Operating Instructions

Connector Gage Kit

Type 'N' Metrology Grade

Model A020D

020-39D

Maury Microwave

Contents

General Information

Description

The Maury model A020D connector gage kit is designed to measure Type N connectors with either female or male interfaces. See **Figure 1**. Also refer to 2Y-003A attached for additional information.

The Maury models A020D1 (female) and A020D2 (male) connector gage assemblies use a "thread-on" design that simulates actual mating conditions allowing high accuracy measurements and hands-free operation. The connector gage assemblies are initially set to zero using master setting gages, A020D3 (female) or A020D4 (male), permitting subsequent measurements to be read directly on the dial indicator. Centering sleeves are provided for measuring beadless air lines and 2-port standards. Flush setting of sliding loads is easily accomplished using the A020D gages. All machined parts are made from non-magnetic stainless steel to assure long life and good stability. Gaging surfaces are lapped to ensure a high degree of accuracy. A parts list is shown in **Table 2**.

Specifications

The specifications listed in **Table 1** are the performance standards based on factory measurements traceable to the U.S.A. National Institute of Standards and Technology (NIST). To verify that your gage kit is performing to traceable specifications, periodically send the kit to Maury Microwave Corporation for calibration. The recommended calibration cycle is one year. The actual need may vary depending on usage.

Connector Gage Specifications

CHARACTERISTICS	LIMITS	COMMENTS
Gage Resolution	± 0.000020	1/5 Least dial graduation [1]
Gage Calibration Accuracy [6]	± 0.000150	1 Least dial graduation [2] plus 0.000050 measurement guardband
Gage Repeatability [4]	± 0.000020	1/5 Least dial graduation [2]
Master Accuracy	± 0.000200	0.00040 Range [3]
Total Uncertainty [5, 6]		
RSS	± 0.000252	Root sum of the squares.
Worst Case	± 0.000390	Add resolution, repeatability, gage and master accuracy limits.

Table 1

NOTES:

1 Per ASME B89.1.10M-2001, C5.1.2.

2 Per ASME B89.1.10M-2001, Table 2.

3 Per manufacturer's specification.

4 Operator skill has a great impact on repeatability. You can easily determine the repeatability of the connector gages by multiple engagements of the master gages following the procedure outlined under ***Zero Setting*** on page 5.

5 Performance standards are in compliance with ANSI/NCSL Z540-1, MIL-STD-45662A and ISO 10012-1.

6 Applies over the operating range for connector gaging a recession of 0.005" to a protrusion of 0.001" from master gage zero setting.

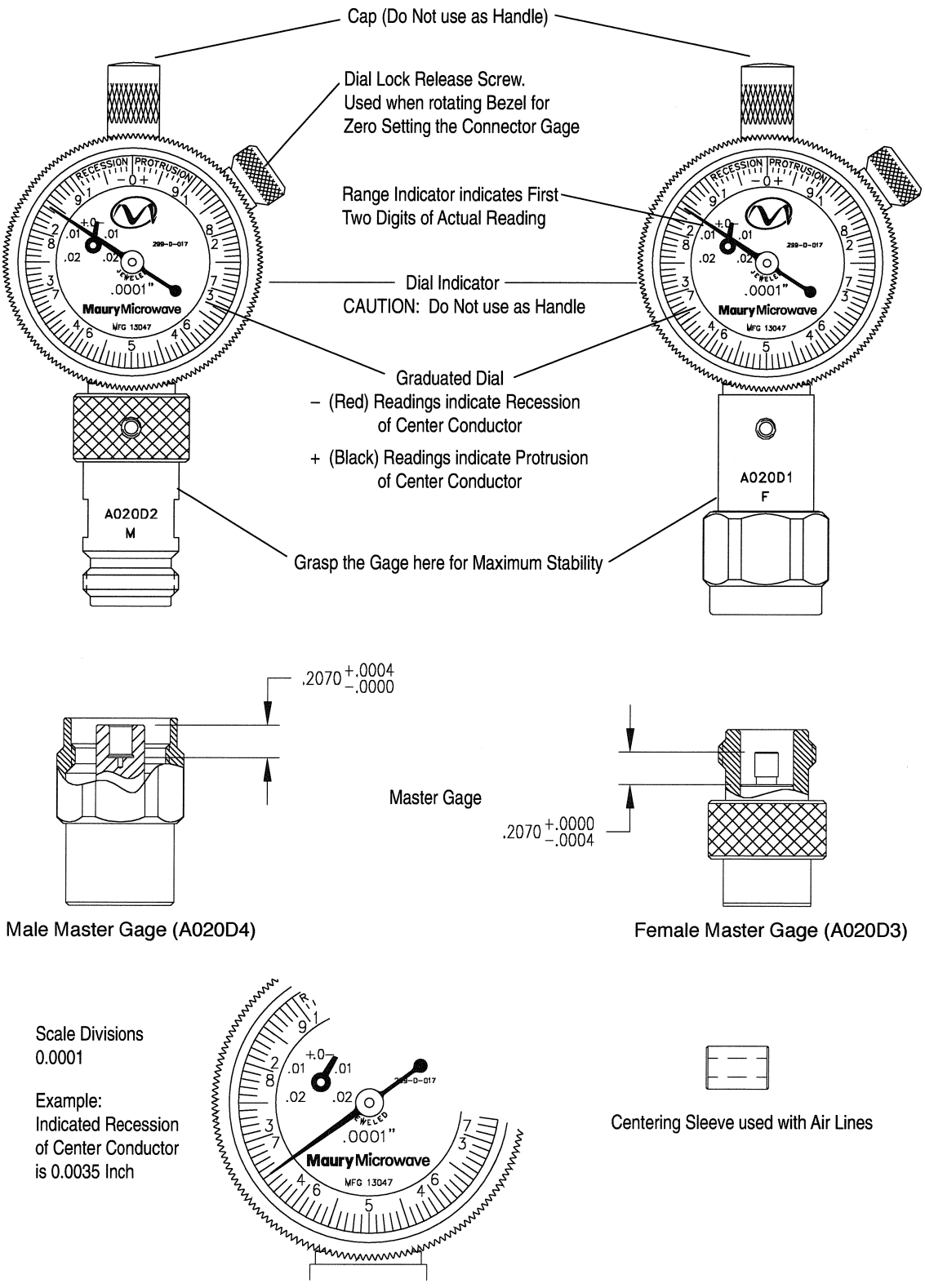


Figure 1. The A020D Connector Gage Kit

Replacement Parts

ITEM	DESCRIPTION	MAURY PART NUMBER	QUANTITY PER ASSEMBLY	NOTES
1	Indicator Assembly, Female	A020D1	1	
2	Indicator Assembly, Male	A020D2	1	
3	Master Gage, Female	A020D3	1	
4	Master Gage, Male	A020D4	1	
5	Sleeve Set, Type N	A028S1	2	*

* The centering sleeves are shipped in a small plastic container.

NOTE: The A020D1 is used to measure female connectors. The A020D2 is used to measure male connectors. The reason for this differentiation is to avoid confusion in their usage.

Table 2. Replacement Parts List

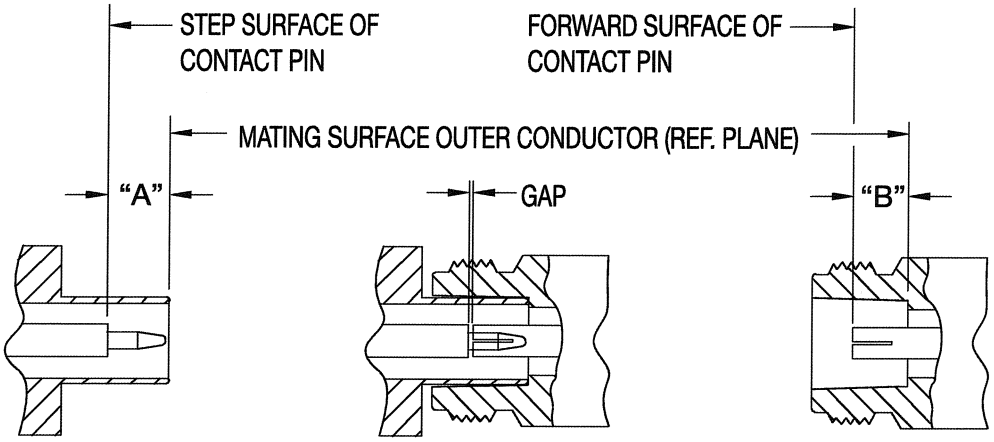


Figure 2

Contact Pin Locations for Commonly Used Type N Connectors

ITEM	SPECIFICATION	A		B		GAP (See Figure 2)			COMMENTS
						MIN	NOM	MAX	
A	Maury High Precision	0.2070	+0.0005 -0.0000	0.2070	+0.0000 -0.0005	0.0000	0.0000	0.0010	MMC high precision type N connector
B	Maury Precision (per Maury data sheet 5E-049)	0.207	+0.003 -0.000	0.207	+0.000 -0.003	0.000	0.000	0.006	MMC precision type N connector [1]
C	IEEE Standard 287-2000	0.207	+0.004 -0.000	0.207	+0.000 -0.003	0.000	0.000	0.007	[2]
D	MIL-STD-348A Test Connector Ref.: 402.1 and 402.2	0.208	+0.003 -0.000	0.207	+0.000 -0.003	0.001	0.001	0.007	MIL-PRF39012D Class 1 [3] STD Test Connector
E	MIL-STD-348A Series N Ref.: 304.1 & 304.2	0.210	+0.020 -0.000	0.207	+0.000 -0.020	0.003	0.003	0.040	MIL-PRF39012D Class 2 [4,5]
F	MIL-T-81490	0.208	+0.003 -0.000	0.207	+0.000 -0.003	0.001	0.001	0.007	MIL-T-81490 Type EW Connectors

Table 3

Notes

1. Precision connector compatible with most precision type N connectors in use today.
2. Applies to "GPC" (General Precision Connectors) and "LPC" (Laboratory Precision Connectors).
3. To measure using this kit requires the use of the optional A020D14 master gage to set the 0.208 dimension.
4. The Maury A007A connector gage kit is designed to measure to this specification.
5. Maury recommends that for better quality the following tolerances be used: $A=0.210^{+0.010}_{-0.000}$ $B=0.207^{+0.000}_{-0.010}$
6. Type N male connectors may be slotted or not; MIL-PRF-39012D and MIL-T-81490 provide this option. Items A, B, C, and D are not slotted. Items E and F may or may not be slotted. ***NOTE:*** *Interface dimension of MIL-PRF-39012D are controlled by MIL-STD-348A.*

Operation

Visual Inspection

Inspect all connectors carefully before each use. If a connector shows deep scratches, dents, uneven wear, or particles clinging to the mating plane surfaces, clean it and inspect again. Damaged connectors should be set aside for repair. Also, try to determine the cause of the damage before making further connections.

75 Ohm Type N Connectors

75 Ohm Type N connectors differ from 50 Ohm Type N connectors in that the center conductor, male contact pin, and female contact hole are smaller. Therefore, mating a male 50 Ohm Type N connector with a female 75 Ohm Type N connector will destroy the female 75 Ohm connector by spreading the female contact fingers apart permanently or even breaking them. This kit is ***NOT*** designed to measure 75 Ohm connectors.

Cleaning

Use dry compressed air of a very low velocity first; then a solvent such as isopropyl alcohol. Clean the contacting surfaces, alignment parts and threads using a lint free swab. Then re-inspect the connector to make sure that no fibers have been left around the contact and mating surface.

CAUTION: ***Never*** rotate parts against each other since this will yield faulty readings and could damage the mating surfaces.

Gaging Male Type N Connectors

Zero Setting the Male Gage A020D2

See Figure 3a.

1. Visually inspect the mating surfaces of your A020D2 connector gage and A020D4 master setting gage.

2. Clean mating surfaces (see ***Cleaning*** section, above).

3. Align the connector gage and master setting gage carefully, then rotate the nut on the master setting gage, allowing it to engage with the thread of your A020D2. Apply light finger pressure avoiding rotation of the mating planes. If you use a torque wrench, it should be rated at 12 inch-pounds. Maury model 2698C2 is recommended.

4. Loosen the bezel lock and rotate it to the zero position indicated by the hands on the indicator. Retighten the bezel lock.

5. Gently loosen the knurled nut and disengage the connector gage and master setting gage.

Checking Male Type N Connectors (0.207 Dimension)

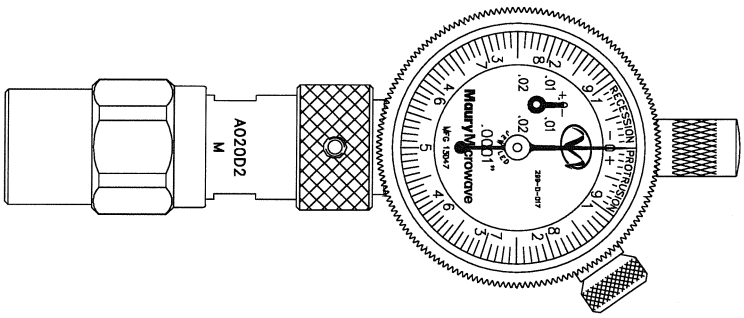
See Figure 3b and c.

1. Visually inspect the mating surfaces of the connector to be gaged.
2. Clean all mating surfaces: connector, master setting gage and connector gage.
3. Zero set your A020D2 by using the procedure described in the previous section, page 5.
4. Align both the connector and your A020D2, then rotate the nut of the connector, allowing the threads to engage. Tighten with light pressure avoiding rotation of the mating planes at the same time. When using a torque wrench, make sure it is rated at 12 inch-pounds. Maury model 2698C2 is recommended.

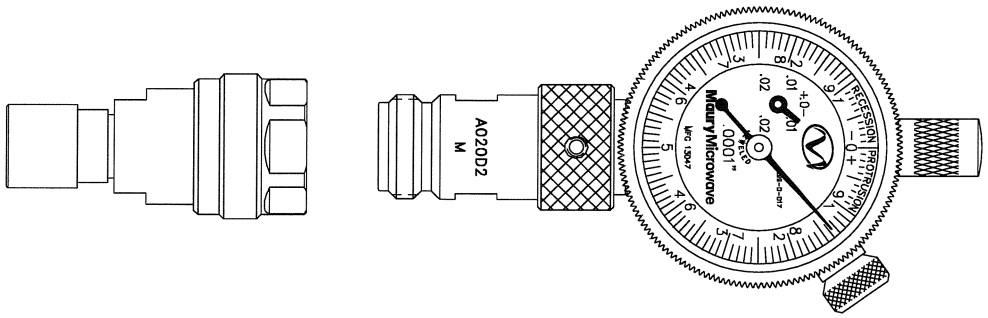
   Example:

   Counterclockwise deflection of the pointer (a 'recession' reading) indicates the shoulder of the male contact pin is recessed at least 0.207 inches. A reading of 0.003 inches recession indicates a setback of 0.210 inches, the maximum recession allowed for Maury Precision Type N connectors.

a. Zero Set the Connector Gage using the Master Gage.



b. Align your Connector Gage and the Connector.



c. Gently Connect the Device.

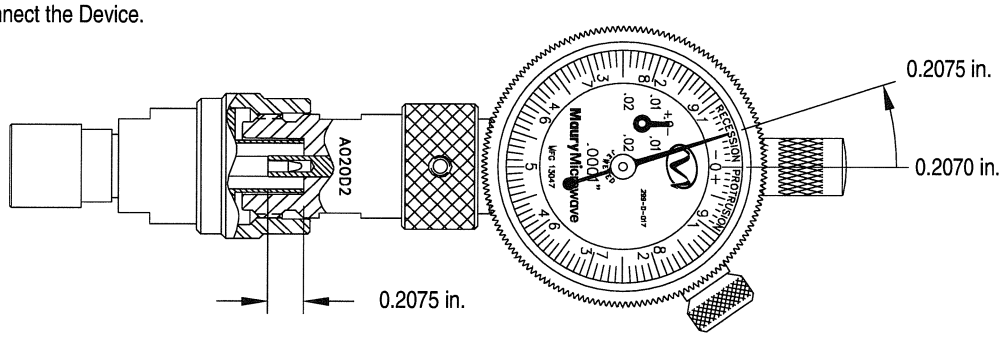


Figure 3. Gaging Precision Male Type N Connectors (Applies Equally to Female Connectors.)

Checking MIL-C-39012 Type N Male Connectors (0.210 Dimension)

Use the zero setting procedure on page 5; except, that in step 4, instead of aligning the gage pointer with zero, align it to ***RECESSION 3*** (red numerals on the bezel). Due to the large variations possible in Type N connectors, also check the turn indicator, which should still be near the zero position. Your A020D2 is now ready to measure MIL-C-39012 male connectors with an 'A' dimension of 0.210.

Checking MIL-C-39012 Standard Test and MIL-T-81490 Type N Connectors (0.208 Dimension)

Use the zero setting procedure on page 5; except, that in step 4, instead of aligning the gage pointer with zero, align it to ***RECESSION 1*** (red numerals on the bezel). Due to the large variations possible in Type N connectors, also check the turn indicator, which should still be near the zero position. Your A020D2 is now ready to measure MIL-C-39012 male connectors with an 'A' dimension of 0.208.

Checking MIL-C-71B Type N Male Connectors (0.223 Dimension)

The metrology grade A020D2 is not recommended for gaging non-precision Type N connectors (MIL-C-39012 class II or MIL-C-71) due to the large tolerance variations possible. These connectors should be gaged using the Maury model A007A.

Gaging Female Type N Connectors

Zero Setting the Female Connector Gage A020D1

1. Visually inspect the mating surfaces of your connector gage and A020D3 master setting gage.

2. Clean mating surfaces using the procedure outlined under the section ***Cleaning*** on page 5.

3. Align the connector gage and master setting gage carefully; then rotate the hex nut of the connector gage allowing it to engage with the thread of the A020D3. Let the master setting gage bottom freely against your A020D1. Apply light finger pressure avoiding rotation of the mating planes. If using a torque wrench, it should be rated at 12 inch-pounds. Maury model 2698C2 is recommended.

4. Loosen the bezel lock and rotate the bezel to the zero position indicated by the hands on the indicator. Retighten the bezel lock.

5. Gently loosen the hex nut and disengage the connector gage and master setting gage.

Checking Female MIL-C-39012 and MIL-T-81490 Type N Connectors (0.207 Dimension)

1. Visually inspect the mating surface of the connector to be gaged.

2. Clean all mating surfaces: connector, master setting gage and connector gage.

3. Zero set your A020D1 by using the master setting gage, following the procedure outlined above.

4. Align both the connector and your A020D1; then, rotate the knurled nut on the bushing, allowing the threads to engage. Let the connector bottom freely against your A020D1. Tighten with light finger pressure avoiding rotation of the mating planes. If using a torque wrench, it should be rated at 12 inch-pounds. Maury model 2698C2 is recommended.

NOTE: *A reading of zero on the connector gage corresponds to a pin depth of 0.207 inches; refer to* ***Table 3*** *for in-tolerance measurements.*

Checking MIL-C-71B Type N Connectors (0.197 Dimension)

The metrology grade A020D1 is **NOT** recommended for gaging non-precision Type N connectors (per MIL-C-39012 class II or MIL-C-71) due to the large tolerance variations possible. These connectors should be gaged using the Maury model A007A.

Sliding Loads and Air Lines

About Sliding Loads

Most sliding loads come equipped with a simple center conductor lock consisting of some form of clamping mechanism. The sliding load connector interface is usually set for a "zero gap" or "flush set" as described below.

NOTE: *Gaging the sliding load is not required for zero gap operation.*

To set a zero gap, loosen the locking mechanism and extend the center conductor and mate it completely with the center conductor on the mating connector. Then mate the outer conductors using a torque wrench for the final connection. The sliding load center conductor remains free in the outer conductor housing as mating of the outer conductors takes place. The locking mechanism is tightened only when all connections have been made.

For flush set operation, the sliding load center conductor is first set to the correct position using a connector gage. Then the center conductor is aligned axially and connected to the mating connector.

NOTE: *The nominal interface dimension is set using the A020D connector gage.*

For flush-set measurements, use Maury *metrology grade* sliding loads, models 8834A and 8834B, with flush-set and pull-back mechanisms. See **Figure 4**.

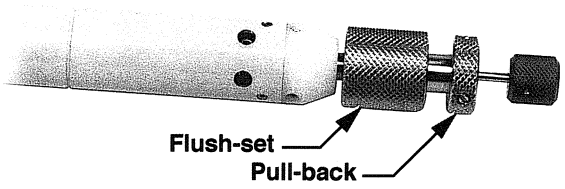


Figure 4

The flush-set mechanism allows you to adjust the center conductor position very accurately, and the pull-back feature provides an easy way to expose the center conductor for connection without sacrificing the proper interface condition preset with the flush-set mechanism. For in-depth information, please refer to the operating instructions for your sliding load.

Gaging Sliding Loads

CAUTION: This section may not have complete information for your particular sliding load. Please consult the manual for your sliding load first.

The following procedure applies to both female and male sliding loads. For female sliding loads, use the A020D1. For male sliding loads, use the A020D2. For in-depth information on how to properly set the interface dimension, refer to the manual provided with your sliding load.

Procedure

Refer to **Figures 5** and **6**.

1. Visually inspect the mating surface of the connector to be gaged before making a connection.
2. Clean all mating surfaces: connector, master setting gage and connector gage.
3. Zero set your connector gage with the appropriate master gage.
4. Expose the center conductor of the sliding load to allow easy engagement of the gaging pin.

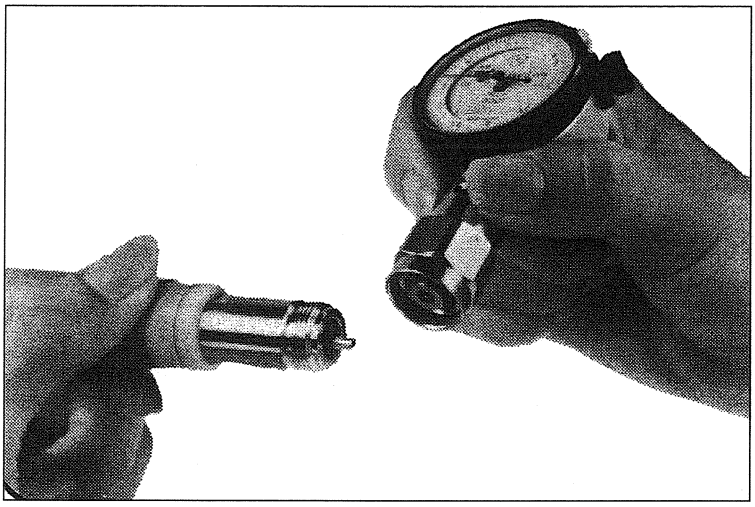
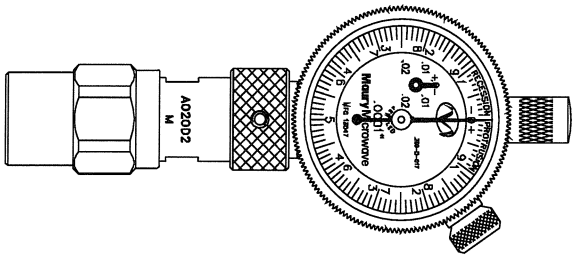


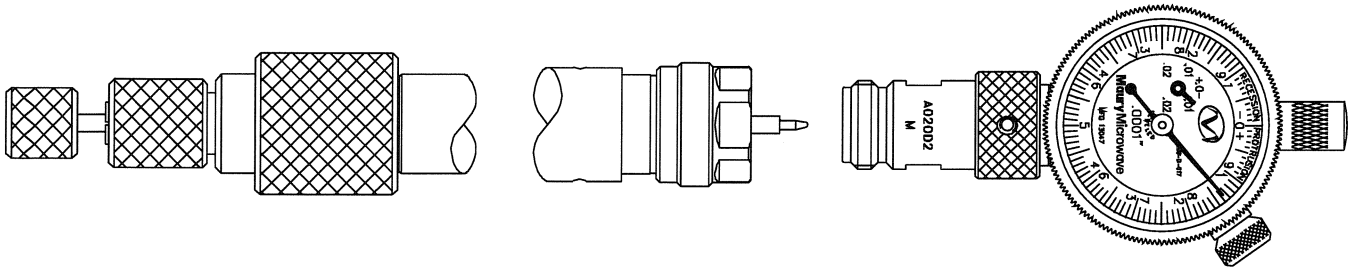
Figure 5

5. Make a gentle connection. Avoid rotation of the mating planes to prevent excessive wear. When using a torque wrench, make sure it is rated at 12 inch pounds. Allow the center conductor to gently push back during the mating process. Set the interface dimensions following the procedure outlined in the operating instructions of your sliding load.

Zero Gage using the Master Gage.



Expose the Free Floating Center Conductor
for Ease of Engagement.



Set Proper Interface
Dimensions

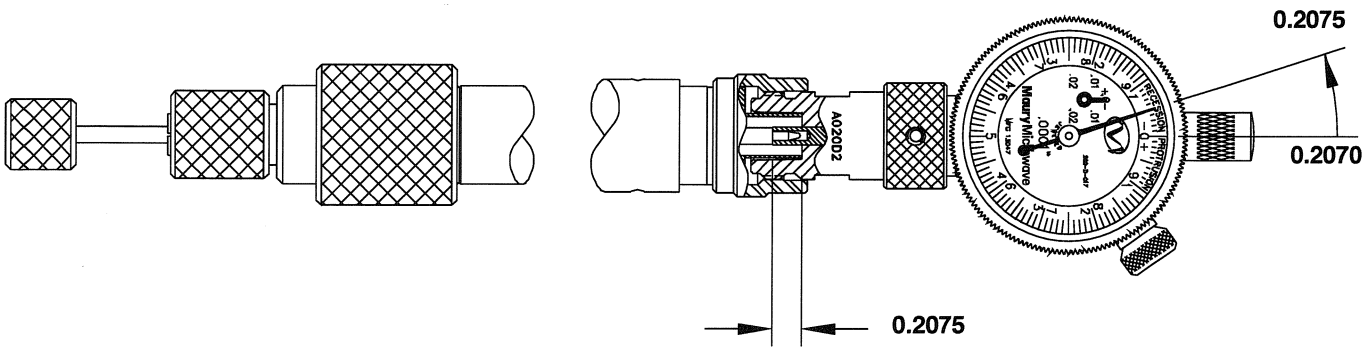


Figure 6. Gaging Precision Sliding Loads

Gaging Type N Air Lines

NOTE: *Use care when handling air line parts. Wear cotton gloves to prevent excessive thermal expansion.*

Maury beadless precision air lines come basically in two connector configurations; female to male, and male to male. To gage these air lines, a master gage is first connected to one end and the corresponding A020D indicator gage is connected to the opposite end.

Procedure

See **Figures 7** and **8**.

NOTE: *Sleeve set A028S1 is required for this measurement (see parts list **Table 2**).*

1. Visually inspect the mating surfaces on the airline to be gaged before making a connection, and clean all mating surfaces.
2. Zero set the connector gage using the respective master setting gage.
3. Slip a centering sleeve on one end of the center conductor and insert into the air line. Avoid scratching the outer conductor while inserting the center conductor. Make sure that the sex of the outer and center conductor comply.
4. Connect the corresponding master setting gage onto the same end of the air line where the sleeve was inserted.
5. Insert the second sleeve into the open end of the air line.
6. Align the air line and your A020D; then carefully connect the connector gage. Tighten finger tight avoiding rotation of the mating surfaces against one another. When using a torque wrench, make sure it is rated at 12 inch pounds.

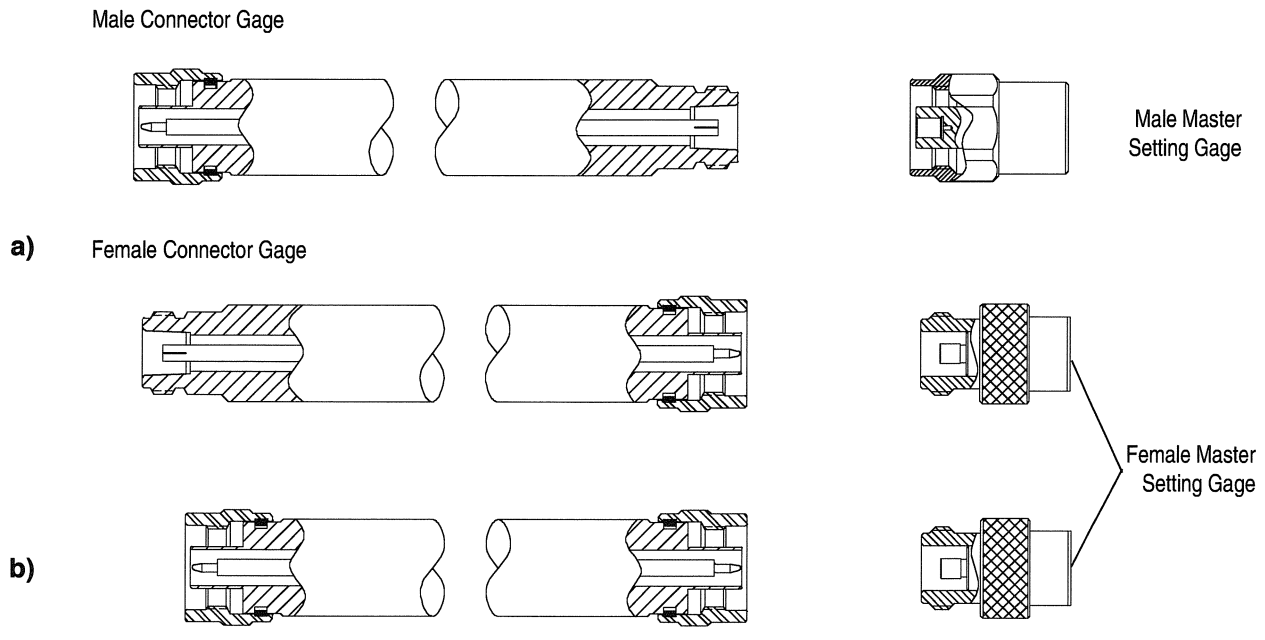
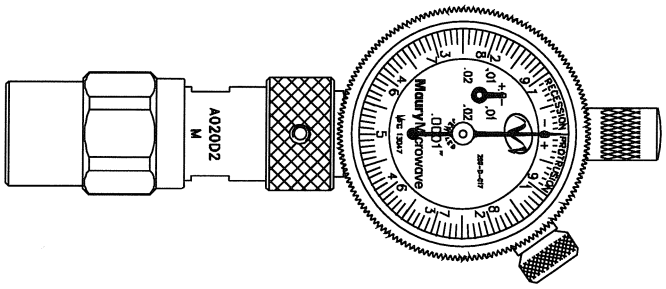
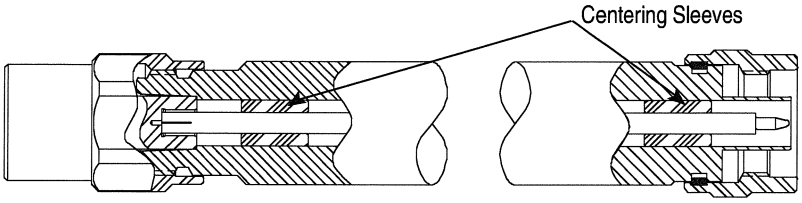


Figure 7. Precision Type N Two Port Standards a) with different interfaces and b) equal interfaces.

Zero Set the Connector Gage using
the Master Setting Gage



Insert Centering Sleeves and Connect Master Gage
to Air Line or Two Port Standard



Engage Air Line and
Connector Gage

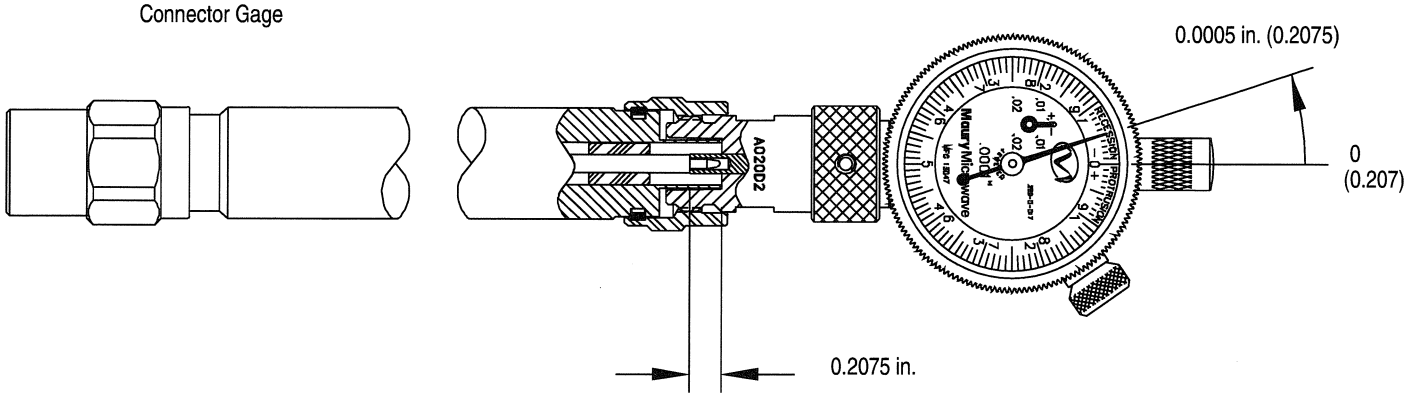


Figure 8. Gaging Beadless Precision Two Ports

Maintenance and Calibration

Maintenance

These connector gage kits are relatively maintenance-free if the components are handled with the same care that is appropriate to all precision equipment. As with any precision component, proper care should be taken to assure clean mating surfaces, proper alignment, and proper torquing. Repair and calibration should be referred to our Customer Service Department.

Calibration

To verify that your calibration kit is performing to traceable specifications, periodically send the kit to Maury Microwave Corporation for calibration. The recommended calibration cycle is one year. The actual need may vary depending on usage.

Should Additional Information or Service be Required, Address Inquiries To:

Maury Microwave Corporation
Attention: Customer Service
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Ontario, California 91764-4804
USA

Phone: (909) 987-4715
Facsimile: (909) 987-1112
E-mail: maury@maurymw.com
Web site: http://www.maurymw.com

Please mention the model number and revision of the software and the date received in any correspondence.

Warranty

We warrant each instrument of our manufacture to be free from defects in material and workmanship. Our obligation under this warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except fuses or batteries. This warranty period is limited to one year from date of shipment to the original purchaser, and to equipment which is returned to us with transportation charges prepaid and which, upon our examination, shall disclose to our satisfaction to have been defective. This warranty does not cover wear from normal usage nor subsequent damage after shipment.

We reserve the right to make changes in design at any time without incurring any obligation to install such changes on units previously sold by us.

This constitutes the only warranty extended by us, and is in lieu of any other obligations or liabilities on our part in connection with the sale of our equipment.