Operating Instructions

Connector Gage Kit

TNC/BNC

Model A012A

012-19B

MAURY MICROWAVE
CORPORATION

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General Information

Description

The Maury model A012A connector gage kit is designed to measure the contact pin and dielectric location of all commonly used TNC/BNC connectors. Generally the TNC and BNC are the same except the TNC is a screw on connector and the BNC is a bayonette type. To check the interface dimensions requires three measurements for each connector to ensure the proper location of the contact pin and dielectric. These locations must be maintained within specifications for good electrical performance and to avoid connector damage when mated. **Figure 1** shows the interface dimensions measured with this A012A connector gage kit. **Table 1** gives the interface dimensions for earlier TNC/BNC designs. The interface dimensions of the more recent TNC connectors are shown in **Table 3**.

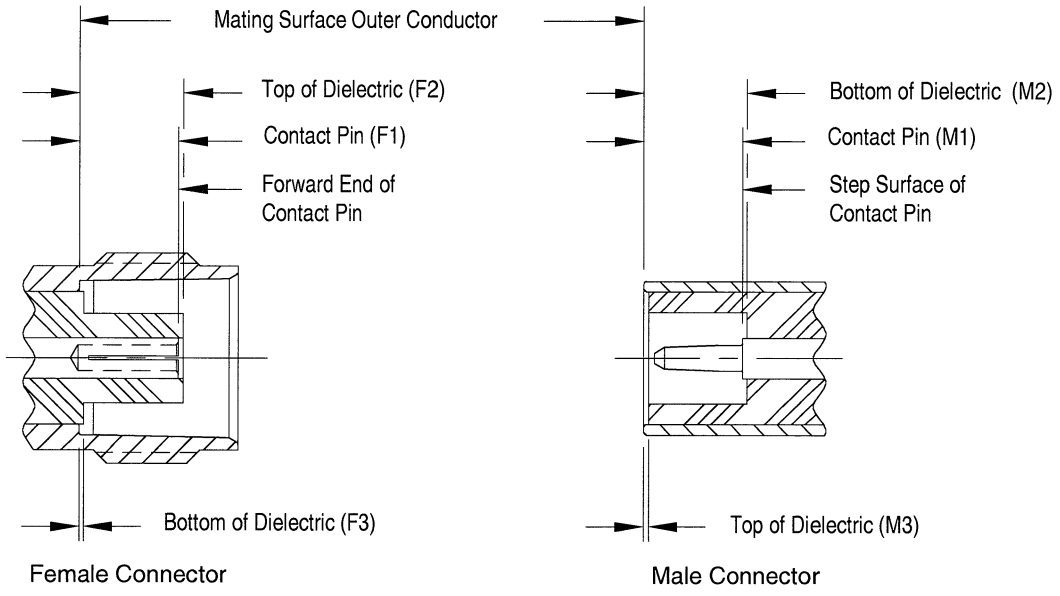

Figure 1. TNC Interface Dimensions

NOTE: *Several of today's TNC connectors are designed to operate up to 18 GHz. The 18 GHz connectors do not have a top of dielectric dimension for the male connector (see **Tables 1** and **2**).*

Specifications

Specification	Female Connector			Male Connector		
	F1	F2	F3	M1	M2	M3
MIL-C-39012 (Class 2)	0.206 max	0.208 max	0.006 max	0.210 min	0.208 min	0.006 min
MIL-C-39012 (Standard Test)	0.206 +0.000/-0.003	0.208 +0.000/-0.008	0.000 +0.008/-0.000	0.209 +0.003/-0.000	0.212 +0.006/-0.000	0.008 +0.004/-0.000
MIL-T-81490 (Type 1)*	0.208 +0.000/-0.003	0.208 +0.000/-0.003	0.003 +0.003/-0.000	0.209 +0.003/-0.000	0.209 +0.003/-0.000	0.006 +0.003/-0.000
MPC/TNC (ES-2047)*	0.208 +0.000/-0.005	0.208 +0.000/-0.008	0.000 +0.000/-0.004	0.209 +0.005/-0.000	0.209 +0.005/-0.000	0.000 +0.004/-0.000

* Applies to TNC only.

Table 1. BNC and TNC Interface Dimensions

NOTE: *Always check the manufacturer's specifications for the connector you are testing. The dimensions vary based on MIL-STD and IEC specifications used. Also refer to* ***Table 3*** *for additional TNC interface information.*

The specifications listed in **Table 2** 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	± 0.000100	1/5 Least dial graduation [1]
Gage Calibration Accuracy [6]	± 0.000750	1 Least dial graduation [2] plus 0.000250 measurement guardband
Gage Repeatability [4]	± 0.000100	1/5 Least dial graduation [2]
Master Accuracy	± 0.000300	0.00060 Range [3]
Total Uncertainty [5, 6]		
RSS	± 0.000820	Root sum of the squares.
Worst Case	± 0.001250	Add resolution, repeatability, gage and master accuracy limits.

Table 2

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 4.

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 +0.003/-0.009" from master gage zero setting.

Operation

The Maury model A012A connector gage kit consists of the following components. Refer to **Figures 2** and **3**.

(1) & (2) Indicator assembly - Adapter bushing attached to dial indicator.
(3) Male bushing (marked BNC/TNC-M).
(4) Female bushing (marked BNC/TNC-F).
(5) Master setting gage (marked BNC/TNC-3).
(6) Pin (stepped down end), see **Figure 2**.
(7) Pin (straight), see **Figure 2**.
(8) Pin (straight with groove), see **Figure 2**.
(9) Pin (stepped down end with groove), see **Figure 2**.
(10) A wooden instrument case.
(11) Allen wrench (4-40).

NOTE: *Numbers in circles ◯ correspond to item numbers in replacement parts list.*

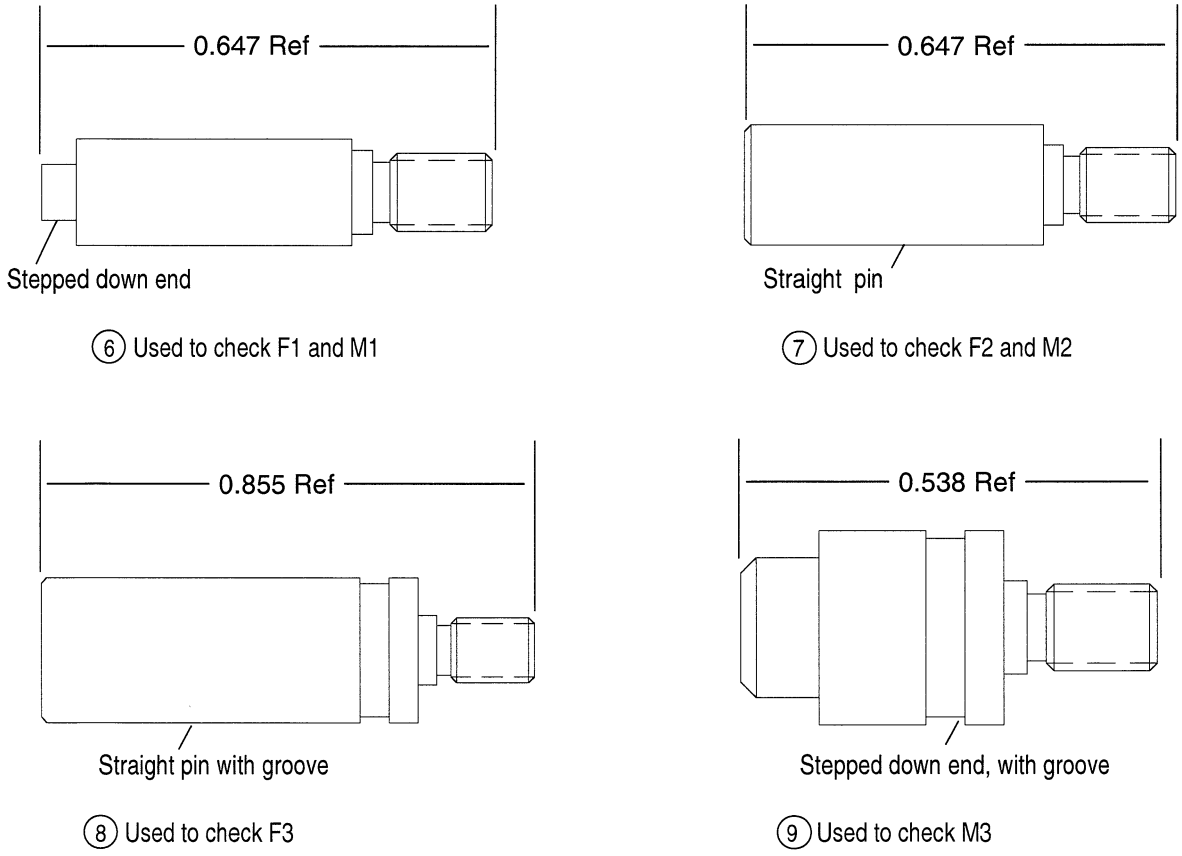

Figure 2. Pin Drawings for Visual Identification

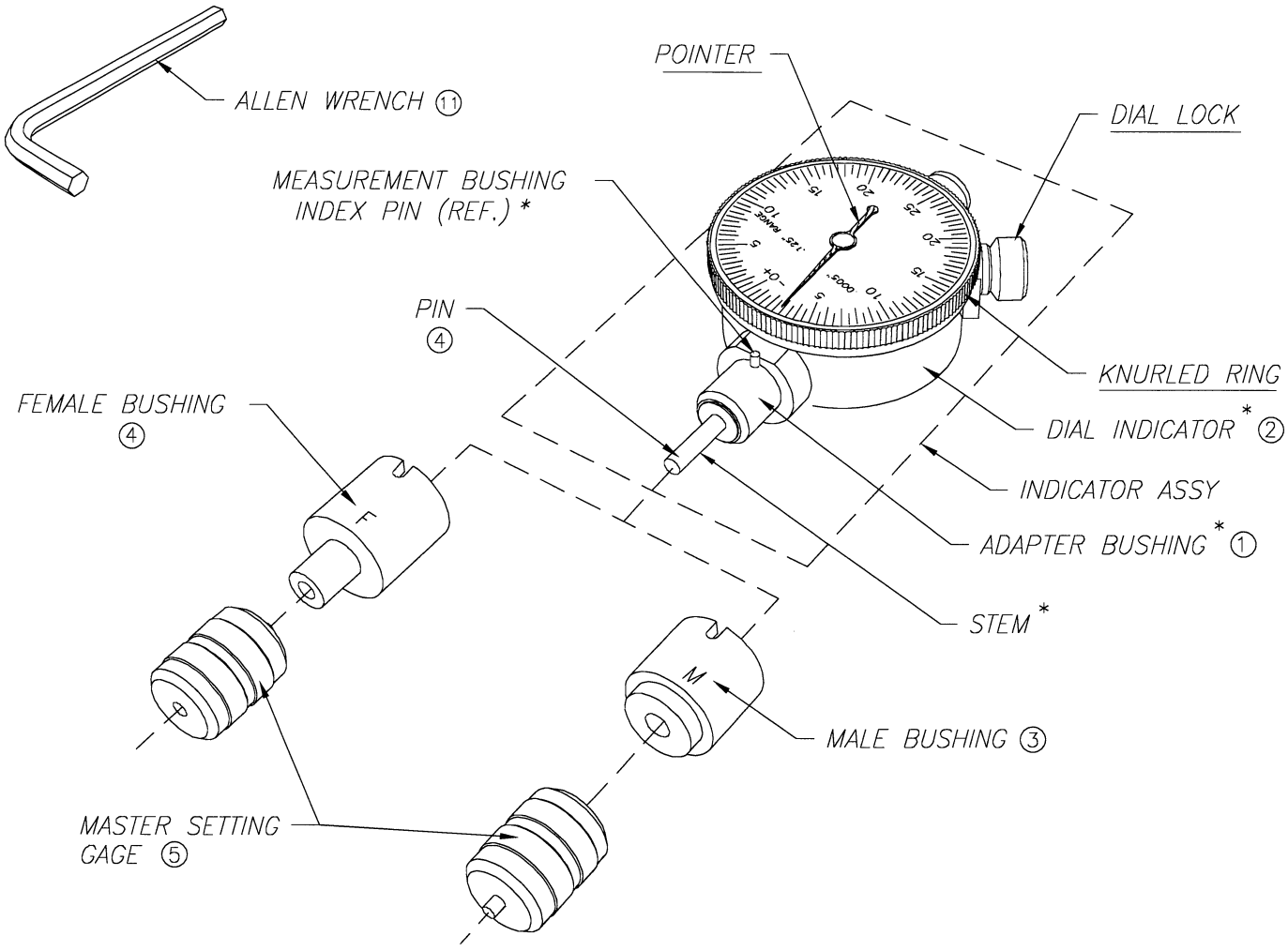

Figure 3.

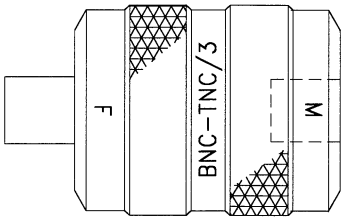

Figure 4. Master Setting Gage

Gaging TNC/BNC Connectors

Several examples are given below for gaging BNC/TNC connectors. Refer to **Figure 1** for the interface dimensions described. See **Figures 2** and **3** for description of circled items.

Also refer to **Table 3** for additional TNC interface information.

1. Checking Contact Pin Location (F1) for BNC or TNC Connectors per MIL-C-39012 (Standard Test), MIL-T-81490 and MPC/TNC .208 Dimension)

a. Screw pin into stem of dial indicator; finger tight is adequate.
b. Attach the female bushing to the indicator assembly and tighten set screws with an Allen wrench.
c. Engage master gage (end marked "F", see Figure 4) to the indicator-bushing assembly and rotate the knurled ring for a zero indication and lock. This sets the indicator to the nominal master gage dimension. The gage is now ready for measuring female connectors, and is zeroed at 0.028.
d. To check a female connector, engage the connector with the indicator busing 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 gage, of the contact pin.

NOTE: *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 gage.*

For example:
Should you measure a female connector and the indicator shows -0.002, the contact pin location is the nominal master gage dimension- 0.002, the actual dimension measured would be 0.208 -0.002 or 0.206.

2. Checking F1 Type BNC or TNC Connectors per MIL-C-39012 Class 2 (0.206 Dimension)

Follow procedure 1 above, except, when engaging the master gage, rotate the knurled ring so that the pointer points to +2 and lock in place. This sets the zero at 0.206, and you add or subtract indicator readings from this nominal setting.

3. Checking F2 Front Dielectric Interface (0.208 Dimension)

Using female bushing ④ and pin ⑦ , follow the same procedure described in 1 above, except using tolerance specified for F2.

4. Checking F3 for Type BNC or TNC Connectors per MIL-C-39012 (Standard Test) and MPC/TNC (0.000 Nominal Dimension)

a. Using female bushing ④ and pin ⑧ , screw pin into stem of dial indicator; finger tight is adequate.
b. Attach the female bushing to the indicator assembly and tighten set screws with an Allen wrench.
c. Engage the flat surface of the master gage (end marked "M") to the indicator-bushing assembly and rotate the knurled ring for a zero indication and lock. A flat surface, such as a surface plate, can also be used to zero the indicator. This sets the indicator so that the end of the pin and busing are coplanar. The gage is now ready for measuring female connectors, and is zeroed at 0.000.

d. 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 of the rear dielectric interface from the outer conductor mating surface.

NOTE: *In order to arrive at the actual rear dielectric interface location, add or subtract the dial indicator reading from zero.*

For example:
1. Should you measure a female connector per MIL-C-39012 standard test specifications and the indicator shows +0.005, rear dielectric interface is 0.005 forward of the outer conductor mating surface and would be within specification.
2. Should you measure a female connector per MPC/TNC and the indicator shows -0.002, the rear dielectric interface would be below the outer conductor mating surface and would be within specification.

5. *Checking F3 for Type TNC Connectors per MIL-T-81490 (0.003 Nominal Dimension)*

Follow procedure 4 above, except in step 4c, while holding the bushing and pin coplanar against a flat surface rotate the knurled ring so that the pointer points to -3 and lock in place. This sets the zero at +0.003 and you add or subtract indicator readings from this nominal setting.

For example:
Should you measure a female connector per MIL-T-81490 specifications and the indicator shows +0.002 then the location of the rear interface would be +0.003 (nominal setting) +0.002 which equals +0.005 which is within specification.

6. *Checking F3 for Type BNC or TNC Connectors per MIL-C-39012, Class 2 (0.006 Maximum Dimension)*

Follow procedure 4 above, except in step 4c, while holding the bushing and pin coplanar against a flat surface rotate the knurled ring so that the pointer points to -3 and lock in place. This sets the zero at +0.003 and you add or subtract indicator readings from this nominal setting.

For example:
Should you measure a female connector per MIL-C-39012, Class 2 specifications and the indicator shows -0.002 then the location of the rear dielectric interface would be +0.006 (nominal setting) -0.002 which equals +0.004 which is within specification.

NOTE: *Any positive indications would be out of specification.*

7. *Checking Contact Pin Location (M1) for BNC or TNC Connectors per MIL-C-39012, (Standard Test), MIL-T-81490 and MPC/TNC (0.0209 Dimension)*

a. Using male bushing ③ and pin ⑥, screw pin into stem of dial indicator; finger tight is adequate.
b. Attach the male bushing to the dial indicator and tighten set screws with an Allen wrench.
c. Engage master gage (end marked "M") to the indicator-bushing assembly and rotate the knurled ring for a zero indication and lock. This sets the indicator to the nominal master gage dimension. The gage is now ready for measuring male connectors, and is zeroed at 0.209.

d. 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 form nominal, as set by the master gage, of the contact pin.

NOTE: *In order to arrive at the actual contact pin location, you must reserve the sign of the dial indicator reading as indicated on the dial face, i.e. "Sign Polarity Reversed for Male Connector" (this does not apply when checking female connectors), then add or subtract this reading from the nominal location as set by the master gage.*

For example:
Should you measure a male connector and the indicator shows -0.002, this is actually +0.002. Therefore, the contact pin location is the nominal master gage dimension +0.002, the actual dimension measured would be 0.209 +0.002 or 0.211.

8. Checking M1 for BNC or TNC Connectors per MIL-C-39012, Class 2 (0.210 Dimension)

Follow procedure 7 above, except when engaging the master gage, rotate the knurled ring so that the pointer points to +1 and lock in place. This sets the zero at 0.210, and you add or subtract indicator readings from this nominal setting.

NOTE: *Remember to reverse the sign of the dial indicator reading when computing.*

9. Checking M2 Rear Dielectric Interface Dimension for TNC Connectors per MIL-T-81490 and MPC/TNC (0.209 Dimension)

Using male bushing ③ and pin ⑦, follow procedure 7a-d.

10. Checking M2 for BNC or TNC Connectors per MIL-C-39012, (0.208 Dimension)

Follow procedure 7a-d, except in step c, when engaging the master gage, rotate the knurled ring so that the pointer points to -1 and lock in place. This sets the zero at 0.208, and you add or subtract indicator readings from this nominal setting.

NOTE: *Remember to reverse the sign of the dial indicator reading when computing.*

11. Checking M2 for BNC or TNC Connectors per MIL-C-39012, Standard Test (0.212 Dimension)

Follow procedure 7a-d, except in step c, when engaging the master gage, rotate the knurled ring so that the pointer points to +3 and lock in place. This sets the zero at 0.212, and you add or subtract indicator readings from this nominal setting.

NOTE: *Remember to reverse the sign of the dial indicator reading when computing.*

12. Checking M3 Front Dielectric Interface Dimension for TNC Connectors per MPC/TNC (0.000 Nominal Dimensions)

a. Using male bushing ③ and pin ⑨, screw pin into stem of indicator, finger tight is adequate.
b. Attach the male bushing to the indicator assembly and tighten set screws with an Allen wrench.
c. Engage the flat surface of the master gage (end marked "M") to the indicator bushing assembly, allow step on pin to enter counterbore in master gage, then rotate the knurled ring for a zero indication and coplanar with the end of the busing. The gage is now ready for measuring male connectors, and is zeroed at 0.000.
d. 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 front dielectric interface from the outer conductor mating surface.

NOTE: *In order to arrive at the actual front dielectric interface location, you must reverse the sign of the dial indicator reading as indicated on the dial face, i.e. "Sign Polarity Reversed for Male Connectors" (this does not apply when checking female connectors), then add or subtract this reading from zero.*

For example:
Should you measure a male connector and the indicator shows -0.002, this is actually +0.002. Therefore, the front dielectric interface location is below the outer conductor mating surface by 0.002, which is within specification.

13. Checking M3 for BNC or TNC Connectors per MIL-C-39012, Class 2 and MIL-T-81490 (0.006 Minimum Dimensions)

Follow procedure 12 above, except in step c, while holding the bushing and pin against the master gage, rotate the knurled ring so that the pointer points to -6 and lock in place. This sets the zero at +0.006 and you add or subtract indicator readings from this nominal setting.

For example:
Should you measure a male connector per MIL-C-39012, Class 2 or MIL-T-81490 specifications and the indicator shows -0.002 then the location of the rear dielectric interface would be +0.006 (nominal setting) +0.002 which equals +0.008 which is within specification.

NOTE: *Remember that you reverse the sign of the dial indicator reading when computing.*

14. Checking M3 for BNC or TNC Connectors per MIL-C-39012, Standard Test (0.008 Dimension)

Follow procedure 12 above, except in step c, while holding the bushing and pin against the master gage, rotate the knurled ring so that the pointer points to -8 and lock in place. This sets the zero at +0.008 and you add or subtract indicator readings from this nominal setting.

For example:
Should you measure a male connector per MIL-C-39012, Standard Test specifications and the indicator shows -0.002 then the location of the rear dielectric interface would be +0.008 (nominal setting) +0.002 which equals +0.010 which is within specification.

NOTE: *Remember that you reverse the sign of the dial indicator reading when computing.*

Operating Tips

Make sure that the bushing mating surfaces and the master gage are clean and devoid of foreign particles.

When checking a connector (female or male) rock connector slightly to feel when connector is properly seated against measurement bushing, then hold securely.

Keep component parts in the instrument case when not in use to eliminate possible damage or misplacing them.

TNC Contact and Dielectric Location Chart

Pin or Dielectric	MIL-C 87104 / 2	MIL-STD 348A [2]	MIL-T 81490	IEC 169-17	IEC 169-26
MALE	**AFTNC [1]**	**TNCA [3]**			
Male Pin	.2105 ± .0015	.208 Min			
Top of Dielectric	NONE	NONE			
Bottom of Dielectric	.2105 ± .0015	.208 Min			
FEMALE					
Female Pin	.2065 ± .0015	.208/.198			
Top of Dielectric	.2065 ± .0015	.208/.198			
Bottom of Dielectric	.0045 ± .0015	.006 Max			
MALE		**Test Connector**		**G0 [3]**	**G0 [3]**
Male Pin		.209 +.003/-.000		.209 +.003/-.000	.208 Min
Top of Dielectric		.006 +.006/-.000		.006 +.006/-.000	NONE
Bottom of Dielectric		.212 +.006/-.000		.212 +.006/-.000	.208 Min
FEMALE					
Female Pin		.208 +.000/-.003		.208 +.000/-.003	.208/.198
Top of Dielectric		.208 +.000/-.008		.206 +.000/-.006	.208/.204
Bottom of Dielectric		.006 +.000/-.006		.006 +.000/-.006	.006 Max +.000/-.006
MALE		**Commercial**	**Type I**	**G2 [3] Commercial**	**G1 [3] Commercial**
Male Pin		.210/.230	.209/.212	.210 Min	.208 Min
Top of Dielectric		.006 Min	.006/.009	.006 Min	NONE
Bottom of Dielectric		.208/.228	.209/.212	.208 Min	.208 Min
FEMALE					
Female Pin		.206/.186	.208/.205	.206/.179	.208/.197
Top of Dielectric		.208/.188	.208/.205	.208 Max	.208/.198
Bottom of Dielectric		.006 Max	.006/.003	.006 Max	.006/.000

1 AFTNC is a Maury designation standing for "Air Force TNC." The Maury AFTNC interface is identical to MIL-C-87104/2 except it has a solid outer conductor on the male connector and is rated to 19 GHz.

2 MIL-C-39012 has been replaced with MIL-STD-348A.

3 The specifications for some of these connectors list only one dimension.

Table 3.

Item	Qty	Number	Description	Notes
1	1	007-1	Bushing Adapter	1
2	1	299-D-010	Dial Indicator	1
3	1	012-13	Bushing-M	
4	1	012-15	Bushing-F	
5	1	012-17	Master Gage	
6	1	012-3-2	Pin	
7	1	012-8	Pin	
8	1	012-14	Pin	
9	1	012-16	Pin	
10	1	012-18	Instrument Box	
11	1	399-K-001	Key #4	2

1 Factory replaceable only.

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

Table 4. Replacement Parts

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
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.