Maury Microwave

2.92/3.5mm Digital
Connector Gage Kit
Metrology Grade
Model A050A

050-10 (Rev C) 07/20

User Guide

2.92/3.5mm Digital Connector Gage Kit

Model A050A

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050-10 (Rev C) 07/20

Warranty

Maury Microwave hardware products are warranted against defects in materials and workmanship for a period of one year from date of shipment. During the warranty period, Maury Microwave will, at its option, either repair or replace products which prove to be defective.

Maury Microwave software products are warranted against defects in material and workmanship of the media on which the product is supplied for a period of ninety (90) days from date of shipment. Maury also warrants that the product shall operate substantially in accordance with published specifications during the same warranty period. During the warranty period, Maury Microwave will, at its option, either repair or replace products which prove to be defective. Maury does not warrant that the operation of the product shall be uninterrupted or error-free.

For warranty service or repair, all products must be returned to Maury Microwave and must be issued a return authorization number by Maury prior to shipment. Buyer shall prepay shipping charges to Maury. Obligation is limited to the original Buyer.

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The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or wear resulting from normal use. No other warranty is expressed or implied. Maury Microwave specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

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Contents

General Information

Gage Kit Description

The Maury model A050A connector gage kit is designed to measure 2.92/3.5mm connectors with either female or male interfaces. The digital indicators used in the A050A connector gage kit provide a measurement resolution of .0001" when used in the inch mode or .001mm (0.000040 inches) when used in the metric mode. For simplicity, the rest of this manual will refer to measuring in inches. However, the principles presented apply equally when used in metric mode. The Maury A050A connector gage kit achieves excellent repeatability by maintaining tightly controlled tolerances on all machined parts. To achieve maximum accuracy, Maury recommends that an average of 3 measurements taken at different gage orientations be used to minimize random errors. See **Figure 1**.

The Maury model A050A1 measures female connectors and A050A2 measures male connectors these 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, A050A3 (female) or A050A4 (male), permitting measurements to be read directly on the digital indicator. Centering sleeves are provided for measuring beadless air lines and mismatch air lines. Flush setting sliding loads is easily accomplished using the A050A. The thread-on design of the A050A also allows more convenient and accurate measurements of network analyzer test ports.

Maury models A050A1 and A050A2 connector gages are compatible with Mitutoyo SPC Digimatic readouts for external display of data. Use Maury model A048B1 & A048B2 data cables. See **Figure 2**. All machined parts are made from heat treated stainless steel to assure long life and excellent stability. Gaging surfaces are lapped to ensure a high degree of accuracy. A parts list is shown in **Table 1**.

Item	Description	Maury Part Number	Quantity Per Assy.	Notes
1	Indicator Assembly, Female	A050A1	1	—
2	Indicator Assembly, Male	A050A2	1	—
3	Master Gage, Female	A050A3	1	—
4	Master Gage, Male	A050A4	1	—
5	Sleeve Set (2), 2.92mm	A035S1	1	*
6	Sleeve Set (2), 3.5mm	A048S8	1	*
6	Torque Wrench, 5/16	8799A1	1	8 in/lbs
7	Open End Wrench, 5/16	A048S1	1	—
8	Battery	SR44**	(1)	Commercial
9	Data Cable (40 inch)	A048B1	(1)	(Optional)
10	Data Cable (80 inch)	A048B2	(1)	(Optional)

* The centering sleeves are shipped in small plastic containers

** 20,000 hour life.

Table 1. Parts List

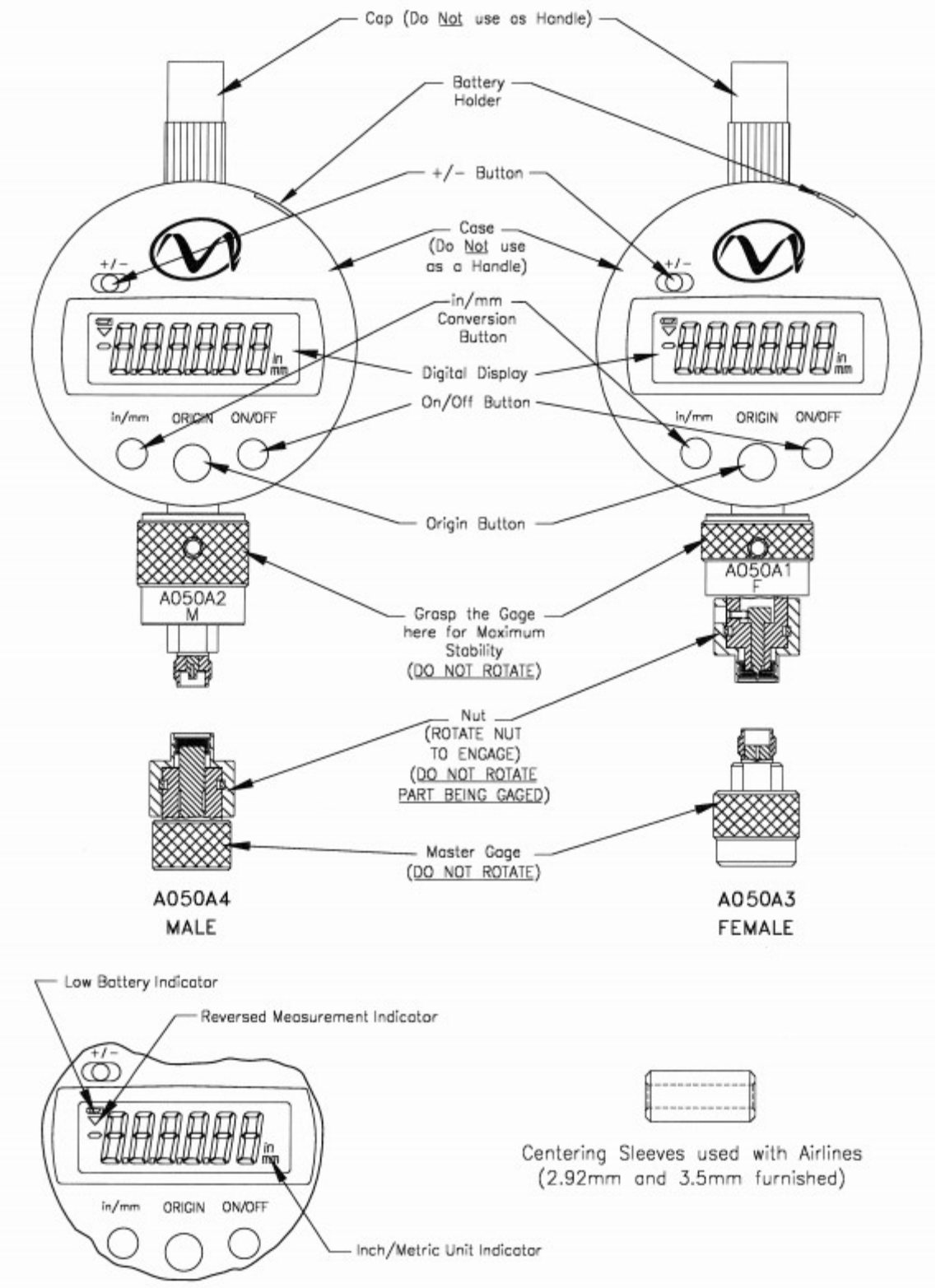
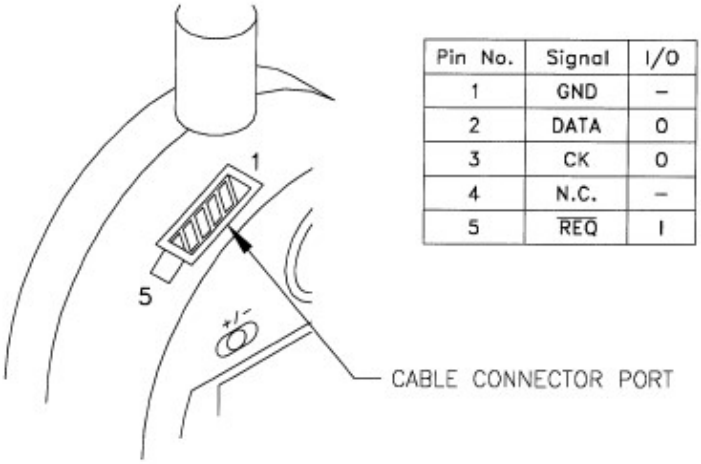
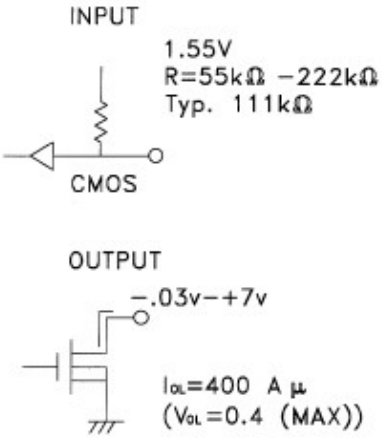


Figure 1. The A050A Connector Gage Kit

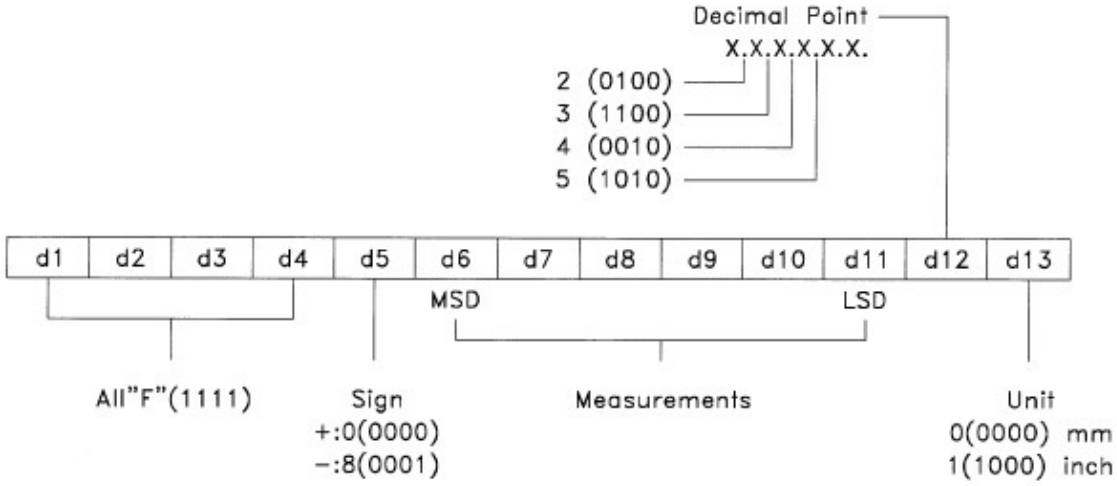
Output Connector Specification:



Pin No.	Signal	I/O
1	GND	–
2	DATA	O
3	CK	O
4	N.C.	–
5	$\overline{REQ}$	I



Output Data Format:



Timing Chart:

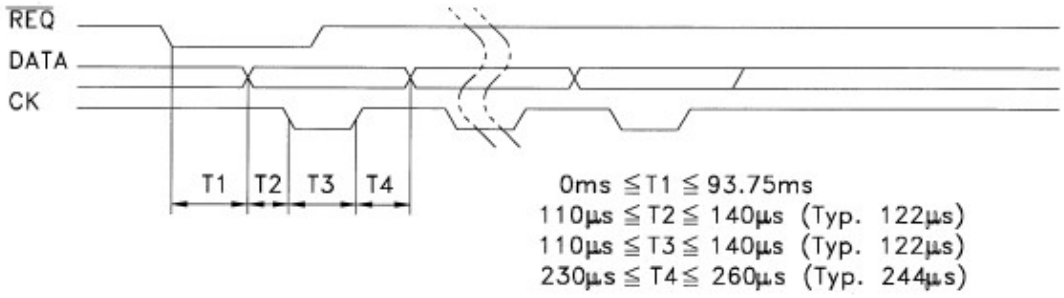


Figure 2. Data Output

Operation

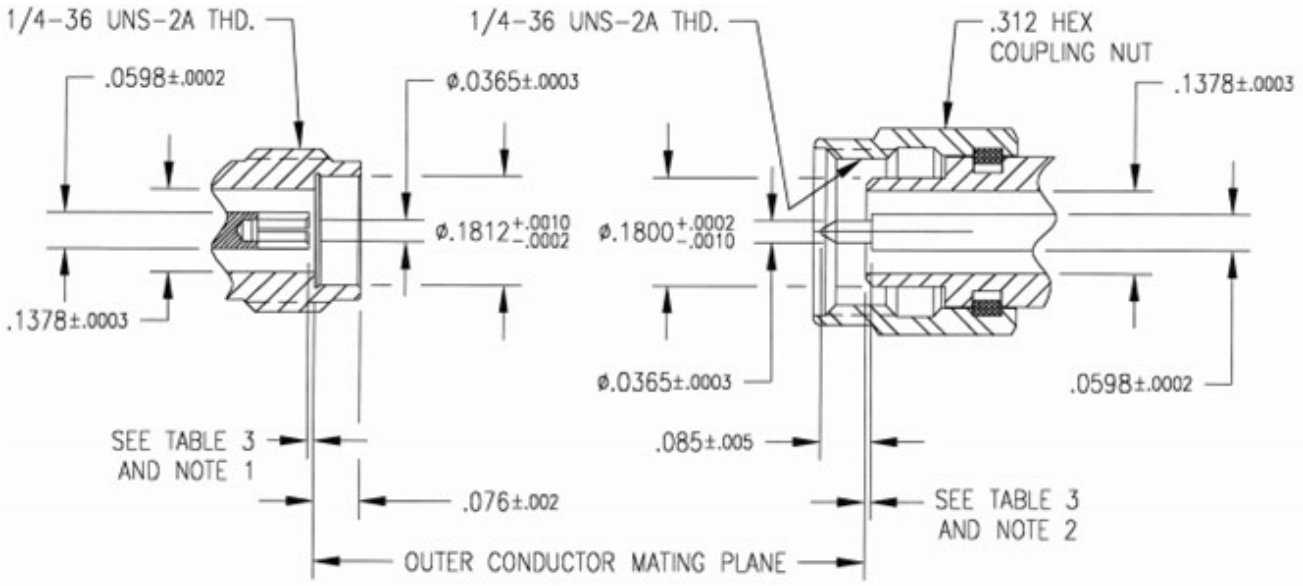


Figure 3. Critical Contact Pin Location Dimensions of 3.5mm Precision Connectors

3.5mm Connector Grade	Pin Depth Specifications	
	mm	Inches (Ref.)
IEEE-287 GPC	0.000 +0.050 -0.000	0.0000 +0.0020 -0.0000
IEEE-287 LPC	0.000 +0.013 -0.000	0.0000 +0.0005 -0.0000
Maury Precision (SEE NOTE 3)	0.000 +0.076 -0.000	0.0000 +0.0030 -0.0000

Table 2. Center Contact Locations for 3.5mm Connectors

Notes

1. Female contact pin location – use gage assembly marked “F”.
2. Male contact pin location – use gage assembly marked “M”.
3. Tighter tolerances can be used at user’s discretion. For high prevision calibration components, Maury recommends and uses +0.000 to +0.013mm (+0.0000 to +0.0005 inches) for center contact pin shoulder recession behind the outer conductor mating plane.
4. In reference to the outline drawing above: Minus (-) tolerances indicate a protruding condition above the outer conductor mating plane. Plus (+) tolerances indicate a recessed condition below the outer conductor mating plane.
5. Other dimensions shown in this figure are shown since they affect the mating of the gage assemblies’ gaging mechanism (bushing and pin). Deviation from these dimensions may cause measurement errors or improper fit between the gaging mechanism and the connector being measured. Consult our Customer Service Department on measuring connectors with interface dimensions other than specified above.
6. When operating the gage: A minus (-) indicates a recessed condition below the outer conductor mating plane. A positive reading indicates a protruding condition above the outer conductor mating plane.
7. Operators are able to validate note 6 by doing the following: After zeroing the gage you will have a minus (-) reading when nothing is connected. As the pin travels towards the gage you will see the value on the gage begin to change in the positive direction.

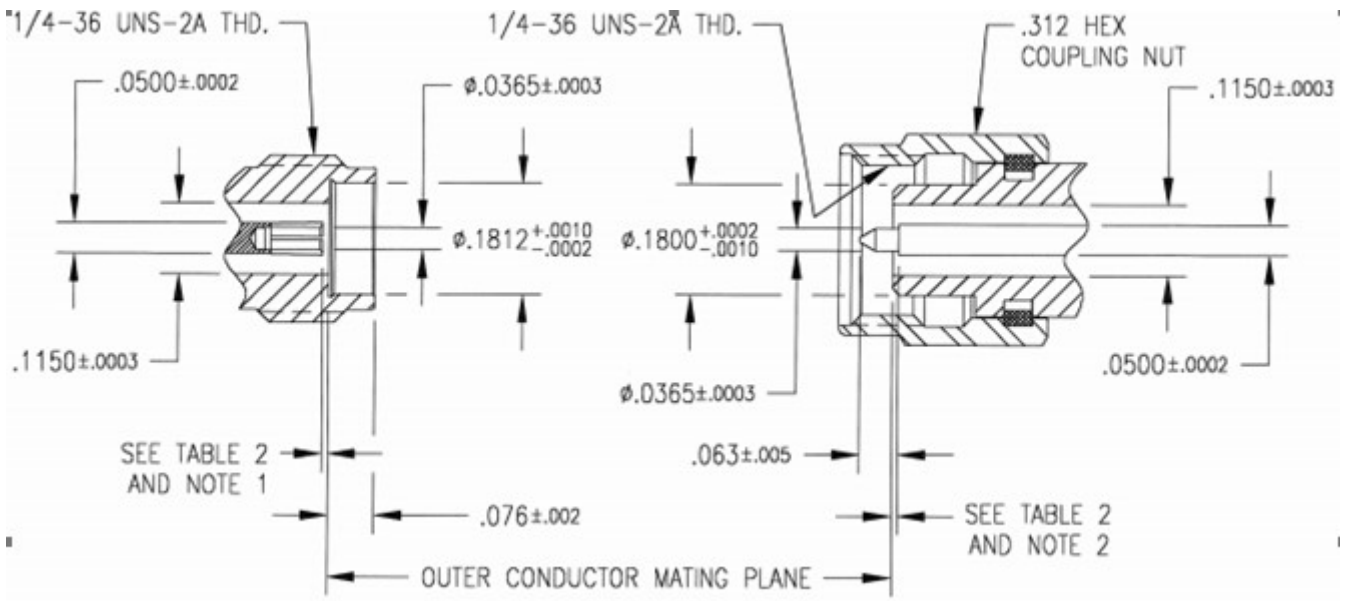


Figure 4. Critical Contact Pin Location Dimensions of 2.92mm Precision Connectors

2.92mm Connector Grade	Pin Depth Specifications	
	mm	Inches (Ref.)
IEEE-287 GPC	0.000 +0.050 -0.000	0.0000 +0.0020 -0.0000
IEEE-287 LPC	0.000 +0.013 -0.000	0.0000 +0.0005 -0.0000
Maury Precision (SEE NOTE 3)	0.000 +0.076 -0.000	0.0000 +0.0030 -0.0000

Table 3. Center Contact Locations for 2.92mm Connectors

Notes

1. Female contact pin location – use gage assembly marked “F”.
2. Male contact pin location – use gage assembly marked “M”.
3. Tighter tolerances can be used at user’s discretion. For high prevision calibration components, Maury recommends and uses +0.000 to +0.013mm (+0.0000 to +0.0005 inches) for center contact pin shoulder recession behind the outer conductor mating plane.
4. In reference to the outline drawing above: Minus (-) tolerances indicate a protruding condition above the outer conductor mating plane. Plus (+) tolerances indicate a recessed condition below the outer conductor mating plane.
5. Other dimensions shown in this figure are shown since they affect the mating of the gage assemblies’ gaging mechanism (bushing and pin). Deviation from these dimensions may cause measurement errors or improper fit between the gaging mechanism and the connector being measured. Consult our Customer Service Department on measuring connectors with interface dimensions other than specified above.
6. When operating the gage: A minus (-) indicates a recessed condition below the outer conductor mating plane. A positive reading indicates a protruding condition above the outer conductor mating plane.
7. Operators are able to validate note 6 by doing the following: After zeroing the gage you will have a minus (-) reading when nothing is connected. As the pin travels towards the gage you will see the value on the gage begin to change in the positive direction.

Specifications

In order to determine the specifications for the A050A gages, Maury performed an extensive gage study with the gages at the Maury factory. The study involved the use of multiple gages and personnel making multiple measurements of a known standard. A statistical analysis was performed on the data collected and the resultant +/- 2-sigma value was determined. Maury considers this value to be the achievable uncertainty under carefully controlled conditions in a controlled environment. The +/- 2-sigma uncertainty for the Maury A050A connector gage, male or female, is +0.0018mm (±0.000070inches).

Applications

Your A050A is an easy to use connector gage kit featuring a "thread on" design for hands-free operation to determine the critical contact location of 3.5 and 2.92mm connectors. These dimensions must be maintained in order to provide the required electrical performance and mechanical mating of the connectors. Destructive interference may result if either the female or male contact protrudes beyond the outer conductor mating planes. Conversely, an excessive gap of the center contacts when mated produces high reflections and impaired overall system performance. See **Figures 3** and **4**.

Figure 5

While primarily designed for metrology grade environment, the A050A can be used in production and for general laboratory testing of connector interfaces.

Figure 6

The A050A greatly simplifies setting the interface of sliding loads by freeing the user's hands to perform the necessary adjustments.

Figure 7

The A050A, along with the centering sleeves, is very useful for measuring the interface dimension of beadless 3.5mm and 2.92mm air lines.

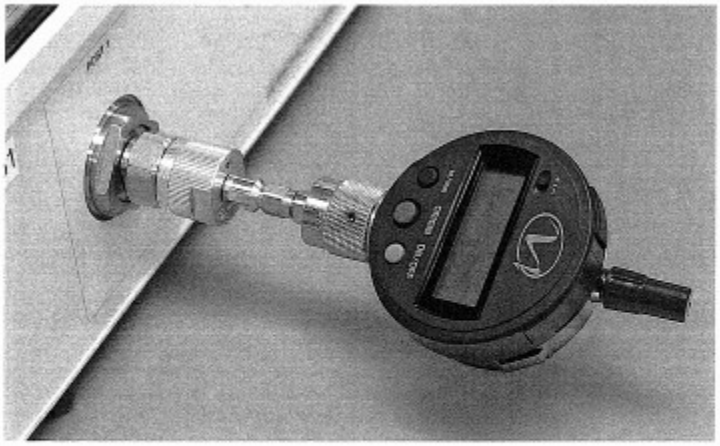


Figure 8

Figure 8 shows the A050A gaging a network analyzer test port connector.

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.

Cleaning

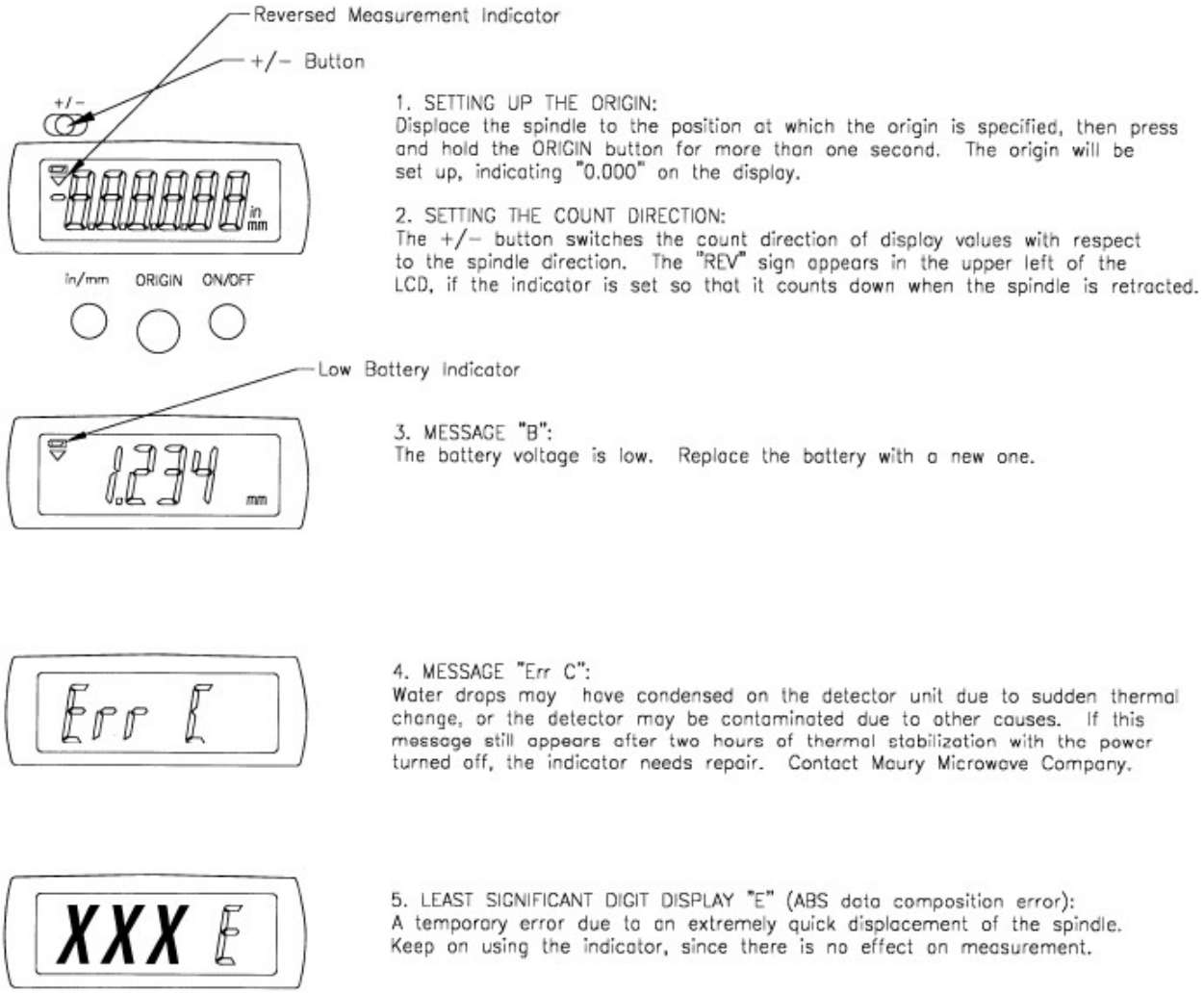
Use dry compressed air at a very low velocity first; then a solvent such as isopropyl alcohol. Clean the contacting surfaces, alignment parts and threads using a lint free swab. Then re-inspect the connector to make sure that no fibers have been left around the contact and interface surfaces.

NOTE: To maintain cleanliness, always wear cotton gloves when performing any of the procedures described in this manual.

CAUTION: For optimum measurements and to prevent damage, always hold the connector gage on the knurled part of the bushing when connecting. Never rotate parts against each other since this could yield faulty readings or damage the mating surfaces.

Error Messages

Figure 9 show the error messages which the indicator may display, as well as the appropriate response.



1. SETTING UP THE ORIGIN:
Displace the spindle to the position at which the origin is specified, then press and hold the ORIGIN button for more than one second. The origin will be set up, indicating "0.000" on the display.

2. SETTING THE COUNT DIRECTION:
The +/− button switches the count direction of display values with respect to the spindle direction. The "REV" sign appears in the upper left of the LCD, if the indicator is set so that it counts down when the spindle is retracted.

3. MESSAGE "B":
The battery voltage is low. Replace the battery with a new one.

4. MESSAGE "Err C":
Water drops may have condensed on the detector unit due to sudden thermal change, or the detector may be contaminated due to other causes. If this message still appears after two hours of thermal stabilization with the power turned off, the indicator needs repair. Contact Maury Microwave Company.

5. LEAST SIGNIFICANT DIGIT DISPLAY "E" (ABS data composition error):
A temporary error due to an extremely quick displacement of the spindle. Keep on using the indicator, since there is no effect on measurement.

Figure 9. Operating Procedures and Error Messages

Gaging Precision 2.92 and 3.5mm Connectors

The critical mechanical specification in precision 2.92 and 3.5mm connectors is the recession (setback) of the center conductor relative to the outer conductor mating plane (Figure 3 and 4). No protrusion of the center conductor in from of the outer conductor mating plane is allowable.

The following procedure applies to both connector gages. For the female connector gage A050A1, use the A050A3 master setting gage and for the male connector gage A050A2, use the A050A4 master setting gage, respectively.

Procedure: Refer to Figure 10

(Example for measuring female connector.)

1. Visually inspect the mating surfaces of your A050A1 connector gage and A050A3 master setting gage
2. Clean all mating surfaces of the master setting gage and connector gage using the recommended cleaning procedure above.
3. Push the ON/OFF button on the indicator to turn on the display.
4. Push the in/mm button until the display reads “in”
5. Set the +/- button so that the REV sign does ***NOT*** appear on the LCD.

   NOTE: Without anything connected to the gage and the REV sign ***NOT*** appearing in the display the gage should show a minus (-) number.
6. Align the connector gage and master setting gage carefully, then rotate the nut on the gage, allowing it to engage with the thread of your A050A3. Apply light finger pressure avoiding rotation of the mating planes. If you use a torque wrench, it should be rated at 8 inch-pounds. Maury model 8799A1 is recommended and supplied with the A050A kit. Hold the corresponding part with the 5/16 open end wrench supplied with the kit.
7. Push and hold the ORIGIN button until the display reads 0.0000 inches. This sets the indicator reading to the nominal dimension of .000” (or other nominal dimensions provided by other master setting gages).
8. Gently loosen and disengage the connector gage and the master gage. You are now ready to measure.

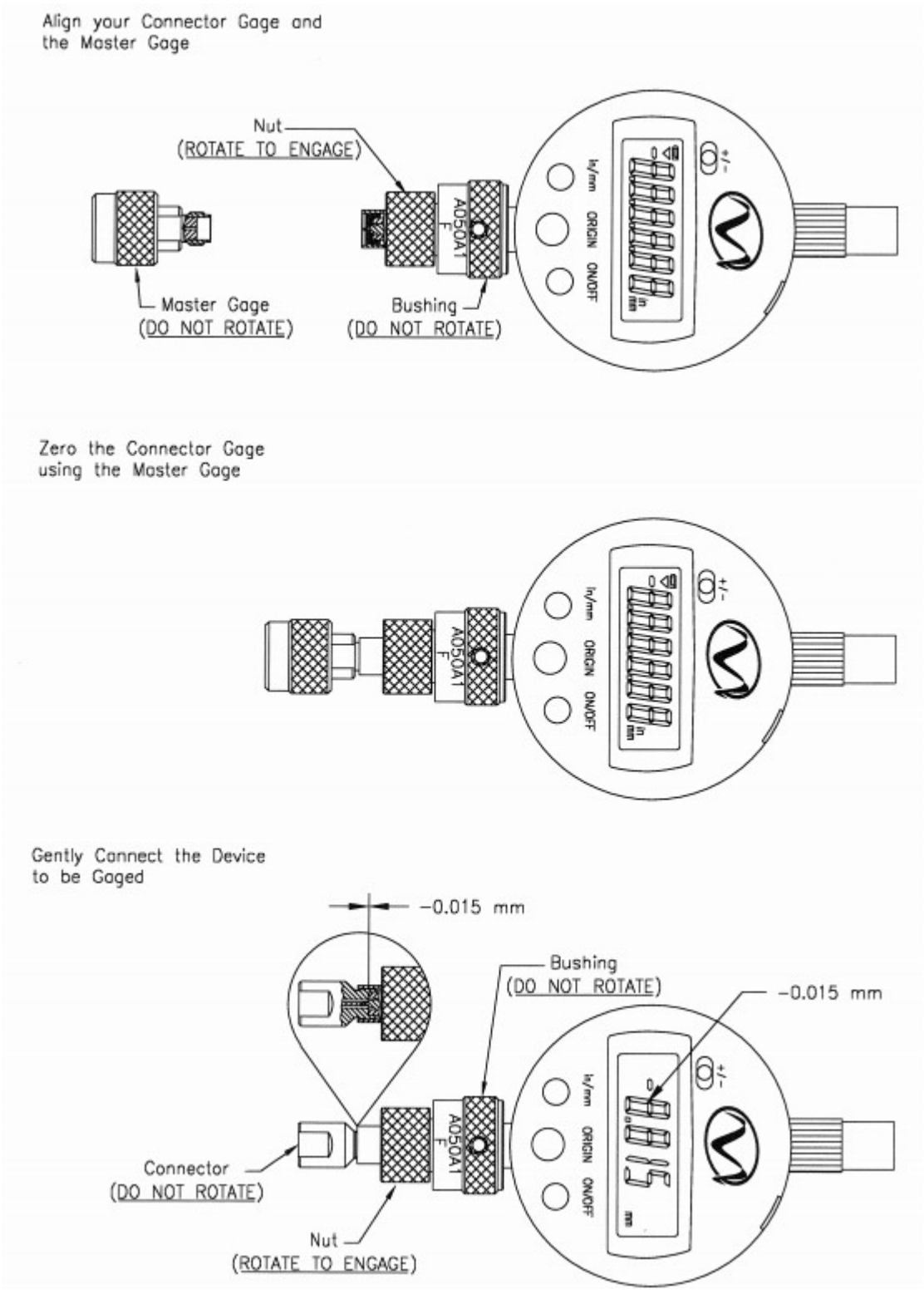


Figure 10. Gaging Precision 2.92mm and 3.5mm Female Connectors
(Applies Equally to the Male Connectors)

Sliding Loads and Air Lines

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.*

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 A050A type connector gage.*

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 A050A1 and A050A3 master gage. For male sliding loads, use the A050A2 and A050A4 respectively. 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 11** and **12.**

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 11

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 8 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.

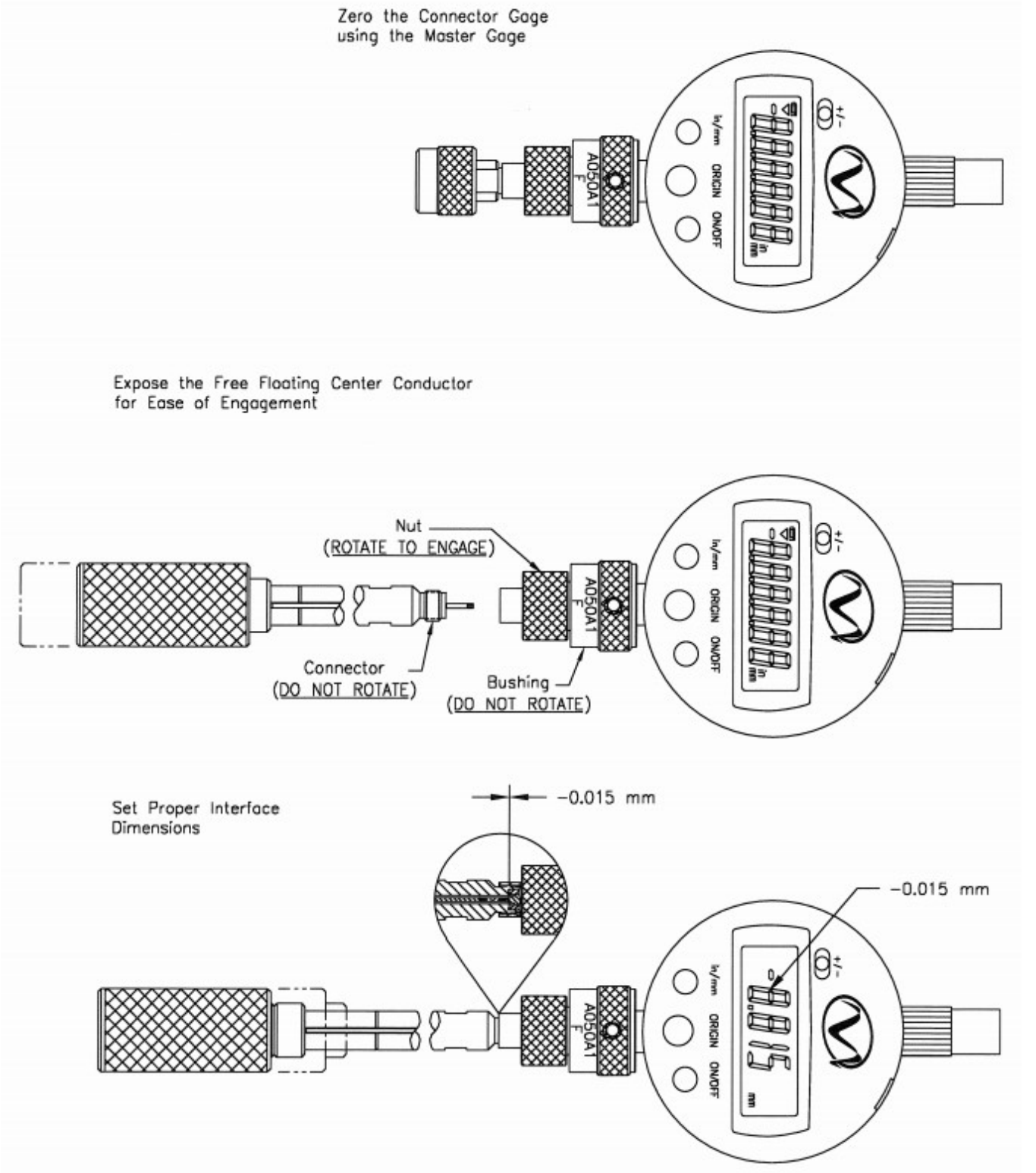


Figure 12. Gaging Precision Sliding Loads

Gaging 2.92 and 3.5mm Air Lines

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

When using a 2.92 or 3.5mm airline, a master gage is first connected to one end of and the corresponding A050A indicator gage is connected to the opposite end.

Procedure

See **Figure 13**

NOTE: Sleeve set is required for this measurement (see parts list **Table 1**).

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 conductors 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 A050A; 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 8 inch pounds.

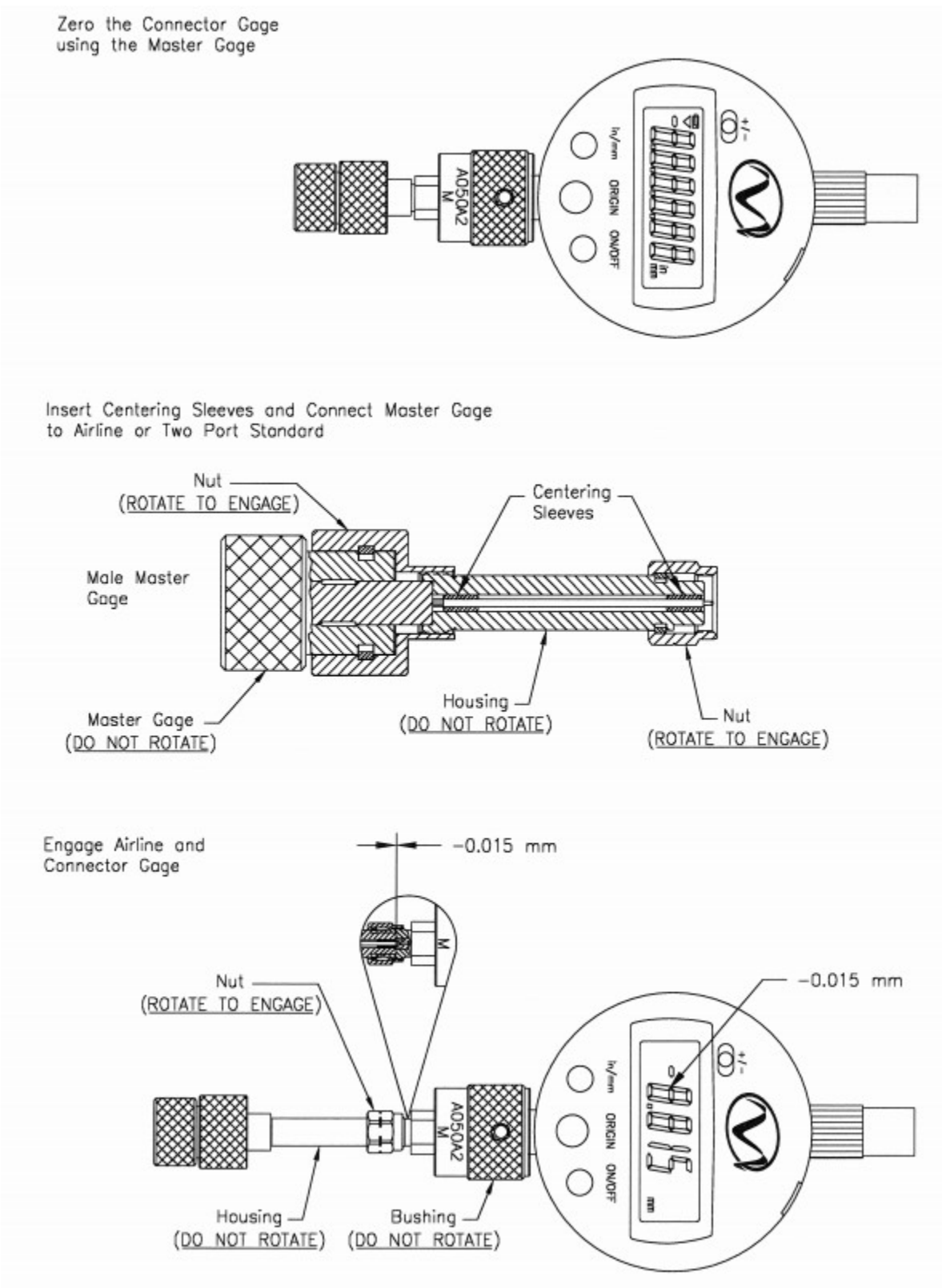


Figure 13. Gaging Beadless Precision 2.92mm and 3.5mm Airlines

Maintenance and Calibration

Maintenance

This connector gage kit is 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, correct alignment when mating, and proper torquing of connectors. To help maintain the integrity of the components in this kit, routine visual inspection and cleaning of mating surfaces is recommended. Failure to do so may result in degraded repeatability and accuracy, and may damage any mated devices. Refer to the *Operation* section of this User Guide for detailed instructions on visual inspection and cleaning.

Calibration

To maintain verification that a connector gage kit is performing to traceable specifications, we recommend that all kits be periodically returned to Maury Microwave for calibration. The typical calibration cycle is one year, although actual need may vary depending on usage.

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Appendix

Data Sheet Resources

2Y-051 – Connector Gages and Connector Gage Kits
http://maurymw.com/pdf/datasheets/2Y-051.pdf

2Y-050A – Torque Wrenches
http://maurymw.com/pdf/datasheets/2Y-050A.pdf

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