

K&V

C O N N E C T O R T I P S



Dear Microwave Engineer

Connector Tips is a document for K & V Connector® users. The format is informal; the subject matter will consist of design and manufacturing techniques, shop talk, and new designs. Please send your comments, ideas, problems, and solutions so they can be included in future issues.

The K & V Connector is designed to be a practical, useful connector that is especially well suited for connections to small or high frequency geometries. Anritsu uses K & V Connectors on all of its new components and has developed many design and production techniques that we intend to share. Listed below are some of the K Connector® features, which may be the subject of future discussions.

- **SMA & 2.4mm Connections** – K, SMA, and 3.5 mm connectors and V, 2.4mm connectors are compatible at the system level.
- **Field Replaceable** – The glass bead allows the connector to be replaced without disturbing the circuit connection.
- **Complete Launcher Designs** – Design details and tools are provided which allow well-matched connections to most circuit media.
- **Glass Bead** – This special-design bead, which is mounted in the housing provides a well-matched, rigid, sealed (both hermetic and non-hermetic) transition to minute circuitry.
- **Self Aligning** – A shortened male pin causes outer conductors to align the connector before the center conductors make contact.
- **Sliding Contacts** – These small sliding circuit connections fit on the glass-bead pin and allow for expansion and contraction without compromising RF performance. Different sizes and shapes are available to accommodate microstrip and stripline.
- **Coaxial Cable** – A special coaxial cable using microporous Teflon minimizes phase change with time and temperature, as does ordinary Teflon. The cable minimizes loss, yet performs well to above 40 GHz.
- **Four-Slot Female Configuration** – The thin walled 4-slot design allows thousands of connections without performance degradation.
- **Complete Tooling** – With complete tooling available, the techniques used to assemble high-frequency K Connectors are comparable to those used to assemble SMA connectors.
- **NIST Traceability** – The K & V Connector uses, as do all other air dielectric connectors, a precision air line as its impedance reference standard. The accuracy of the airlines can be determined from mechanical measurements that are traceable to NIST. Except for the GPC-7, NIST has no microwave hardware to certify directly the SWR of connectors.
- **NC Standard**

X	±5 mm	±0.2 in
X.X	±0.5 mm	±0.02 in
X.XX	±0.15 mm	±0.005 in

Above NC Standard tolerance applies to all components unless otherwise noted.
All measurements in millimeters unless otherwise specified.

The Connector Tips is intended to address all aspects of use, assembly, and test. We welcome your comments, experiences and suggestions. Please address your questions and comments to Connector Tips at the address given below.

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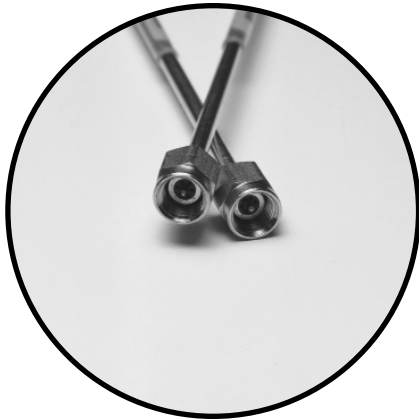
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K CONNECTORS®

DC to 40 GHz



The K Connector® is a precision coaxial connector system that operates up to 40 GHz. It is compatible with SMA, WSMA, and 3.5 mm connectors. It is well suited to applications in components, systems, or instrumentation.

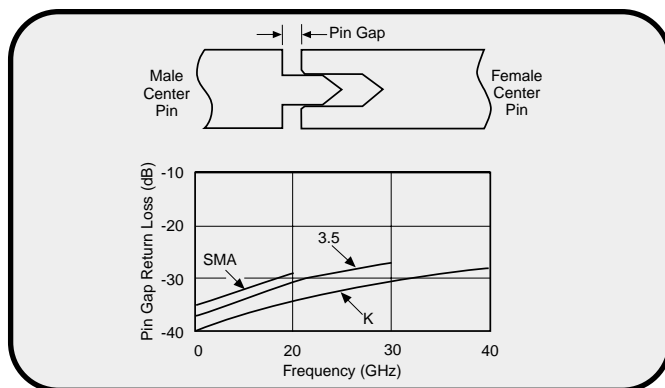
K Connector® features

- Excellent performance up to 40 GHz
- Performance exceeding SMA below 18 GHz
- Superior reliability
- Compatibility with SMA, WSMA, and 3.5 mm
- Complete testability on existing network analyzers

Exceptional reliability and repeatability

Microwave connector reliability is affected by insertion force, outer conductor strength, stress relief while mating, and mating alignment. The K Connector® exhibits exceptional performance in all of these areas.

For proper seating, a standard SMA or 3.5 mm connector can require in excess of 27N* of insertion force. In contrast, the K Connector® requires only 2.3N*. The reduced wear on the female center conductor improves reliability. In addition, the K Connector® outer conductor is four times thicker than that of SMA. Taken together, the lower insertion force and the thicker wall offer more reliable connections than available from an SMA connector. Life tests show that the K Connector® makes greater than 10,000 connections with negligible change in electrical characteristics.

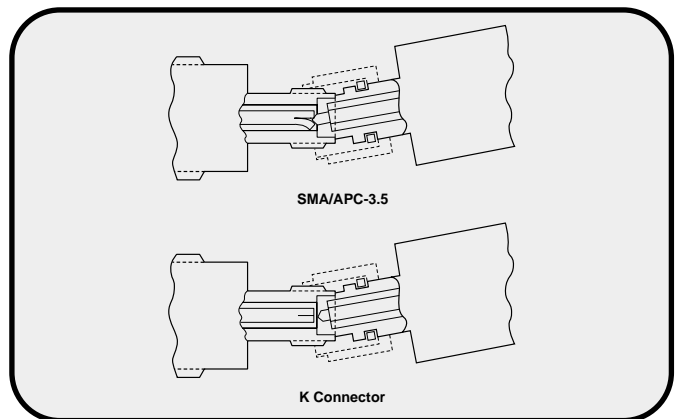


Effect of Pin Gap

*Force is measured in Newtons (N).

All K Connectors, including the cable connectors, incorporate a feature that eliminates a major cause of connector failure; misalignment of the male pin with respect to the female contacts. To solve the problems the K Connector® male pin is deliberately made shorter than the SMA or 3.5 mm pin. With this arrangement, the outer housing is properly aligned prior to the mating of the center conductors. Thus a proper, non-destructive alignment before mating is ensured.

The effect of pin gap on a connection is often overlooked, but is the dominant source of error in many connection systems. Pin gap is the short length of smaller diameter caused when a connector pair is mated. Pin gap causes a discontinuity at the connector interface. The K Connector® has considerably less susceptibility to pin gap than either SMA or 3.5 mm connectors.



Shortened Male Pin Eliminates Damage to Female K Connector®

Compatibility

The K Connector® interfaces electrically and mechanically with 3.5 mm connectors, including SMA and 3.5 mm without degradation in performance.

Launcher design

At the heart of the K Connector® product line are the launchers. As their name implies, the launchers “launch” (make the transition) from a microwave circuit (microstrip, suspended substrate, stripline, or coplanar waveguide) to a coaxial connector and an outside transmission line. The key to making the transition without compromising electrical and mechanical objectives is the glass bead in the launcher assembly.

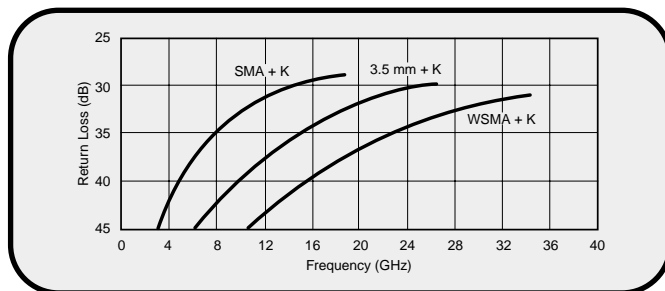
K CONNECTORS®

DC to 40 GHz

Low-reflection bead

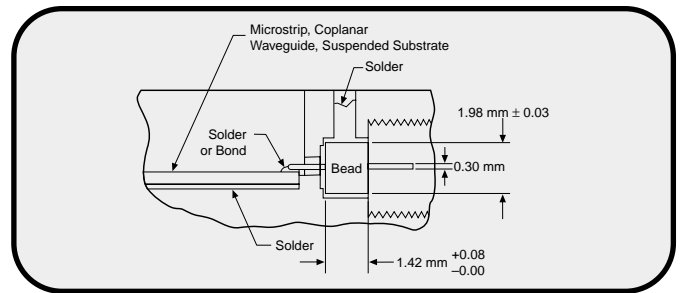
The K Connector's standard glass bead has a unique 0.30 mm center conductor and readily connects to fragile devices. The bead is appropriate for most applications employing Duroid® and ceramic (Alumina) microstrip, such as the 0.25 mm wide transmission line on a 0.25 mm thick Alumina substrate. Applications using suspended substrate geometry are equally well satisfied. The bead is constructed of Corning 7070 glass and has a gold-plated center conductor and a gold-plated Kovar® collar.

The outstanding design of the bead is largely accountable for the excellent performance of the K Connector® launchers. Because the small 0.30 mm pin introduces minimal discontinuity, return loss is typically better than 20 dB at 40 GHz and better than 25 dB below 18 GHz. In addition, the design provides for soldering the bead to achieve a hermetic seal. 310°C max. soldering temperature is recommended, with a 2.01 mm diameter cavity.



Return Loss Characteristics

Both the sparkplug (screw-in) and the flange-mounted K Connector® launchers offer an additional advantage over existing designs. These launchers do not use an epoxy pin to secure the center conductor, as used in some SMA designs. Without an epoxy pin, the outer conductor remains solid, and thereby eliminates the leakage path common to pin-captivated designs. Furthermore, K launchers have a wall thickness that is four times that of typical launchers (0.8 vs. 0.2 mm). The heavier wall results in superior resistance to over-torquing. Finally, the K Connector® launcher can be removed for repair without removal of the glass bead. This ensures that during removal the critical microcircuit-to-glass bead interface is not disturbed, hermeticity is preserved, and the micro-circuit will not be subjected to the



Transition from Microcircuit to External Transmission Line

additional stress caused by heating to soldering temperature. Hardware locking compound such as "Removable Loctite®" should be used to further secure the launcher in its housing.

Complete family

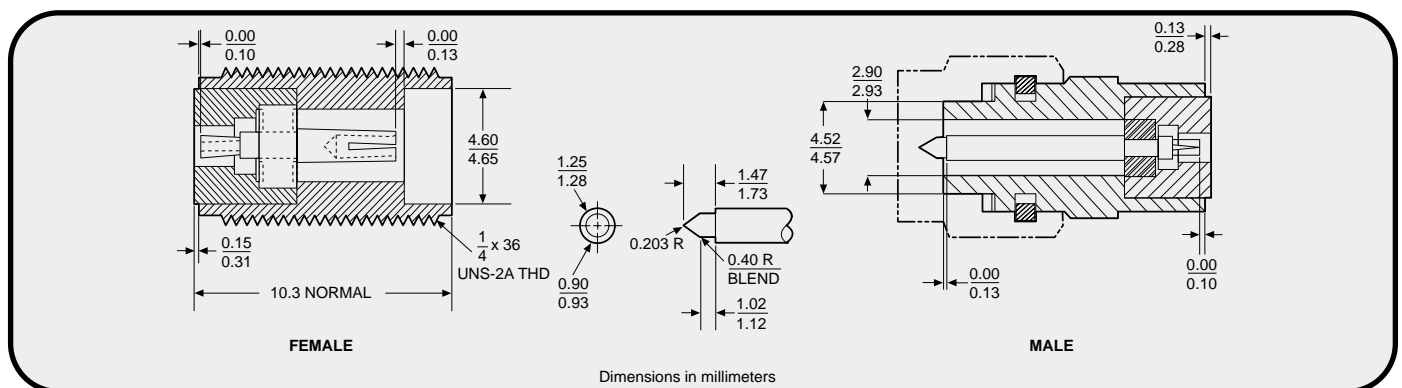
Virtually every interface need can be satisfied by one or more of the K Connector® items offered. There are six different models of K Connector® launchers. Two sparkplug (screw-in) launchers are available—the K102F female version and the K102M male version. Both screw into the housing that encloses the microwave circuit. And, like all Anritsu launchers, they can be easily removed for replacement or repair without unsoldering the glass bead and its interface to the microwave circuit.

When the housing that encloses the microwave circuit is not thick enough to support a threaded, screw-in launcher, flush-mounted (flange) launchers are required. Models with two mounting holes are available in both male and female versions, K103M and K103F. Two other models, the K104F and K104M, have four mounting holes. Mounting hole spacing is identical to that of similar SMA flange launchers. The glass bead interface, of course, is the same design used for the sparkplug launcher.

Cable connectors

Both male and female cable connectors are available. The cable connectors, K101M and K101F, use gold-plated, beryllium-copper center conductors for optimum performance and wear characteristics. Typical return loss at 40 GHz for finished cables exceeds 16 dB (1.35 SWR).

Many connector manufacturers specify connector performance assuming no pin gap, an unrealistic assumption. K Connectors are specified assuming pin gap to be at its maximum tolerance, to provide you the assurance of real-world specifications.



K Connector® interface dimensions in metric measurements

K CONNECTORS®

DC to 40 GHz

Evaluation kit

01-101A Evaluation Kit
Kit contains one K120 25 cm Male/Male Cable Assembly, two K102F Female Sparkplug Launcher Connector Assemblies, two K104F Female Flange Launcher Connector Assemblies, five K100 Glass Beads, one 01-102A Test Fixture, one 01-104 Drill and Tap Set, five K110-1 Microstrip Sliding Contacts, and all other parts and fixtures required to assemble launchers with or without sliding contacts.



Tools and fixtures

01-103 Soldering Fixture
for sparkplug launcher glass beads, package of 10



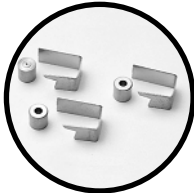
01-104 Drill and Tap Set
for precision machining of concentric holes for mounting K Connector® in microwave housing. (Drill Part No. B14094) (Tap Part No. 783-255)



01-105A
Male and Female Sparkplug Torquing Kit



01-106
K Soldering Fixture for flange launcher glass bead, package of 5.



01-107M or 01-107F
Cable Sleeve Soldering Fixture for K101M Male and K101F Female Cable Connectors, package of 10.



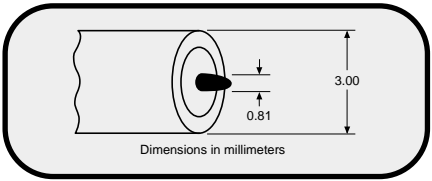
01-108 Drill and Tap Set
for precision machining of concentric holes for mounting K Connector® in microwave housing in applications where stress relief contacts are used. (Drill Part No. B16526) (Tap Part No. 783-255)



Semi-rigid coaxial cable

Type	Semi-rigid coaxial, tin-plated copper outer conductor, silver-plated copper center conductor.
Impedance	50 ± 2 Ohms
Dielectric type	Microporous Teflon, 0.24 cm diameter
Dielectric constant	1.687
Relative velocity	0.77
Outside diameter	3.00 mm
Center conductor diameter	0.81 mm
Minimum bend radius	0.65 cm
Attenuation	1.6 dB/m at 10 GHz 2.3 dB/m at 20 GHz 3.3 dB/m at 30 GHz 4.7 dB/m at 40 GHz

K118 Semi-rigid Coaxial Cable
1.5m length of 3.00 mm semi-rigid cable for K101 series connector

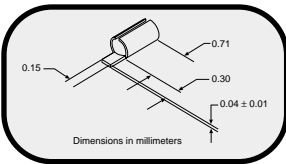


Stress relief contacts

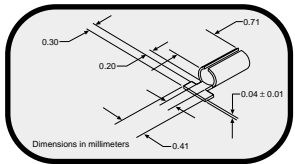
Stress Relief Contacts provide an elegant yet simple solution to relieving stress at the interface of the microcircuit and its connecting coaxial conductor. These contacts simply slide onto the standard glass bead pins.

Frequency range	DC to 40 GHz
Material	0.025 mm heat-treated BeCu
Plating	Bondable gold
Packaging	Lots of 25

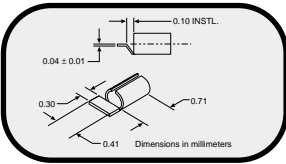
K110-1 Microstrip and Coplanar Waveguide



K110-3 Microstrip



K110-2 Stripline



01-118 K Connector® Cable Assembling Fixture Kit
for 0.118 semi-rigid coaxial cable.

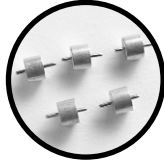


K CONNECTORS®

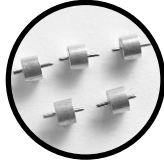
DC to 40 GHz

Launchers and cable connectors

Return loss (launchers only)	15 dB up to 40 GHz
Coupling nut tightening torque	1.36 N-m max
Material	Passivated stainless steel with heat-treated beryllium copper center conductors
Pin depth	0.000 to -0.13 mm for male and female connectors
Temperature range	-55°C to +125°C (200°C available; contact factory)



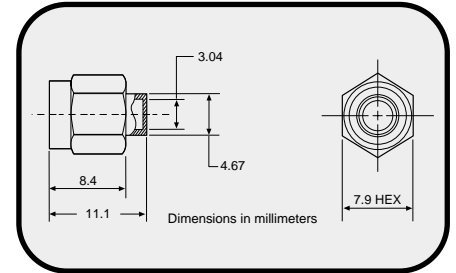
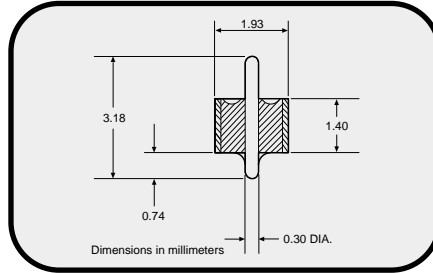
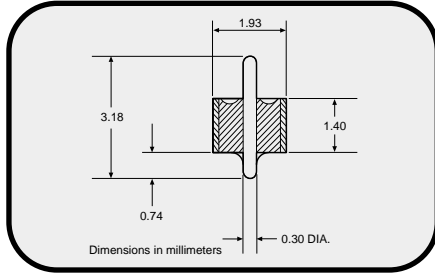
K100
Glass Beads for
K102, K103, and
K104 connectors



K100B
High Hermeticity* Glass
Beads for K102, K103,
and K104 connectors



K101M
K Male In-Line Cable
Connector, DC-40 GHz for
0.118 cable
K101M-85
for 0.085 cable



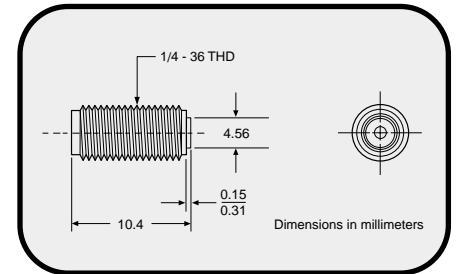
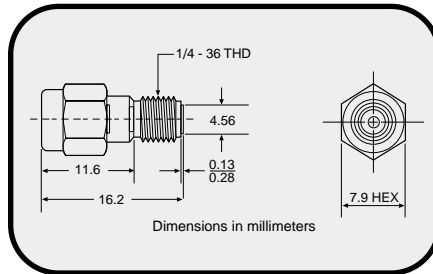
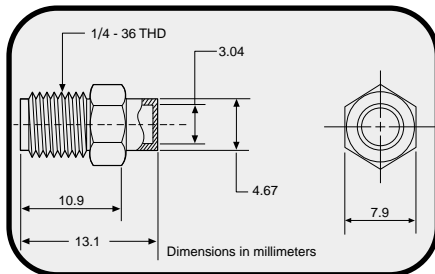
K101F
K Female In-Line Cable
Connector, DC-40 GHz for
0.118 cable



K102M
K Male Sparkplug Launcher
Connector, DC-40 GHz



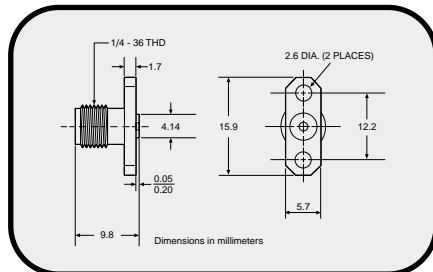
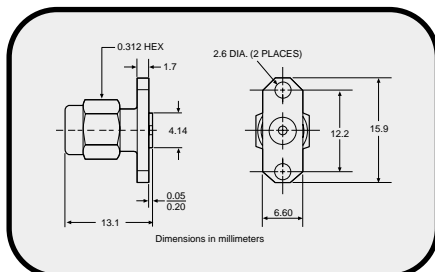
K102F
K Female Sparkplug
Launcher Connector, DC-40
GHz



K103M
K Male Flange Launcher,
two-hole, DC-40 GHz



K103F
K Female Flange Launcher,
two-hole, DC-40 GHz



*Glass Bead Hermeticity Spec: Hermetic to 1×10^{-8} std cc He/sec at 1 atm differential

K CONNECTORS®

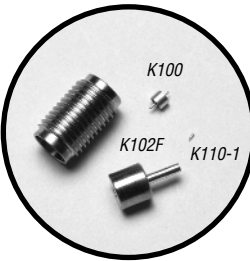
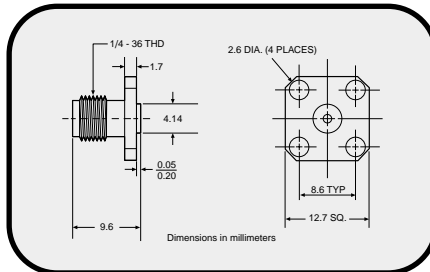
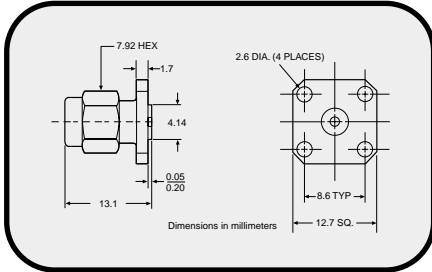
DC to 40 GHz



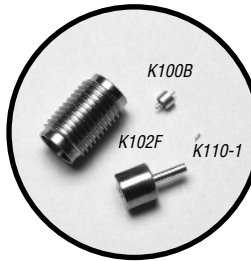
K104M
K Male Flange Launcher,
four-hole, DC-40 GHz



K104F
K Female Flange Launcher,
four-hole, DC-40 GHz



K202F
Combination of
K102F, K100,
K110-1



K202FB
Combination of
K102F, K100B,
K110-1

Ordering information

Please specify model/order number, name, and quantity when ordering.

Model/Order No.	Name
01-101A	K Connector® (evaluation kit)
01-103	Soldering fixture for sparkplug launcher glass bead
01-104	Drill and tap set
01-105A	Male and female sparkplug torquing kit
01-106	Soldering fixture for flange launcher glass bead
01-107F	Cable sleeve soldering fixture, female connector
01-107M	Cable sleeve soldering fixture, male connector
01-108	Drill and tap set
01-118	Cable assembling fixture for 0.118-inch semi-rigid coax cable
K110-1	Microstrip stress relief contact
K110-2	Stripline stress relief contact
K110-3	Microstrip stress relief contact
K100	Glass bead for K102/103/104 connector
K100B	Hermetic glass bead for K102/103/104 connector
K101M	K(m) in-line cable connector, DC to 40 GHz
K101F	K(f) in-line cable connector, DC to 40 GHz
K102M	K(m) sparkplug launcher connector, DC to 40 GHz
K102F	K(f) sparkplug launcher connector, DC to 40 GHz
K103M	K(m) flange launcher connector, DC to 40 GHz, 2 mounting holes
K103F	K(f) flange launcher connector, DC to 40 GHz, 2 mounting holes
K104M	K(m) flange launcher connector, DC to 40 GHz, 4 mounting holes
K104F	K(f) flange launcher connector, DC to 40 GHz, 4 mounting holes
K118	Coaxial cable, 1.5m of 3.00 mm semi-rigid cable for K101 series connector
K202F	Combination of K100, K102F, and K110-1
K202FB	Combination of K100B, K102F, and K110-1

K Connector® Components Kit Model 01-101A

This component kit enables you to design 46 GHz coaxial components and systems using the new Anritsu K Connector®. Included are parts and technical information you need to design high-quality interfaces with microminiature 40 GHz devices.

The K Connector® is mechanically and electrically compatible with SMA, APC-3.5®, and WSMA connectors. The typical performance of systems using these connectors is not degraded significantly by the addition of K Connectors. Only the K Connector®, however, has guaranteed performance up to 46 GHz. An assembled connector and interface has a typical return loss of 18 dB at 40 GHz.

The connector uses a glass bead to provide transition from the microdevice to the connector itself. The use of a glass bead adds several features to the connector design:

- (1) The bead provides a hermetic seal and mechanical isolation.
- (2) The 0.30 mm diameter center conductor in the bead is small enough to make connection to microminiature circuits.
- (3) The connector assembly is easily replace in the field.

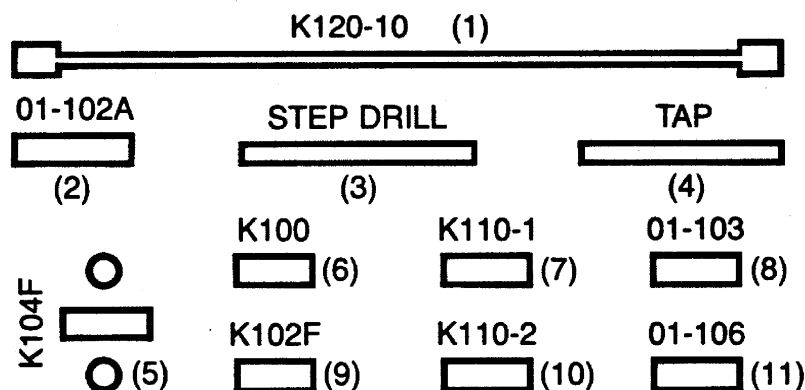
Please note that the male pin of the K Connector® is shorter than that of lower frequency connectors. This design feature eliminates the pin damage that occurs during mating of other connectors whenever the male and female conductors are not perfectly aligned. This important advantage is achieved in the K Connector® without degradation in performance.

The semirigid cable assemblies included in the kit have a microporous Teflon dielectric and a soft-copper center conductor, making the cable suitable for applications where sharp bends are required. The cables and connectors are assembled using standard techniques. The kit also includes an assembled and tested 0.010 inch (0.254 mm) thick Alumina® microstrip through-line assembly.

The K Connectors are manufactured by Anritsu Company. Call for prices. Quantity discounts available.

Anritsu also offers a complete line of test equipment to measure the components and systems that use K Connectors. The Anritsu Model 37XXX Series Vector Network Analyzer can make error corrected measurements from 40 MHz to 62.5 GHz in on continuous sweep.

Item	Quantity	Description
1	1	K120-10, Cable Assembly, 10 inch (25.4 cm)
2	1	01-102A, Test Fixture, K Male
3 & 4	1	01-104, Step Drill and Tap
5	2	K104F, Flange-Mount K Connector® Assembly
6	5	K100, Glass Beads
7	5	K110-1, Sliding Contacts, Microstrip
8	1	01-103, Holding Fixture, Glass Bead
9	1	K102F, Sparkplug K Connector® Assembly
10	5	K110-2, Sliding Contacts, Stripline
11	1	01-106, Holding Fixture, Glass Bead



K Connector® Finishing Step Drill and Tap Kit Model 01-104

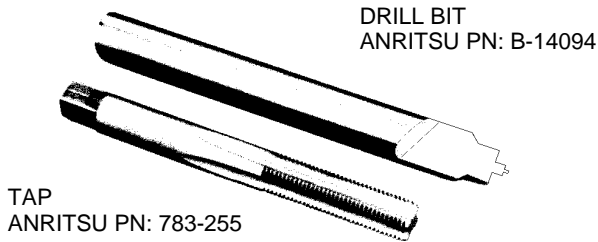


Figure 1. Finishing Step Drill

The finishing step drill is made of high-speed steel. It is designed for use on aluminum and brass housings.

CAUTION

The drill bit in this kit is not intended for use with stainless steel, invar, or Kovar®. However, satisfactory operation—with a limited life—can be obtained with these materials if a pilot hole is drilled first. This pilot hole should be 0.025 mm to 0.125 mm smaller than the required 5.664, 1.981, and 0.711 mm hole diameters. Handle drill bit with care: It has a 0.711 mm diameter tip.

Machining Instructions

The drill bit in this kit (Figure 1) simultaneously machines the concentric holes (Figure 2) needed to install the K102 Sparkplug and K103/K104 Flange Mount Connectors.

NOTE

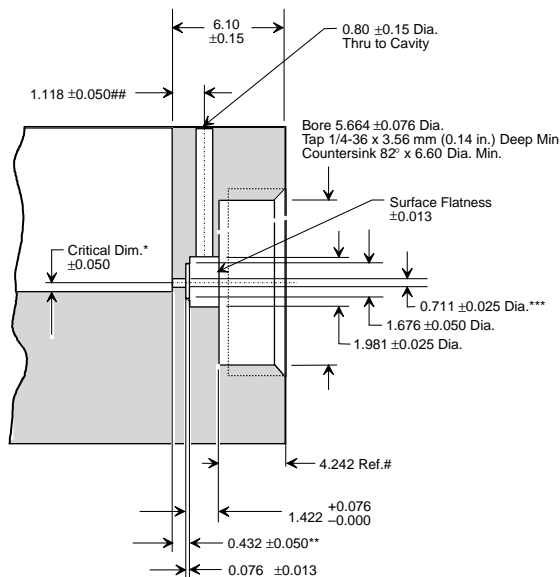
If sliding contacts are used, the 01-108 kit is recommended. However, if the 01-104 kit is used, the small hole must be rebores to the 0.838 mm dimension.

CAUTION

Do not use a drill press for the following steps. The precise tolerances needed require a milling machine.

1. For the pilot hole:
 - a. Drill a through hole using a number-74 (0.0225 in.) or 0.60 mm drill bit.
 - b. Expand the hole to a depth of 5.00 with a number-52 (0.063 in) or 1.60 mm drill bit.
2. Install the step-drill bit directly into the collet of the mill. Do not use a drill chuck to hold the bit.
3. Set the drilling speed for 1500 to 2000 rpm and the feed rate for 0.006 mm per-revolution.

4. Place the material to be machined into the vise of the mill.
5. Drill the holes using full-flood coolant and a steady, even feed. Periodically withdrawing the drill bit and clearing away the chips will make the drilling easier—it will also make breaking the drill bit less likely.
6. For the K102 Sparkplug Connector:
 - a. Drill the hole as shown in Figure 2 for the 6.096 mm wall thickness.
- b. Tap the hole using the tap supplied with the 01-104 kit.
7. For the K103 and K104 Flange Mount Launchers:
 - a. Drill only the 0.711, 1.676, and 1.981 mm holes; make the 1.981 mm hole 1.448 mm deep.
 - b. Tap the two or four mounting holes as shown in Figures 3 and 4.



- * Dimension is 0.152 (Pin Radius) + Substrate thickness + Solder thickness
- ** Dimension is 0.889 ±0.050 mm, if sliding contacts are used.
- *** Dimension is 0.889 ±0.025 mm, if sliding contacts are used.
- # Dimension is 3.785 mm, if sliding contacts are used.
- ## Dimension is 1.575 ±0.050 mm, if sliding contacts are used.

NOTES

1. All dimensions are in mm.
2. The concentricity of the 1.676, 1.981, and 5.1 holes to the 0.711 hole is critical, and must be held within ±0.038 mm.
3. With the Model 01-104 Drill Kit, all of the req concentric holes can be machined at the sar time using a single bit.

Figure 2. Machining Dimensions

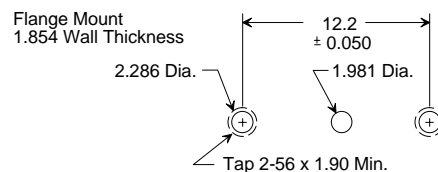


Figure 3. Mounting-Hole Dimensions for the K103 Flange Mount Connections

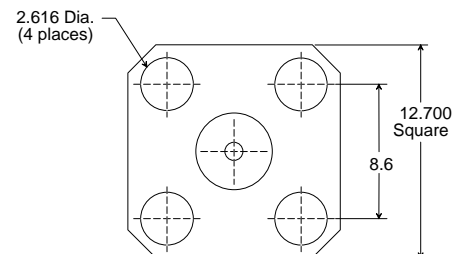


Figure 4. Mounting-Hole Dimensions for the K104 Flange Mount Connections

1. Introduction

This Instruction Sheet provides a listing of the individual tools in the Model 01-105 Torquing Tool Kit and procedures for using these tools to torque the K female cable connector and male and female sparkplug launchers to 1.8 N-meter.

2. Tool List

Table 1 provides a listing of the tools in the Model 01-105 Torquing Tool Kit. The index numbers in Table 1 correspond with those in Figure 1. It is recommended that LOCTITE® RC/609 retaining compound be used in addition to the tools included in this kit.

3. Use with the K102M Sparkplug Launcher

a. Torquing the K102M

(Procedure assumes the connector is in place in its mounting hole)

1. Loosen the K102M outer conductor and apply a small amount of LOCTITE to the threads. Install the centering tool (5) over the center conductor.
2. Tighten the outer conductor finger tight.
3. Place the male-connector-tightening socket (7) over the outer conductor.
4. Install the 5/16-inch socket (6) onto the screwdriver handle (1).
5. Torque the outer conductor to 1.8 N-meter using the screwdriver handle and socket.
6. Remove the male-connector-tightening socket and centering tool.

b. Disassembling the K102M

1. Place the male-connector-tightening socket (7) over the K102M outer conductor.

Index No.	Name	Anritsu Part No.
1	Handle, Screwdriver, Torque Limiting	783-253
2	Wrench, Open End, 5/16-9/32 in., 2 each	783-254
3	Nut, Barrel	01-A-14812
4	Adapter, Tightening, Connector, Female	01-A-14814
5	Tool, Centering	01-A-13921
6	Socket, 1/4 in. drive, 5/16 in., 6-point	783-252
7	Socket, Tightening, Connector, Male	01-A-14813

Table 1. 01-105 Parts List

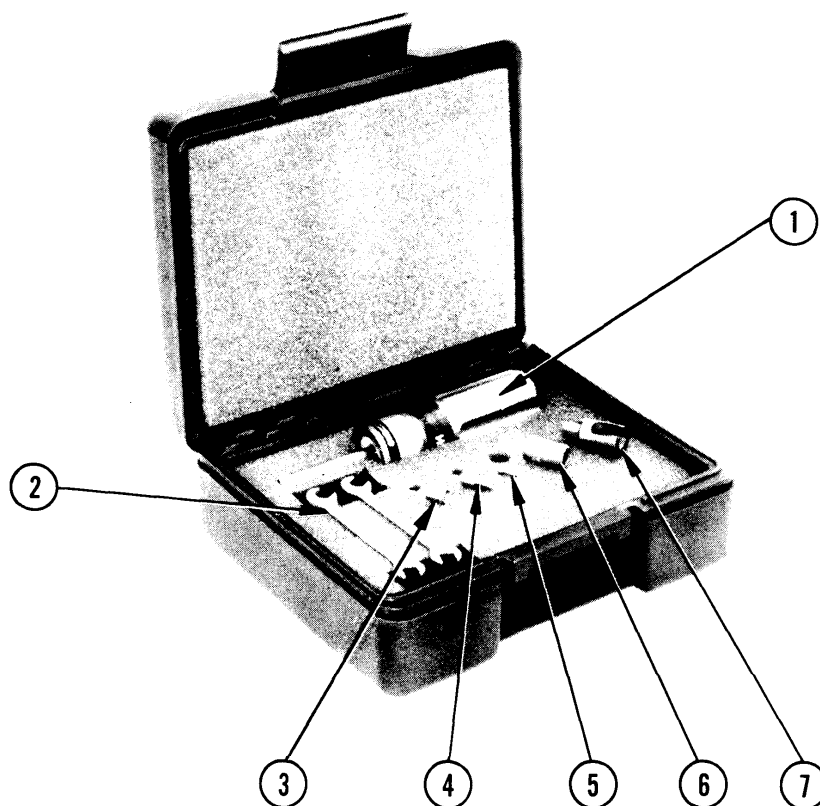


Figure 1. Model 01-105 Torquing Tool Kit

2. Install the 5/16-inch socket (6) onto the screwdriver handle (1).
3. Loosen the outer conductor using the screwdriver handle and socket.
4. Unscrew the outer conductor, and remove the center-pin assembly from the mounting hole.

4. Use with the K102F Sparkplug Launcher

- a. Torquing the K102F
(Procedure assumes the connector is in place in its mounting hole)

1. Loosen the K102F outer conductor and apply a small amount of LOCTITE to the threads. Install the centering tool (5) over the center conductor.
2. Tighten the outer conductor finger tight.
3. Remove the centering tool.
4. Screw the female-connector-tightening adapter (4) into the barrel nut (3) until the top thread is barely covered. Leave a 1.588 mm gap (approximately) between the head of the adapter and the nut.
5. Screw the barrel-nut assembly onto the outer conductor until finger tight.
6. Install the 5/16-inch socket (6) onto the screwdriver handle.
7. Torque the outer conductor to 1.8 N-meter using the screwdriver handle and socket.
8. Remove the barrel-nut assembly from the outer conductor by (a) holding the barrel nut with one of the 5/16-inch wrenches while (b) loosening the adapter with the screwdriver handle and socket.

- b. Disassembling the K102F

1. Screw the female-connector-tightening adapter (4) into the barrel nut (3) until the top thread is barely covered. Leave a 1.588 mm gap (approximately) between the head of the adapter and the nut.

2. Screw the barrel nut assembly onto the K102F outer conductor until finger tight.
3. Place one of the 5/16-inch wrenches (2) onto the barrel nut, and the other wrench onto the adapter in order to form an angle of approximately 45° between the wrenches. Squeeze both wrenches together to tighten the barrel nut assembly onto the outer conductor.
4. With a wrench on the barrel nut, loosen the barrel nut assembly and unscrew the outer conductor.
5. While holding the barrel nut with one wrench, loosen the adapter with the other.
6. Unscrew the outer conductor from the barrel nut assembly.
7. Remove the center-pin assembly from the mounting hole.

5. Use with the K101F Cable Connector

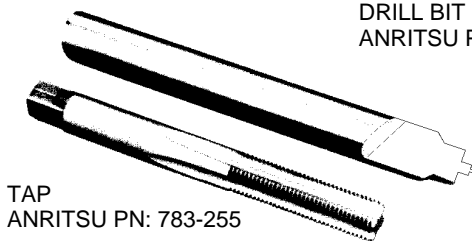
- a. Torquing the K101F
(Procedure assumes the connector is in place on the end of the cable)

1. Loosen the K101F outer conductor from the assembly nut and apply a small amount of LOCTITE to the threads. Install the centering tool (5) over the center conductor.
2. Tighten the assembly nut on the outer conductor until finger tight.
3. Remove the centering tool.
4. Screw the female-connector-tightening adapter (4) into the barrel nut (3) until the top thread is barely covered. Leave a 1.588 mm gap (approximately) between the head of the adapter and the nut.

5. Screw the barrel-nut assembly onto the outer conductor until finger tight.
6. Install the 5/16-inch socket (6) onto the screwdriver handle.
7. While holding the assembly nut, torque the outer conductor to 1.8 N-meter using the screwdriver handle and socket.
8. Remove the installation fixture from the outer conductor by (a) holding the barrel nut with one of the 5/16-inch wrenches while (b) loosening the adapter with the screwdriver handle and socket.

- b. Disassembling the K101F

1. Screw the female-connector-tightening adapter (4) into the barrel nut (3) until the top thread is barely covered. Leave a 1.588 mm gap (approximately) between the head of the adapter and the nut.
2. Screw the barrel nut assembly onto the K101F outer conductor until finger tight.
3. While holding the K101F assembly nut, place one of the 5/16-inch wrenches (2) onto the barrel nut, and the other wrench onto the adapter in order to form an angle of approximately 45° between the wrenches. Squeeze both wrenches together to tighten the barrel nut assembly onto the outer conductor.
4. With a wrench on the barrel nut, loosen the barrel nut assembly and unscrew the outer conductor.
5. Hold the barrel nut and loosen the adapter hex head.
6. Unscrew the outer conductor from the barrel nut assembly.
7. Remove the center-pin assembly from the K101F sleeve.



Anritsu

K Connector®

Finishing Step Drill and Tap Kit (Sliding Contacts) Model 01-108

Figure 1. Finishing Step Drill

The finishing step drill is made of high-speed steel. It is designed for use on aluminum and brass housings.

CAUTION

The drill bit in this kit is not intended for use with stainless steel, invar, or Kovar®. However, satisfactory operation—with a limited life—can be obtained with these materials if a pilot hole is drilled first. This pilot hole should be within 0.125 mm of the required 5.664, 1.981, and 0.838 mm hole diameters.

Handle drill bit with care: It has a 0.838 mm diameter tip.

Machining Instructions

The drill bit in this kit (Figure 1) simultaneously machines the concentric holes (Figure 2) needed to install the K102 Sparkplug and K103/K104 Flange Mount Connectors used in conjunction with the K110 Sliding Contacts and K100 Glass Bead.

CAUTION

Do not use a drill press for the following steps. The precise tolerances needed require a milling machine.

- For the pilot hole:
 - Drill a through hole using a number-74 (0.0225 in.) or 0.60 mm drill bit.
 - Expand the hole to a depth of 5.00 with a number-52 (0.063 in) or 1.60 mm drill bit.
- Install the step-drill bit directly into the collet of the mill. Do not use a drill chuck to hold the bit.
- Set the drilling speed for 1500 to 2000 rpm and the feed rate for 0.006 mm per-revolution.
- Drill the holes using full-flood coolant and a steady, even feed. Periodically

withdrawing the drill bit and clearing away the chips will make the drilling easier—it will also make breaking the drill bit less likely.

- Place the material to be machined into the vise of the mill.
- For the K102 Sparkplug Connector:
 - Drill the hole as shown in Figure 2 for the 6.096 mm wall thickness.
 - Tap the hole using the tap supplied with the 01-108 kit.
- For the K103 and K104 Flange Mount Launchers:
 - Drill only the 0.813, 1.676, and 1.981 mm holes; make the 1.981 mm hole 1.448 mm deep.
 - Tap the two or four mounting holes as shown in Figures 3 and 4.

Used in the manner described above, the 01-108 drill bit should provide reliable performance for thousands of operations.

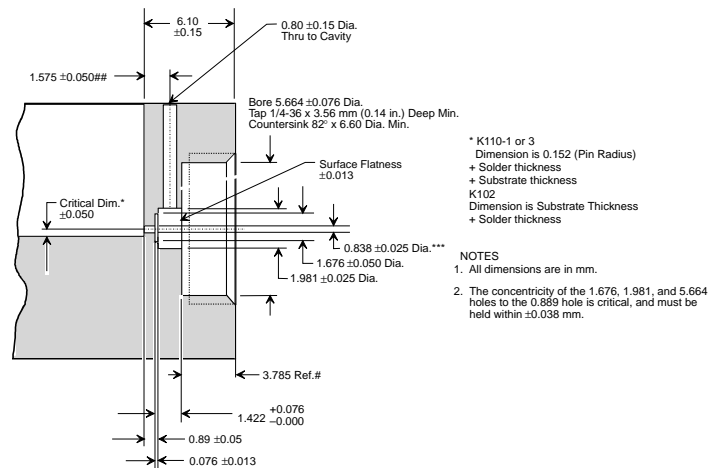


Figure 2. Machining Dimensions

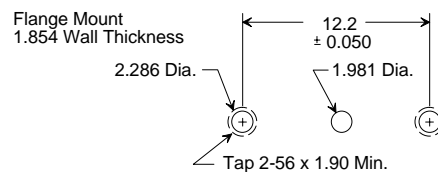


Figure 3. Mounting-Hole Dimensions for the K103 Flange Mount Connections

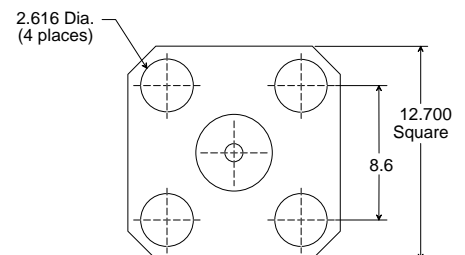


Figure 4. Mounting-Hole Dimensions for the K104 Flange Mount Connections

K Connector® Cable Assembly Tool Kit Model 01-118

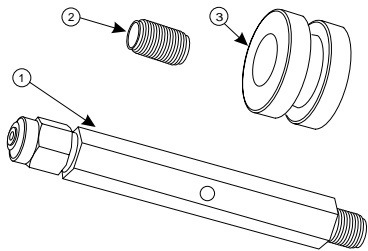


Figure 1. Model 01-118 Cable Assembly Tool

1. Purpose

The Model 01-118 Cable Assembly Tool Kit (Figure 1) provides tools that facilitate assembly of the male and female K101 cable connectors.

2. Tool List

Table 1 provides a listing of the tools in the 01-118 tool kit. The index numbers correspond with those in Figure 1.

Index Number	Name	Anritsu Part Number
1	Multipurpose Tool	01-6-14850
2	Assembly Barrel	01-A-14890
3	Fixture, Cable Bending	01-A-14701

Table 1. Tool List

3. Use With the K101M Cable Connector

General instructions for K101 M assembly are provided in the instruction sheet included with each connector. Use of the multipurpose tool for bead installation—step v. in the Model K101 M Instruction Sheet—is amplified below.

- a. Connect the male-connector bead-pressing end of the multipurpose tool (Figure 2) to the coupling nut on the K101 M connector.

- b. Tighten the K101 M coupling nut to press the bead into place. The male pin should not move during this process.

4. Use With The K101F Cable Connector

Instructions for using the cable-bending fixture and the multipurpose tool in assembling the K101 F cable connector are provided in the Model K101 F Instruction Sheet.

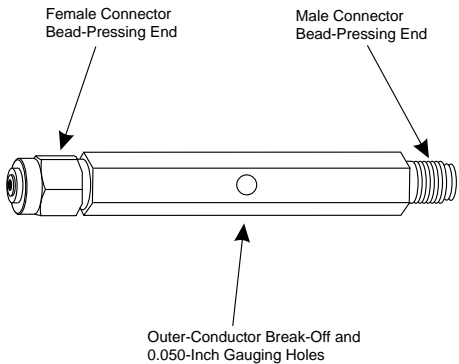


Figure 2. Multipurpose Tool

Specifications

Material:

Sleeve and Center Conductor: Kovar®,
Gold plated

Bead: Corning 7070 glass

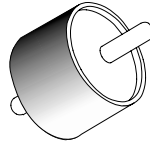


Figure 1. K100 Glass Bead

Anritsu

K Connector®
Glass Bead
Model K100
5 Each

1. Tools And Materials

The following tools and materials are needed to install the K100 Glass Bead in the mounting hole on the housing. Equivalent tools may be used if the recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Support Bead	01-103 or 01-106
Holding Fixture	ANRITSU Co.
Torquing Tool	01-105 ANRITSU Co.
Step Drill Kit	01-104 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the glass bead in the K102 F/M Sparkplug and K103 F/M and K104 F/M Flange Mount installation are given in Figure 5 on the reverse side.

CAUTION

The three holes shown in Note 2 of Figure 5 must be concentric within 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-104, is available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for installing the K100 Glass Bead in the microwave-device housing are provided below. These instructions are for both the K102 F/M Sparkplug and K103 F/M and K104 F/M Flange Mount Connectors.

- Install the microstrip into the housing. Refer to Figure 2 for dimensional tolerances around the glass bead.
- Set the hot plate to 200 10°C.
- For the K102 F/M Sparkplug installation:
 - Flux the glass bead and insert it, long-end first, into the 01-103 Glass Bead Holding Fixture (Figure 3).
 - Using the holding fixture to handle the bead, insert the bead into the mounting-hole opening until the center conductor protrudes through the backside interface and contacts the microstrip.
 - Go to step e.
- For the K103 F/M or K104 F/M Flange Mount installation:

- Flux the glass bead and insert it, long-end first, into the 01-106 Glass Bead Holding Fixture (Figure 3).
- Using the holding fixture to handle the bead, insert the bead into the mounting-hole opening until the center conductor protrudes through the backside interface and contacts the microstrip.
- Hold the holding fixture in place by using the spring clip furnished with the fixture (Figure 4) or the K103/K104 outer conductor. If the spring clip is used, position it so as not to obstruct the solder access hole in housing. Ensure that the glass bead is centered, and that it is making good contact with the microstrip.
- Insert a length of solder into the soldering access hole, and cut it flush with the top of the hole.
- Place the device on the hot plate and leave it there for approximately 15 seconds after the solder has melted.
- Remove the device from the hot plate and allow it to cool.

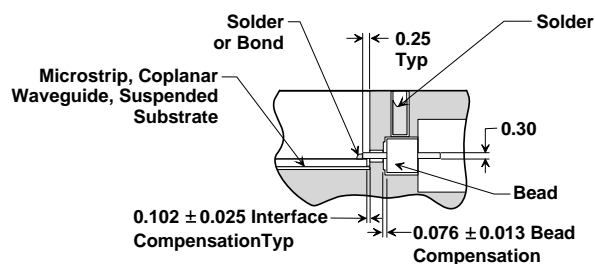


Figure 2. Glass Bead Installation

h. Bond or solder the center conductor to the microstrip. Use a minimum amount of solder.

i. Remove the glass support bead holding fixture, and clean the device to remove any flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO® bead material in center pin support bead.

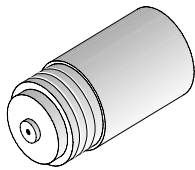


Figure 3. 01-103 Glass Bead Holding Fixture

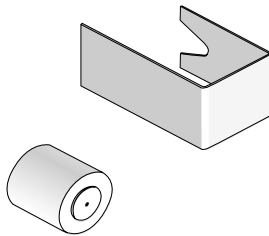


Figure 4. 01-106 Glass Bead Holding Fixture

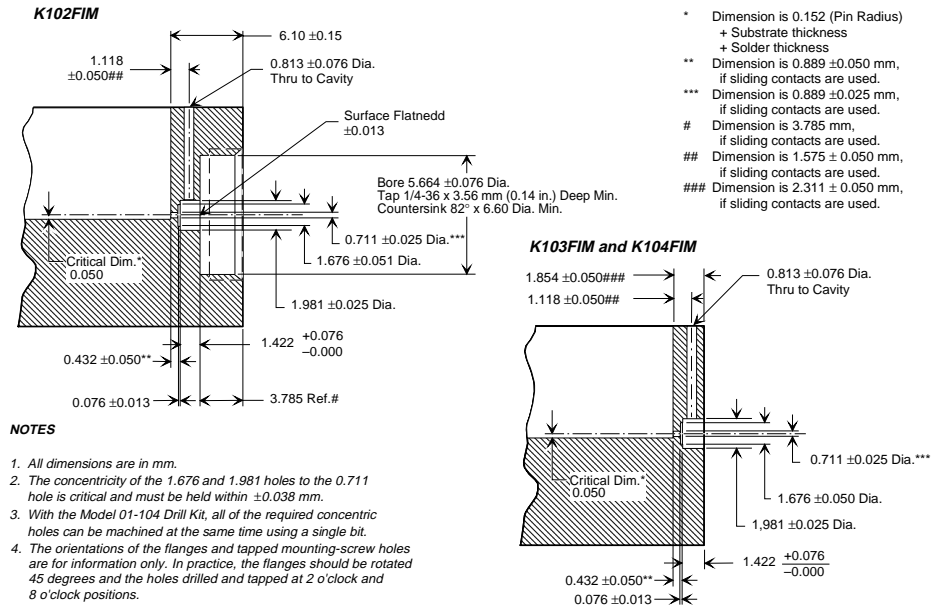


Figure 5. Machining Dimensions for K100 Glass Bead in the K102, K103, and K106 Assembly Installations

Specifications

Temperature Range: -55° C to +125°C

Material:

Center Conductor: Heat treated beryllium copper, gold plated

Bead: Polyphenylene Oxide Noryl (PPO)®

Bead holder and outer conductor:
Passivated stain-less steel

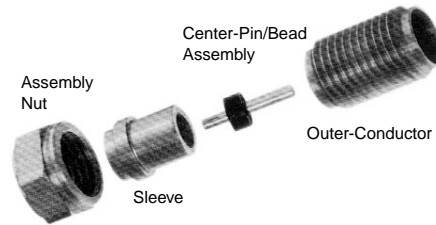


Figure 1. Female K Connector®, Unassembled

Anritsu

K Connector®

Female Connector for 0.118-Inch Outer Diameter Semi-Rigid Coaxial Cable Model K101F

1. Tools And Materials

The following tools and materials are needed to install K101F connector on the K118 semi-rigid coaxial cable. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Resistance Soldering Unit, with Tweezers (TC-10S) and Tip (TT-2)	H101A, Contact, Inc. Hudson, NH
Tool Kit Cable Assembly	01-118 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol
Soldering Fixture	01-107F

2. Fabrication Instructions

Fabrication instructions for the cable assembly are given below. Refer to Figures 1 and 2 to identify the connector parts referenced in the procedure.

a. Remove approximately 6.35 mm of the outer conductor from one end of the cable. The outer conductor should be cut square and be free of burrs. A suggested method using the multipurpose tool in the 01-118 tool kit follows:

- (1) Clamp the multipurpose tool in a vise with the hole facing up.
- (2) Insert the end of the semi-rigid cable into the hole as far as it will go.

- (3) While pressing the cable against the bottom of the hole and rotating it, cut a deep groove around the circumference of the outer conductor using a razor blade or saw.
 - (4) Break off the outer conductor and remove it from the cable.
- b. Remove the exposed Teflon insulation and trim it flush with the outer conductor, taking care not to cut into the center conductor.
- c. Cut and trim the exposed center conductor to 1.27 ± 0.15 mm. The "F" gauging hole in the 01-118 tool kit may be used to measure this distance.
- d. File the center conductor to a smooth point that tapers approximately 0.51 mm back from the point.
- e. Slide the assembly nut onto the cable.
- f. Clean the end of the cable with a solvent-dampened swab to remove any oils due to handling.

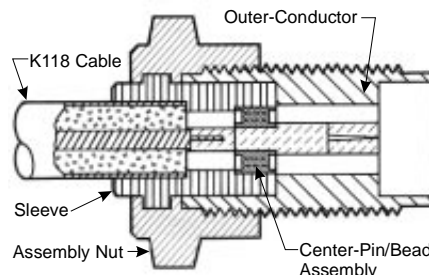


Figure 2. Female K Connector®, Assembled

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve the PPO bead material.

g. Slide the sleeve onto the cable, as shown in Figure 2.

h. While applying pressure to keep the sleeve bottomed out on the cable, apply solder to the back end of the sleeve and solder it square with the cable. Fixture 01-107F is recommended to hold parts while soldering.

i. Inspect the connection to ensure that there are no solder gaps (Figure 3) and that the sleeve assembly is square with the cable.

j. Clean any residue flux from the Teflon interface located on the inside of the connector housing. A small piece of cotton, dampened in solvent and held by tweezers, works best for this cleaning operation.

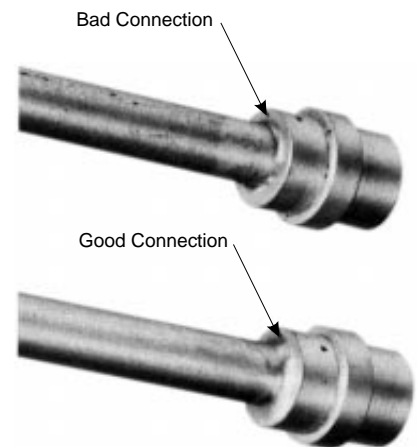


Figure 3. Examples of Good and Bad Solder Connections

- k. Inspect the inside of the connector to ensure that the solder seam has no gaps. A 30x microscope is best for this inspection. There should be no evidence of solder on the sleeve inner diameter.
- l. Press the center-pin/bead assembly into the sleeve, whereupon, spring-fingers on the pin will connect with the cable center conductor. A recommended method using the 01-118 tool kit's multi-purpose tool follows:
 - (1) Slide the assembly-barrel from the tool kit over the sleeve, and screw it into the assembly nut until it is hand-tight.
 - (2) Place the long end of the center-pin/bead assembly into the hole on the female end of the multipurpose tool.
 - (3) Connect the coupling nut on the multipurpose tool with the assembly-barrel and tighten to press the center-pin/bead assembly into the sleeve.
 - (4) Loosen the coupling nut, and remove the multipurpose tool from the end of the cable.
 - (5) Unscrew the assembly-barrel from the assembly nut, and replace it with the outer-conductor barrel from the K101F parts bag.
 - (6) Torque the outer-conductor barrel to 1.8 N-meter. the 01-105 torquing Tool Kit may be used for this purpose.
- m. For best performance, purge residue solvent by placing the completed cable assembly in an oven and baking at 65°C for 8 hours, minimum.

CAUTION

If solvent is allowed to remain, it may cause increased transmission loss.

3.Cable Bending Instructions

Bending instructions for the cable assembly are given below. Bending should not be attempted until connectors are installed on both ends.

- a. Center the cable assembly in the 6.35 mm (0.25 in.) radius bending fixture supplied with the 01-118 tool kit.
- b. Clamp the bending fixture into a vise, and tighten only enough to prevent it from slipping.
- c. Bend the cable to the shape of the bending fixture.

CAUTION

Always use the bending fixture for bending the cable.

Specifications

Temperature Range: -55° C to +125°C

Material:

Center Conductor: Heat treated beryllium copper, gold plated

Bead: Polyphenylene Oxide Noryl (PPO)®

Bead holder and outer conductor: Passivated stain-less steel

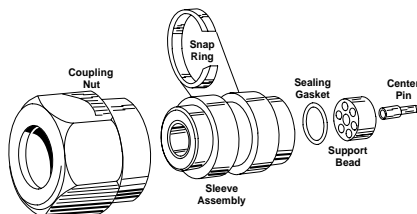


Figure 1. Male K Connector®, Unassembled

Anritsu

K Connector®

Male Connector for 0.118-Inch Outer Diameter Semi-Rigid Coaxial Cable Model K101M

1. Tools And Materials

The following tools and materials are needed to install K101M connector on the K118 semi-rigid coaxial cable. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Resistance Soldering Unit, with Tweezers (TC-10S) and Tip (TT-2)	H101A, Contact, Inc. Hudson, NH
Tool Kit Cable Assembly	01-118 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol
Soldering Fixture	01-107M

2. Fabrication Instructions

Fabrication instructions for the cable assembly are given below. Refer to Figures 1 and 2 to identify the connector parts referenced in the procedure.

- Remove approximately 6.35 mm of the outer conductor from one end of the cable. The outer conductor should be cut square and be free of burrs. A suggested method using the multipurpose tool in the 01-118 tool kit follows:
 - Clamp the multipurpose tool in a vise with the hole facing up.
 - Insert the end of the semi-rigid cable into the hole as far as it will go.

- While pressing the cable against the bottom of the hole and rotating it, cut a deep groove around the circumference of the outer conductor using a razor blade or saw.
 - Break off the outer conductor and remove it from the cable.
- Trim the Teflon away from the center conductor, taking care not to cut into the center conductor. The trimming of the Teflon must be flush with the outer conductor to properly install the center pin later in this procedure.
- Cut, trim, and carefully—so as not to nick or otherwise damage the center conductor—deburr the exposed center conductor to 2.286 ± 0.15 inches. The end of the 01-118 multipurpose tool marked "M" can be used to measure this distance.
- Clamp the cable, and, using a soldering iron, tin (i.e., lightly coat with solder) the exposed center conductor.
- Set the Resistance Soldering Unit to 1.

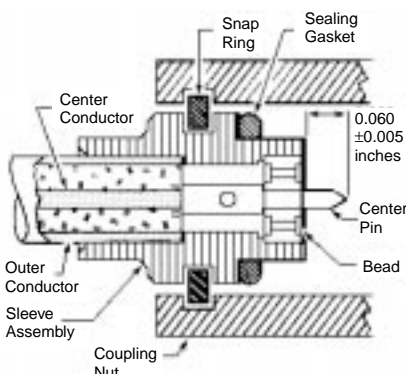


Figure 2. Male K Connector®, Assembled

- Heat the center pin and slide it onto the center conductor, locating it flush with the Teflon dielectric. Avoid getting solder on the outside of the pin.
- Clean the center pin with a solvent-dampened swab to remove all flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve the PPO bead material.

- Clean the end of the cable with a solvent dampened swab to remove any oils due to handling.
- Apply a small amount of flux to the end of the cable.
- Orient the sleeve assembly so that the smaller end is positioned over the end of the cable.
- Slide the sleeve assembly onto the cable until it reaches the bottom limit of the sleeve. When properly positioned, the center pin will protrude as shown in Figure 2, and the sleeve will cover approximately 4.76 mm of the cable. Check pin extension.
- Install the 01-107M Soldering Fixture onto the end of the cable. This will hold the sleeve assembly secure and will also keep it square while it is being soldered onto the cable.
- Set the Resistance Soldering Unit to 4.
- Grasp the sleeve assembly with the soldering tongs and apply solder to the back end of the sleeve to solder it to the cable. Ensure that the sleeve assembly does not move on the cable during this operation.

- o. Inspect the connection to ensure that there are no solder gaps and that the sleeve assembly is square with the cable.
- p. Remove the 01-107M Soldering Fixture.
- q. Clean any residue flux from the Teflon interface located on the inside of the connector housing. A small piece of cotton, dampened in solvent and held by tweezers, works best for this cleaning operation.
- r. Inspect the inside of the connector to ensure that the solder seam has no gaps. A 30X microscope is best for this inspection. Also, ensure that the pin extension is 1.524 ± 0.15 mm.
- s. Spread the snap-ring and slip it onto the groove of the sleeve assembly.
- t. Place the sealing gasket over the large end of the sleeve assembly. It should fit snugly against the shoulder of the sleeve assembly.
- u. Using the snap-ring pliers—or other suitable pliers—compress the snap-ring and slip the assembly into the coupling nut. When the assembly is positioned properly, the snap-ring will “click” into place as it fits into the groove inside the coupling nut.
- v. Carefully slide the bead over the center pin, and press it into the end of the sleeve assembly. The multipurpose tool in the 01-118 tool kit should be used to press the bead into place. the center pin should not be pushed back during this operation.
- w. Inspect the cable assembly to ensure the following:
 - (1) That the support bead is flush with or slightly recessed from the end of the sleeve assembly.
 - (2) That the center pin extends out from the bead as shown in Figure 2.
- x. For best performance, purge residue solvent by placing the completed cable assembly in an oven and baking at 65°C for 8 hours, minimum.

CAUTION

If solvent is allowed to remain, it may cause increased transmission loss.

3. Cable Bending Instructions

Bending instructions for the cable assembly are given below. Bending should not be attempted until connectors are installed on both ends.

- a. Center the cable assembly in the 6.35 mm (0.25 in.) radius bending fixture supplied with the 01-118 tool kit.
- b. Clamp the bending fixture into a vise, and tighten only enough to prevent it from slipping.
- c. Bend the cable to the shape of the bending fixture.

CAUTION

Always use the bending fixture for bending the cable.

Specifications

Return Loss: 15 dB to 40 GHz (usable to 46 GHz)

Temperature Range: -55°C to +125°C

Material:

Center Conductor: Heat treated beryllium copper, gold plated

Bead: Polyphenylene Oxide Noryl (PPO)®

Bead holder and outer conductor: Passivated stainless steel

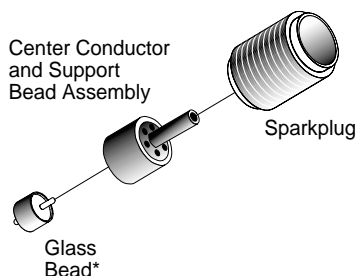


Figure 1. Sparkplug Connector

Anritsu

K Connector® Microstrip to K Female Sparkplug Connector Model K102F

1. Tools And Materials

The following tools and materials are needed to install K102F Flange Mount Connector in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Step Drill Kit	01-104 ANRITSU Co.
Torquing Tool	01-105 ANRITSU Co.
Support Bead Holding Fixture	01-103 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the microstrip to K female flange mount connector are provided in Figure 5 on the reverse side.

CAUTION

The four holes shown in Note 2 of Figure 5 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-104, is available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for the sparkplug connector assembly are provided below. Figures 1 and 2 identify the connector parts. Refer to these figures while performing the following steps.

- Install microstrip into housing. Refer to Figure 3 for dimensional tolerances around glass bead.
- Set hot plate to $200 \pm 10^\circ\text{C}$.
- Flux glass bead and insert it, long-end first, into 01-103 Glass Bead Holding Fixture (Figure 4).
- Using holding fixture to handle bead, screw bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.
- Insert a length of solder into soldering access hole, and cut it flush with top of hole.

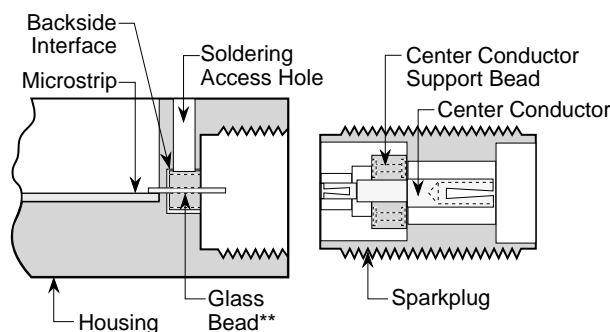


Figure 2. K Connector® Sparkplug Assembly

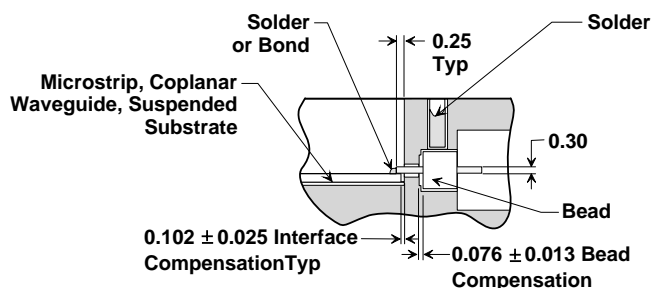


Figure 3. Glass Bead Installation

K Connector is a registered trademark of Anritsu Company.
PPO is a registered trademark of General Electric
*Glass bead is not supplied—ANRITSU Part No: K100.

- f. Place device on hot plate and leave there for approximately 15 seconds after solder melts.
- g. Remove device from hot plate and allow it to cool.
- h. Bond or solder center conductor to microstrip. Use minimum amount of solder.
- i. Remove glass support bead holding fixture, and clean device to remove flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO bead material in center pin support bead.

- j. Screw sparkplug assembly into tapped mounting hole and torque to 1.7 – 2.0 N-meter using the 01-105 Torquing Tool Kit.

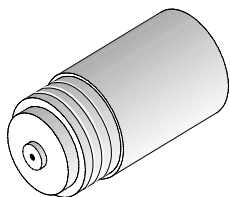
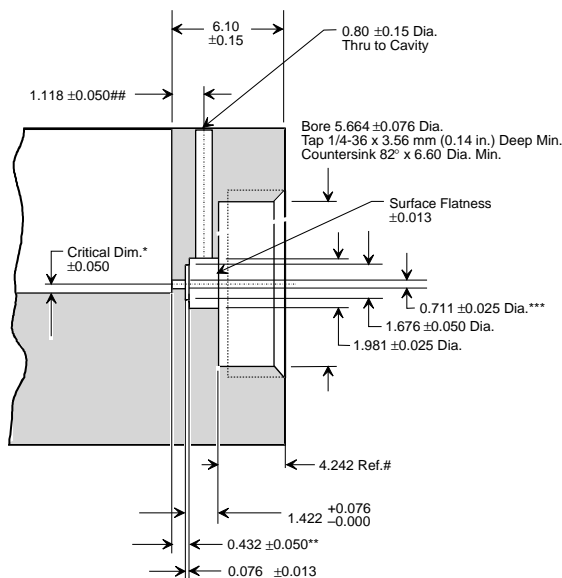


Figure 4. 01-103 Glass Bead Holding Fixture



- * Dimension is 0.152 (Pin Radius) + Substrate thickness + Solder thickness
- ** Dimension is 0.889 ±0.050 mm, if sliding contacts are used.
- *** Dimension is 0.889 ±0.025 mm, if sliding contacts are used.
- # Dimension is 3.785 mm, if sliding contacts are used.
- ## Dimension is 1.575 ± 0.050 mm, if sliding contacts are used.

NOTES

1. All dimensions are in mm.
2. The concentricity of the 1.676, 1.981, and 5. holes to the 0.711 hole is critical, and must be held within ±0.038 mm.
3. With the Model 01-104 Drill Kit, all of the concentric holes can be machined at the same time using a single bit.

Figure 5. Machining Dimensions for the Sparkplug Connector Mounting Hole

Specifications

Return Loss: 15 dB to 40 GHz (usable to 46 GHz)

Temperature Range: -55°C to +125°C

Material:

Center Conductor: Heat treated beryllium copper, gold plated

Bead: Plastic

Bead holder and outer conductor: Passivated stainless steel

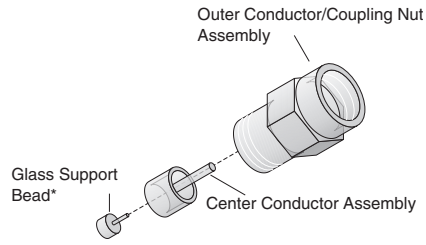


Figure 1. Sparkplug-Launcher Connector, Unassembled

Anritsu

K Connector® Microstrip to K Female Sparkplug-Launcher Model K102M

1. Tools And Materials

The following tools and materials are needed to install K102M Sparkplug-Launcher Connector in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Step Drill Kit	01-104 ANRITSU Co.
Torquing Tool	01-105 ANRITSU Co.
Support Bead Holding Fixture	01-103 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the microstrip to K sparkplug-launcher connector are provided in Figure 5 on the reverse side.

CAUTION

The four holes shown in Note 2 of Figure 5 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-104, is available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for the Sparkplug-Launcher connector assembly are provided below. Figures 1 and 2 identify the connector parts. Refer to these figures while performing the following steps.

a. Install microstrip into housing. Refer to Figure 3 for dimensional tolerances around glass bead.

b. Set hot plate to $200 \pm 10^\circ\text{C}$.

c. Flux glass bead and insert it, long-end first, into 01-103 Glass Bead Holding Fixture (Figure 4).

d. Using holding fixture to handle bead, insert bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.

e. Insert a length of solder into soldering access hole, and cut it flush with top of hole.

f. Place device on hot plate and leave there for approximately 15 seconds after solder melts.

g. Remove device from hot plate and allow it to cool.

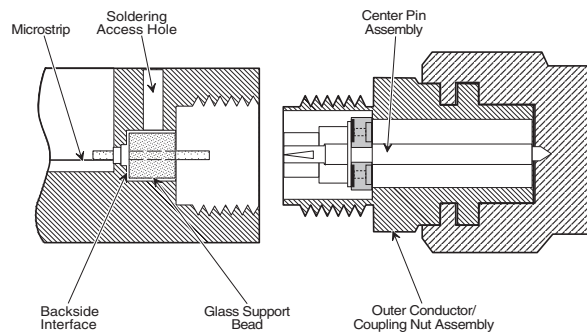


Figure 2. K Connector® Sparkplug-Launcher Assembly

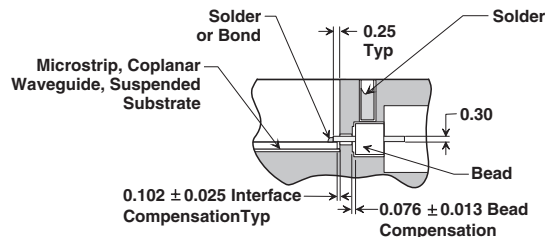


Figure 3. Glass Bead Installation

- h. Bond or solder the center conductor to the microstrip. Use a minimum amount of solder.
- i. Remove the glass bead holding fixture and clean the device to remove the flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO bead material in center pin support bead.

- j. Screw the sparkplug assembly into the tapped mounting hole and torque to 1.7 – 2.0 N-meter using the 01-105 Torquing Tool Kit.

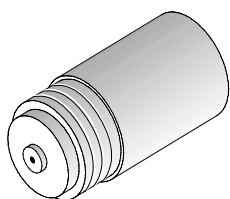
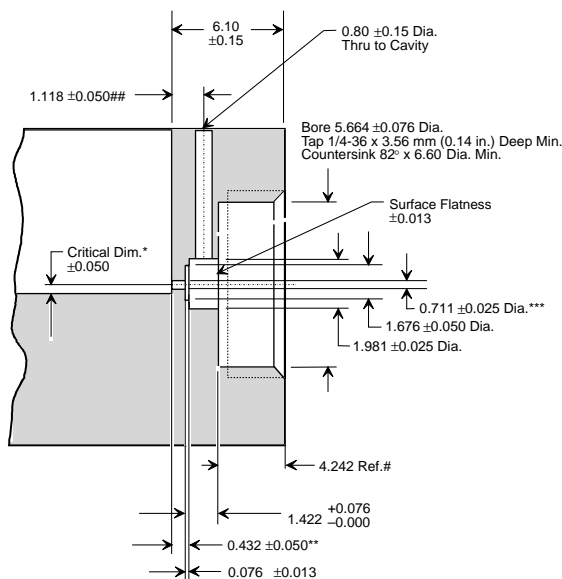


Figure 4. 01-103 Glass Bead Holding Fixture



- * Dimension is 0.152 (Pin Radius) + Substrate thickness + Solder thickness
- ** Dimension is 0.889 ±0.050 mm, if sliding contacts are used.
- *** Dimension is 0.889 ±0.025 mm, if sliding contacts are used.
- # Dimension is 3.785 mm, if sliding contacts are used.
- ## Dimension is 1.575 ±0.050 mm, if sliding contacts are used.

NOTES

1. All dimensions are in mm.
2. The concentricity of the 1.676, 1.981, and 5.6 holes to the 0.711 hole is critical, and must be held within ±0.038 mm.
3. With the Model 01-104 Drill Kit, all of the required concentric holes can be machined at the same time using a single bit.

Figure 5. Machining Dimensions for the Sparkplug-Launcher Connector Mounting Hole

Specifications

Return Loss: 15 dB to 40 GHz (usable to 46 GHz)

Temperature Range: -55° C to +125° C

Material: Center Conductor: Heat treated beryllium copper, gold plated

Bead: Plastic

Bead holder and outer conductor: Passivated stainless steel

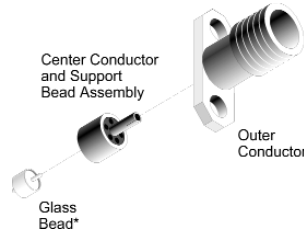


Figure 1. Female Flange Mount Connector, Unassembled

Anritsu

K Connector® Microstrip to K Female Flange Mount Connector Model K103F

1. Tools And Materials

The following tools and materials are needed to install K103F Flange Mount Connector in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Step Drill Kit	01-104 01-108 (For Sliding Contacts) ANRITSU Co.
Support Bead Holding Fixture	Kit 01-106 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the microstrip to K female flange mount connector are provided in Figure 6 on the reverse side.

CAUTION

The three holes shown in Note 2 of Figure 6 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-104, is available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for the flange mount connector assembly are provided below. Figures 1 and 2 identify the connector parts. Refer to these figures while performing the following steps.

- Install microstrip into housing. Refer to Figure 3 for dimensional tolerances around glass bead.
- Set hot plate to $200 \pm 10^\circ\text{C}$.
- Flux glass bead and insert it, long-end first, into 01-106 Glass Bead Holding Fixture (Figure 4).
- Using holding fixture to handle bead, insert bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.

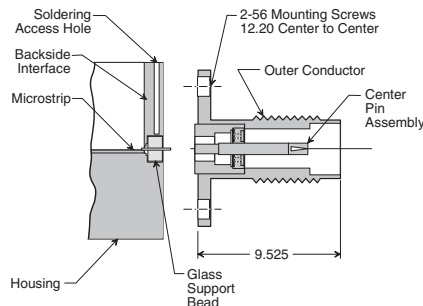


Figure 2. K Connector® Flange Mount Assembly

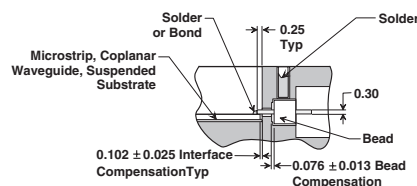


Figure 3. Glass Bead Installation

- Hold the holding fixture in place by using the spring clip furnished with the fixture (Figure 5) or the K103 outer conductor (Figure 1). If spring clip is used, position it so as not to obstruct the solder access hole in housing. Ensure that glass bead is centered, and that it is making good contact with microstrip.
- Insert a length of solder into soldering access hole, and cut it flush with top of hole.
- Place device on hot plate and leave there for approximately 15 seconds after solder melts.

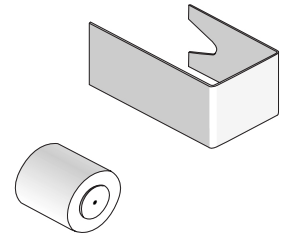


Figure 4. 01-106 Glass Bead Holding Fixture

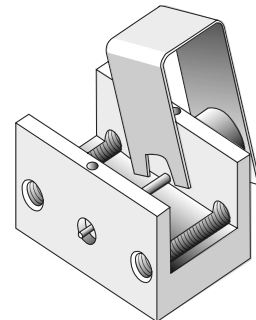


Figure 5. Glass Bead Holding Fixture Secured with Spring Clip

K103F

- h. Remove device from hot plate and allow it to cool.
- i. If a sliding contact is not used, bond or solder center conductor to microstrip. Use minimum amount of solder. However, if a sliding contact is used, see its instruction sheet for soldering instructions.
- j. Remove glass support bead holding fixture, and clean device to remove flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO bead material in center pin support bead.

- k. Install K103F outer conductor onto housing. Make sure that center conductor mates properly with K103F center pin. Secure outer conductor with two 2-56 in. (2.2 mm) screws. When tightening screws, use care to keep flanges parallel to housing.

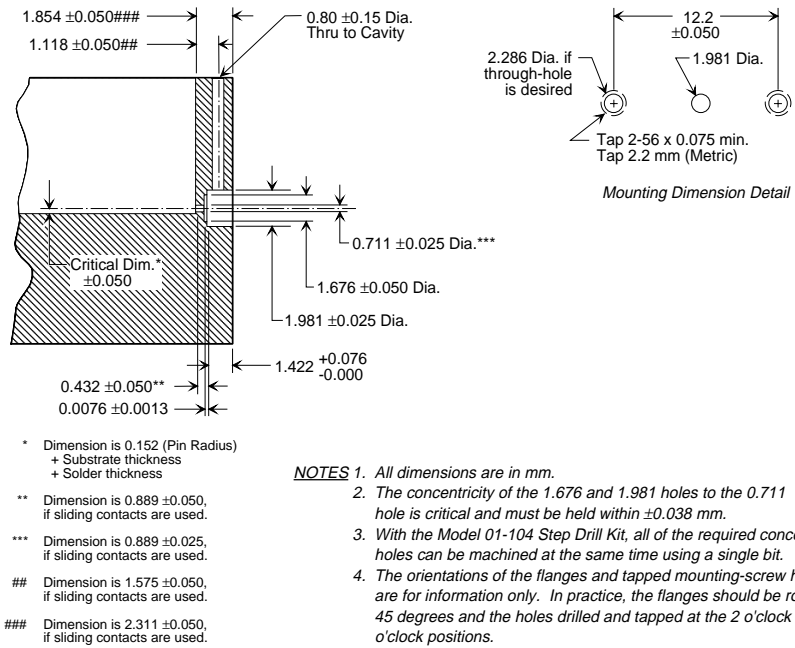


Figure 6. Machining Dimensions for the Flange Mount Connector Mounting Holes

Specifications

Return Loss: 15 dB to 40 GHz (usable to 46 GHz)

Temperature Range: -55° C to +125° C

Material: Center Conductor: Heat treated beryllium copper, gold plated

Bead: Plastic

Bead holder and outer conductor: Passivated stainless steel

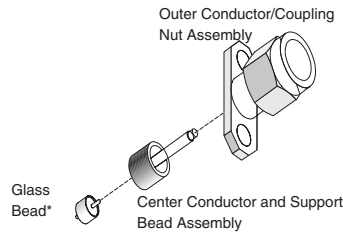


Figure 1. Male Flange Mount Connector, Unassembled

Anritsu

K Connector® Microstrip to K Male Flange Mount Connector Model K103M

1. Tools And Materials

The following tools and materials are needed to install K103M Flange Mount Connector in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Step Drill Kit	01-104 01-108 (For Sliding Contacts) ANRITSU Co.
Support Bead Holding Fixture	Kit 01-106 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the microstrip to K female flange mount connector are provided in Figure 6 on the reverse side.

CAUTION

The three holes shown in Note 2 of Figure 6 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-104, is available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for the flange mount connector assembly are provided below. Figures 1 and 2 identify the connector parts. Refer to these figures while performing the following steps.

- Install microstrip into housing. Refer to Figure 3 for dimensional tolerances around glass bead.
- Set hot plate to $200 \pm 10^\circ\text{C}$.
- Flux glass bead and insert it, long-end first, into 01-106 Glass Bead Holding Fixture (Figure 4).
- Using holding fixture to handle bead, insert bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.

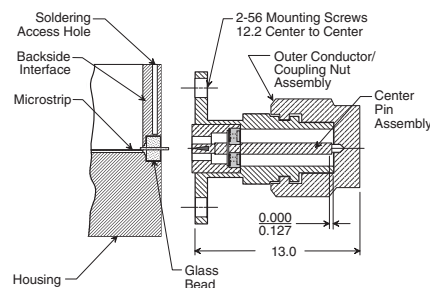


Figure 2. K Connector® Flange Mount Assembly

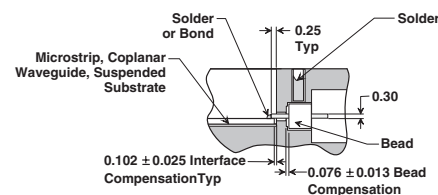


Figure 3. Glass Bead Installation

- Hold the holding fixture in place by using the spring clip furnished with the fixture (Figure 5) or the K103 outer conductor (Figure 1). If spring clip is used, position it so as not to obstruct the solder access hole in housing. Ensure that glass bead is centered, and that it is making good contact with microstrip.
- Insert a length of solder into soldering access hole, and cut it flush with top of hole.
- Place device on hot plate and leave there for approximately 15 seconds after solder melts.

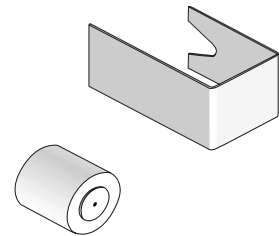


Figure 4. 01-106 Glass Bead Holding Fixture

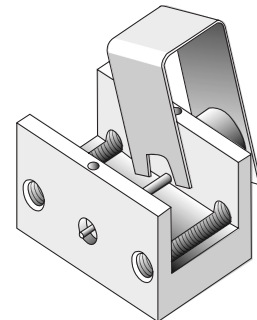


Figure 5. Glass Bead Holding Fixture Secured with Spring Clip

- h. Remove device from hot plate and allow it to cool.
- i. If a sliding contact is not used, bond or solder center conductor to microstrip. Use minimum amount of solder. However, if a sliding contact is used, see its instruction sheet for soldering instructions.
- j. Remove glass support bead holding fixture, and clean device to remove flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO bead material in center pin support bead.

- k. Install K103 outer conductor onto housing. Make sure that center conductor mates properly with K103 center pin. Secure outer conductor with four 2-56 in. (2.2 mm) screws. When tightening screws, use care to keep flanges parallel to housing.

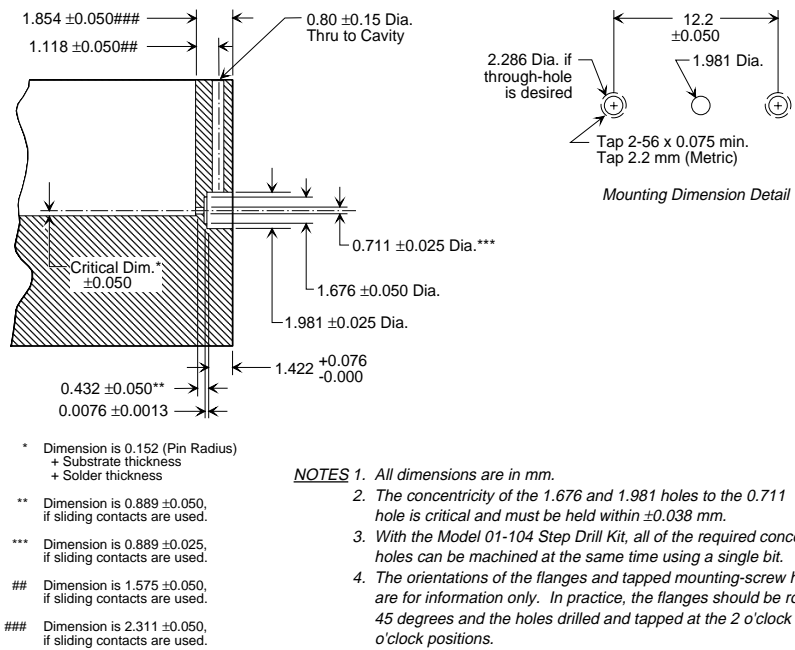


Figure 6. Machining Dimensions for the Flange Mount Connector Mounting Holes

Specifications

Return Loss: 15 dB to 40 GHz (usable to 46 GHz)

Temperature Range: -55° C to +125° C

Material: Center Conductor: Heat treated beryllium copper, gold plated

Bead: Plastic

Bead holder and outer conductor: Passivated stainless steel

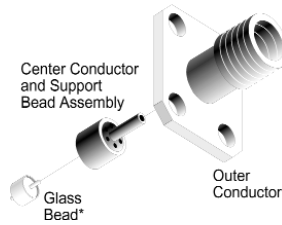


Figure 1. Female Flange Mount Connector, Unassembled

Anritsu

K Connector® Microstrip to K Female Flange Mount Connector Model K104F

1. Tools And Materials

The following tools and materials are needed to install K104F Flange Mount Connector in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Step Drill Kit	01-104 01-108 (For Sliding Contacts) ANRITSU Co.
Support Bead Holding Fixture	Kit 01-106 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the microstrip to K female flange mount connector are provided in Figure 6 on the reverse side.

CAUTION

The three holes shown in Note 2 of Figure 6 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, custom-made drill-bit kits, Model 01-104 and 01-108, are available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for the flange mount connector assembly are provided below. Figures 1 and 2 identify the connector parts. Refer to these figures while performing the following steps.

- Install microstrip into housing. Refer to Figure 3 for dimensional tolerances around glass bead.
- Set hot plate to $200 \pm 10^\circ\text{C}$.
- Flux glass bead and insert it, long-end first, into 01-106 Glass Bead Holding Fixture (Figure 4).
- Using holding fixture to handle bead, insert bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.

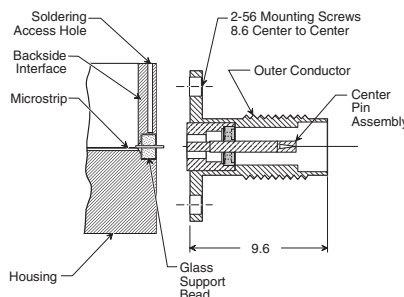


Figure 2. K Connector® Flange Mount Assembly

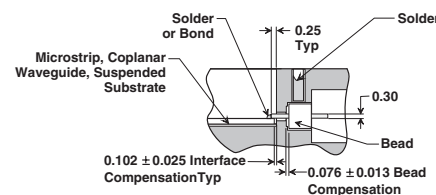


Figure 3. Glass Bead Installation

- Hold the holding fixture in place by using the spring clip furnished with the fixture (Figure 5) or the K104 outer conductor (Figure 1). If spring clip is used, position it so as not to obstruct the solder access hole in housing. Ensure that glass bead is centered, and that it is making good contact with microstrip.
- Insert a length of solder into soldering access hole, and cut it flush with top of hole.
- Place device on hot plate and leave there for approximately 15 seconds after solder melts.

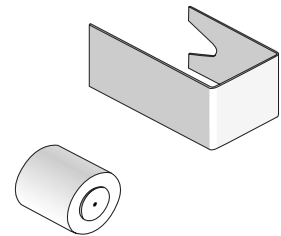


Figure 4. 01-106 Glass Bead Holding Fixture

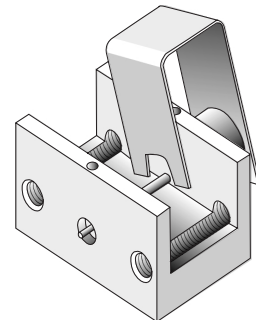


Figure 5. Glass Bead Holding Fixture Secured with Spring Clip

- h. Remove device from hot plate and allow it to cool.
- i. If a sliding contact is not used, bond or solder center conductor to microstrip. Use minimum amount of solder. However, if a sliding contact is used, see its instruction sheet for soldering instructions.
- j. Remove glass support bead holding fixture, and clean device to remove flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO bead material in center pin support bead.

- k. Install K104 outer conductor onto housing. Make sure that center conductor mates properly with K104 center pin. Secure outer conductor with two 2-56 in. (2.2 mm) screws. When tightening screws, use care to keep flanges parallel to housing.

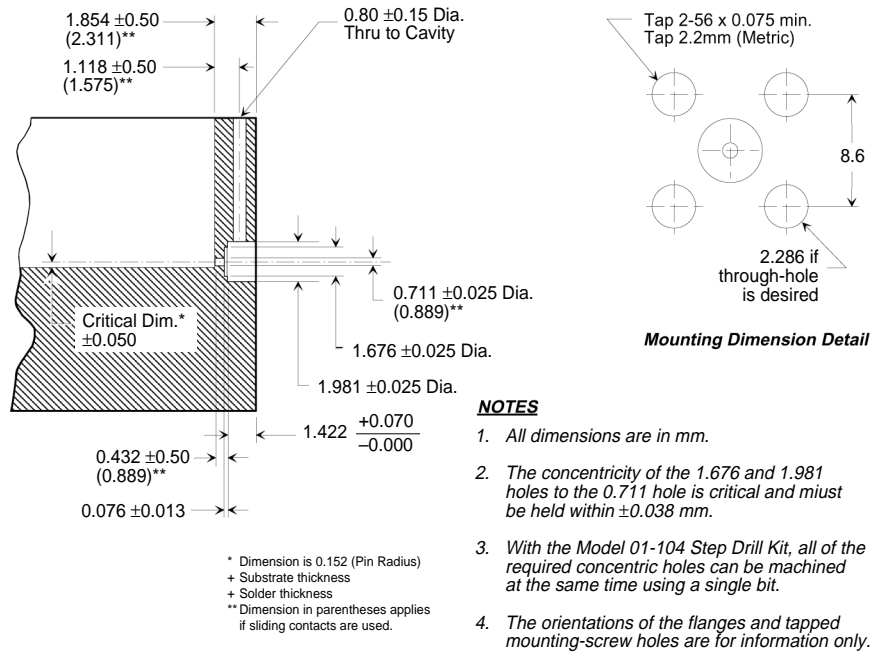


Figure 6. Machining Dimensions for the Flange Mount Connector Mounting Holes

Specifications

Return Loss: 15 dB to 40 GHz (usable to 46 GHz)

Maximum DC Input: 1200 volts

Temperature Range: -55°C to +125°C

Material: Center Conductor: Heat treated beryllium copper, gold plated

Bead: Plastic

Bead holder and outer conductor: Passivated stainless steel

Outer Conductor/Coupling
Nut Assembly

Glass
Bead**

Center Conductor and Support
Bead Assembly

Figure 1. Male Flange Mount Connector, Unassembled

Anritsu

K Connector® Microstrip to K Male Flange Mount Connector Model K104M

1. Tools And Materials

The following tools and materials are needed to install K104M Flange Mount Connector in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2155, Micro Hot Plate, Thermolyne, Baxter Scientific Products
Step Drill Kit	01-104 01-108 (For Sliding Contacts) ANRITSU Co.
Support Bead Holding Fixture	Kit 01-104 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the microstrip to K female flange-mount connector are provided in Figure 6 on the reverse side.

CAUTION

The three holes shown in Note 2 of Figure 6 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-104, is available from ANRITSU.

3. Fabrication Instructions

Fabrication instructions for the flange mount connector assembly are provided below. Figures 1 and 2 identify the connector parts. Refer to these figures while performing the following steps.

- Install microstrip into housing. Refer to Figure 3 for dimensional tolerances around glass bead.
- Set hot plate to $200 \pm 10^\circ\text{C}$.
- Flux glass bead and insert it, long-end first, into 01-106 Glass Bead Holding Fixture (Figure 4).
- Using holding fixture to handle bead, insert bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.

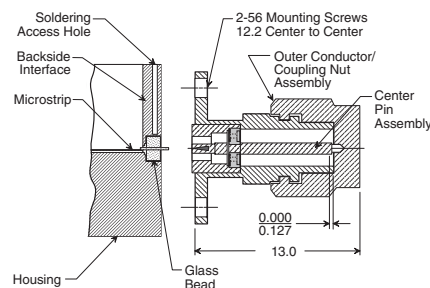


Figure 2. K Connector® Flange Mount Assembly

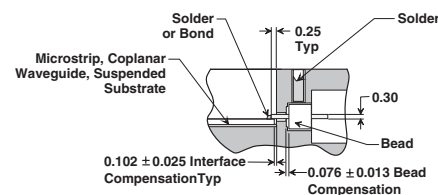


Figure 3. Glass Bead Installation

- Hold the holding fixture in place by using the spring clip furnished with the fixture (Figure 5) or the K104 outer conductor (Figure 1). If spring clip is used, position it so as not to obstruct the solder access hole in housing. Ensure that glass bead is centered, and that it is making good contact with microstrip.
- Insert a length of solder into soldering access hole, and cut it flush with top of hole.
- Place device on hot plate and leave there for approximately 15 seconds after solder melts.

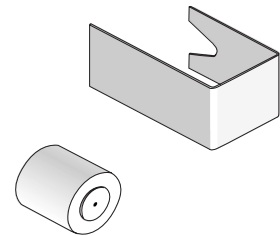


Figure 4. 01-106 Glass Bead Holding Fixture

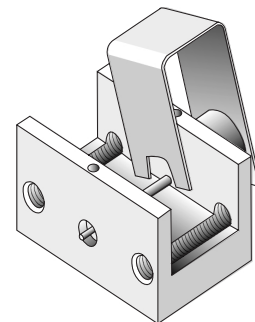


Figure 5. Glass Bead Holding Fixture Secured with Spring Clip

- h. Remove device from hot plate and allow it to cool.
- i. If a sliding contact is not used, bond or solder center conductor to microstrip. Use minimum amount of solder. However, if a sliding contact is used, see its instruction sheet for soldering instructions.
- j. Remove glass support bead holding fixture, and clean device to remove flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon®). These compounds may soften or dissolve PPO bead material in center pin support bead.

- k. Install K104 outer conductor onto housing. Make sure that center conductor mates properly with K104 center pin. Secure outer conductor with four 2-56 in. (2.2 mm) screws. When tightening screws, keep flanges parallel to housing and tighten screws incrementally so as to apply pressure evenly.

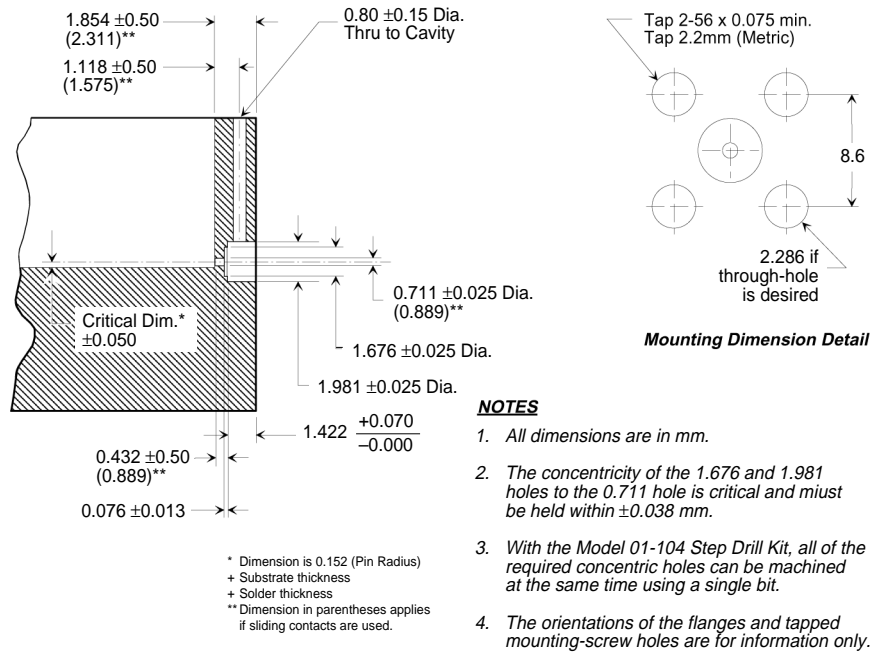


Figure 6. Machining Dimensions for the Flange Mount Connector Mounting Holes

Specifications

Frequency: DC to 46 GHz

Material: 0.001 inch heat-treated BeCu.

Plating: 120 microinch gold, minimum

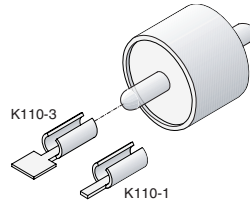


Figure 1. Glass Bead, K110-1, Sliding Contacts for Alumina Microstrip, and K110-3 Sliding Contacts for Duroid® Microstrip

Anritsu

K Connector® Sliding Contacts for Microstrip Model K110-1/K110-3

1. Tools And Materials

The following tools and materials will be helpful in installing the K110 Sliding Contacts on the pin of the glass bead.

Name	Vendor and Model/Part Number
Stereo Microscope	Bausch & Lomb 30 power
Thermo-Compression Bonder	MECH-EL Model 970 West Bond Model 7416
Parallel-Gap Welder and Pulse Bonder	Hughes Model WCW550 with VTA-90 Head
Step Drill	01-108 ANRITSU Co.
Solder, Indium #2	Indium Corp. of America
Jewelers Screwdriver	N/A
Tweezers	N/A

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the K102 F/M Sparkplug and K103 F/M and K104 F/M Flange Mount K Connector® assemblies are given in Figure 2.

The precision step drill listed in the table in paragraph 1 makes it easier to achieve concentricity of the respective four or three holes required for the K102 or K103 and K104 installations.

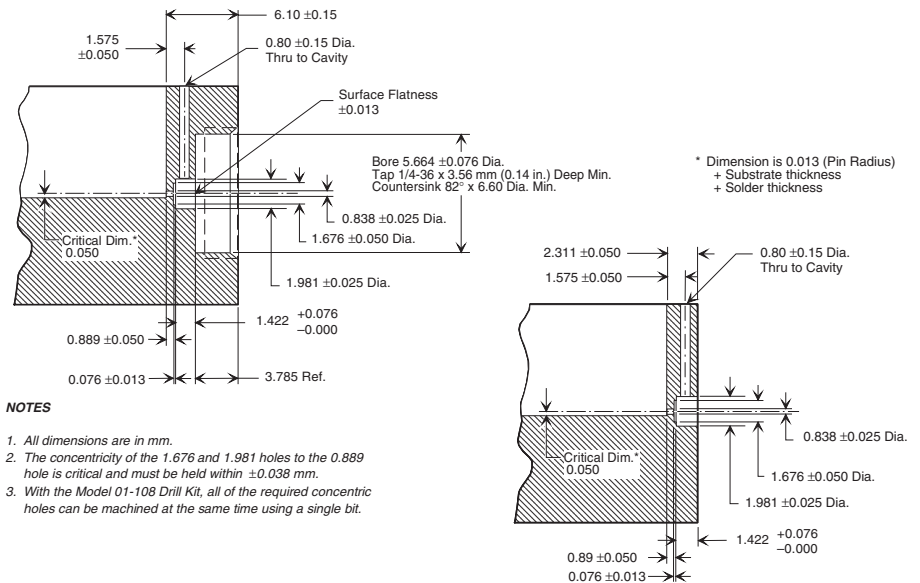
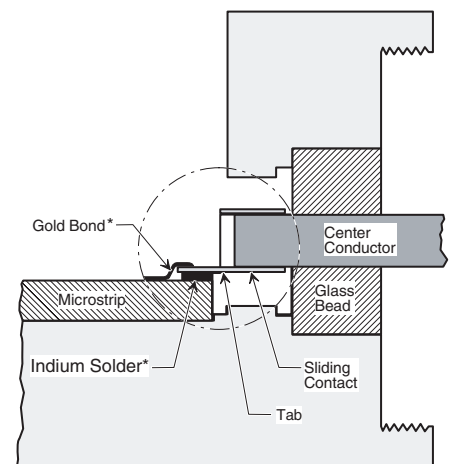


Figure 2. Mounting Hole Dimensions for K102 Sparkplug and K103/K104 Flange Mount Connector

3. Fabrication Instructions

The sliding contacts slip over the pin of the glass bead and mate with the microcircuit as shown in Figures 3. The following is the recommended procedure for installing the sliding contacts and mating them with the microcircuit.

- Drill the required holes and install the microcircuit and glass bead, as shown in the instruction sheet that accompanies the K102F/M, K103F/M, or K104F/M assembly.
- Check that the center pin in the glass bead is level with the top of the microcircuit ± 0.051 mm. If necessary, you can bend the pin to achieve this degree of levelness.



* Alternate attachment techniques.

Figure 3. K110 Sliding Contacts Installation

- c. Using tweezers,
 - (1) Remove one of the K110 Sliding Contacts from its package.
 - (2) With the sleeve-end facing the pin on the glass bead, lay the K110 on the microcircuit near the bead.
- d. Using the tip of the jewelers screwdriver, gently press the K110 tab both down onto the microcircuit and in toward the glass bead.
- e. Position the sleeve as shown in Figure 3.

NOTE

If you desire optimum RF performance, position the sliding contacts dynamically on the center pin as follows:

Ensure that the tab makes good electrical contact with the microcircuit.

Measure the SWR (return loss) of the connection.

Slide the sleeve back and forth in small increments until the RF performance is optimized.

- f. If the sleeve on the K110 should become slightly malformed during the above operation, you can usually reform it using tweezers. However, ensure that it still make firm contact with the bead's pin afterward.
- g. Attach the tab on the K110 to the microcircuit by any of the following three methods:
 - Soldering: For thin-film microcircuits, use Indium solder to prevent the leaching of gold from the microcircuit. For other types, you can use any acceptable solder.

CAUTION

Use a minimum amount of solder to prevent the sleeve from becoming soldered to the pin.

TC Bonding: Using ultrasonic or pulse bond-ing usually makes TC bonding easy. Ensure that the tab firmly contacts the microcircuit for best RF performance.

Parallel-Gap Welding: Use a tip that is approximately the same size as the tab (0.203 mm). Optimize the voltage, duration, and weight for a strong weld.

NOTE

Due to the method used to form the sliding contacts, there may be inconsistencies in the surface finish and the break-away area at the cylindrical end, which may have a jagged edge. These occurrences will not harm the performance of the sliding contact.

Specifications

Frequency: DC to 46 GHz

Material: 0.001 inch heat-treated BeCu.

Plating: 300 pinches gold over a 25 pinch nickel flash.

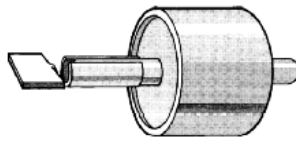


Figure 1. Glass Bead with K110-2 Sliding Contacts

Anritsu

K Connector® Sliding Contacts for Stripline Model K110-2

1. Tools And Materials

The following tools and materials will be helpful in installing the K110 Sliding Contacts on the pin of the glass bead.

Name	Vendor and Model/Part Number
Stereo Microscope	Bausch & Lomb 30 power
Step Drill	01-108 ANRITSU Co.
Jewelers Screwdriver	N/A
Tweezers	N/A

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the K102 F/M Sparkplug and K103 F/M and K104 F/M Flange Mount K Connector® assemblies are given in Figure 2.

The precision step drill listed in the table in paragraph 1 makes it easier to achieve concentricity of the respective four or three holes required for the K102 or K103 and K104 installations.

3. Fabrication Instructions

The sliding contacts slip over the pin of the glass bead and mate with the microcircuit. The following is the

recommended procedure for installing the sliding contacts and mating them with the microcircuit.

- Drill the required holes and install the microcircuit and glass bead, as shown in the instruction sheet that accompanies the K102F/M, K103F/M, or K104F/M assembly.
- Check that the center pin in the glass bead is level with the top of the microcircuit ± 0.051 mm. If necessary, you can bend the pin to achieve this degree of levelness.
- Install the K110-2 Sliding Contact using either of two methods described in Figure 3.

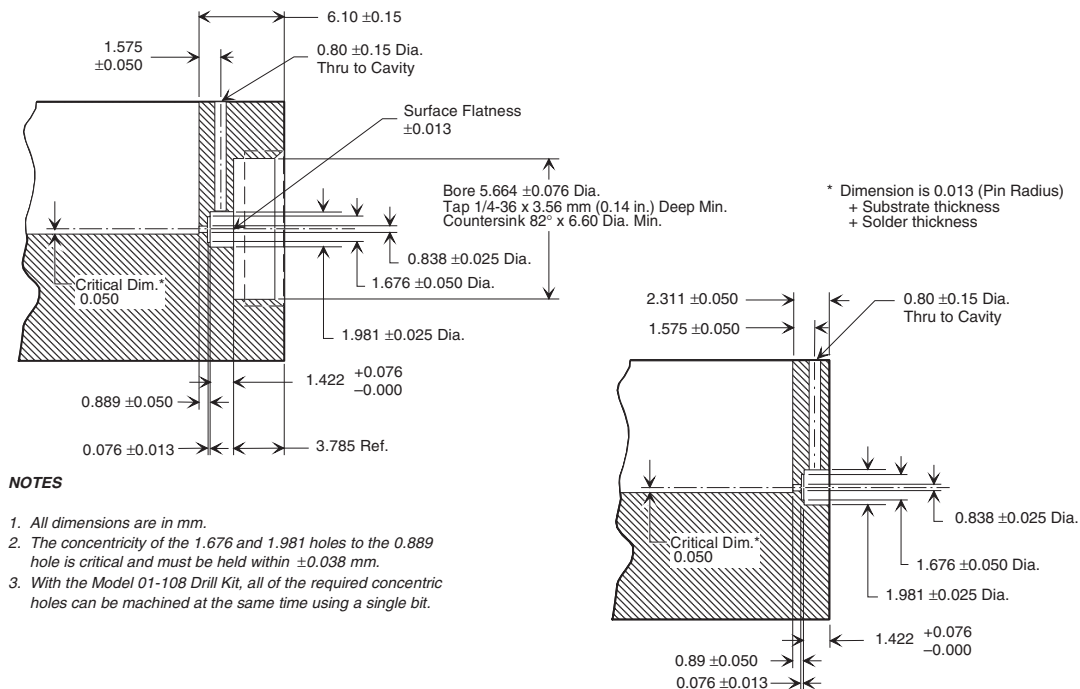
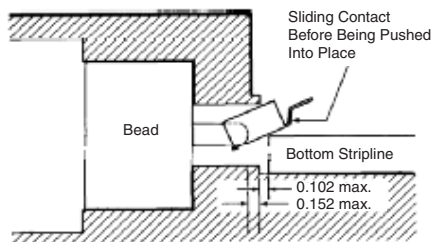
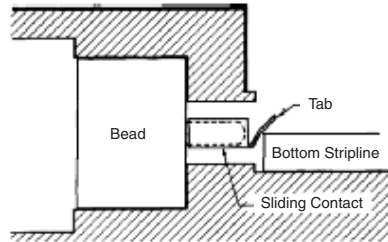


Figure 2. Mounting Hole Dimensions for K102 Sparkplug and K103/K104 Flange Mount Connector



Method 1

1. Install lower stripline board.
2. Using tweezers, place the K110-2 onto the center pin and position as shown above.
3. Using a jewelers screwdriver, gently push sliding contact onto the center pin.
4. Press the tab onto the stripline. Although not necessary, you may solder, bond or epoxy, if desired.
5. Install the top stripline. The finished assembly should resemble Figure 4.



Method 2

1. Using tweezers,
 - A. Place the K110-2 onto the center pin of the bead, and position it as shown above.
 - B. Gently tilt the tab on the K110-2 upward, and install the bottom stripline into the cavity.
2. Press the tab onto the stripline. Although not necessary, you may solder, bond or epoxy, if desired.
3. Install the top stripline. The finished assembly should resemble Figure 4.

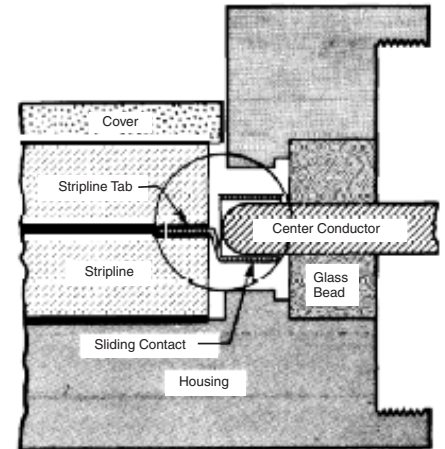


Figure 4. K110-2 Sliding Contacts Installation 2

Figure 3. K110-2 Sliding Contacts Installation

Specifications

Temperature Range: -55°C to $+125^{\circ}\text{C}$

Material:

Center Conductor: Heat treated beryllium copper, gold plated

Bead: Plastic

Bead holder and outer conductor:
Passivated stainless steel

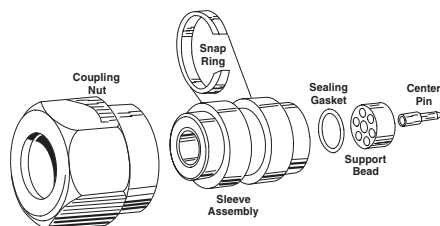


Figure 1. Male K Connector[®], Unassembled

Anritsu

K Connector[®]

Male Connector for 0.85-Inch Outer Diameter Semi-Rigid Coaxial Cable Model K101M-085

1. Tools And Materials

The following tools and materials are needed to install K101M-085 connector on the V085 semi-rigid coaxial cable. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Resistance Soldering Unit, with Tweezers (TC-10S) and Tip (TT-2)	H101A, Contact, Inc. Hudson, NH
Tool Kit Cable Assembly	SC5296 ANRITSU Co.
Solder, 62% tin, 0.50 mm diameter rosin core	SN62 Kester Co.
Rosin Flux	135, Kester Co.
Cleaning Fluid	Isopropyl Alcohol
Soldering Fixture	01-107M

2. Fabrication Instructions

Fabrication instructions for the cable assembly are given below. Refer to Figures 1 and 2 to identify the connector parts referenced in the procedure.

- Remove approximately 6.35 mm of the outer conductor from one end of the cable. The outer conductor should be cut square and be free of burrs. A suggested method using the multipurpose tool SC5296:
 - Clamp the multipurpose tool in a vise with the hole facing up.
 - Insert the end of the semi-rigid

cable into the hole as far as it will go.

- While pressing the cable against the bottom of the hole and rotating it, cut a deep groove around the circumference of the outer conductor using a razor blade or saw.
 - Break off the outer conductor and remove it from the cable.
- Trim the Teflon[®] away from the center conductor, taking care not to cut into the center conductor. The trimming of the Teflon must be flush with the outer conductor to properly install the center pin later in this procedure.
 - Cut, trim, and carefully – so as not to nick or otherwise damage the center conductor – deburr the exposed center conductor to 2.286 ± 0.15 mm. The end of the SC5296 multipurpose tool marked “M” can be used to measure this distance.
 - Clamp the cable, and, using a soldering iron, tin (i.e., lightly coat with solder) the exposed center conductor.
 - Set the Resistance Soldering Unit to 1.

- Heat the center pin and slide it onto the center conductor. Locate it such that there is a 0.10 ± 0.025 mm gap between it and the Teflon dielectric. Avoid getting solder on the outside of the pin.
- Clean the center pin with a solvent-dampened swab to remove all flux residue.

CAUTION

Avoid cleaning fluids containing halogenated and aromatic hydrocarbons (Freon[®]). These compounds may soften or dissolve the PPO bead material.

- Clean the end of the cable with a solvent dampened swab to remove any oils due to handling.
- Apply a small amount of flux to the end of the cable.
- Orient the sleeve assembly so that the smaller end is positioned over the end of the cable.
- Slide the sleeve assembly onto the cable until it reaches the bottom limit of the sleeve. When properly positioned, the center pin will protrude as shown in Figure 2, and the sleeve will cover approximately 4.76 mm of the cable. Check pin extension.
- Install the 01-107M Soldering Fixture onto the end of the cable. This will hold the sleeve assembly secure and will also keep it square while it is being soldered onto the cable.
- Set the Resistance Soldering Unit to 4.
- Grasp the sleeve assembly with the soldering tongs and apply solder to the back end of the sleeve to solder it to the cable. Ensure that the sleeve assembly does not move on the cable during this operation.

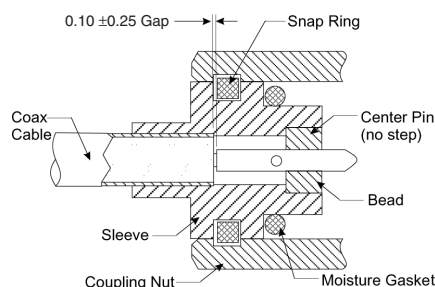


Figure 2. Male K Connector[®], Assembled

K Connector is a registered trademarks of Anritsu Company.
Teflon is a registered trademark of E.I. Du Pont De Nemours and Company.
Freon is a registered trademark of Kinetic Chemicals, Inc.

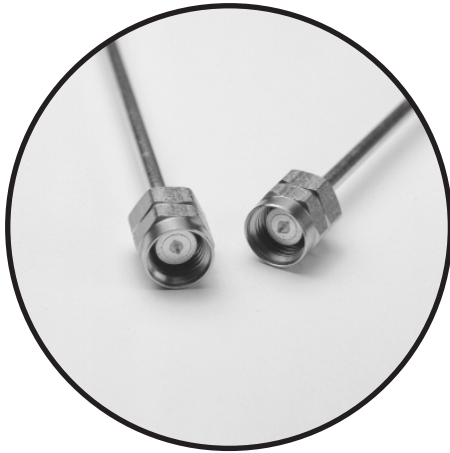
- o. Inspect the connection to ensure that there are no solder gaps and that the sleeve assembly is square with the cable.
- p. Remove the 01-107M Soldering Fixture.
- q. Clean any flux residue from the Teflon interface located on the inside of the connector housing. A small piece of cotton, dampened in solvent and held by tweezers, works best for this cleaning operation.
- r. Inspect the inside of the connector to ensure that the solder seam has no gaps. A 30X microscope is best for this inspection.
- s. Spread the snap-ring and slip it onto the groove of the sleeve assembly.
- t. Place the sealing gasket over the large end of the sleeve assembly. It should fit snugly against the shoulder of the sleeve assembly.
- u. Using the snap-ring pliers – or other suitable pliers – compress the snap-ring and slip the assembly into the coupling nut. When the assembly is positioned properly, the snap-ring will “click” into place as it fits into the groove inside the coupling nut.
- v. Carefully slide the bead over the center pin, and press it into the end of the sleeve assembly. The multipurpose tool in the 01-118 tool kit should be used to press the bead into place. the center pin should not be pushed back during this operation.
- w. Inspect the cable assembly to ensure the following:
 - (1) That the support bead is flush with or slightly recessed from the end of the sleeve assembly.
 - (2) That the center pin extends out from the bead as shown in Figure 2.
- x. For best performance, purge solvent residue by placing the completed cable assembly in an oven and baking at 65°C for 8 hours, minimum.

CAUTION

If solvent is allowed to remain, it may cause increased transmission loss.

V CONNECTORS®

DC to 65 GHz



The V Connector® is a reliable 1.85 mm device that operates up to 65 GHz. It is compatible with 2.4 mm connectors and is assembled using procedures that are similar to those used on K Connectors. It is well suited to applications in components, systems, or instrumentation.

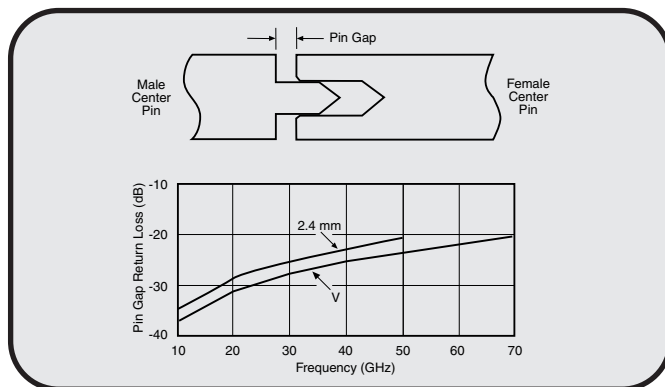
V Connector® features

- Excellent performance up to 65 GHz
- Low VSWR
- Superior reliability
- Low Loss

Exceptional reliability and repeatability

Microwave connector reliability is affected by insertion force, outer conductor strength, stress relief while mating, and mating alignment. The V Connector® exhibits exceptional performance in all of these areas.

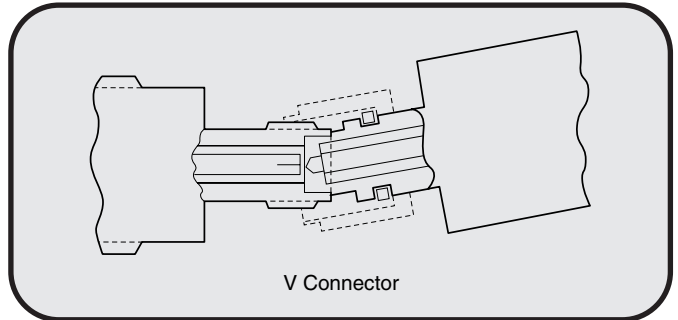
For proper seating, the V Connector® requires only 1/2 the insertion force of a 2.4 mm connector. The reduced wear on the center conductor equates to greater reliability. All V Connectors, including the cable connectors, incorporate another feature that eliminates a major cause of connector failure—misalignment of the male pin with respect to the female. To solve the problem, the V Connector® male pin is deliberately made sufficiently short to prevent damage to the female connector by misalignment.



Effect of Pin Gap

With this arrangement, the outer housing must be properly aligned prior to the mating of the center conductors. Thus a proper, non-destructive alignment before mating is ensured.

The effect of pin gap on a connection is often overlooked, but is the dominant source of error in many connection systems. Pin gap is the short length of smaller diameter created when a connector pair is mated. Pin gap causes a discontinuity at the connector interface. The V Connector® has considerably less susceptibility to pin gap than 2.4 mm connectors.



Shortened Male Pin Eliminates Damage to Female V Connector

Many connector manufacturers specify connector performance assuming no pin gap, an unrealistic assumption. V Connectors are specified assuming pin gap to be at its maximum tolerance, to provide you the assurance of real-world specifications.

Launcher design

At the heart of the V Connector® product line are the launchers. As their name implies, the launchers “launch” (make the transition) from a microwave circuit (microstrip, suspended substrate, stripline, or coplanar waveguide) to a coaxial connector and an outside transmission line. The key to making the transition without compromising electrical and mechanical objectives is the glass bead in the launcher assembly.

Low-reflection glass bead

The V Connector's standard glass bead has a unique 0.23 mm center conductor and readily connects to fragile devices. The bead is appropriate for most applications employing Duroid and ceramic (Alumina) microstrip, such as the 0.25 mm wide center conductor on a 0.25 mm thick Alumina substrate. Applications using suspended substrate geometry are equally well satisfied. The bead is constructed of Corning 7070 glass and has a gold-plated center conductor and a gold-plated Kovar® collar.

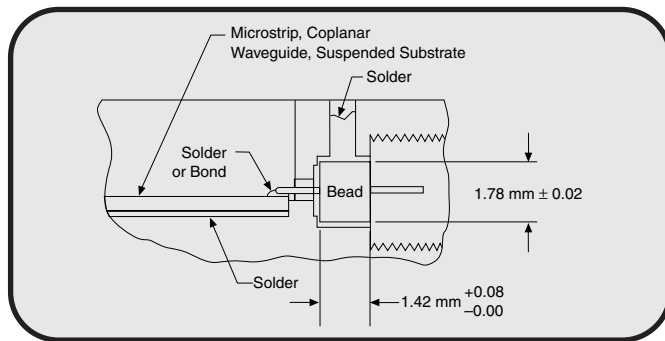
The outstanding design of the bead is largely accountable for the excellent performance of the V Connector® launchers. In addition, the design provides for soldering the bead to achieve a hermetic seal. 310°C max. soldering temperature is recommended, with a 1.80 mm diameter cavity. The V Connector® launchers can be removed for repair without removal of the glass bead. This ensures that during removal the critical microcircuit-to-glass bead interface is not disturbed, that hermeticity is preserved, and that the microcircuit will not be subjected to the additional stress caused by heating to soldering temperature. Hardware locking compound such as “Removable Loctite®” should be used to further secure the launcher in its housing.

V CONNECTORS®

DC to 65 GHz

Complete family

Anritsu's family of V Connector® products is large and growing. Virtually every interface need can be satisfied by one or more of the items offered. As a convenience to the design engineer, each item is completely specified with both guaranteed and typical performance. There are four different models of V Connector® launchers. Two types of sparkplug (screw-in) launchers are available; the V102F female version and the V102M male version. Both screw into the housing that encloses the microwave circuit. And, like all Anritsu launchers, they can be easily removed for replacement or repair without unsoldering the glass bead and its interface to the microwave circuit.



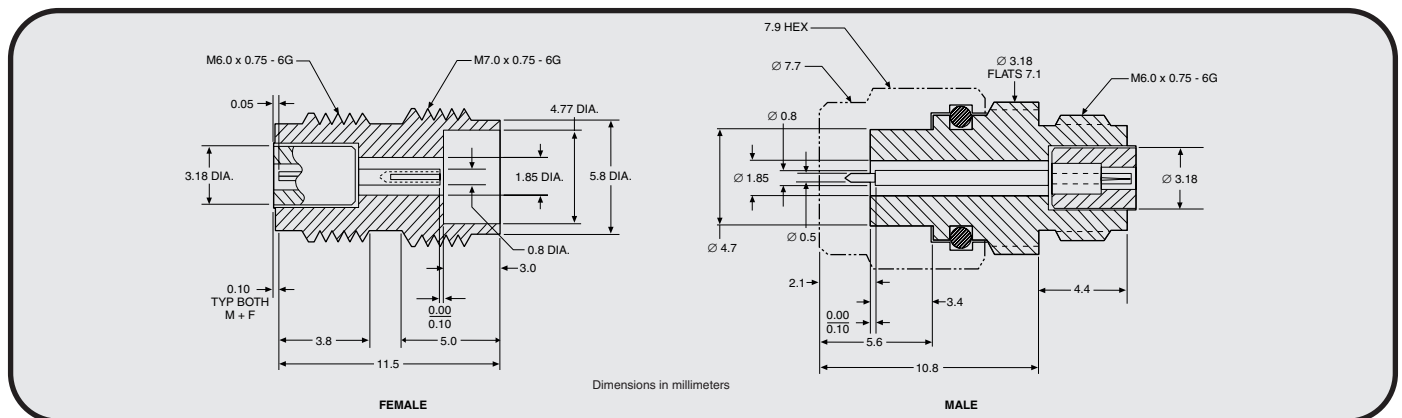
Transition from Microcircuit to Outside Transmission Line

When the housing that encloses the microwave circuit is not thick enough to support a threaded, screw-in launcher, flush-mounted (flange) launchers are required. Models with two mounting holes are available in both male and female versions, V103M and V103F. The mounting hole spacing is identical to that of similar SMA flange launchers. The glass bead interface, of course, is the same design used for the sparkplug launcher.

Cable connectors

To complement a high performance cable, both male and female cable connectors are available. Typical return loss at 60 GHz for finished cables exceeds 16 dB (1.35 SWR).

The V Connector® coaxial cable connectors use a 2.16 mm cable with a microporous Teflon dielectric and a copper center conductor. The cable assemblies use the center conductor of the coax as the male pin. This is similar to the UT-141 SMA-type assembly and the 2.4 mm cable assemblies. The microporous Teflon dielectric has maximum phase stability and minimum insertion loss. This type of cable assembly allows for easy assembly and maximum RF performance; however, since the male pin is copper, the cable assemblies are not suitable for repeated connections. In applications where the cable will be subject to more than 100 connections, it is recommended that a connector saver be used.



V Connector® interface dimensions in metric measurements

Evaluation kit

01-301 V Connector® Evaluation Kit contains one V120-10 25 cm Male/Male Cable Assembly, two V102F Female Sparkplug Launcher Connector Assemblies, two V103F Female Flange Launcher Connector Assemblies, two V101M Male In-line Cable Connector Assemblies, five V100 Glass Beads, one 01-304 Drill and Tap Set, one 01-302 Test Fixture, one 01-303 Soldering Fixture.



Tools and fixtures

01-303 Soldering Fixture for sparkplug launcher glass beads, package of 10.



01-304 Drill and Tap Set for precision machining of concentric holes for mounting V Connector® in microwave housing. (Drill Part No. 783-568) (Tap Part No. 783-569)



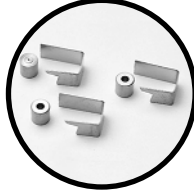
V CONNECTORS®

DC to 65 GHz

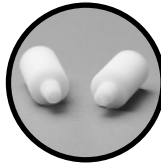
01-105A K and V Connector® Male and Female Sparkplug Torquing Kit



01-306
K Soldering Fixture for flange launcher glass bead, package of 5.



01-307M or 01-307F
Cable Sleeve Soldering Fixture for K101M Male and K101F Female Cable Connectors, package of 10.



01-308
Drill and Tab set where stress relief is used.



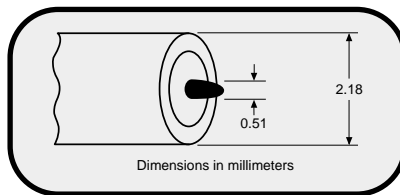
01-309
V Connector® Cable Assembling Fixture Kit for 0.085 semi-rigid cable.



Semi-rigid coaxial cable

Type	Semi-rigid coaxial, tin-plated copper outer conductor, silver-plated copper center conductor.
Impedance	50 ± 2 Ohms
Dielectric type	Microporous Teflon, 0.14 cm diameter
Dielectric constant	1.687
Relative velocity	0.77
Outside diameter	2.18 mm
Center conductor diameter	0.51 mm
Minimum bend radius	0.65 cm
Attenuation	2.3 dB/m at 10 GHz 3.6 dB/m at 20 GHz 4.3 dB/m at 30 GHz 5.2 dB/m at 40 GHz 7.2 dB/m at 60 GHz

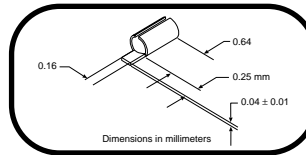
V085 semirigid coaxial cable
1.5m length of 2.18 mm semirigid cable for V101 series connector



Stress relief contacts

Stress Relief Contacts provide an elegant yet simple solution to relieving stress at the interface of the microcircuit and its connecting coaxial conductor. These contacts simply slide onto the standard glass bead pins.

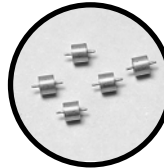
Frequency range	DC to 67 GHz
Material	0.025 mm heat-treated BeCu
Plating	Bondable gold
Packaging	Lots of 25



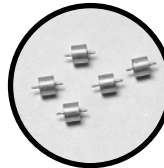
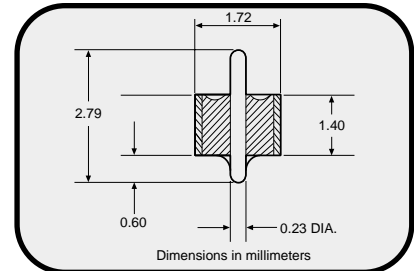
V110-1
Microstrip and Coplanar Waveguide

Launchers & cable connectors

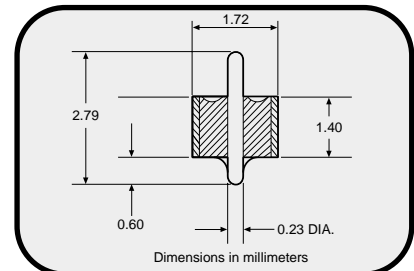
Return loss (launchers only)	13 dB up to 60 GHz
Coupling nut tightening torque	1.36 N-m max
Material	Passivated stainless steel with heat-treated beryllium copper center conductors
Pin depth	0.000 to -0.13 mm for male and female connectors
Temperature range	-55°C to +125°C



V100
Glass Beads for V102, and V103 connectors (package of 5)



V100B
High Hermeticity 1 Glass Beads for V102, and V103 connectors (package of 5)



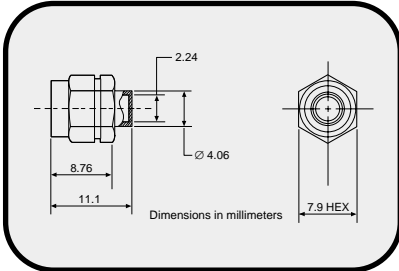
*Glass Bead Hermeticity Spec: Hermetic to 1 x 10⁻⁸ std cc He/sec at 1 atm differential

V CONNECTORS®

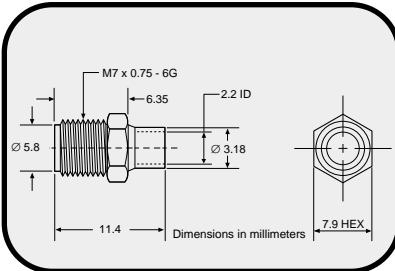
DC to 65 GHz



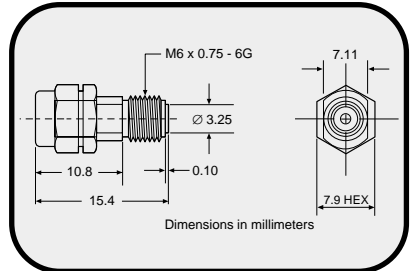
V101M
V Male In-Line Cable
Connector, DC-65 GHz
for V085 cable



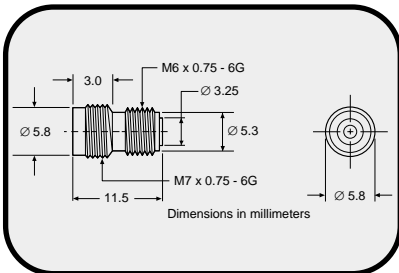
V101F
V Female In-Line Cable
Connector, DC-65 GHz
for V085 cable



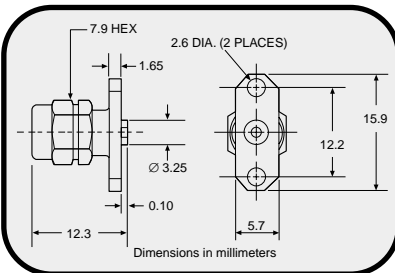
V102M
V Male Sparkplug
Launcher Connector, DC-
65 GHz



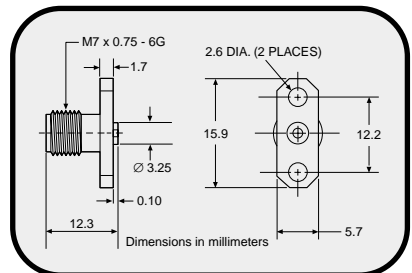
V102F
V Female Sparkplug
Launcher Connector, DC-
65 GHz



V103M
V Male Flange Launcher,
two-hole, DC-65 GHz



V103F
V Female Flange
Launcher, two-hole,
DC-65 GHz



V202F
Combination of
V102F, V100,
V110-1



V202FB
Combination of
V102F, V100B,
V110-1

Ordering information

Please specify model/order number, name, and quantity when ordering.

Model/Order No.	Name
01-105A	Male and female sparkplug torquing kit
01-301	V Connector® (evaluation kit)
01-303	Soldering fixture for sparkplug launcher glass bead
01-304	Drill and tap set
01-306	Soldering fixture for flange launcher glass bead
01-307M	Cable sleeve soldering fixture, male connector
01-307F	Cable sleeve soldering fixture, female connector
01-308	Drill and tap set
01-309	Cable assembly fixture
V085	Coaxial cable, 152 cm (5 feet) length of 0.085-inch semi-rigid cable
V100	Glass bead for V102/103 connectors
V100B	Hermetic glass beads for V102/103 connectors
V101M	V(m) in-line cable connector, DC to 65 GHz
V101F	V(f) in-line cable connector, DC to 65 GHz
V102M	V(m) sparkplug launcher connector, DC to 65 GHz
V102F	V(f) sparkplug launcher connector, DC to 65 GHz
V103M	V(m) flange launcher connector, DC to 65 GHz, 2 mounting holes
V103F	V(f) flange launcher connector, DC to 65 GHz, 2 mounting holes
V110-1	Microstrip stress relief contact
V202F	Combination of V100, V102F, and V110-1
V202FB	Combination of V100B, V102F, and V110-1

V Connector® Components Kit Model 01-301

This component kit enables you to design 65 GHz coaxial components and systems using the new Anritsu V Connector®. Included are parts and technical information you need to design high-quality interfaces with microminiature 65 GHz devices.

The V Connector® is mechanically and electrically compatible with 2.4 mm connectors. The typical performance of systems using these connectors is not degraded significantly by the addition of V Connectors. Only the V Connector®, however, has guaranteed performance up to 60 GHz, and is usable up to 65 GHz. An assembled connector and interface has a typical return loss of 16 dB at 60 GHz.

The connector uses a glass bead to provide transition from the microdevice to the connector itself. The use of a glass bead adds several features to the connector design:

- (1) The bead provides a hermetic seal and mechanical isolation.
- (2) The 0.228 mm diameter center conductor in the bead is small enough to make connection to microminiature circuits.
- (3) The connector assembly is easily replaced in the field.

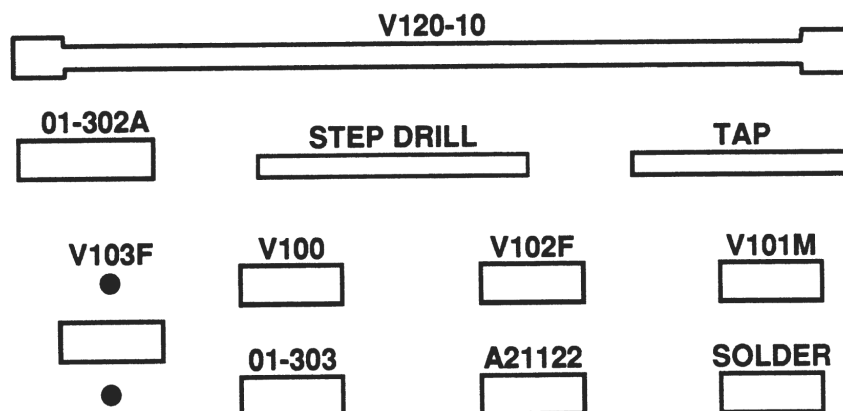
The semi-rigid cable assemblies included in the kit have a microporous Teflon® dielectric and a soft-copper center conductor, making the cable suitable for applications where sharp bends are required. The cables and connectors are assembled using standard techniques. The kit also

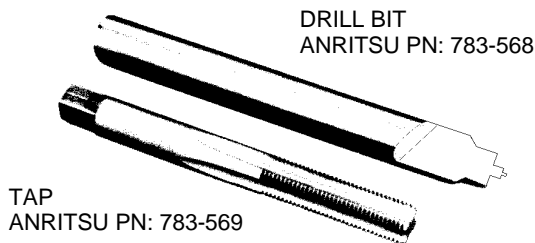
includes an assembled and tested 0.010 inch (0.254 mm) thick alumina microstrip through-line assembly.

The V Connectors are manufactured by Anritsu Company. Call for prices. Quantity discounts available.

Anritsu also offers a complete line of test equipment to measure the components and systems that use V Connectors. The Anritsu Model 37XXX Series Vector Network Analyzer can make error corrected measurements from 40 MHz to 62.5 GHz in on continuous sweep.

Item	Quantity	Description
1	1	V120-10, Cable Assembly, 10 inch (25.4 cm)
2	1	01-302A, Test Fixture, V Male
3 & 4	1	01-304, Step Drill and Tap
5	2	K103F, Flange-Mount V Connector® Assembly
6	5	V100, Glass Beads
7	1	V102F, Sparkplug V Connector® Assembly
8	5	V101M, V In-Line Connector
9	1	01-303, Holding Fixture, Glass Bead
10	1	A21122, V-F Install Fixture
11	—	Solder





Anritsu

V Connector® Finishing Step Drill and Tap Kit Model 01-304

Figure 1. Finishing Step Drill

The finishing step drill is made of high-speed steel. It is designed for use on aluminum and brass housings.

CAUTION

The drill bit in this kit is not intended for use with stainless steel, invar, or Kovar®. However, satisfactory operation—with a limited life—can be obtained with these materials if a pilot hole is drilled first. This pilot hole should be within ± 0.127 mm of required 0.526-, 1.27-, 1.778-, and 5.334-mm-hole diameters.

Machining Instructions

The drill bit in this kit (Figure 1) simultaneously finishes concentric holes (Figure 2) needed to install the V102F/M Sparkplug and V103F/M Flange Mount Connectors.

CAUTION

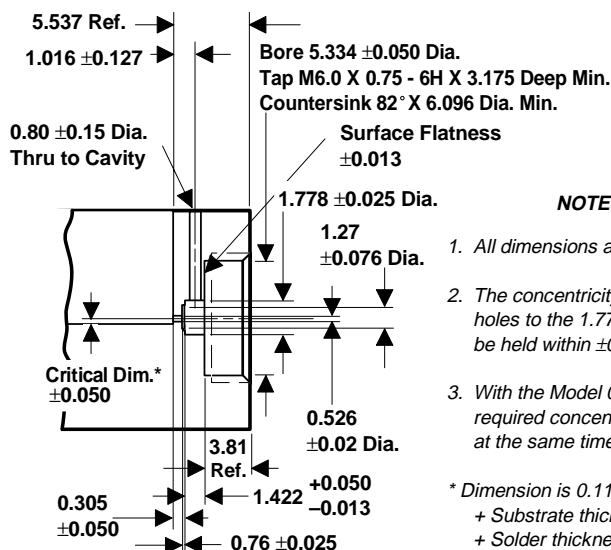
Do not use a drill press for the following steps. The precise tolerances needed require a milling machine.

1. Drill pilot hole to within 0.127 mm of required 0.526-, 1.27-, 1.778-, and 5.334-mm-hole diameters
2. Install the step-drill bit directly into the collet of the mill. Do not use a drill chuck to hold the bit.
3. Set the drilling speed for 1500 to 2000 rpm and the feed rate for 0.006 mm per-revolution.
4. Drill the holes using full-flood coolant and a steady, even feed. Periodically withdrawing the drill bit and clearing

away the chips will make the drilling easier—it will also make breaking the drill bit less likely.

5. Place the material to be machined into the vise of the mill.
6. For the V102F/M Sparkplug Connector:
 - a. Drill the hole as shown in Figure 2 for 5.537 mm wall thickness.
 - b. Tap the hole using the tap supplied with the 01-304 kit.
7. For the V103F/M Flange Mount Connectors:
 - a. Drill all three holes shown in Figure 2. Make 1.778-mm hole 1.448-mm deep.
 - b. Tap the two mounting holes as shown in Figures 3.

Used in the manner described above, the 01-304 tap should provide reliable performance for thousands of operations.



NOTES

1. All dimensions are in mm.
2. The concentricity of the 0.526 and 1.27 holes to the 1.778 hole is critical, and must be held within ± 0.038 mm.
3. With the Model 01-304 Step Drill Kit, all of the required concentric holes can be machined at the same time using a single bit.

* Dimension is 0.114 (Pin Radius)
+ Substrate thickness
+ Solder thickness

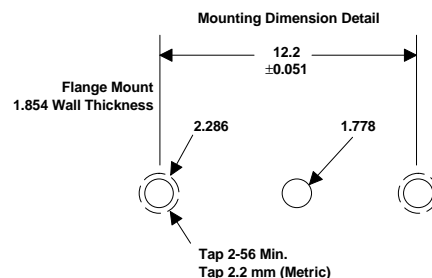


Figure 2. Machining Dimensions

Figure 3. Mounting-Hole Dimensions for the V103 Flange Mount

1. Introduction

This Instruction Sheet provides a listing of the individual tools in the Model 01-105A Torquing Tool Kit and procedures for using these tools to torque the K female cable connector and male and female (K and V) sparkplug launchers to 1.8 N-meter.

2. Tool List

Table 1 provides a listing of the tools in the Model 01-105A Torquing Tool Kit. The index numbers in Table 1 correspond with those in Figure 1. It is recommended that LOCTITE® RC/609 retaining compound be used in addition to the tools included in this kit.

3. Use with the K102M or V102M Sparkplug Launcher

a. Torquing the K102M or V102M
(Procedure assumes the connector is in place in its mounting hole)

1. Loosen the connector's outer conductor and apply a small amount of LOCTITE to the threads. Install the centering tool (3 or 4) over the center conductor.
2. Tighten the outer conductor finger tight.
3. Place the male-connector-tightening socket (8) over the outer conductor.
4. Install the 5/16-inch socket (7) onto the screwdriver handle (1).
5. Torque the outer conductor to 1.8 N-meter using the screwdriver handle and socket.
6. Remove the male-connector-tightening socket and centering tool.

b. Disassembling the K102M or V102M

1. Place the male-connector-tightening socket (8) over the K102M (V102M) outer conductor.

Index No.	Name	Anritsu Part No.
1	Handle, Screwdriver, Torque Limiting	783-253
2	Wrench, Open End, 5/16-9/32 in., 2 each	783-254
3	K Centering Fixture	A-13921
4	V Centering Fixture	A-20495
5	Installation Fixture, K Female	A-21148
6	Installation Fixture, V Female	ND21130
7	Socket, 1/4 in. drive, 5/16 in., 6-point	783-252
8	Socket, Tightening, Connector, Male	01-A-14813

Table 1. 01-105A Parts List

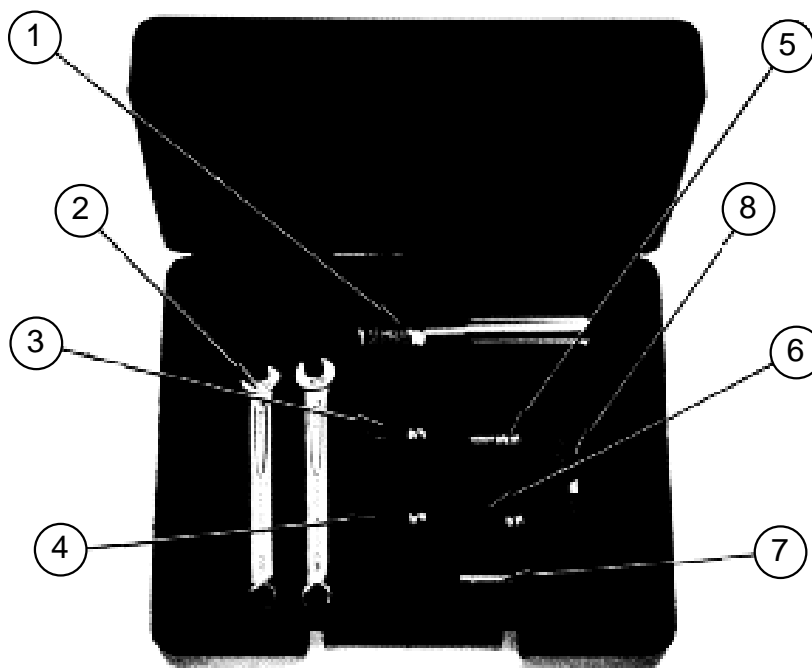


Figure 1. Model 01-105A Torquing Tool Kit

2. Install the 5/16-inch socket (7) into the screwdriver handle (1).
3. Loosen the outer conductor using the screwdriver handle and socket.
4. Unscrew the outer conductor, and remove the center-pin assembly from the mounting hole.

4. Use with the K102F or V102F Sparkplug Launcher

- a. Torquing the K102F or V102F (Procedure assumes the connector is in place in its mounting hole)
 1. Loosen the connector's outer conductor and apply a small amount of LOCTITE to the threads. Install the K or V Centering Fixture (3 or 4) over the center conductor.
 2. Tighten the outer conductor finger tight.
 3. Remove the K Centering Fixture.
 4. Screw the KF or VF Installation Fixture (5 or 6) onto the outer conductor until finger tight. Leave a 1.588 mm (approximately) between the head of the adapter and the nut.
 5. Install the 5/16-inch socket (7) onto the screwdriver handle.
 6. Torque the outer conductor to 1.8 N-meter using the screwdriver handle and socket.
 7. Remove the installation fixture from the outer conductor by (a) holding the barrel nut with one of the 5/16-inch wrenches while (b) loosening the adapter with the screwdriver handle and socket.

- b. Disassembling the K102F or V102F
 1. For the K102F, screw the KF Installation Fixture (5) onto the K102F outer conductor until finger tight. Leave a 1.588 mm gap (approximately) between the head of the adapter and the nut. For the V102F, do the same using the VF Installation Fixture (6).
 2. Place one of the 5/16-inch wrenches (2) onto the barrel nut, and the other wrench onto the adapter in order to form an angle of approximately 45° between the wrenches. Squeeze both wrenches together to tighten the barrel nut assembly onto the outer conductor.
 3. With a wrench on the barrel nut, loosen the barrel nut assembly and unscrew the outer conductor.
 4. While holding the barrel nut with one wrench, loosen the adapter with the other.
 5. Unscrew the outer conductor from the barrel nut assembly.
 6. Remove the center-pin assembly from the mounting hole.

5. Use with the K101F

- a. Torquing the K101F (Procedure assumes the connector is in place on the end of the cable)
 1. Loosen the connector's outer conductor from the assembly nut, and install the K Centering Fixture (3) over the center conductor.
 2. Tighten the assembly nut on the outer conductor finger tight.
 3. Remove the centering tool.

4. Screw the KF Installation Fixture (5) onto the outer conductor until finger tight. Leave a 1.588 mm gap between the head of the adapter and the nut.
5. Install the 5/16-inch socket (7) onto the screwdriver handle.
6. While holding the assembly nut, torque the outer conductor to 1.8 N-meter using the screwdriver handle and socket.
7. Remove the installation fixture from the outer conductor by (a) holding the barrel nut with one of the 5/16-inch wrenches while (b) loosening the adapter with the screwdriver handle and socket.
- b. Disassembling the K101F
 1. Screw the KF Installation Fixture (5) onto the K101F outer conductor until finger tight. Leave a 1.588 mm gap between the head of the adapter and the nut.
 2. While holding the K101F assembly nut, place one of the 5/16-inch wrenches (2) onto the barrel nut, and the other wrench onto the adapter in order to form an angle of approximately 45° between the wrenches. Squeeze both wrenches together to tighten the barrel nut assembly onto the outer conductor.
 3. With a wrench on the barrel nut, loosen the barrel nut assembly and unscrew the outer conductor.
 4. Hold the barrel nut and loosen the adapter hex head.
 5. Unscrew the outer conductor from the barrel nut assembly.
 6. Remove the center-pin assembly from the sleeve.

Specifications

Temperature Range: -55 to 300°C

Material:

Sleeve and Center Conductor: Kovar®, Gold plated

Bead: Corning 7070 glass

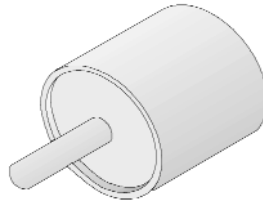


Figure 1. V100 Glass Support Bead

Anritsu

V Connector®
Glass Support Bead
Model V100
5 Each

1. Tools And Materials

The following tools and materials are needed to in-stall V100 Glass Support Bead in mounting hole on housing. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Hot Plate	H2215, American Scientific Products
Glass Support Bead Holding Fixture	01-303 ANRITSU Co.
Step Drill and Tap Kit	01-304 ANRITSU Co.
Solder, 62% tin, 24 gauge, 0.40 mm diameter rosin core	SN62 Kester Co.
Rosin Flux 135,	Kester Co.
Cleaning Fluid	Isopropyl Alcohol

2. Machining Dimensions

Machining dimensions for mounting hole required to install glass support bead in V102 F/M Sparkplug and V103 F/M Flange Mount installations are provided in Figure 4 on reverse side.

CAUTION

The four holes shown in Note 2 of Figure 4 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made drill-bit kit, Model 01-304, is available from ANRITSU.

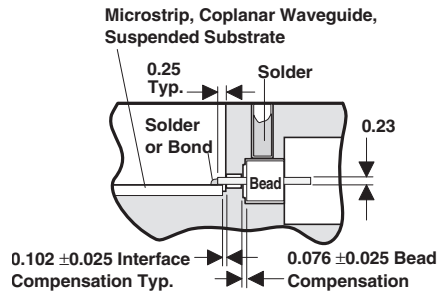


Figure 2. Glass Support Bead Installation

3. Fabrication Instructions

Fabrication instructions for installing V100 Glass Support Bead in microwave-device housing are given below. These instructions are for both V102 F/M Sparkplug and V103 F/M Flange Mount Connectors.

- Install microstrip into housing. Refer to Figure 2 for dimensional tolerances around glass support bead.
 - Set hot plate to $200 \pm 10^\circ\text{C}$.
 - For V102 F/M Sparkplug installation:
 - Flux glass support bead and insert it, long-end first, into 01-303 Glass Support Bead Holding Fixture (Figure 3).
 - Using holding fixture to handle bead, screw bead into mounting-hole opening until center conductor protrudes through backside interface and contacts microstrip.
 - Go to step e.
- For V103 F/M Flange Mount Installation:

Lightly flux glass support bead and insert it short-end first into mounting hole opening. Push in until center conductor protrudes through backside interface and contacts microstrip.
 - Ensure that glass support bead is centered, and that it is making good contact with microstrip.
 - Insert a length of solder into soldering access hole, and cut it flush with top of hole.
 - Place device on hot plate and leave there for approximately 15 seconds after solder melts.
 - Remove device from hot plate and allow it to cool.
 - Bond or solder center conductor to microstrip. Use minimum amount of solder.
 - Remove glass support bead holding fixture, and clean device to remove flux residue.

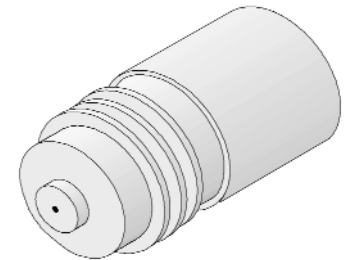


Figure 3. Glass Support Bead Holding Fixture

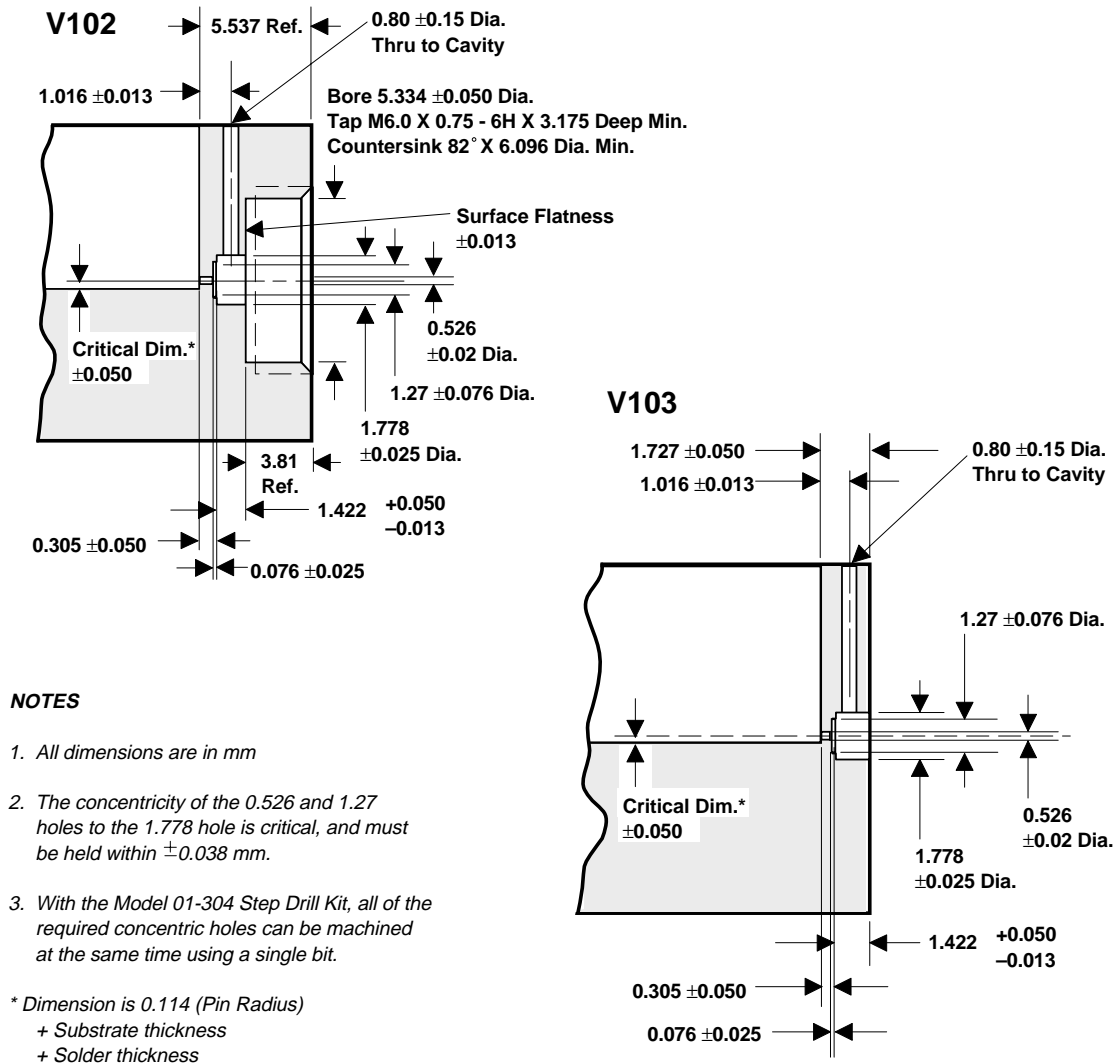


Figure 4. Machining Dimensions for the V100 Glass Bead and the V102 and V103 Connector Assembly Installations

Specifications

Temperature Range: -55°C to 125°C

Material:

Outer conductor: Beryllium Copper, gold plated

Center Conductor: Beryllium Copper, heat treated, gold plated



Figure 1. V101F Connector

Anritsu

V Connector®

Female Connector for 0.086-Inch OD Semi-Rigid Microporous Teflon Coaxial Cable, Model V101F

1. Tools and Materials

The following tools and materials are needed to install V101F connector on 2.184 mm outer diameter cable. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Resistance Soldering Unit, with Tweezers	H101A Contact, Inc. Hudson, NH
Solder, 62% tin, 24 gauge, 0.40 mm diameter rosin core	SN62 Kester Co.
Cleaning Fluid	Isopropyl Alcohol
Stereo Microscope .07-30X Zoom 4	Bausch & Lomb, Model Stereo
Rosen Flux	135 Kester Co.
Cable Cutting Fixture	ANRITSU 01-309

2. Fabrication Instructions

- Cut cable to length desired and deburr ends. Refer to Figure 2 while performing the following steps.
- Using 2.26 mm (0.089 in.) gauge pin, wrap 0.40 mm solder to form two rings.
- Using X-ACTO®-type knife or saw, initially score cable back 2.54 mm from end. Make scoring deep enough to break metal jacket cleanly, without distortion or jagged edges.
- Remove metal jacket.
- Deburr cable end using care to avoid damaging or distorting Teflon® dielectric.

- Insert the cable into position 1 of the 01- 309 fixture until the outer conductor bottoms in the hole and the Teflon dielectric is protruding from the back of the fixture. Using X-ACTO-type knife or razor blade, cut the Teflon dielectric flush with the fixture. Do not score the center conductor. After cutting, the Teflon dielectric should protrude 0.127 mm from the outer conductor.
- Insert the cable into position 2 of the 01- 309 fixture until the outer conductor bottoms in the hole and the center conductor is protruding from the back of the fixture. Using cutting tool, cut the center conductor flush with the fixture. After cutting, the center conductor should protrude 1.397 mm from the outer conductor as shown in Figure 2.
- Tin cable center conductor with SN62 solder. Slip V101F center pin onto center conductor and position adjacent to the Teflon face. Set resistance soldering iron to #1 and, with soldering tweezers, grasp center pin and reflow solder. Do not grasp onto fingers of center pin. i. Using X-ACTO-type knife or razor blade, carefully remove the Teflon dielectric behind the center pin flush with the

outer conductor (Figure 3). Do not score the center conductor.

- Slide two previously prepared solder rings onto cable.
- Place connector outer conductor onto cable.
- Set soldering iron to 4.
- With soldering tweezers, grasp outer conductor in space between hex and threads.
- Heat assembly and, at same time, apply pressure to outer conductor to ensure snug fit with cable.
- Avoid getting solder on outer face of connector.

CAUTION

Excessive heat causes Teflon dielectric to shrink below acceptable levels. Use care to heat solder only until it starts flowing.

- Clean end of cable with solvent dampened swab to remove any flux residue and oils due to handling.
- Place cable assembly in 55°C oven for 30 minutes to ensure evaporation of solvent.
- Refer to Figure 4 for completed assembly.

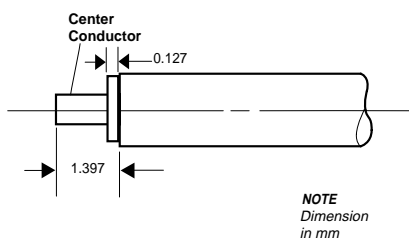


Figure 2. Preparing the Cable

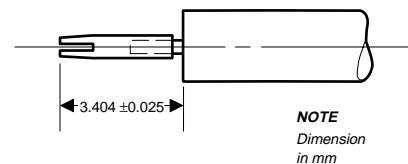
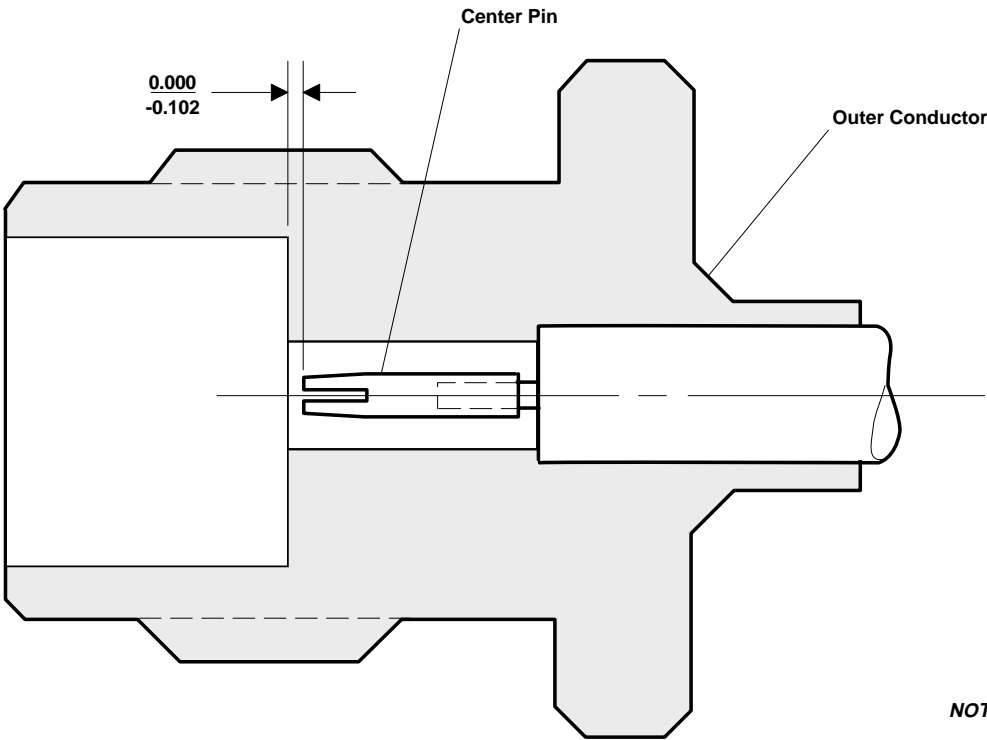


Figure 3. Installing the Center Conductor

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X-Acto is a registered trademark of X-Acto Crescent Products Co., Inc.
Teflon is a registered trademark of E.I. Du Pont De Nemours and Company.



NOTE
Dimension
in mm

Figure 4. V101F Connector, Fully Assembled View

Specifications

Temperature Range: -55°C to 125°C

Material:

Outer conductor sleeve: Beryllium

Copper, gold plated

Coupling Nut: Stainless Steel

Snap Ring: Beryllium Copper, heat treated

Sealing Gasket: Silicon

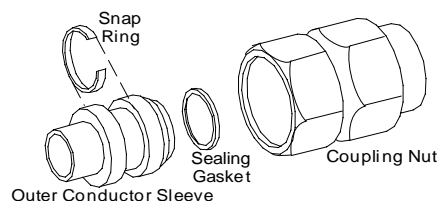


Figure 1. V101M Connector

Anritsu

V Connector®

Male Connector for 0.086-Inch OD Semi-Rigid Microporous Teflon Coaxial Cable, Model V101M

1. Tools and Materials

The following tools and materials are needed to install V101M connector on 0.086-inch (2.184 mm) outer diameter cable. Equivalent tools may be used if recommended tools are not available.

Name	Vendor and Model/Part Number
Resistance Soldering Unit, with Tweezers	H101A Contact, Inc. Hudson, NH
Solder, 62% tin, 24 gauge, 0.40 mm diameter rosin core	SN62 Kester Co.
Cleaning Fluid	Isopropyl Alcohol
Stereo Microscope .07-30X	Bausch & Lomb, Model Stereo Zoom 4
Rosen Flux	135 Kester Co.
Cable Cutting Fixture	ANRITSU 01-309

2. Fabrication Instructions

- Cut cable to desired length and remove burrs from (deburr) ends. Refer to Figure 2 while performing the following steps.
- Using 2.26 mm (0.089 in.) drill bit or gauge pin, wrap 0.40 mm solder to form two rings.
- Using X-ACTO®-type knife or saw, initially score cable back 3.81 mm from end. Make scoring deep enough to break metal jacket cleanly, without distortion or jagged edges.
- Remove cable outer conductor.

- Deburr outer conductor end using care to avoid damaging or distorting Teflon® dielectric.
- Insert the cable into position 3 of the 01- 309 fixture until the outer conductor bottoms in the hole and the Teflon dielectric is protruding from the back of the fixture. Using X-ACTO-type knife or razor blade, cut the Teflon dielectric flush with the fixture. Do not score the center conductor. After cutting, the Teflon dielectric should protrude 1.143 mm from the outer conductor as shown in Figure 2.

- Insert the cable into position 4 of the 01- 309 fixture until the outer conductor bottoms in the hole and the center conductor is protruding from the back of the fixture. Using cutting tool, cut the center conductor flush with the fixture. After cutting, the center conductor should protrude 1.651 mm from the outer conductor.

- Insert the cable into position 5 of the 01-309 fixture until the outer conductor bottoms in the hole and the center conductor is protruding from the back of the fixture. While rotating the cable in the hole of the fixture, carefully file the center conductor to a smoothly tapered tip. Refer to Figure 3.

- Slide two previously prepared solder rings onto cable.
- Place connector outer conductor sleeve onto cable (Figure 4).
- Set soldering iron to 4.
- With soldering tweezers, grasp outer conductor sleeve in snap-ring groove.
- Heat assembly and, at same time, apply pressure to outer conductor sleeve to ensure a snug fit with cable.
- Avoid getting solder on outer face of connector.

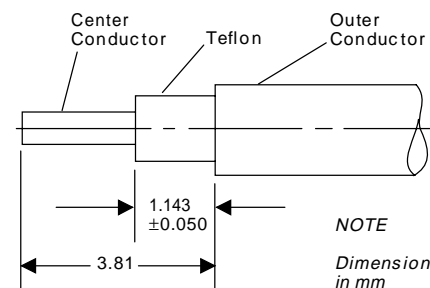


Figure 2. Preparing the Cable

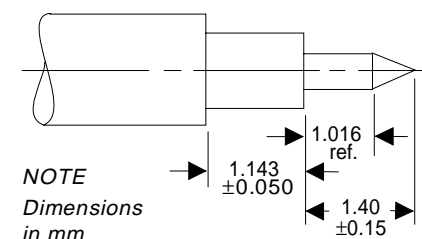


Figure 3. Trimming and Filing Center Conductor

CAUTION

Excessive heat causes Teflon dielectric to shrink below acceptable levels. Use care to heat solder only until it starts flowing.

- Clean end of cable with solvent dampened swab to remove any flux residue and oils due to handling.
- Place cable assembly in 55°C oven for 30 minutes to ensure evaporation of solvent.
- Slip snap ring into groove of outer conductor sleeve.
- Place sealing gasket over end of outer conductor sleeve.

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X-Acto is a registered trademark of X-Acto Crescent Products Co., Inc.
Teflon is a registered trademark of E.I. Du Pont De Nemours and Company.

- s. Using snap ring or other suitable pliers, compress snap ring and slip coupling nut onto outer conductor sleeve. When positioned properly, snap ring will click into place as it fits into groove inside coupling nut.
- t. Referring to Figure 4, inspect cable assembly to ensure following:
 - (1) Center conductor is tapered smoothly and has no nicks
 - (2) Face of microporous Teflon dielectric is 0.125 mm below face of outer conductor.
 - (3) Teflon is not distorted.

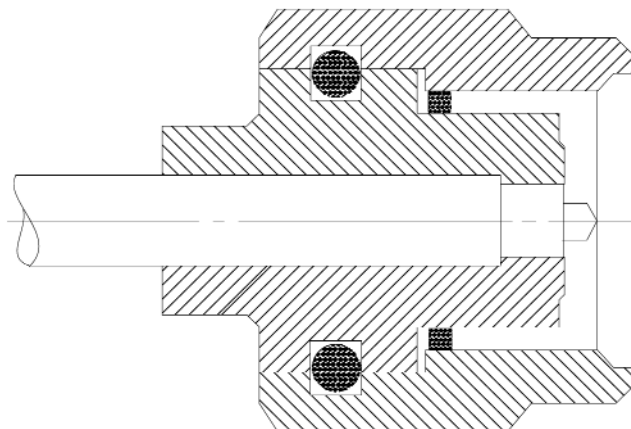


Figure 4. V101M Connector, Fully Assembled View

Specifications

Temperature Range: -55°C to +125°C

Return Loss: 15 dB to 60 GHz

Material:

Outer conductor: Stainless Steel

Center Conductor and Bead Support:

Beryllium Copper, heat treated, gold plated

Bead: Teflon®

Center Conductor and
Support Bead Assembly

Glass Bead*

Sparkplug

Anritsu

V Connector® Microstrip to V Female Sparkplug Connector Model V102F

Figure 1. Female Sparkplug Connector, Unassembled

*Glass bead not supplied – ANRITSU Part No. V100

1. Tools And Materials

The only tools and materials needed are ANRITSU 01-105A Torquing Tool and a small amount of LOCTITE® RC/609 Retaining Compound.

2. Machining Dimensions

Machining dimensions for mounting hole required for installation of microstrip to V female sparkplug connector are provided in Figure 3 on reverse side.

3. Installation Instructions

Installation instructions for sparkplug connector are given below. Figures 1 and 2 identify connector parts.

- a. The V102F uses shims to precisely set the pin depth. If your V102F is supplied with shims

- (1) Remove the center conductor and support bead assembly.
- (2) Insert all shims.
- (3) Reinsert the center conductor and support bead assembly.

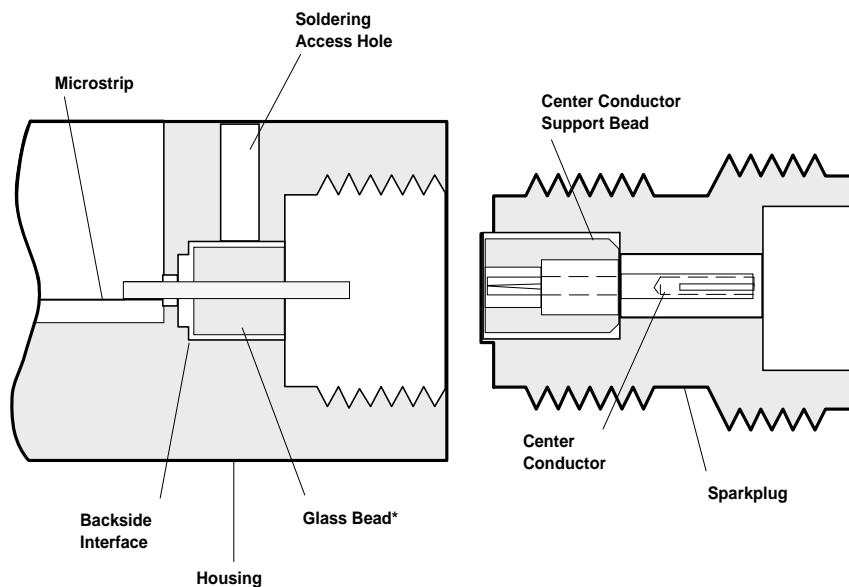
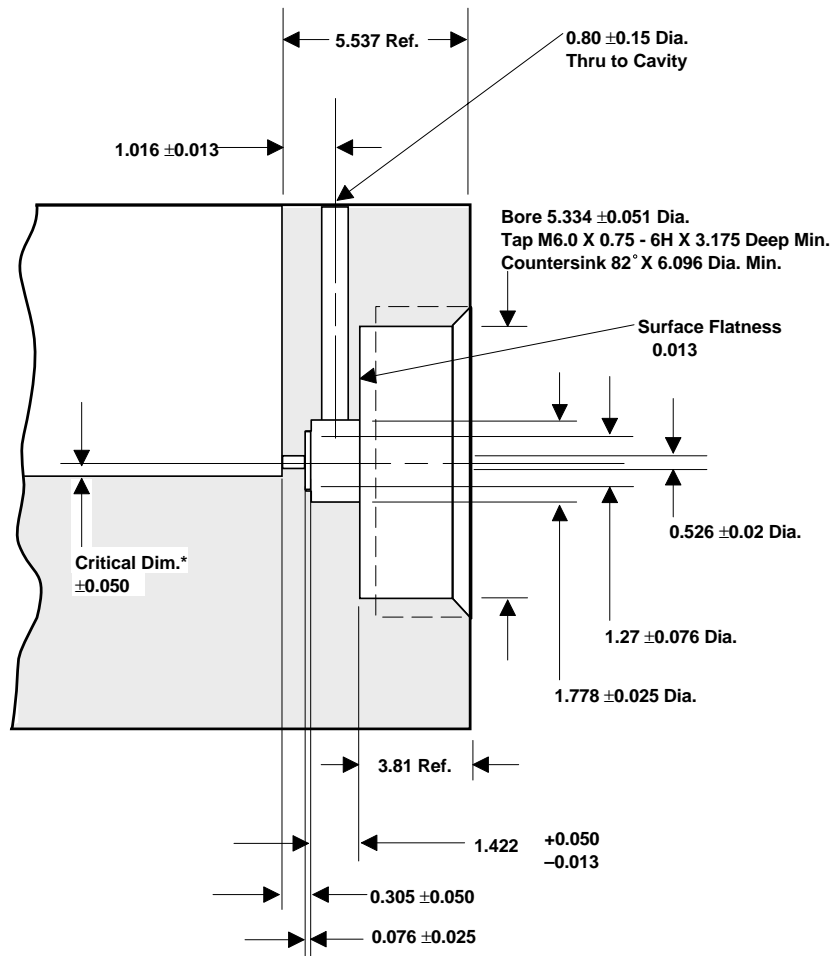


Figure 2. Sparkplug Assembly



NOTES

1. All dimensions are in mm
2. The concentricity of the 0.526 and 1.27 holes to the 1.778 hole is critical, and must be held within ± 0.038 mm.
3. With the Model 01-304 Step Drill Kit, all of the required concentric holes can be machined at the same time using a single bit.

* Dimension is 0.114 (Pin Radius)
+ Substrate thickness
+ Solder thickness

Figure 3. Machining Dimensions for V102F Mounting Holes

Specifications

Temperature Range: -55°C to 125°C

Return Loss: 15 dB to 60 GHz

Material:

Outer conductor: Passivated stainless steel

Center Conductor and Bead Holder:

Heat treated beryllium copper, gold plated

Bead: Teflon®



Figure 1. Sparkplug-Launcher Connector, Unassembled

*Glass support bead not supplied – ANRITSU Part No. V100

Anritsu

V Connector® Microstrip to V Male Sparkplug Connector Model V102M

1. Tools And Materials

The only tools and materials needed are ANRITSU 01-105A Torquing Tool and a small amount of LOCTITE® RC/609 Retaining Compound.

2. Machining Dimensions

Machining dimensions for mounting hole required for installation of microstrip to V female sparkplug connector are provided in Figure 3 on reverse side.

3. Installation Instructions

Installation instructions for sparkplug-launcher are given below. Figures 1 and 2 identify connector parts.

- The V102M may use shims to precisely set the pin depth. If your V102M is supplied with shims:
 - Remove the center conductor and support bead assembly.
 - Insert all shims.
 - Reinsert the center conductor and support bead assembly.
 - Install V103 onto housing, making sure that center conductor mates properly with the glass bead.
 - Secure outer conductor with two 2-56 inch or 2.2 mm metric screws. Tighten screws to approximately 0.226 N-meter.
- When tightening screws, use care to keep flanges parallel to housing.
- Apply a small amount of LOCTITE to threads of outer conductor assembly.
 - Screw sparkplug assembly into tapped mounting hole and torque to between 1.7 and 2.03 N-meter (17.32-20.78 cm-kg) using 01-105A Torquing Tool Kit.

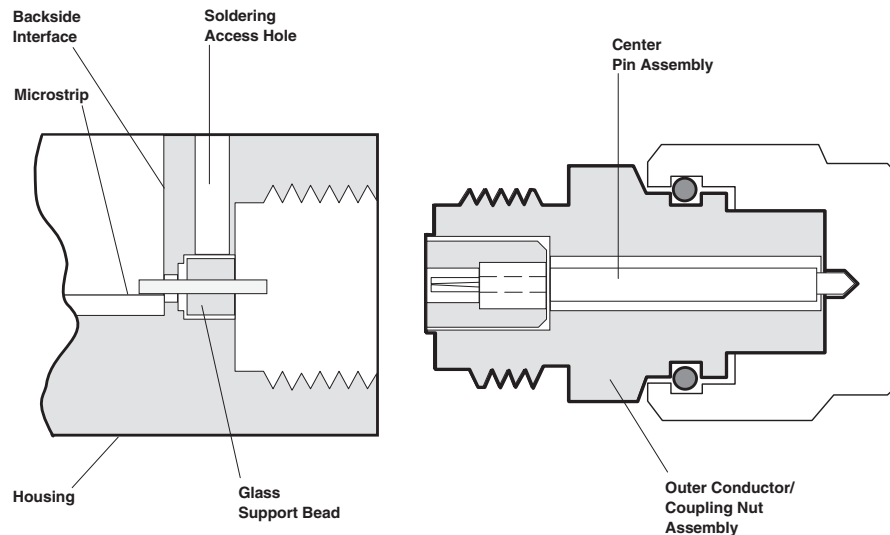


Figure 2. Sparkplug-Launcher Assembly “V Connector” is a trademark of ANRITSU Company.

V Connector is a registered trademark of Anritsu Company.
LOCTITE is a registered trademark of American Sealands Corporation.
Teflon is a registered trademark of E.I. Du Pont De Nemours and Company.

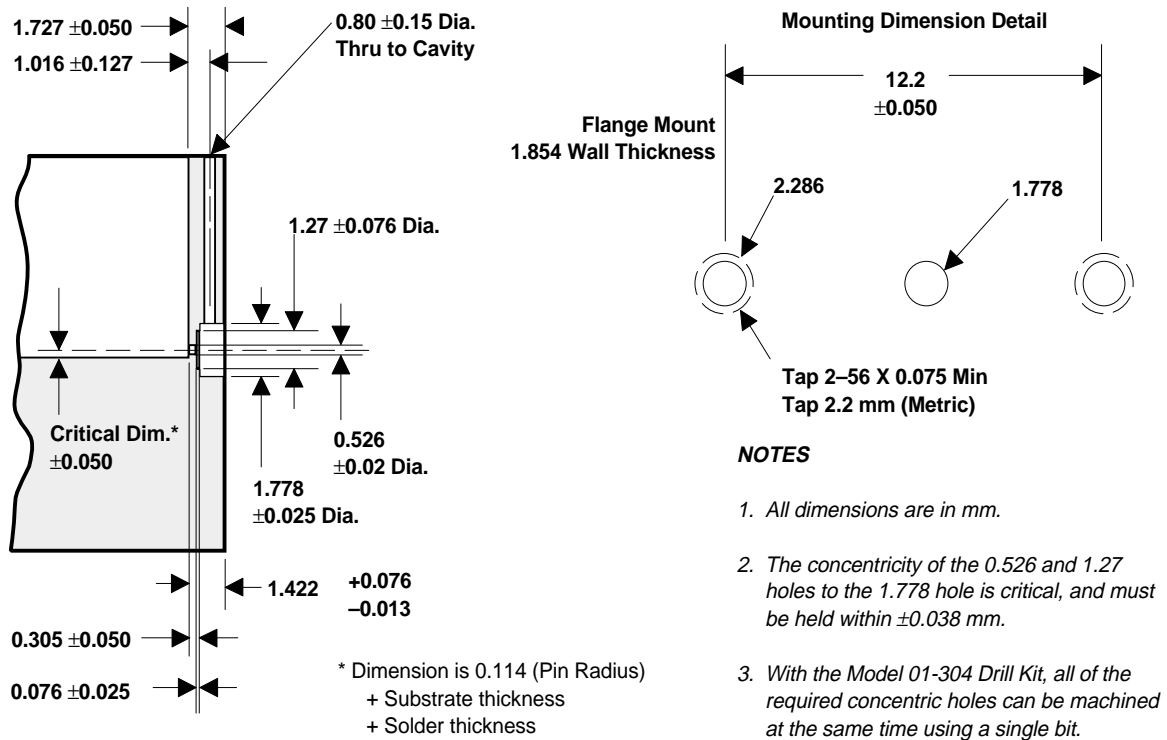


Figure 3. Machining Dimensions for V102M Mounting Holes

Specifications

Temperature Range: -55°C to 125°C

Return Loss: 15 dB to 60 GHz

Material:

Outer conductor: Passivated stainless steel

Center Conductor and Bead Holder:
Heat treated beryllium copper, gold plated

Bead: Teflon®

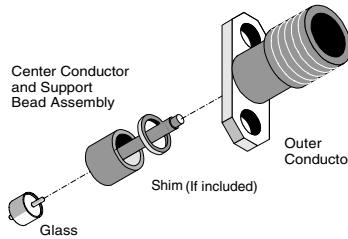


Figure 1. Female Flange Mount Connectors, Unassembled

Anritsu

V Connector® Microstrip to V Female Flange Mount Connector Model V103F

1. Tools And Materials

No special tools or material are required for installation of V103F Flange Mount Connector.

2. Machining Dimensions

Machining dimensions for mounting hole required for installation of microstrip to V female sparkplug connector are provided in Figure 3 on reverse side.

3. Installation Instructions

Installation instructions for flange-mount connector are given below. Figures 1 and 2 identify connector parts.

- The V103F uses shims to precisely set the pin depth. If your V103F is supplied with shims
 - (1) Remove the center conductor and support bead assembly.
 - (2) Insert all shims.
 - (3) Reinsert the center conductor and support bead assembly.

- Install V103 outer conductor onto housing, making sure that center conductor mates properly with V103 center pin. Secure outer conductor with two 2-56 inch or 2.2 mm metric screws. When tightening screws, use care to keep flanges parallel to housing.

NOTE

Flanges may not be flush with housing after installation. This does not degrade connector performance. Be careful, however, not to overtighten.

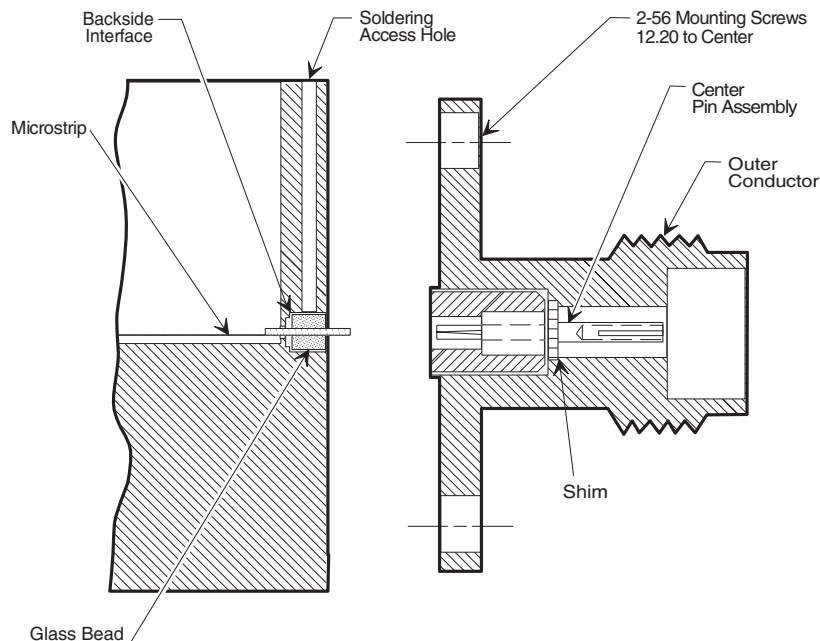


Figure 2. Flange Mount Assembly

V Connector is a registered trademark of Anritsu Company.
Teflon is a registered trademark of E.I. Du Pont De Nemours and Company.

*Glass bead not supplied – ANRITSU Part No.V100

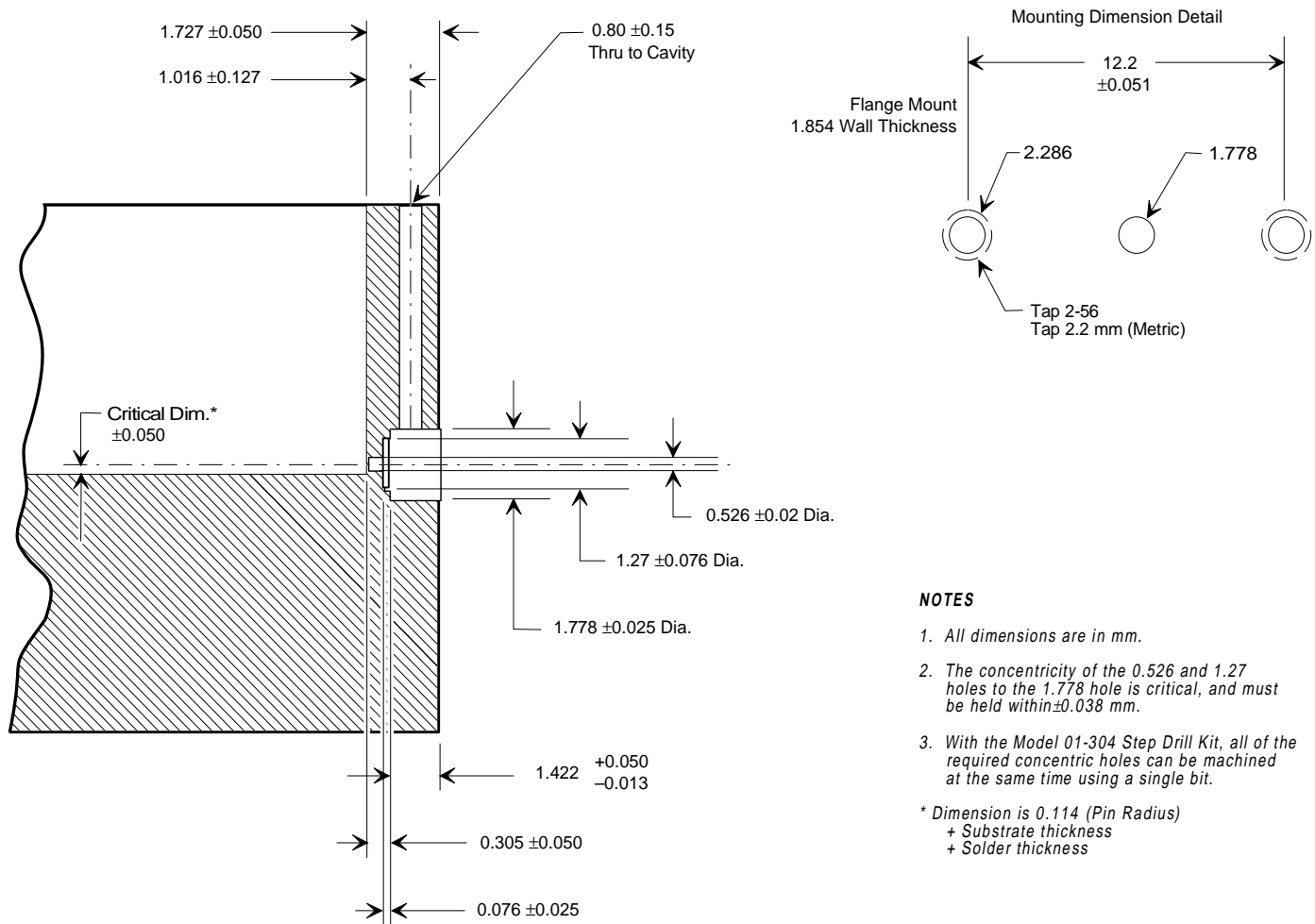


Figure 3. Dimensions for V103F Mounting Hole

Specifications

Temperature Range: -55°C to 125°C

Return Loss: 15 dB to 60 GHz

Material:

Outer conductor: Passivated stainless steel

Center Conductor and Bead Holder:

Heat treated beryllium copper, gold plated

Bead: Teflon®

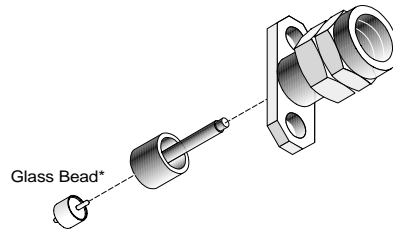


Figure 1. Male Flange Mount Connector, Unassembled V Connector®

Anritsu

V Connector® Microstrip to V Male Flange Mount Connector Model V103M

1. Tools And Materials

No special tools or materials are required for installation of V103M Flange Mount Connector.

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of microstrip to V male flange-mount connector are provided in Figure 3 on reverse side.

CAUTION

The three holes shown in Note 2 of Figure 3 must be concentric within ± 0.038 mm. If they are not, connector performance will be degraded. To make this required concentricity easier to achieve, a custom-made Finishing Step Drill and Tap kit, Model 01-304, is available from ANRITSU.

3. Installation Instructions

a. The V103M uses shims to precisely set the pin depth. If your V103M is supplied with shims:

- (1) Remove the center conductor and support bead assembly.
- (2) Insert all shims.
- (3) Reinsert the center conductor and support bead assembly.

b. Install V103 onto housing, making sure that center conductor mates properly with the glass bead.

- c. Secure outer conductor with two 2-56 inch or 2.2 mm metric screws. Tighten screws to approximately 0.226 N-meter.
- d. When tightening screws, use care to keep flanges parallel to housing.

NOTE

Flanges may not be flush with housing after installation. This does not degrade connector performance. Be careful, however, not to overtighten.

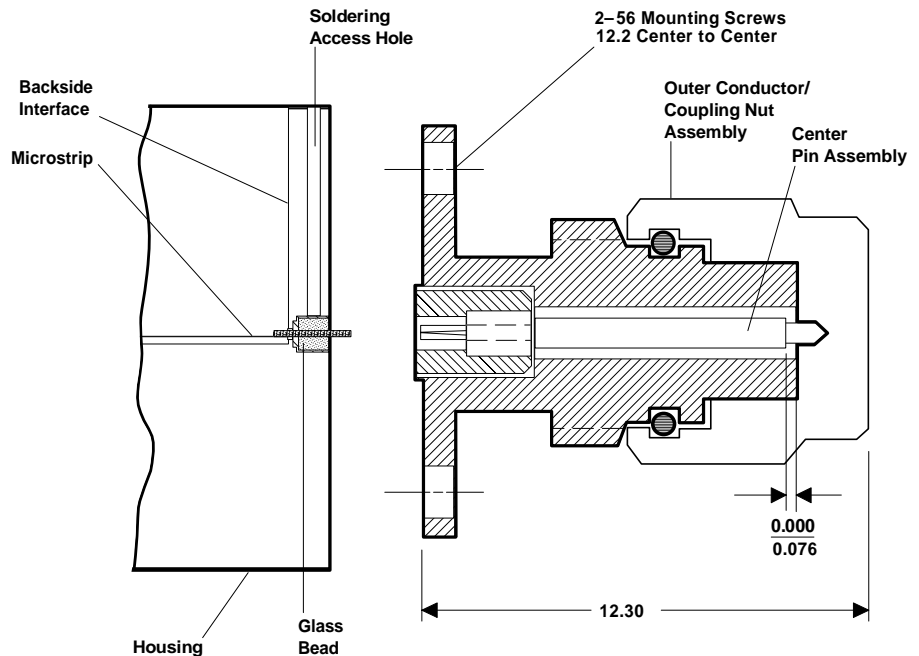


Figure 2. Flange Mount Assembly

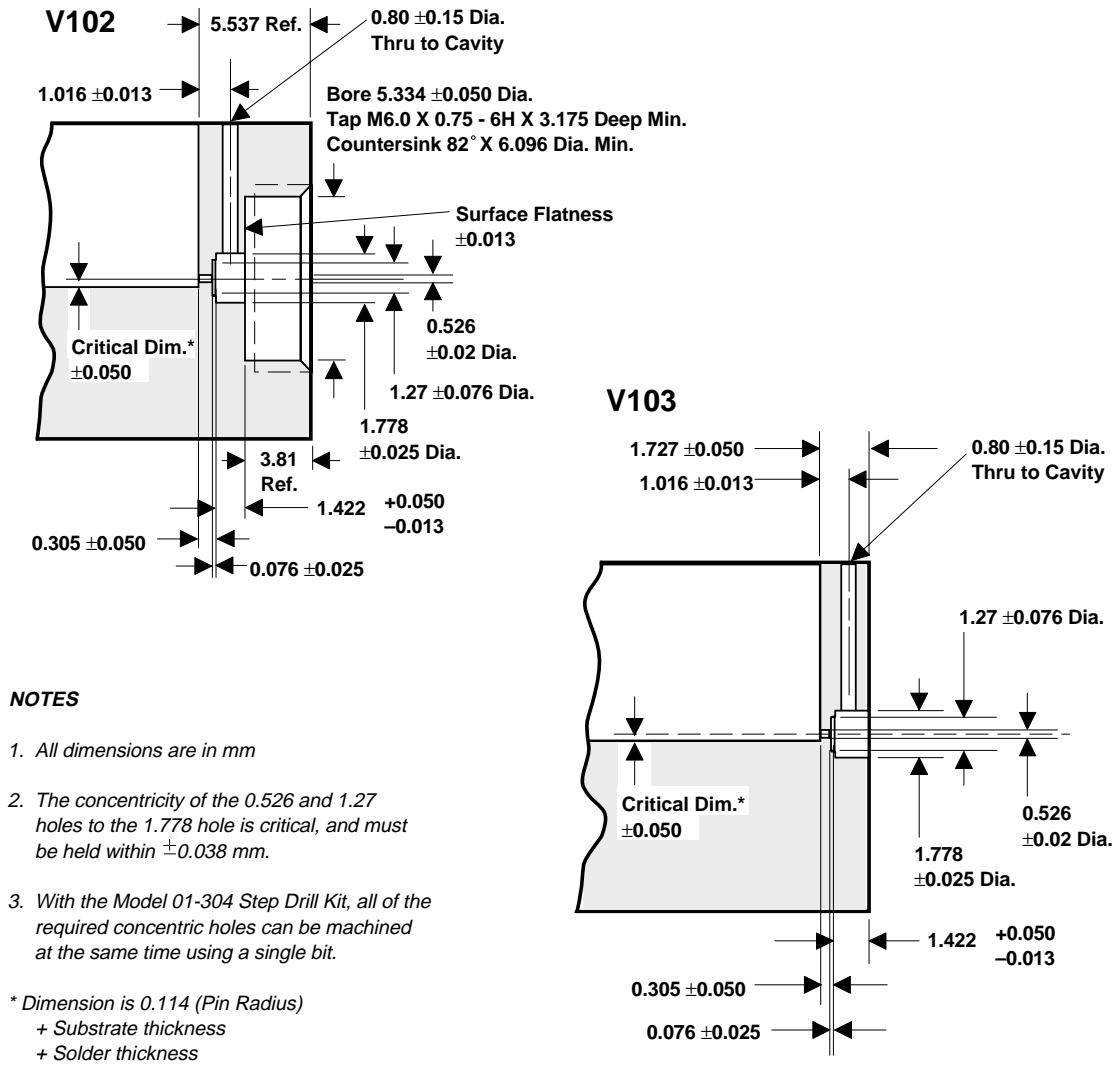


Figure 3. Machining Dimensions for V Connector® Mounting Holes

Specifications

Frequency: DC to 67 GHz

Material: 0.001 inch heat-treated BeCu.

Plating: 200 microinch gold, minimum

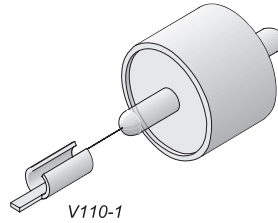


Figure 1. Glass Bead, V110-1, Sliding Contacts for Alumina® Microstrip

Anritsu

V Connector® Sliding Contact for Microstrip Model V110-1

1. Tools And Materials

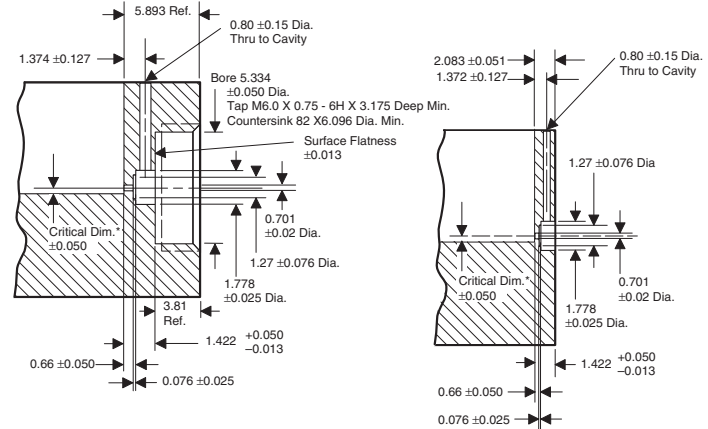
The following tools and materials will be helpful in in-stalling the V110-1 Sliding Contacts on the pin of the glass bead.

Name	Vendor and Model/Part Number
Stereo Microscope	Bausch & Lomb 30 power
Thermo-Compression Bonder	MECH-EL Model 907 West Bond Model 7416
Parallel-Gap Welder and Pulse Bonder or Solder, Indium #2	Hughes Model WCW550 with VTA-90 Head Indium Corp. of America
Step Drill	01-304 ANRITSU Co.
Jewelers Screwdriver	N/A
Tweezers	N/A

2. Machining Dimensions

Machining dimensions for the mounting hole required for installation of the V102 F/M Sparkplug and V103 F/M Flange Mount launchers are given in Figure 2.

The precision step drill listed in the table in paragraph 1 makes it easier to achieve concentricity of the respective holes required for the V102 or V103 installations. Bore the holes slightly undersized, using the appropriate bores, then use the step drill to expand and clean-up the holes. After using the step drill, expand the smallest hole to the 0.701 mm dimension with a drill bit.



NOTES

1. All dimensions are in mm.
2. The concentricity of the 0.701 and 1.27 holes to the 1.778 hole is critical, and must be held within ±0.038 mm.

* Dimension is 0.114 (Pin Radius)
+ Substrate thickness
+ Solder thickness

Figure 2. Mounting Hole Dimensions for V102 Sparkplug and V103 Flange Mount Connector Assembly Installations

3. Fabrication Instructions

The sliding contacts slip over the pin of the glass bead and mate with the microcircuit as shown in Figures 3. The following is the recommended procedure for installing the sliding contacts and mating them with the microcircuit.

- Drill the required holes. Install the microcircuit and glass bead, as shown in the V100, V102 F/M or V103 F/M Instruction Sheets.
 - a. Check that the center pin in the glass bead is level with the top of the microcircuit ±0.051 mm. If necessary, you can bend the pin slightly to achieve this degree of levelness.
 - b. Using tweezers,
 - (1) Remove one of the V110-1 Sliding Contacts from it's package.

- (2) With the sleeve-end facing the pin on the glass bead, lay the V110-1 on the microcircuit near the bead.

- c. Using the tip of the jewelers screwdriver, gently press the V110-1 tab both down onto the microcircuit and in toward the glass bead.
- d. Position the sleeve as shown in Figure 3.

NOTE

If you desire optimum RF performance, position the sliding contacts dynamically on the center pin as follows:

- Ensure that the tab makes good electrical contact with the microcircuit.
- Measure the SWR (return loss) of the connection.

- Slide the sleeve back and forth in small increments until the RF performance is optimized.
- e. Attach the tab on the V110-1 to the microcircuit by any of the following three methods:
- Soldering: For thin-film microcircuits, use Indium solder to prevent the leaching of gold from the microcircuit. For other types, you can use any acceptable solder.

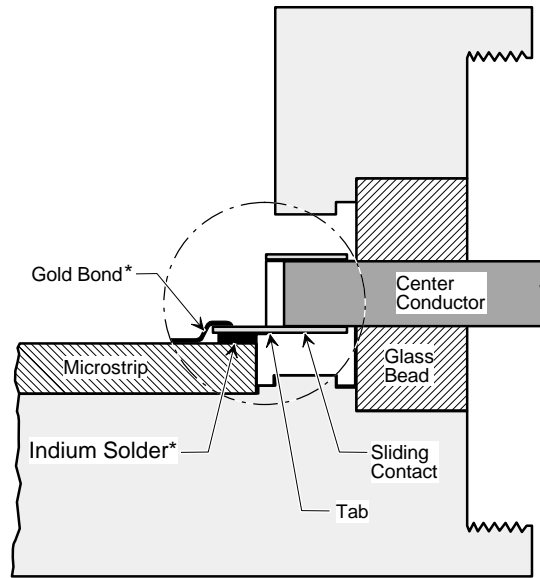
CAUTION

Use a minimum amount of solder to prevent the sleeve from becoming soldered to the pin.

- TC Bonding: Using ultrasonic or pulse bonding usually makes TC bonding easy. Ensure that the tab firmly contacts the microcircuit for best RF performance.
- Parallel-Gap Welding: Use a tip that is approximately the same size as the tab (0.203 mm). Optimize the voltage, duration, and weight for a strong weld.

NOTE

Due to the method used to form the sliding contacts, there may be inconsistencies in the surface finish and the break-away area at the cylindrical end, which may have a jagged edge. These occurrences will not harm the performance of the sliding contact.



*Alternate attachment techniques

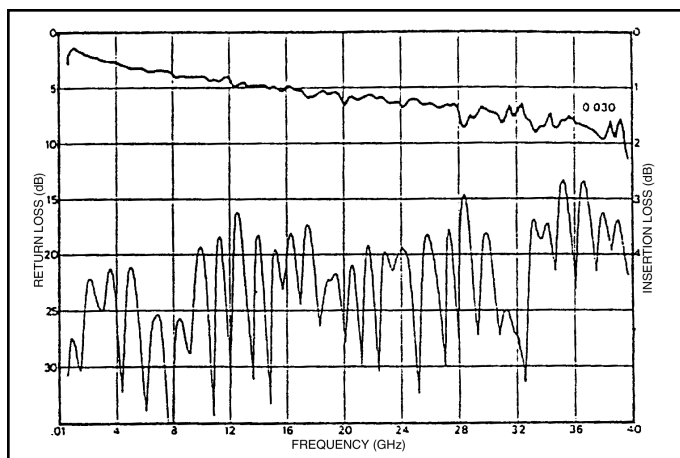
Figure 3. V110 Sliding Contacts Installation

K & V Commentary

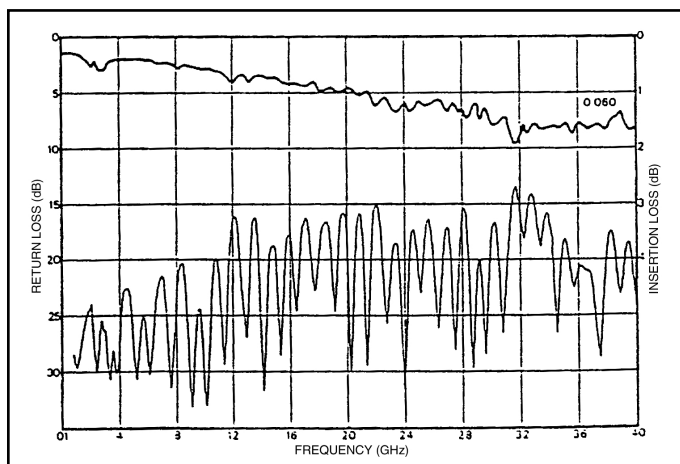
Stripline Interfacing at mm Frequencies

Except for its use in couplers, stripline is not used as commonly as microstrip. Perhaps because of its limited use there is little information about stripline performance above 18 GHz. It is known that the approximate upper frequency limit on TEM stripline is reached when the ground plane spacing (b) is one-half wavelength. For a Duroid® dielectric, a "b" of 0.060 inch is the approximate theoretical maximum for 40 GHz performance. Unfortunately there can be moding problems well below this frequency. If excited, the parallel-plate mode does decay rapidly, but still causes a "glitch."

One of the most sensitive areas of mode excitation is at the connector. Lack of symmetry and thick connection tabs are among the most common causes of moding. A K Connector® with a Kit of-2 sliding contacts provide a technical solution to these problems. Graphs 1 and 2 show return loss and insertion loss of 0.030 inch and 0.060 inch "b" dimension striplines. Even with the K 102, the 0.060 inch design is susceptible to moding; careful centering and solid ground-plane seals are necessary for mode-free performance. The 0.030-inch design is much less sensitive to moding and its insertion loss is not appreciably more than that of the 0.060-inch size (Graph 2). Double registration (i.e., center conductor on both stripline sections) makes the 0.060 inch less sensitive. A tight fitting (no gap) interface gives the best results. A 0.005 inch, 45° center conductor chamfer on the 0.060 in. stripline prevents the possibility of a shortage to ground. No attempt has been made to maximize performance by selection or tuning.



Graph 1. Insertion (top curve) and return loss for 0.030 in. "b" dimension striplines, 3 in. long.



Graph 2. Insertion (top curve) and return loss for 0.060 in. "b" dimension striplines, 3 in. long.

The three-layer system commonly used for couplers has not been tested to 40 GHz, although in the past we have had moding problems below 26 GHz with a 0.030 inch, 0.015 inch to 0.030 inch layer system. This system is naturally asymmetrical and thus very susceptible to moding.

Military High Reliability Specifications

We frequently get requests for military qualification information. MIL-C39012C is the broad document that defines the tests that a connector must pass to be accepted for military applications. The K Connector® has successfully passed all MIL C39012C tests. In particular, the durability test showed no degradation of electrical or insertion (retention) performance.

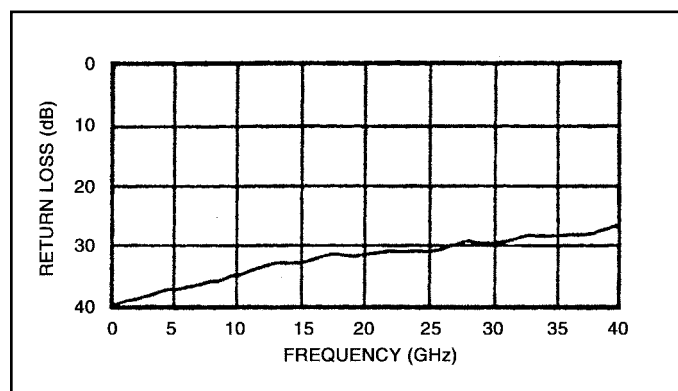
A specification sheet is available outlining the K Connector® capabilities for military applications.

K Connector® Insertables

K Connector® insertables offer an elegant, inexpensive solution to the vexing measurement problem of calibrating a -system to test a component with the same connector on all ports. Typically the component under test has female connectors, and the test system component has male connectors. The standard calibration technique requires a female-to-female adapter. Unfortunately, since the adapter is removed before the actual test data are taken, the adapter's loss, mismatch, and phase length are included in the calibration data but not in the test data. These errors caused by the adapter can be appreciable, especially at high frequencies.

The K Connector® insertables solve this problem nicely. The product line consists of three adapters: male-male (Model K 220), female-female (Model K 222), and male-female (Model K 224). All have similar loss, SWR, and phase characteristics. Thus the sex of the connector in the test setup can be changed without significantly changing electrical performance. In the standard calibration technique described above, the female-female insertable would be used for calibration and a male-female for measurement. With this arrangement, similar data are taken during calibration and measurement, thus improving the measurement accuracy significantly.

Even at their low cost, these insertables have exceptional performance. For example the return loss specification of 20 dB to 40 GHz is usually exceeded by a large margin (Graph 3). In addition, the insertables are useful as standard adapters or connector savers.



Graph 3. Return loss of K Connector® insertables.

Soldering Tips for Glass Beads

We now recommend a 0.032 inch solder access hole instead of the original 0.042 inch. The smaller diameter reduces the machining tolerance required for the hole's location.

One of our leading assemblers, has these tips for bead soldering:

1. Be sure all parts are clean and degreased.
2. Tighten the holder only finger tight.
3. Lightly flux the bead using a thin syringe in the access hole.
4. Hand feed very thin (0.015 in.) solder to each bead, touching only the bead and not the housing. Feed solder until the hole is almost full.

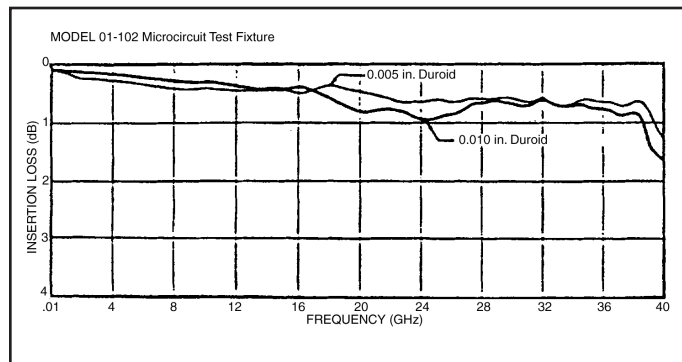
To replace a defective bead with minimum disassembly:

1. Remove all connectors.
2. Heat unit to 190°C on a hot plate.
3. Remove the defective bead with pliers. Do not bang or shake the housing as this may disrupt the other beads
4. Remove excess solder from the hole with fluxed, solder wick.
5. Place a new, lightly fluxed bead into the hole using tweezers.
6. Feed solder through access hole.
7. Cool housing.
8. Screw in the soldering fixture to ensure that the bead pin is correctly aligned. Do this carefully, so that the pin is not damaged if the bead is not properly located.
9. Clean flux with isopropyl alcohol.

Performance of Duroid Microstrip Up to 40 GHz

Duroid®, a glass-filled Teflon microstrip, is often more convenient to use than hard material, such as Alumina®, sapphire, or quartz. Properly designed Duroids can be bonded, soldered, and epoxied with ease. Furthermore, the material withstands temperatures up to 200°C and is much less expensive to process, especially in low volume applications. In the following paragraphs, we offer recommended design parameters developed in our laboratories.

In general, thick, low-dielectric substrates radiate more than thin, high dielectric substrates. For example, above 20 GHz, low dielectric Duroids radiate; whereas the radiation from 0.010 inch Alumina is negligible up to 40 GHz.

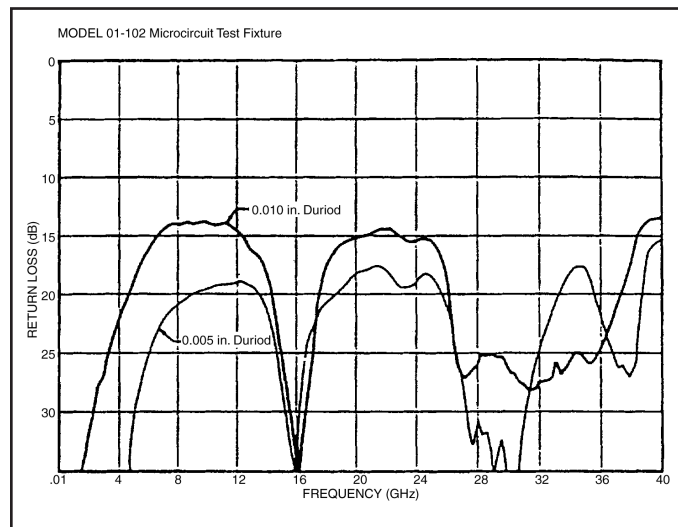


Graph 4. Because of its greater radiation at higher frequencies the total insertion loss of 0.010 in. Duroid (0.3 in. long) exceeds that of 0.005 inch Duroid.

Graph 4 shows the insertion loss of 0.005 in. and 0.010 in. Duroid in a non-channelized test fixture. Note that at the higher frequencies the 0.010-inch thick Duroid has more loss than the 0.005 inch Duroid. We recommend channelized 0.0075 inch Duroid for operation up to 40 GHz.

Plated Duroid is very easy to bond and solder, one-ounce copper being the best for bonding. Typically, plating consists of 100 microinches of gold over a 25-microinch-nickel-barrier layer. High temperature SN92 can be used to solder the Duroid to the housing; 0.003 in. thick ribbon solder works well. The use of high temperature solder allows subsequent soldering and bonding, including the installation of the glass bead, without unsoldering the Duroid.

Pulse bonding is the preferred technique for bonding Duroid although ultrasonic thermal compression bonding also works well. Bonding to small trace islands can be a problem, as excess heat can destroy the copper-to-Duroid adhesion. The standard 0.004 inch. gap can be used effectively for compensation at the glass-bead-Duroid interface.



Graph 5. The curves show return loss of 0.005 and 0.010 inch thick Duroid, 0.3 inches long

Graph 5 shows the return loss of test fixtures with 0.005 in. and 0.010 in. thick Duroid. Note that the return loss of the 0.010 in. Duroid is worse at the lower frequencies than at the higher. This is caused by the non-50-ohm impedance of the microstrip. There are two reasons for the impedance not being exactly 50 ohms:

1. The Duroid test pieces were designed to be used in a channel, but the data were taken in an unchannelized test fixture.
2. Dispersion causes the impedance to vary with frequency, and the line width selected was optimized for good performance at the higher frequencies.

High Temperature Performance of the K Connector®

There are two questions that several customers have asked about temperature characteristics:

1. What are the K Connector® operating temperature limitations?
2. What hierarchy of temperatures apply when manufacturing MIC or MMIC? This column will answer in the first.

The Launcher

The glass bead with its associated Kovar® center conductor and outer ring operate at temperatures well above 500°C. However, for brazing applications, we recommend that special beads without gold plating be ordered.

The Connector®

The K Connector® consists of a polyphenolic oxide (PPO®) bead and of metal parts that are not affected by typical temperatures. The bead is the critical item and is responsible for the 125°C connector specification. As delivered, the bead has already been press fitted into a bead holder. If the bead is subjected to temperatures above 100°C for more than approximately five minutes, it will shrink slightly and become loose in the bead holder. This does not, however, affect the connector's electrical performance. In fact, the K Connector® meets the thermal shock requirements of MIL-STD-202, Method 107, Condition B.

Isopropyl alcohol is the recommended cleaning agent for the K Connector®. Exposure to MEK or trichloroethane can damage PPO.

The Teflon® Bead

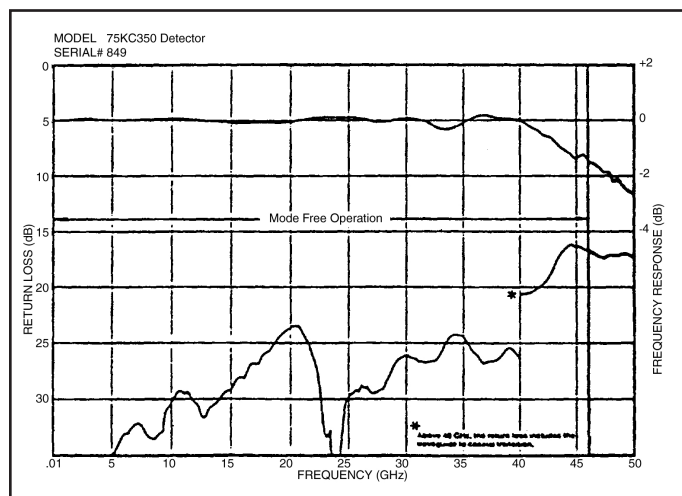
For higher temperature applications, Anritsu offers a Duroid® bead with a 200°C rating. It is impervious to MEK and trichloroethane and can be ordered by adding the suffix "T" to the part number, e.g., K102FT.

The Cable

Performance of cables at high temperature varies significantly with the type used. For example, the 0.118 inch semi-rigid, microporous cable available from Anritsu is rated up to 200°C, while typical specifications for the common 0.085-inch and 0.141-inch cables are rated up to 125°C. Flexible cables are typically rated up to 90°C or 100°C. Therefore, in some applications, the use of a flexible cable may determine the upper temperature limit of the subsystem in which it is used.

Bead Performance

How often have you been vexed by a poorly performing test fixture? In almost all cases, the problem area is the substrate interface. Nevertheless, everyone seems to hold the lingering assumption that the problem is with the connector glass bead. Figure 1 shows a setup that allows these parts to be tested with ease. As shown, the glass bead support is sandwiched between two K Connectors. In Graph 7, typical test results are shown.



Graph 6. The broad 10 MHz to 40 GHz range, flat response, and exceptional return loss of the 75KC350 make it suitable for almost every application. Below 46 GHz, the detector is mode free; above, high order modes may occur.

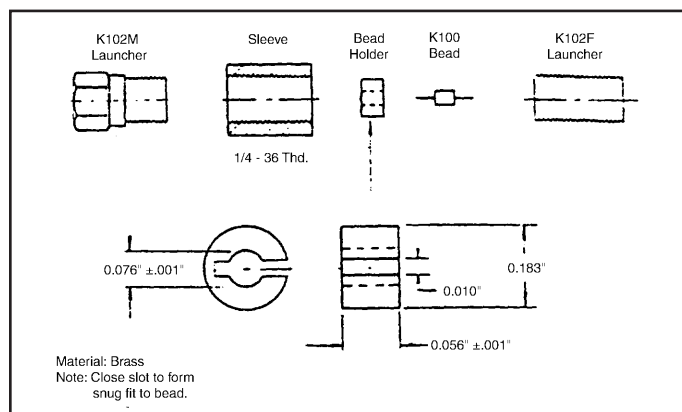
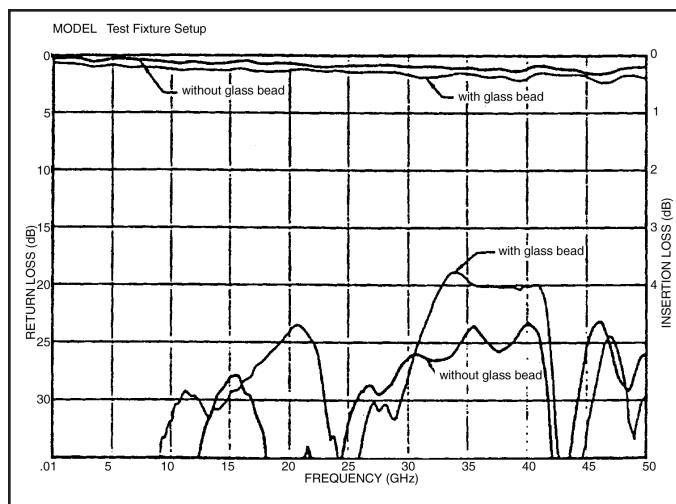


Figure 1. With the bead holder included in the test fixture setup shown, the assembly provides accurate and consistent test results.



Graph 7. Test data taken in the Figure 1 test setup show changes in performance with and without a glass bead.

Backside Interface

The backside interface of a connector assembly is the area where the coaxial transmission line interfaces with the microwave circuit. Its design is a major factor in determining the performance and reliability of a device. Often, more engineering effort is spent on this interface than on the actual circuit design. There are many reasons for this:

1. A change in mode occurs, e.g., from coax to microstrip.
2. Very small geometry is involved. The parts are fragile, and tighter machining tolerances are required.
3. Good grounding is more difficult to achieve. Butt joints on covers are often inadequate.
4. It is difficult to provide both mechanical strain relief and good RF performance.

The challenge, therefore, in backside design is to make a low-reflection transition while maintaining the mechanical integrity of very small geometries.

The Mode Change

Whenever a transmission line is altered in size or shape, a discontinuity occurs at the interface. The more radical the change, the larger the discontinuity. The discontinuity is usually in the form of fringing capacitance. Figure 2A illustrates the capacitance distribution that occurs with a simple change in coaxial line size. Figure 2B illustrates the difference in field distribution between coax and microstrip. Such a radical change introduces a reflection and can also be responsible for non-TEM mode generation or even the dreaded "glitch." If the interface is designed carefully, the principal effect is excess capacitance that can be compensated for by an appropriate inductance

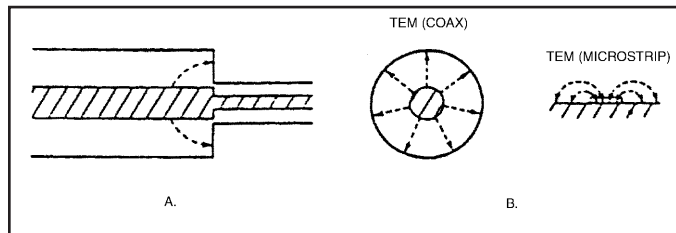


Figure 2. A change in size (A) or shape (B) of a transmission line alters fringing capacitance distribution and introduces a discontinuity.

The standard K Connector® launcher uses a small glass bead (Anritsu K100) in the backside interface. Previous K Commentaries discussed the use of the bead in Duroid microstrip and stripline configurations. When coplanar waveguide is used in MIC applications, obtaining a good ground connection may present a problem. Figure 3 shows one solution used successfully at Anritsu with which a good soldered ground connection is possible. An inductive compensation can be added by cutting a small amount of the center conductor back at the bead center-conductor contact area.

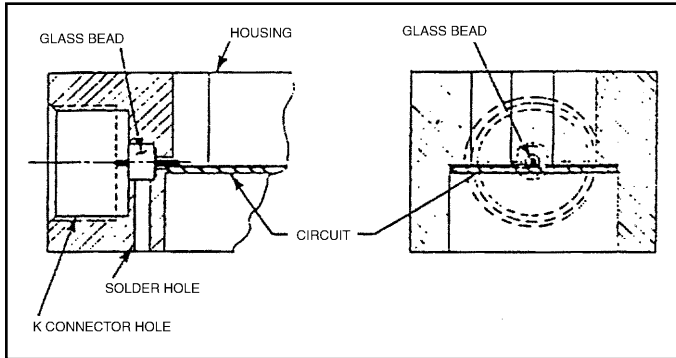


Figure 3. Coplanar waveguide interface configuration provides good soldered ground connection.

Backside Interfaces Without the Glass Bead

Some K Connector® applications – including waveguide-to-coax adapters, coaxial switches, isolators, and attenuators do not require the glass bead. In these applications, a 0.040-inch coaxial center “post” can be integrated into the device (Figure 4A). The more flexible design of Figure 4B allows the designer to use a special configuration, one that must have a 0.050-inch diameter in the bead holder area. In Figure 4C a third design includes a small pin that can be mated with the standard K Connector® backside.

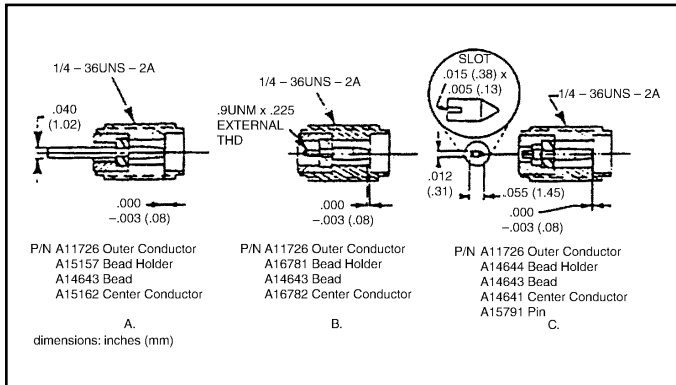


Figure 4. When a glass bead is not required, there are several interface configurations from which to choose.

Temperature Hierarchy

In K Commentary Number 2, the temperature performance of the K Connector® was discussed. When designing a test fixture or an MIC, there are a number of assembly operations involved. It is important to be aware of the temperatures required in each step of the assembly and to make certain that subsequent steps do not require temperatures that would affect prior operations. Assembly of a test fixture using K Connectors involves at least three steps:

1. Mount the substrate on the housing. This is usually the first step, the one requiring the highest temperature.

For Duroid, use SN95 solder (approximately 290°C).

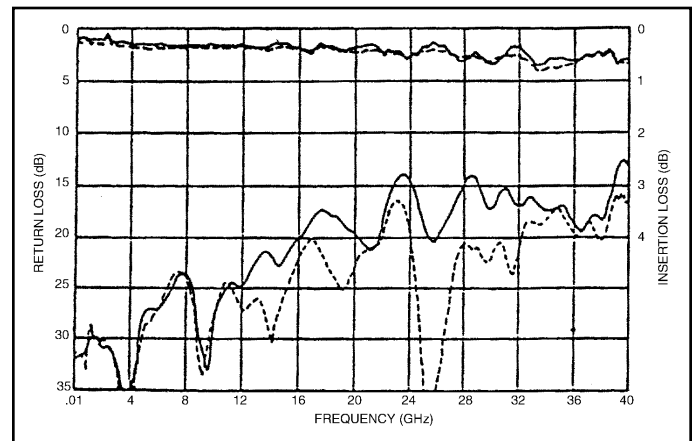
For Alumina, use gold-tin solder (approximately 270°C). Note that most solders leach gold and cannot be used for this first step.

2. Install the glass bead(s). Type SN62 (approximately 190°C) is recommended.

3. Attach the bead center conductor or a sliding contact to the substrate. Indium solder (type 2) can be used (approximately 150°C). This works well with gold. Bonding operations are possible on the sliding contacts which have a thick 300 microinch) gold plate. Pulse bonding is recommended; however, thermal compression can be used. In the latter case, the housing should not be heated to greater than 180°C, which requires special techniques.

Standards

K Connector® performance is specified up to 46 GHz, often raising the question of which standards apply. At Anritsu, airlines are used as impedance standards for K, GPC7, N, and WSMA connectors. The physical measurements of K Connector® airlines (Figure 5) are traceable to NIST. Based upon these dimensions, reference standards of 45 dB have been established. Since SWR Autotesters with 32 dB directivity up to 40 GHz are available, high quality measurements can be made to greater than 20 dB. This is usually more than adequate for most millimeter coaxial applications.



Graph 8. These insertion loss (upper traces) and return loss curves for two Anritsu K250 Bias Tees are typical.

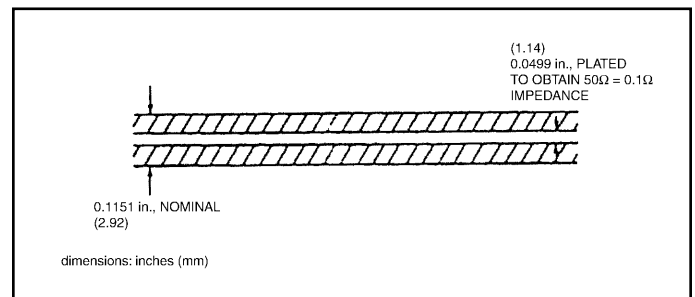


Figure 5. Physical measurements of K Connector® impedance standards are traceable to NIST.

K102 Installation Assembly Tips

The K102F Sparkplug is the most popular K Connector® used with the K100 Launcher and is installed after the component is assembled. For test purposes, a finger-tight connection is usually adequate. However, for the final step, the connector should be tightened with a torque wrench, Anritsu Part No. 01-105, and a small amount of LOCTITE® applied. We have heard of cases in which the backside fingers were damaged when the K102F was installed. Typically, this problem occurs

- Step 1** Clean the glass bead interface carefully, using a small cotton swab. (A Q-Tip swab is too large and may bend the glass-bead pin.)
- Step 2.** Inspect the K100 center conductor. Use a 01-103 Solder Fixture to ensure concentricity, if necessary.
- Step 3.** Insert the installation fixture shown in Figure 6.
- Step 4.** Install the bead-holder assembly on the K100 center conductor.
- Step 5.** Remove the installation fixture.
- Step 6.** Install the K102F threaded housing, using a torque wrench as required.

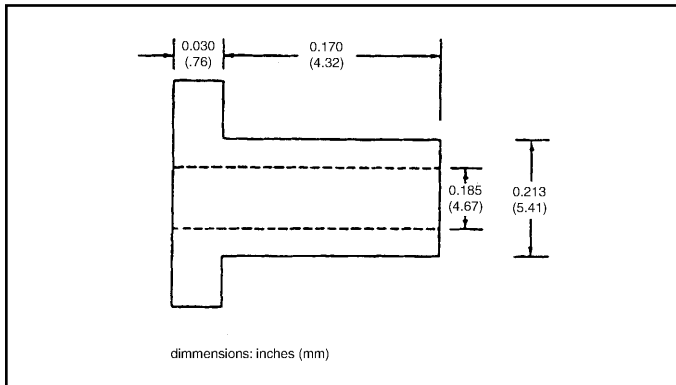


Figure 6. Installation fixture avoids backside finger damage during K102F installation.

K Connectors Without Glass Beads

One of our K Connector® users, Stan Gaglione of Westinghouse, suggested that for some types of fixtures, the glass beads were not required and that better results could be obtained without the glass bead. There are quite a few occasions where this is the case. The basic idea of a glass bead was to provide a hermetic, rigid, and small size contact at the area where the connector interfaced with the circuit. For 40 GHz circuits, this was usually 10 mil (0.25mm) Alumina microstrip.

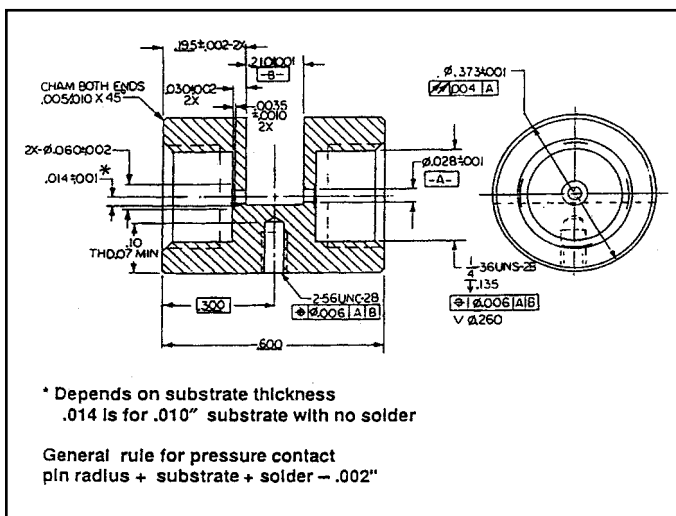


Figure 7. Detailed machining dimensions for a beadless test fixture. Depends on substrate thickness .014 is for .010" substrate with no solder. General rule for pressure contact pin radius + substrate + solder - .002"

The contact to the 0.25 mm wide microstrip center conductor is very fragile, so the glass bead allows the main connector to be removed and replaced without damaging the circuit. However, the return loss of the connector is slightly degraded when the glass bead is used.

An example of a design that does not incorporate the glass bead is Anritsu's 41 Series and 43 Series Coaxial Fixed Attenuator line. These attenuators have an SWR (return loss) spec of 1.25:1 to 40 GHz. This spec could not be met if glass beads were used. Also, the interface to the suspended substrate used in the pads is not suitable for glass beads. The diagram in the datasheet for the Series 41 and Series 43 Coaxial Fixed Attenuators shows the connection interface to the suspended substrate.

Another suggested use of the K Connector® without glass beads is in test fixtures. Using a 0.012-inch pin in place of the glass bead provides two benefits: (1) improved return loss; and (2) a more flexible attachment to the substrate. The fingers of the K Connector® provide spring pressure to the substrate via the pin. This means that the interface to the circuit does not have to be bonded; the connection is mechanical.

A third possible use occurs when using Duroid substrate with microstrip. The best thickness to use for 40 GHz components is 0.0075 inch; the center conductor of Duroid is also solderable. In this case one can use 28-gauge buss wire for the 0.012-inch pin and solder it directly to the Duroid. Details are shown in Figure 8. This method allows a considerable improvement in the Return Loss as shown in Graph 9.

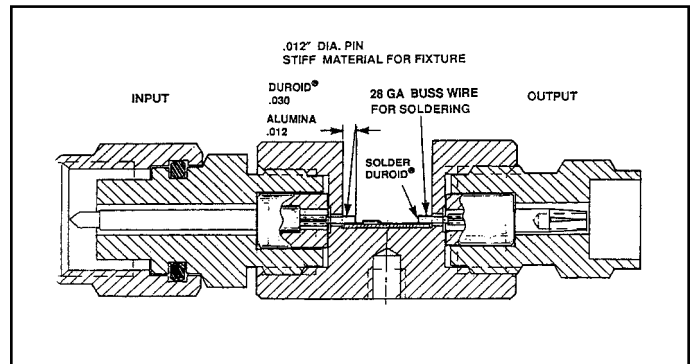
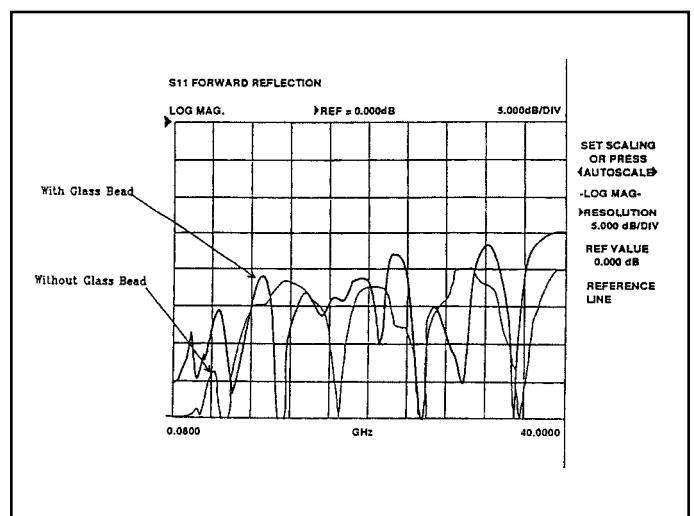


Figure 8. Soldering details for a Duroid test fixture.

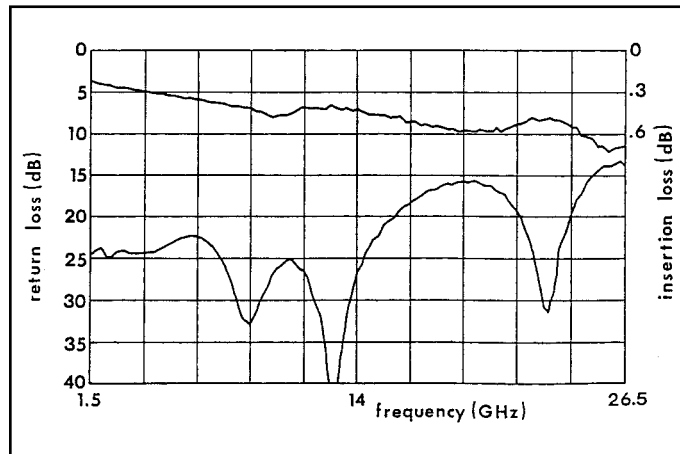


Graph 9. The improvement in return loss using a beadless test fixture can easily be seen from the above return loss measurements.

A user submitted the following information regarding a test fixture design utilizing the K Connector®:

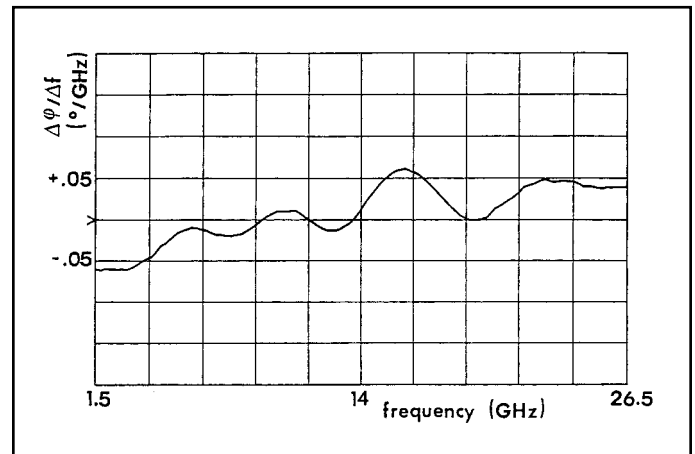
VECTORIAL MEASUREMENTS; PHASE LENGTH DIFFERENCE BETWEEN K102M AND K102F CONNECTORS UP TO 26.5GHz
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Centre Hypenrequences et Semiconducteurs
U.A. 287 CNRS - Bat. P4
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59655 VILLENEUVE D'ASCQ CEDEX FRANCE

When both female and male K Connectors are used in a microwave test fixture for accurate vectorial measurements, it is of primary importance to accurately and separately determine the input and output insertion phase and loss because the reference planes are not symmetrical. The T.S.D. calibration using a high reflective load yields such a determination.



Graph 10. Return loss performance of a thru line on 0.01-inch Alumina substrate using the beadless test fixture

The test fixture involving K102M and K102F connectors used up to 26.5 GHz for MESFET and HEMT measurements. The performance of a thru line on a 0.01-inch Alumina substrate is shown in Graph 10. This good performance allows us to easily determine the insertion phase of the input and output error network by de-embedding. The phase length difference is $5.89^\circ/\text{GHz} + 0.05^\circ/\text{GHz}$, namely a geometrical length difference of 0.193 inch (in free-space propagation). This measured length difference quite agrees with the theoretical value ($0.190 + 0.006$ inch). Figure 11 shows the phase length evolution versus frequency. Note that this phase length does not depend on the frequency and shows the very good propagation quality of K Connectors and their associated microstrip transitions.



Graph 11. Phase length versus frequency for the beadless test fixture

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