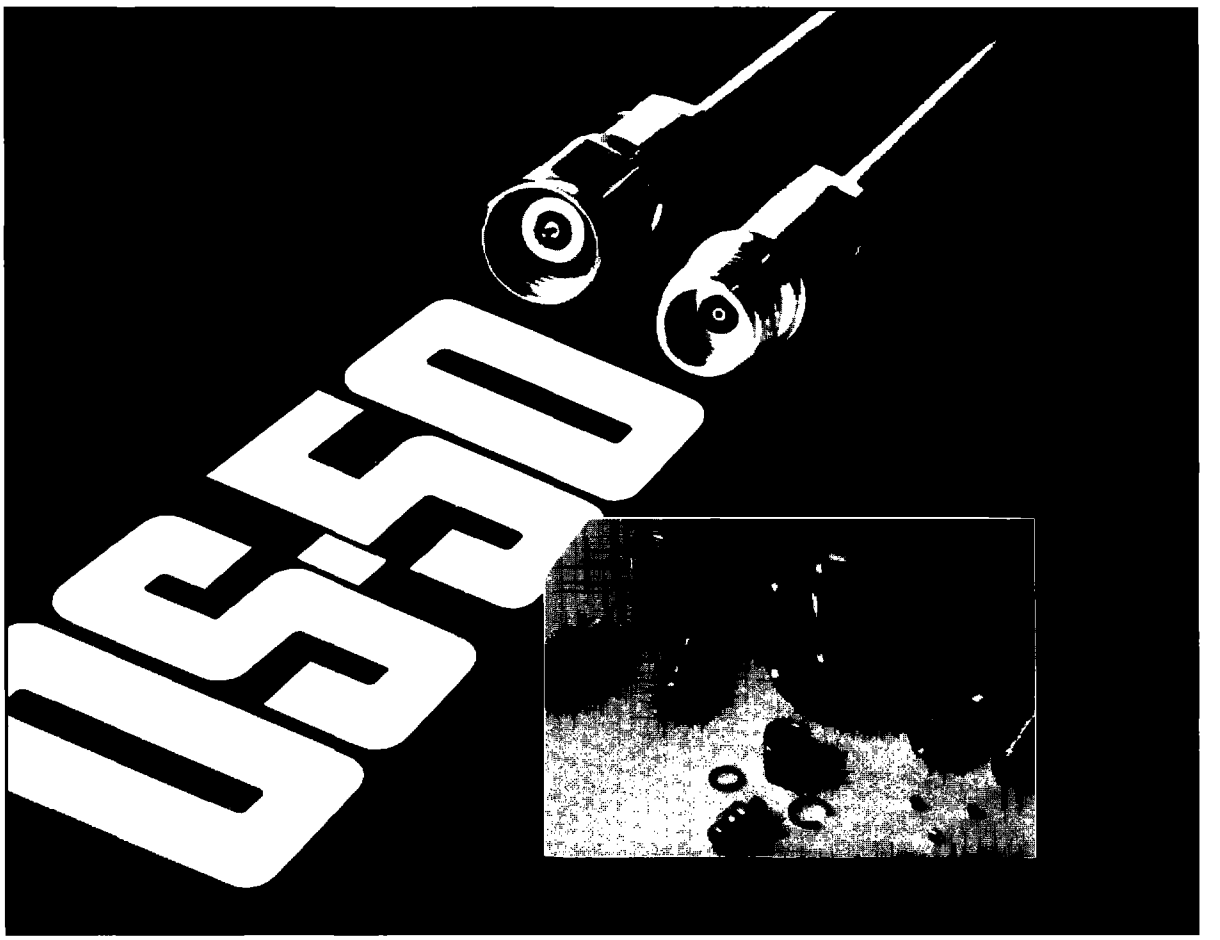
OS-2.4 (OS-50) DC-50 GHz Coaxial Connectors



In order to support millimeter component and systems development, there is a pressing need for broadband test equipment operating to at least 50 GHz. This equipment requires a high performance coaxial interface capable of reliable mode free operation DC through 50 GHz and one that could achieve NBS traceability. Presently, there are no NBS traceable coaxial connector standards above 18.0 GHz.

The introduction of the OS-50 (2.4mm) interface gives the microwave industry a solution to the broadband coax problem DC through 50 GHz. Implementation of the 2.4mm concept is in the form of three levels or grades: Production/MIL-Spec, Instrumentation and Metrology. Production/MIL-Spec grade connectors are being produced by M/A-COM as a new connector series designated OS-50 intended for industry wide use components, integrated MIC packages and cabling operating broadband up to 50 GHz.

Table of Contents

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OS-2.4 (OS-50) Design Characteristics

Design Criteria for the OS-50 (2.4mm) Connector

The design and development of the OS-50 connector family overcame many of the design limitations of other connector families. The design criteria were:

- Mode free operation DC-50 GHz
- Low VSWR and insertion loss
- Rugged and repeatable mating interface
- NBS traceability
- Meet or exceed MIL-C-39012 requirements
- Low cost

The new connector series is designed around a 2.4mm outer conductor line size with an air dielectric and had TE_{11} mode threshold above 52 GHz. A comparison of the OS-50 interface with the SMA interface is shown in Figure 2.

Low VSWR and return loss were achieved by selecting the 2.4mm line size and the air dielectric. This allowed for the largest possible center conductor diameter, the lowest conductor losses and minimized the dielectric losses. In addition, using an air dielectric minimized the impedance mismatch at the interface due to line size changes and air gaps between dielectrics. Typical performance for the OS-50 Production/Mil Spec grade interface is shown in Figure 3.

Interface Comparison of OS-50 (2.4mm) and OSM® (SMA)

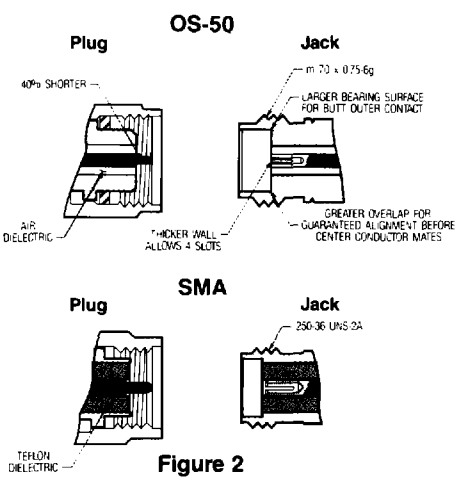
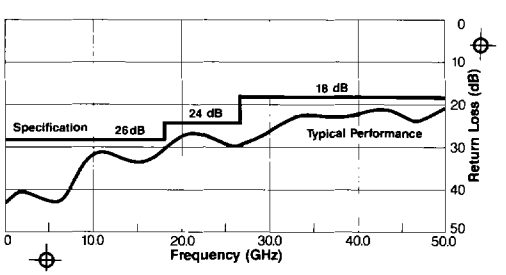


Figure 2

Return Loss Performance OS-50 Interface



Data obtained from a mated pair of OS-50 .085 semi-rigid cable connectors: 8501-7885-02 to 8502-7885-02.

Figure 3

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Mating Features

By foregoing compatibility with existing connector types, a substantial improvement in mechanical reliability and repeatability has been achieved. Though the line size is smaller than an SMA, several design features actually make the interface more rugged and therefore more reliable.

The female center contact design of the OS-50 has a wall thickness nearly twice that of an SMA or K female contact. This allows for a 4 slot design with short slots that is very durable. The outer conductor geometry of the OS-50 interface has much more bearing surface than an SMA which distributes the mating forces over a larger area and cuts down on wear and distortion with repeated connections. Also, the depth of the outer conductor recess on the female OS-50 is deep enough to insure engagement and alignment of the outer conductors before the center conductors engage. See Figure 4. This eliminates damage to the center contacts which is one of the most common failure modes in subminiature connectors.

Since the reference plane of the outer and inner conductors of the interface are coincident and there is an air dielectric, full NBS traceable standards can be developed for calibration purposes. While no MIL-Spec exists as yet for the production grade OS-50 connector series, the construction materials, electrical and environmental specifications will meet or exceed the applicable requirements of MIL-C-39012.

OS-50 Connector Mating Sequence

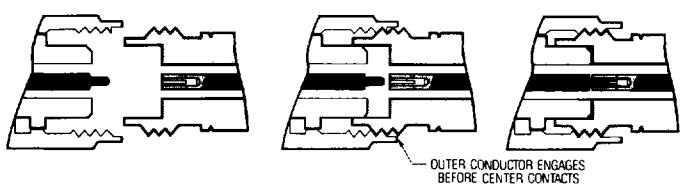

Figure 4

K is a trademark of Wiltron.

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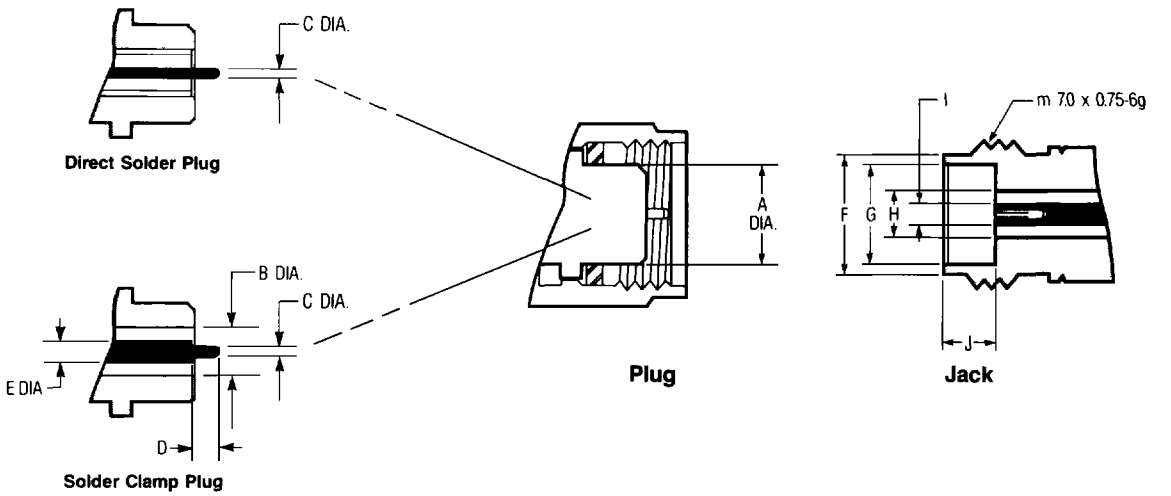
OS-2.4 (OS-50) Interface Mating Dimensions



Letter	Dimension Inches (mm)
A	.187 (4.7) NOM.
B	.094 (2.4) NOM.
C	.020 (0.5) NOM.
D	.055 (1.4) NOM.
E	.041 (1.0) NOM.

Letter	Dimension Inches (mm)
F	.230 (5.8) NOM.
G	.188 (4.8) NOM.
H	.094 (2.4) NOM.
I	.041 (1.0) NOM.
J	.120 (3.0) NOM.

NOTES
1. When fully engaged, the two reference planes must coincide with metal to metal contact
2. Metric equivalents (to the nearest 0.01 mm) are given for general information only and are based on 1 inch = 25.4 millimeters

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OS-2.4 (OS-50) Specifications

The specifications given refer specifically to the mated pair of Part Number 8501-7885-02 and 8502-7885-02 (RG 405). Specifications on other OS-50 products are available from the company on request.

The general electrical, mechanical and environmental specifications in the following table are recommended for procurement documents or drawings.

Electrical M17/133-RG 405 (.085)

Nominal Impedance:	50 Ohms
Frequency Range:	DC-50.0 GHz
Temperature Rating:	−55°C to +125°C
VSWR (Mated Pair):	
DC-18.0 GHz:	1.11 Max.
18.0-26.5 GHz:	1.13 Max.
26.5-50.0 GHz:	1.29 Max.
RF Transmission Loss:	.05x $\sqrt{f(GHz)}$
Insulation Resistance:	5,000 Megohms Min.
Contact Resistance:	
Center Contact:	4.0 Milliohms Max.
Outer Contact:	4.0 Milliohms Max.
Dielectric Withstanding Voltage, Sea Level:	500 Volts RMS
Corona at 70,000 ft.:	150 Volts RMS
RF Leakage:	−(90-f(GHz)) dB Fully Mated

Environmental

Corrosion:	Method 101, Condition B, MIL-STD-202
Vibration:	Method 204, Condition D, 20Gs, MIL-STD-202
Shock:	Method 213, Condition I, 100Gs, MIL-STD-202
Temperature Cycling:	Method 107, Condition B, MIL-STD-202
Moisture Resistance:	Method 106, MIL-STD-202

Material

Housing:	Corrosion resistant steel Type 303 (stainless) per ASTM A484 and A582
Center Contact:	Beryllium Copper per ASTM-B-196
Finish:	
On Housing:	Passivated per ASTM-A380
On Center Contact:	Gold plate per MIL-G-45204 Type II, Class 1 over copper plate per MIL-C-14550
Dielectric:	TFE Flourocarbon per ASTM-D-1457

Mechanical

Coupling Nut Retention Force:	Not applicable for jack connectors. For plug connectors, the axial force is 60 lb. min. The torque is 15 in.-lbs. min.
Durability:	500 Cycles Min.
Force to Engage:	2 Inch Pounds
Cable Retention:	
Axial Force:	30 lbs. Min. (RG 405)
Torque:	16 in. oz. Min. (RG 405)
Coupling Proof Torque:	15 in. lbs. min.

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OS-2.4 (OS-50) Evaluation Kits

M/A-COM offers two applications oriented connector evaluation kits for the OS-50 (2.4mm) product line. These kits are designed to provide the engineer with an economical way to evaluate and gain experience with this DC to 50 GHz connector series.

Waveguide to OS-50 Adapters can be ordered separately.

Hermetic Connector Kit
Part No. 8598-5006-54

Contents

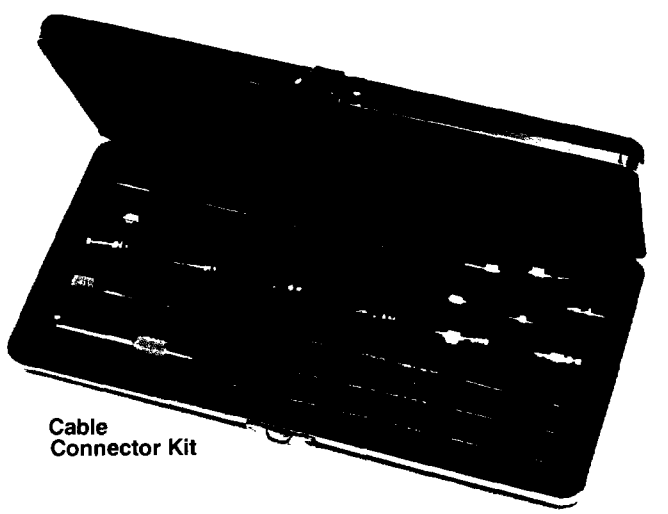
- OS-50 Glass Seals (5)
- OS-50 Jack Launcher (4)
- OS-50 Plug to K™ Jack Adapter (2)
- Microstrip Test Fixture (1)
- Panel Mount Soldering Fixture (1)
- Step Drill (1)
- Solder Preforms (10)
- Assembly Instructions

Cable Connector Kit
Part No. 8598-5005-54

Contents

- OS-50 Direct Solder Cable Plug Without Center Contact (4)
- OS-50 Cable Plug — Solder Clamp Attachment (1)
- OS-50 Cable Jack — Solder Clamp Attachment (1)
- Cable Assembly with OS-50 Plug/Plug Direct Solder Connectors (1)
- Cable Assembly with OS-50 Plug/Jack Solder Clamp Connectors (1)
- OS-50 Plug to K™ Jack Adapter (1)
- OS-50 Jack to K Plug Adapter (1)
- OS-50 Jack to K Jack Adapter (1)
- Cable Facing Tool (1)
- Interface Locating Tool (1)
- .085 Semi-Rigid Coaxial Cable (3)
- Assembly Instructions

Hermetic Connector Kit



Cable Connector Kit

OS-50 is a trademark of M/A-COM
K is a trademark of Wiltron

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OS-2.4 (OS-50) DC-50 GHz • For Semi-Rigid Cable

- DC - 50 GHz Performance
- Alternative to Waveguide
- Meets Requirements of MIL-C-39012
- Designed for .085 and .096 inch Semi-Rigid Coaxial Cable
- Interchangeable Plug and Jack Interfaces
- Excellent Electrical Performance

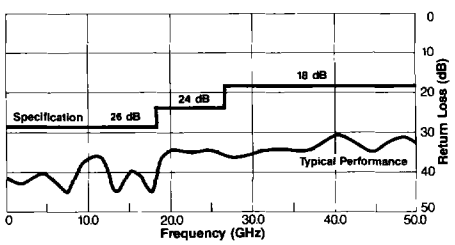
Description

M/A-COM's OS-50 (2.4mm) miniature connectors for semi-rigid cable meet MIL-C-39012 requirements. These connectors exhibit the high performance characteristics required for microwave and millimeter frequency applications. Connectors are available for use on .085 inch cable and the newly developed .096 inch diameter semi-rigid cable which exhibits lower attentuation.

.085 and .096 DIA. Direct Solder and Solder Clamp Attachment

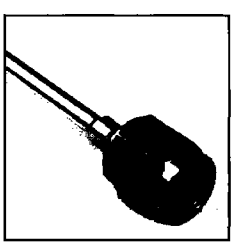
The Direct Solder Cable Connector is a simple and reliable transition from .085 cable to the 2.4mm interface. The cable inner conductor of part number 8501-7985-02, suitably pointed, is used as the connector center contact pin.

The Solder Clamp style connector employs a bushing which is soldered to the cable jacket allowing cable rotation and locking in any angular position.

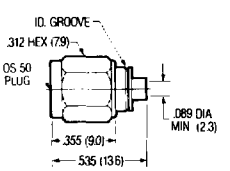


Data obtained from a mated pair of OS-50 .085 semi-rigid cable connectors: 8501-7985-02 and 8502-7885-02.

.085 Dia. • Direct Solder Attachment



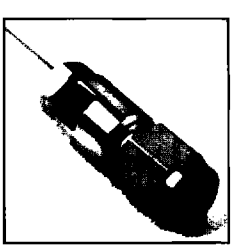
Straight Cable Plug
Without Center Contact



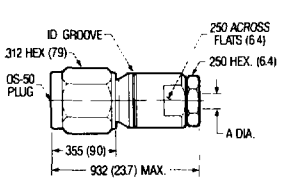
Cable	RG 405/U (.085)
Part Number	8501-7985-02

Finish: Housing is gold plated in all cases. Coupling nut is passivated steel. For gold plated coupling nut, change the part number suffix from -02 to -00.
Cable facing tool Part Number 2598-5044-02 is recommended for assembly.
Refer to Appendix for Coaxial Cable Characteristics.
Refer to recommended assembly tools in Tool Section.

.085 and .096 Dia. • Solder Clamp Attachment



Straight Cable Plug
Captured Center Contact



Cable	RG 405/U (.085)	.096
Part Number	8501-7885-02	8501-7896-02
Dim. A	Inches (mm) .089 Min. (2.3)	Inches (mm) .099 Min. (2.5)

Finish. Passivated stainless steel. For gold plate change the part number suffix from -02 to -00. The solder sleeve is gold plated in all cases.
Refer to recommended assembly tools in Tool Section.

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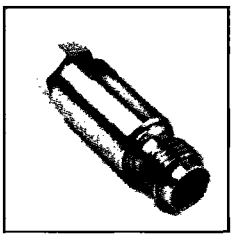
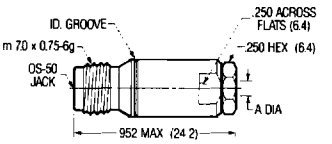
OS-2.4 (OS-50) DC-50 GHz • For Semi-Rigid Cable

.085 and .096 Dia. • Solder Clamp Attachment



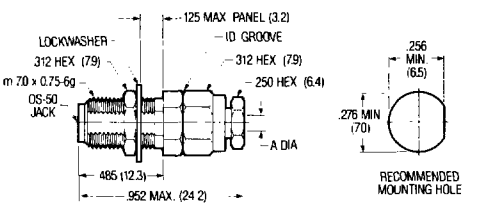
Straight Cable Jack
Captured Center Contact



Cable	RG 405/U (.085)		.096	
Part Number	8502-7885-02		8502-7896-02	
Dim. A	Inches .089 Min.	(mm) (2.3)	Inches .099 Min.	(mm) (2.5)

Finish: Passivated stainless steel. For gold plate, change the part number suffix from -02 to -00. The solder sleeve is gold plated in all cases.
Refer to recommended assembly tools in Tool Section.

Bulkhead Feedthrough Cable Jack
Captured Center Contact



Cable	RG 405/U (.085)		.096	
Part Number	8504-7885-02		8504-7896-02	
Dim. A	Inches .089 Min.	(mm) (2.3)	Inches .099 Min.	(mm) (2.5)

Finish: Passivated stainless steel. For gold plate, change the part number suffix from -02 to -00. The solder sleeve is gold plated in all cases.
Refer to recommended assembly tools in Tool Section.

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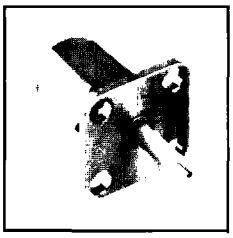
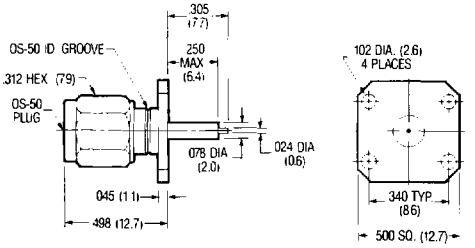
OS-2.4 (OS-50) DC-50 GHz • Panel Mount

Non-Hermetic • Straight Terminal

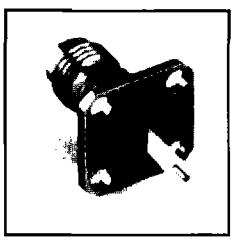


Flange Mount Plug Receptable

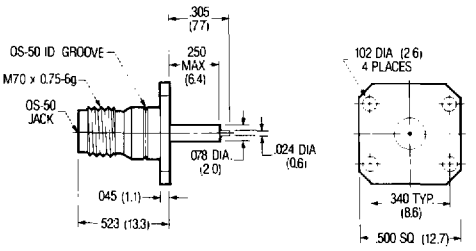


Captured Center Contact	
Part Number	8551-1201-02

Finish: Passivated stainless steel.



Flange Mount Jack Receptacle



Captured Center Contact	
Part Number	8552-1201-02

Finish: Passivated stainless steel

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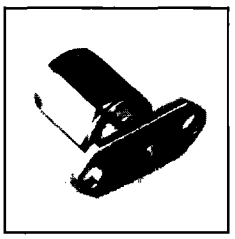
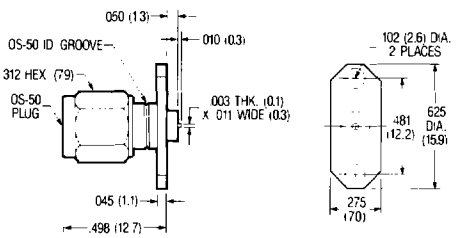
OS-2.4 (OS-50) DC-50 GHz • For Stripline Circuits

End Launch • Tab Terminal

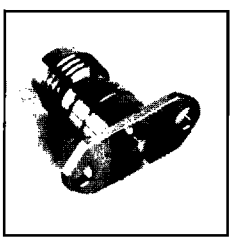


Flange Mount Plug Receptacle

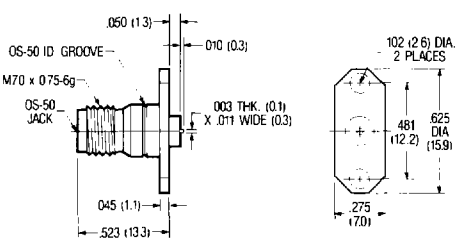


Captured Center Contact	
Part Number	8551-5001-02

Suggested Stripline Parameters:
Ground Plane Spacing: .020, .025 inches
Line Width: .012, .018 inches
Dielectric Constant (Er): 2.2
Finish: Passivated stainless steel.
Recommended Mounting Hole Detail E.

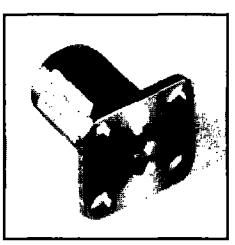


Flange Mount Jack Receptacle

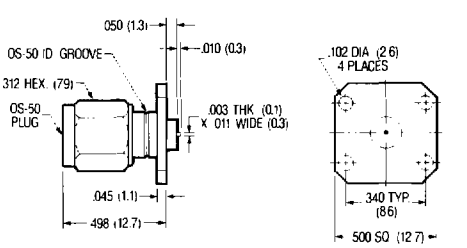


Captured Center Contact	
Part Number	8552-5001-02

Suggested Stripline Parameters:
Ground Plane Spacing: .020, .025 inches
Line Width: .012, .018 inches
Dielectric Constant (Er): 2.2
Finish: Passivated stainless steel.
Recommended Mounting Hole Detail E.

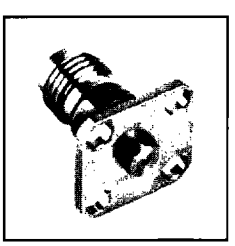


Flange Mount Plug Receptacle

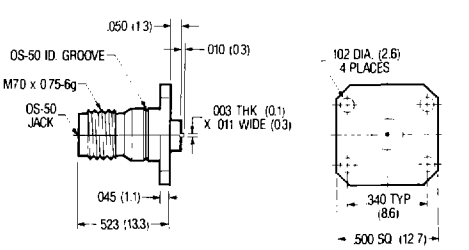


Captured Center Contact	
Part Number	8551-5002-02

Suggested Stripline Parameters:
Ground Plane Spacing: .020, .025 inches
Line Width: .012, .018 inches
Dielectric Constant (Er): 2.2
Finish: Passivated stainless steel.
Recommended Mounting Hole Detail E



Flange Mount Jack Receptacle



Captured Center Contact	
Part Number	8552-5002-02

Suggested Stripline Parameters:
Ground Plane Spacing .020, .025 inches
Line Width: .012, .018 inches
Dielectric Constant (Er): 2.2
Finish: Passivated stainless steel.
Recommended Mounting Hole Detail E

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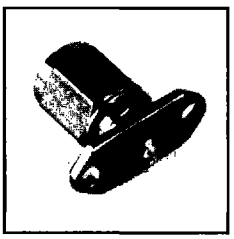
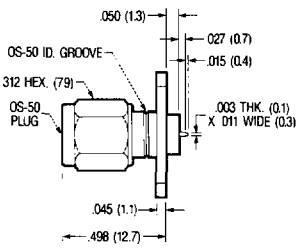
OS-2.4 (OS-50) DC-50 GHz • For Microstrip Circuits

End Launch • Tab Terminal

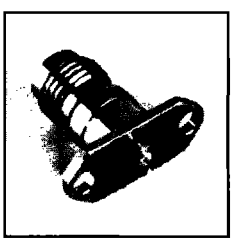


Flange Mount Plug Receptacle

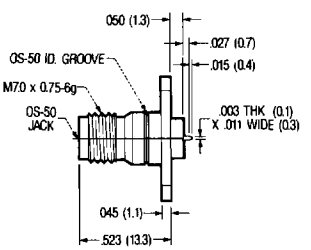


Captured Center Contact	
Part Number	8551-5003-02

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric: Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail F.

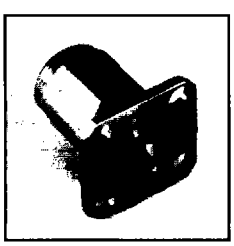


Flange Mount Jack Receptacle

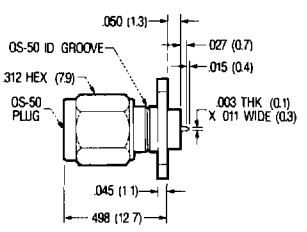


Captured Center Contact	
Part Number	8552-5003-02

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric: Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail F.

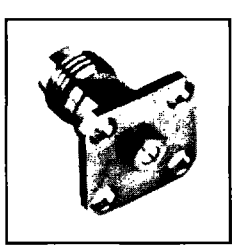


Flange Mount Plug Receptacle

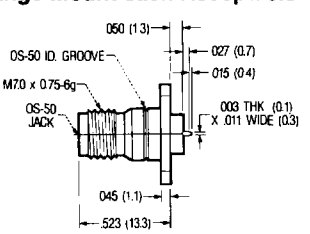


Captured Center Contact	
Part Number	8551-5004-02

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric: Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail F



Flange Mount Jack Receptacle



Captured Center Contact	
Part Number	8552-5004-02

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric: Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section
Recommended Mounting Hole Detail F.

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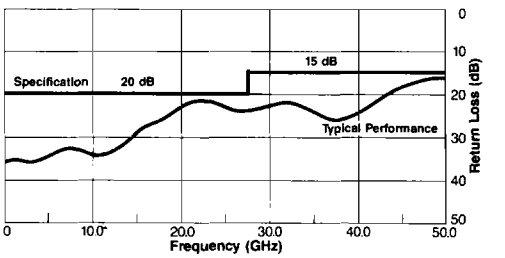
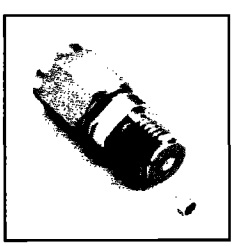
OS-2.4 (OS-50)

DC-50 GHz • Hermetic • For Microstrip Circuits

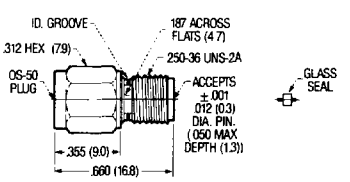
- DC-50 GHz Performance
- Field Replaceable Interface
- Low Loss, Low VSWR, Solder/Braze-In Seal
- Designed for MIC Packaging
- Hermetic Seal Leak Rate: $<1 \times 10^{-8}$ cc/sec.
- Meets Requirements of MIL-C-39012
- Stripline Versions Available



Solder and Braze-In Seal

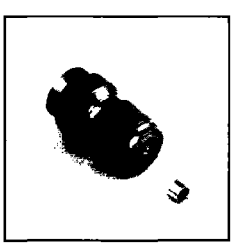


Field Replaceable Panel Feedthrough Plug Receptacle

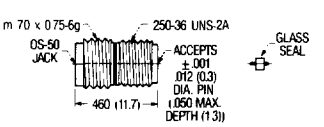


Part Number	8557-5329-02 Connector and Seal	8598-0294-00 Seal Only	8557-5328-02 Connector Only

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric: Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail B.



Field Replaceable Panel Feedthrough Jack Receptacle



Part Number	8558-5329-02 Connector and Seal	8598-0294-00 Seal Only	8558-5328-02 Connector Only

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric: Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail B.

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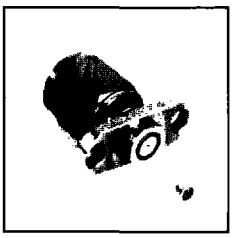
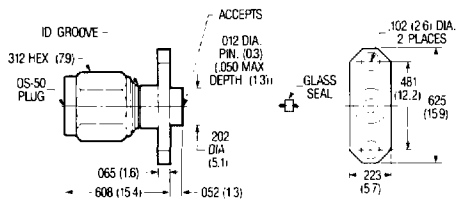
OS-2.4 (OS-50) DC-50 GHz • Hermetic • For Microstrip Circuits

Solder and Braze-In Seal

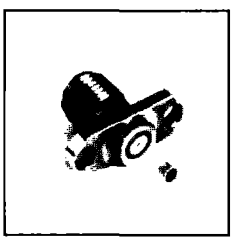


Field Replaceable Two-Hole Flange Mount Plug Receptacle

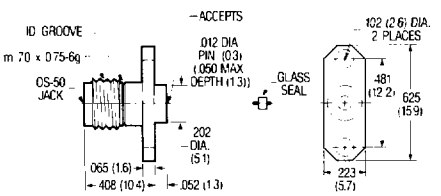


Part Number	8551-0207-02 Connector and Seal	8598-0294-00 Seal Only	8551-3201-02 Connector Only

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section
Recommended Mounting Hole Detail C.

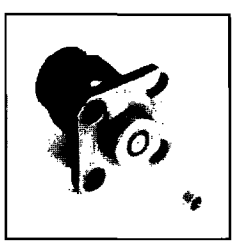


Field Replaceable Two-Hole Flange Mount Jack Receptacle

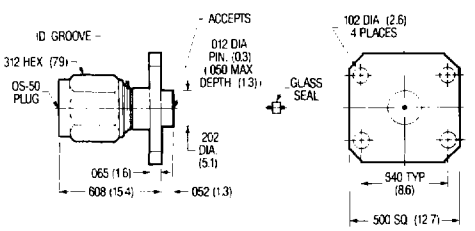


Part Number	8552-0207-02 Connector and Seal	8598-0294-00 Seal Only	8552-3201-02 Connector Only

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail C.

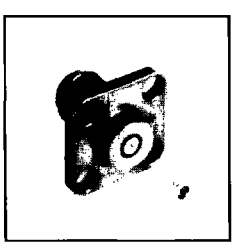


Field Replaceable Four-Hole Flange Mount Plug Receptacle

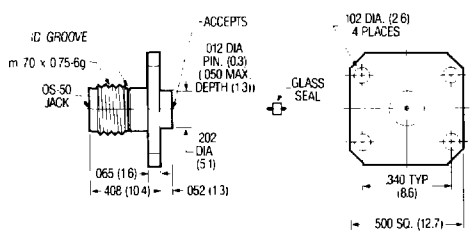


Part Number	8551-3202-02 Connector and Seal	8598-0294-00 Seal Only	8551-3203-02 Connector Only

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail D



Field Replaceable Four-Hole Flange Mount Jack Receptacle



Part Number	8552-3202-02 Connector and Seal	8598-0294-00 Seal Only	8552-3203-02 Connector Only

Suggested Microstrip Parameters:
Material: Alumina, .015, .010 inches thick
Line Width: .014, .0096 inches
Dielectric Constant (Er): 9.8
Finish: Passivated stainless steel.
Refer to recommended assembly tools in Tool Section.
Recommended Mounting Hole Detail D.

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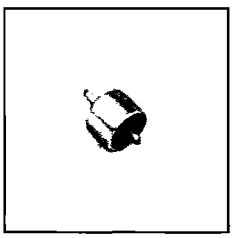
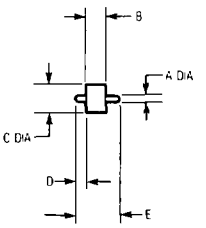
OS-2.4 (OS-50)

DC-50 GHz • Hermetic Accessories and Mounting Hole Detail

Solder-in Thermally Matched Hermetic Seal





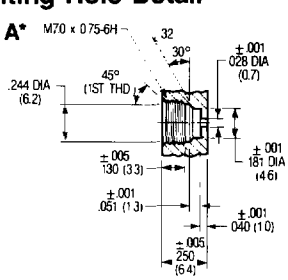
A = $\pm .001$ (.012) (0.3)
B = $+.003$ $-.001$ (.055) (1.4)
C = $+.002$ $-.001$ (.076) DIA (1.9)
D = $\pm .005$ (.029) (0.7)
E = $\pm .005$ (.125) (3.1)

Part Number	8598-0294-00

Note: Diameters Concentric Within .002 T.I.R.

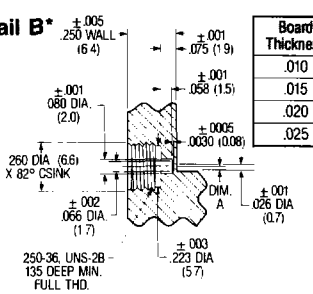
Mounting Hole Detail

Detail A*



NOTE: Diameters Concentric Within .002 T.I.R.

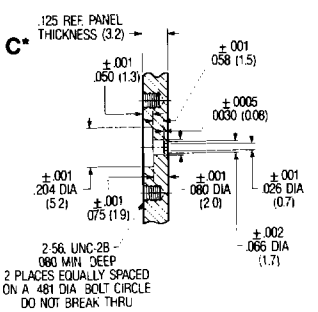
Detail B*



Board Thickness	Dim A ±.001
.010	.019
.015	.024
.020	.029
.025	.034

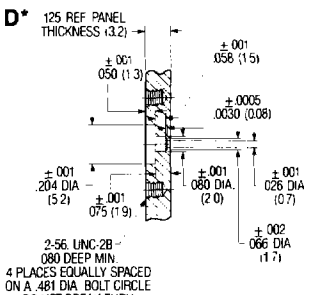
NOTE: Diameters Concentric Within .002 T.I.R.

Detail C*



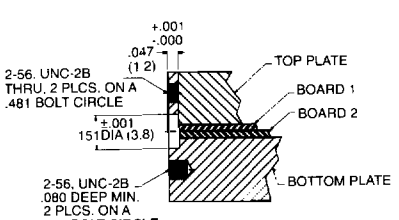
NOTE: Diameters Concentric Within .002 T.I.R.

Detail D*

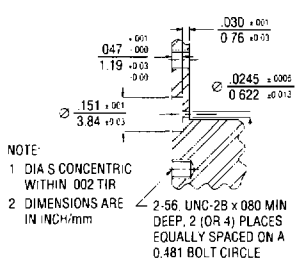


NOTE: Diameters Concentric Within .002 T.I.R.

Detail E



Detail F



*Consult appropriate Assembly Procedure for complete mounting procedure.

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OS-2.4 (OS-50) DC-50 GHz • In-Series Adapters

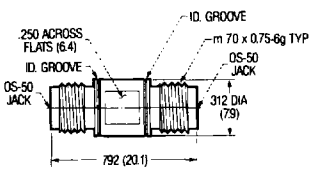
- Low VSWR and Insertion Loss
- Mode-Free 2.4mm Interface
- Meets MIL-A-55339 Requirements where applicable

Description

OS-50 adapters provide a convenient transition between the OS-50 (2.4mm) connector series and other microwave series connector types.

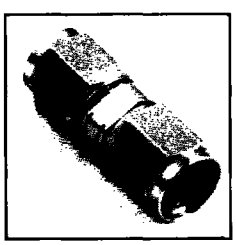
These coaxial adapters are designed to meet MIL-A-55339 requirements. The small size, low VSWR and broad frequency coverage permits a wide range of applications for measurement, instrumentation and system use. Consult the factory for special design capabilities.

OS-50 Jack to OS-50 Jack

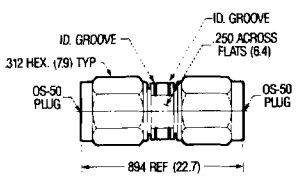


Part Number	8580-0000-02		
Frequency	DC - 18 GHz	18 - 26.5 GHz	26.5 - 50 GHz
Return Loss	26dB	24dB	18dB

Finish: Passivated stainless steel.

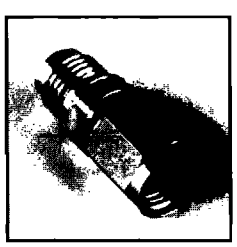


OS-50 Plug to OS-50 Plug

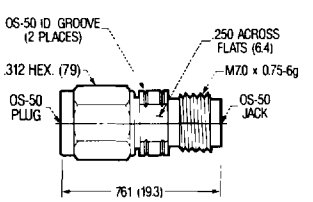


Part Number	8581-0000-02		
Frequency	DC - 18 GHz	18 - 26.5 GHz	26.5 - 50 GHz
Return Loss	26dB	24dB	18dB

Finish: Passivated stainless steel.



OS-50 Plug to OS-50 Jack



Part Number	8582-0000-02		
Frequency	DC -18 GHz	18 - 26.5 GHz	26.5 - 50 GHz
Return Loss	26dB	24dB	18dB

Finish: Passivated stainless steel.

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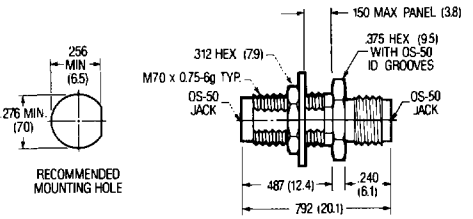
OS-2.4 (OS-50) DC-50 GHz • In-Series Adapters

OS-50 Jack to OS-50 Jack Bulkhead Feedthrough



Part Number	8584-0000-02		
Frequency	DC -18 GHz	18 - 26.5 GHz	26.5 - 50 GHz
Return Loss	26dB	24dB	18dB

Finish: Passivated stainless steel.

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