

Operating Instructions

Connector Gage Kit Type 'N' Connectors

Model A020A



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General Information

Description

The model A020A Connector Gage Kit is designed to measure and check the center contact pin location from the outer conductor mating surface of type N male and female connectors, per MIL-C-39012C Class 1 or Maury Precision or High Precision test connectors.

The model A020A provides a convenient and accurate means for checking type N connectors for compliance to applicable specifications. Since it is basically a comparator, it can be used to check a wide variety of nominal dimensions. Once set to a given nominal dimension, the indicator will read the actual deviation of the connector being checked from the nominal dimension.

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	± 0.000200	1/5 Least dial graduation ¹
Gage Calibration Accuracy ⁶	± 0.001500	1 Least dial graduation ² plus 0.00050 measurement guardband
Gage Repeatability ⁴	± 0.000200	1/5 Least dial graduation ²
Master Accuracy	± 0.000500	0.0010 Range ³
Total Uncertainty ^{5, 6}		
RSS	± 0.001606	Root sum of the squares.
Worst Case	± 0.002400	Add resolution, repeatability, gage and master accuracy limits.

Table 1

NOTES:

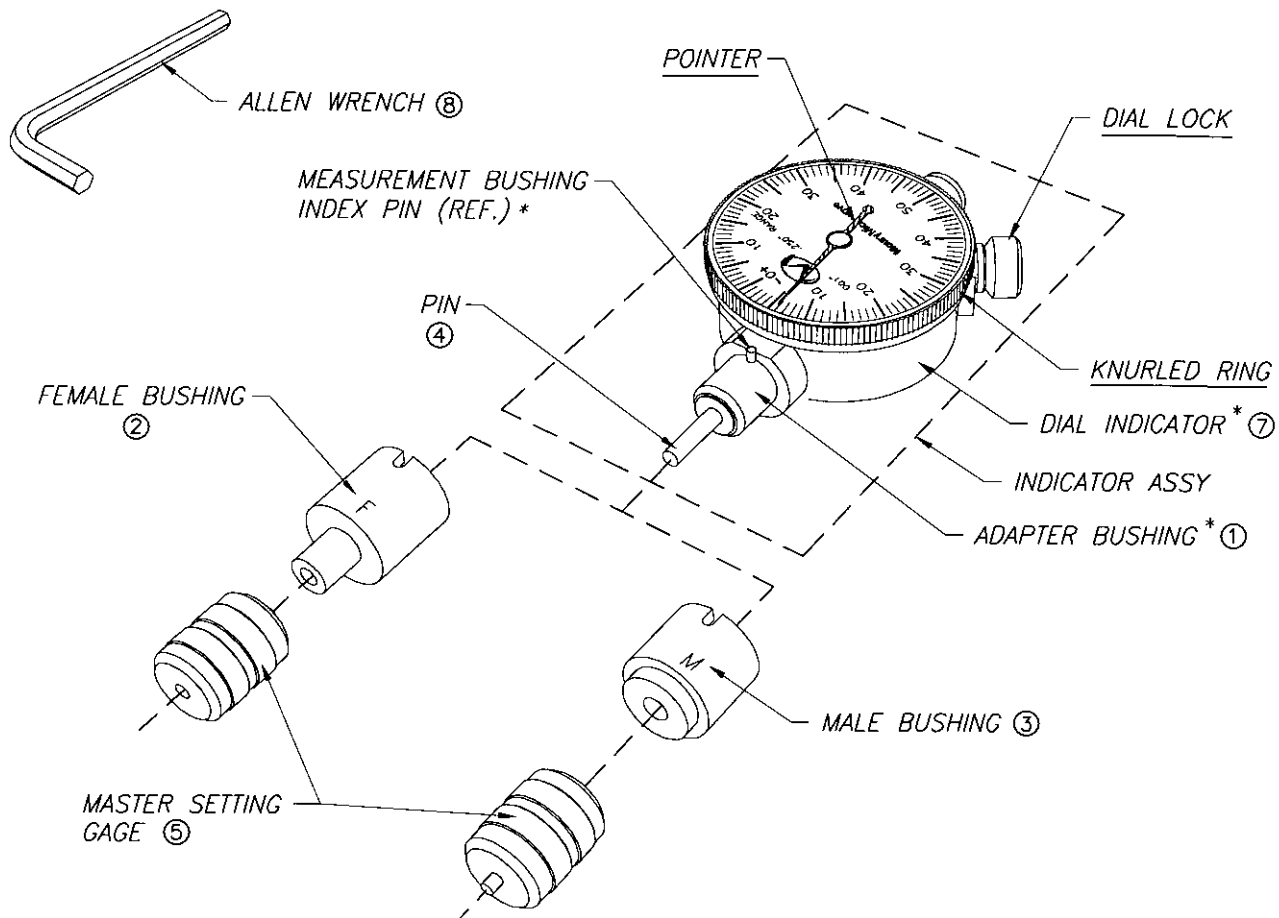
- ¹ Per ASME B89.1.10M-2001, C5.1.2.
- ² Per ASME B89.1.10M-2001, Table 2.
- ³ Per manufacturer's specification.
- ⁴ Operator skill has a great impact on repeatability. You can easily determine the repeatability of the connector gages by multiple engagements of the master gages following the procedure outlined under **Zero Setting** on page 7.
- 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 +0.011/-0.001" from master gage zero setting.

Equipment Supplied

The model A020A Connector Gage Kit consists of the following components:

- a) Indicator Assembly - A precision adapter bushing and pin attached to a precision dial indicator graduated in 0.00025 inch increments.
- b) A precision master setting gage.
- c) Female bushing (marked N-F).
- d) Male bushing (marked N-M).
- e) Allen wrench (4-40).
- f) A wooden instrument case (size 6.0 x 4.0 x 2.0 in inches).
- g) Operating instructions.

Figure 1, below, shows these components and the operational controls and indicators which are underlined.



* - Part of Indicator Assembly

O - Numbers refer to Item Numbers listed in Replacement Parts List, see Table 2.

Figure 1. The Type N Connector Gage Kit

Replacement Parts

Item	Description	Maury Part Number	Quantity Per Assembly
1	Bushing, Adapter	A007S2	1
2	Bushing, Female	A007S3	1
3	Bushing, Male	A007S1	1
4	Pin	A005S11	1
5	Master Setting Gage	A005S35	1
6	Operating Instructions	A020S2	1
7	Dial Indicator	A020S3	1
8	Key, Allen Head #4	1	1
9	Instrument Box	A020S1	1

¹ This item may be bought from any local hardware distributor.

Table 2. Replacement Parts List

Connector Care

Visual Inspection

Inspect all connectors carefully before every connection. If a connector shows deep scratches or dents, particles clinging to the mating plane surfaces, or uneven wear, clean it and inspect it again. Preferably use a lighted magnifying glass with a magnification of about 4x to 8x.

Damage of these kinds may indicate that the connector itself is damaged and should not be used. Try to determine the cause of the damage before making further connections.

As type N connectors wear, the protrusion of the female contact fingers generally increase, due to wear of the outer conductor mating plane inside the female connector. This decreases the total center conductor contact separation and should be monitored carefully.

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

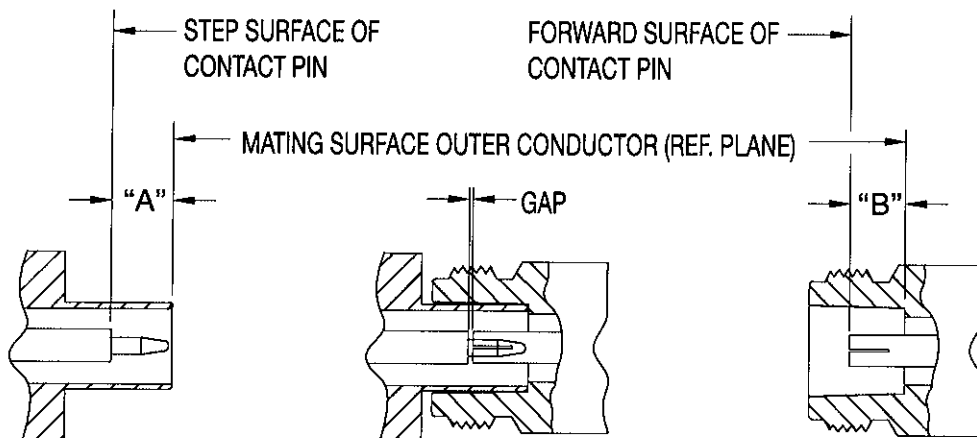


Figure 2.

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	—	0.207	+0.010 -0.000	0.207	+0.000 -0.010	0.000	0.000	0.020	²
D	MIL-C-39012 Class 1	0.208	+0.003 -0.000	0.207	+0.000 -0.003	0.001	0.001	0.007	MIL-C-39012C Standard Test Connector
*E	MIL-C-39012 Class 2	0.210	+0.020 -0.000	0.207	+0.000 -0.020	0.003	0.003	0.040	Type N General Specification ³
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

* The Maury A007A kit is designed to measure this specification.

Table 3

Notes

- ¹ Precision connector compatible with most precision type N connectors in use today.
- ² Maury's general purpose type N connector per MIL-C-39012C except dimension A is reduced and the tolerances are tighter.
- ³ 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}
- ⁴ Type N male connectors may be slotted or not; MIL-C-39012 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.

Operation

Guidelines for Connector Gaging

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.

CAUTION: *Hold the connector gage gently and do not force parts together.*

- a) Operator skill is essential in making a good measurement. Before gaging a connector make sure it is not damaged. Preferably use a lighted magnifying glass with a magnification of about 4x to 8x. Clean the connector to be tested and the connector gage as described on page 7.
- b) Make sure that the bushing mating surfaces and the master setting gage are clean and devoid of foreign particles.
- c) Never rotate or slide parts against each other since this will yield faulty readings and could cause damage to the mating planes.
- d) Align the master setting gage or the connector to be tested with the connector gage for proper engagement. Avoid cocking of the devices as much as possible. Rock the connector slightly to feel when it is properly seated against the measurement bushing then hold securely and make the reading.
- e) All in-spec readings are to the left of zero.
- f) Keep component parts in the instrument case when not in use to eliminate possible damage or misplacing them.

Checking Male Type N Connectors

Setting Up the Connector Gage - See Figure 3a.

Procedure:

- a) Assemble the dial indicator assembly and the male bushing, aligning the notch in the male bushing to the index pin on the dial indicator assembly.
- b) Gently slide the male bushing (marked "N-M") over the adapter bushing until it bottoms out completely against the measurement bushing.
- c) Gently tighten the two setscrews on the back of the male bushing using the Allen wrench.

The male gage is now ready for use. Follow zero setting procedure on page 7.

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 reinspect the connector to make sure that no fibers have been left around the contact and mating surface.

Zero Setting the Connector Gage - See Figure 3b.

- a) Assemble the male bushing to the dial indicator assembly (as described in previous section).
- b) Clean both mating surfaces using a cotton swab and a small amount of Isopropyl alcohol. Do not touch the surfaces after cleaning since any fingerprints will reduce accuracy.
- c) Align both the Connector Gage and the recessed end of the Master Setting Gage (marked M) and let it bottom freely against the A020A. Apply light finger pressure to keep the Master Setting Gage seated against the male bushing.
- d) Loosen the dial lock and rotate it to the zero position indicated by the hand on the indicator. Retighten the dial lock.

Gaging Male Type N Connectors (0.207 Dimension) - See Figure 3c

- a) Make sure pin is properly secured to the dial indicator; finger tight is adequate.
- b) Attach the male bushing to the dial indicator assembly and tighten set screws with the Allen wrench and zero set the connector gage as previously described.
- c) To check a male connector, engage the connector with the indicator-bushing assembly, making sure that the mating surfaces are seated properly. The pointer of the dial indicator will then show the actual deviation of the contact pin from nominal, as set by the master setting gage.
- d) To arrive at the actual contact pin location, reverse the sign of the dial indicator reading (polarity reversed for male connectors), then add or subtract this reading from nominal location as set by the master setting gage.

Example (Figure 3c)

Should you measure a male connector and the indicator shows -0.0003 , this is actually $+0.003$. Therefore, the contact pin location is the nominal master setting gage dimension $+0.003$, the actual dimension measured would be $0.207 + 0.003$ or 0.210 .

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

Follow the same procedure as in the section ***Gaging Male Type N Connectors (0.207 Dimension)*** except use master setting gage N-2 (A005S32) (see Maury data sheet 2Y-003). If this master setting gage is not available, use the 0.207 master setting gage supplied with the A020A. Fully engage the 0.207 master gage with the indicator assembly, rotate the knurled ring so that the pointer points to +3 and lock in place. This sets the zero at 0.210.

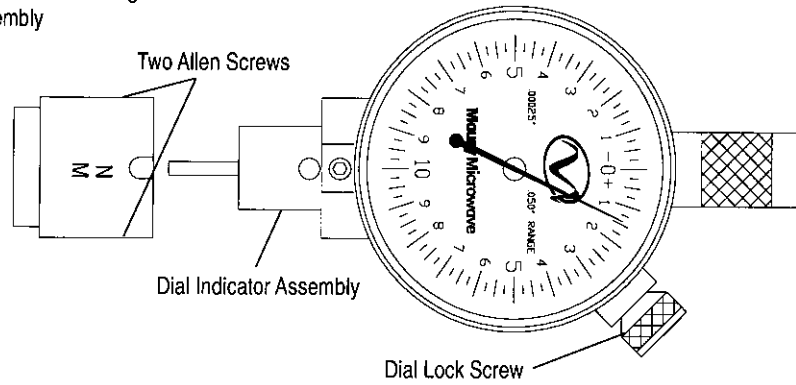
Gaging MIL-C-39012 Standard Test and MIL-T-81490 Type N Male Connectors (0.208 Dimension)

Follow the same procedure as in the section ***Gaging Male Type N Connectors (0.207 Dimension)*** except use master setting gage N-3 (A005S34) (see Maury data sheet 2Y-003). If this master setting gage is not available, use the 0.207 master setting gage supplied with the A020A. Fully engage the 0.207 master gage with the indicator assembly, rotate the knurled ring so that the pointer points to +1 and lock in place. This sets the zero at 0.208.

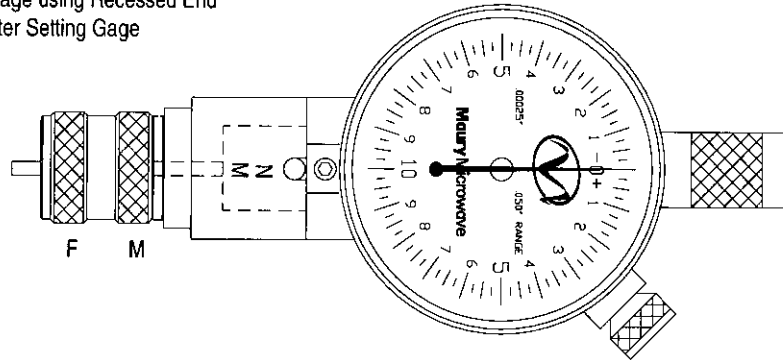
Gaging MIL-C-71B Type N Male Connectors (0.223 Dimension)

We do not recommend the Model A020A connector gage kit for checking non-precision Type N connectors (MIL-C-39012 class 2 or MIL-C-71) due to the large tolerance variation possible. These connectors should be checked using connector gage model A007A.

- a. Attach Male Bushing to Dial Indicator Assembly



- b. Zero Gage using Recessed End of Master Setting Gage



- c. Insert Gage into Connector

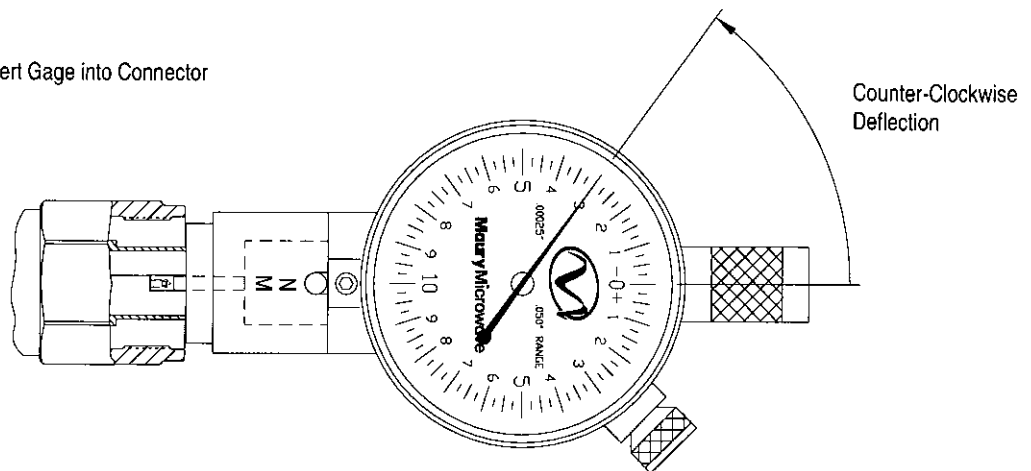


Figure 3. Gaging Male Precision Type N Connectors

Checking Female Type N Connectors

Setting up the Connector Gage - See Figure 4a.

Procedure:

- a) Assemble the dial indicator assembly and the female bushing, aligning the notch in the female bushing to the index pin on the dial indicator assembly.
- b) Gently slide the female bushing (marked "N-F") over the adapter bushing until it bottoms out completely against the measurement bushing.
- c) Gently tighten the two set screws on the back of the male bushing using the Allen wrench.

To change the busing from the male to female, apply the procedure outlined on page 6.

Zero Setting the Connector Gage (Figure 4b)

- a) Assemble the male bushing to the dial indicator assembly (as described in previous section).
- b) Clean both mating surfaces using a cotton swab and a small amount of Isopropyl alcohol. Do not touch the surfaces after cleaning since any fingerprints will reduce accuracy.
- c) Align both the Connector Gage and the protruding end of the master setting gage (marked F) and let it bottom freely against the A020A. Apply light finger pressure to keep the Master Setting Gage seated against the male bushing.
- d) Loosen the dial lock and rotate the knurled ring to the zero position indicated by the hand on the indicator. Retighten the lock.

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

See Figure 4c.

- a) Make sure pin is properly secured to the dial indicator; finger pressure is adequate.
- b) Attach the female bushing to the dial indicator assembly, tighten set screws with the Allen wrench and zero set the connector gage as outlined above.
- c) To check a female connector, engage the connector with the indicator-bushing assembly, making sure that the mating surfaces are seated properly. The pointer of the dial indicator will then show the actual deviation from nominal, as set by the master setting gage, of the contact pin.
- d) In order to arrive at the actual contact pin location, add or subtract the dial indicator reading from the nominal location as set by the master setting gage.

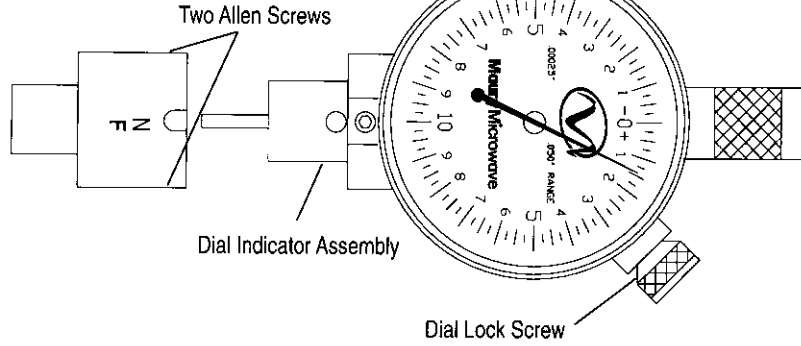
Example (Figure 4c)

Should you measure a female connector and the indicator shows -0.003, the contact pin location is the nominal master setting gage dimension -0.003, the actual dimension measured would be 0.207 -0.003 or 0.204.

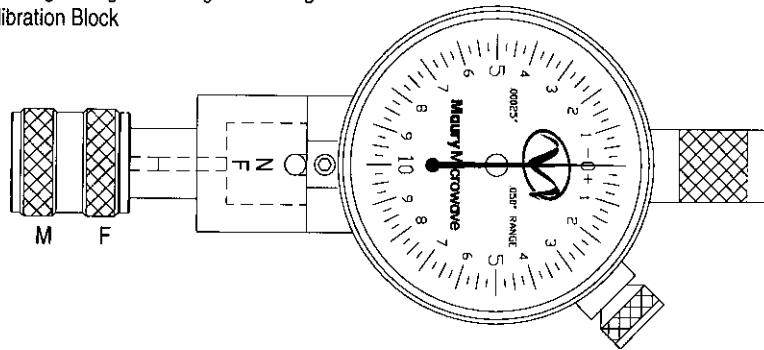
Gaging MIL-C-71B Type N Female Connectors (0.197 Dimension)

We do not recommend the model A020A connector gage kit for checking non-precision Type N connectors (MIL-C-39012 class 2 or MIL-C-71) due to the large tolerance variation possible. These connectors should be checked using connector gage model A007A.

- a. Attach Female Bushing to Dial Indicator Assembly



- b. Zero Gage using Protruding end of Gage Calibration Block



- c. Gently Connect the Device

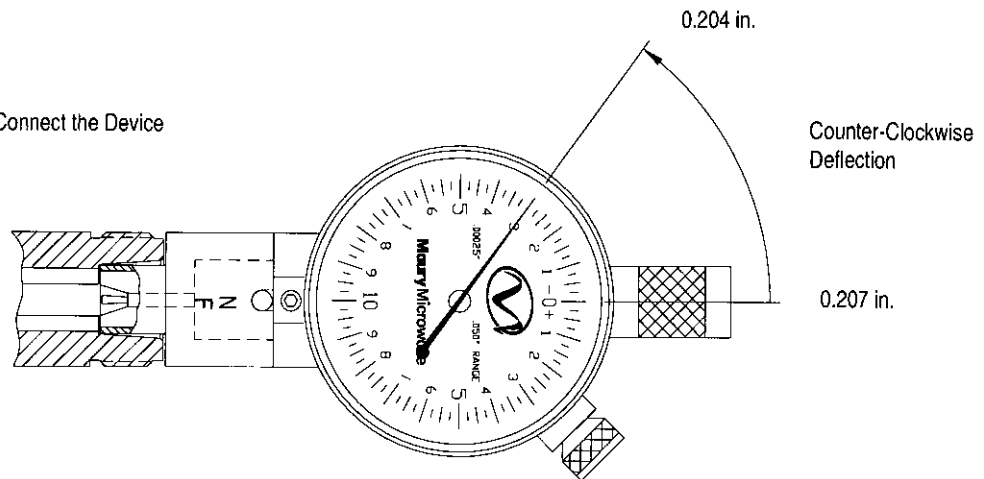


Figure 4. Gaging Female Precision Type N Connectors

Maintenance, Calibration and Warranty

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
2900 Inland Empire Boulevard
Ontario, California 91764-4804
USA

Phone: (909) 987-4715
E-mail: maury@maurymw.com

Facsimile: (909) 987-1112
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.

