



# USER GUIDE

## WR75 Waveguide TRL Calibration Kit

10.0 – 15.0 GHz

Models: WR75C30\32 Series



# USER GUIDE

## WR75 Waveguide TRL Calibration Kit

**10.0 – 15.0 GHz**

**Models: WR75C30\32 Series**



2900 Inland Empire Boulevard  
Ontario, California 91764-4804 USA  
Telephone: (909) 987-4715  
Facsimile: (909) 987-1112

[maurymw.com](http://maurymw.com)

8770-512 (Rev A) 03/16

Copyright © 2017 Maury Microwave Corporation. All rights reserved.



## ***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.

## ***Limitation of Warranty***

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.

The remedies provided herein are the Buyer's sole and exclusive remedies. Maury Microwave shall not be liable for any direct, indirect, special, incidental, or consequential damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other financial loss) arising out of the Buyer's use of or inability to use the product, even if Maury or an authorized Maury dealer has been advised of the possibility of such damages.





# CONTENTS

|  |           |
|--|-----------|
| <i>Calibration Kit Description</i> .....           | 1         |
| <i>Maintenance</i> .....                           | 1         |
| <i>Calibration</i> .....                           | 1         |
| <i>Supporting Test Port Adapters</i> .....         | 1         |
| <i>Electrostatic Discharge Precautions</i> .....   | 1         |
| <i>Waveguide Flange Description</i> .....          | 2         |
| <i>Waveguide Flange Care</i> .....                 | 2         |
| <i>Using Your Verification Devices</i> .....       | 3         |
| <i>Calibration Kit Contents</i> .....              | 4         |
| <b>STANDARD DEFINITIONS</b> .....                  | <b>6</b>  |
| <i>Anritsu Network Analyzers</i> .....             | 6         |
| <i>Keysight Network Analyzers</i> .....            | 7         |
| <i>Keysight Network Analyzers</i> .....            | 7         |
| <i>Rhode &amp; Schwarz Network Analyzers</i> ..... | 8         |
| <b>APPENDIX</b> .....                              | <b>11</b> |
| <i>Data Sheet Resources</i> .....                  | 11        |
| <b>CONTACTS</b> .....                              | <b>12</b> |
| <i>Corporate</i> .....                             | 12        |
| <i>Sales</i> .....                                 | 12        |
| <i>Customer Support</i> .....                      | 12        |
| <i>Website</i> .....                               | 12        |
| <i>Web Resources</i> .....                         | 12        |



## TABLES

|  |   |
|--|---|
| Table 1. Standard Definitions for Anritsu .....                  | 6 |
| Table 2. Standard Definitions for Keysight .....                 | 7 |
| Table 3. Standard Definitions for Rohde & Schwarz .....          | 8 |
| Table 4. Peak-toPeak Ripple (dB) vs. Source Match vs. VSWR ..... | 8 |

## FIGURES

|   |   |
|---|---|
| Figure 1. Flange with Indexing Pins ..... | 2 |
|---|---|



## GENERAL INFORMATION

### ***Calibration Kit Description***

The WR75C30\32 series of waveguide TRL calibration kits are designed to provide accurate calibrations of network analyzers in the WR75 band of 10.0 – 15.0 GHz. Each of these kits includes all the necessary TRL calibration standards and associated hardware needed for the accurate calibration of most network analyzers. This kit can also be used for Short-Short-Load-Thru (SSLT) and Offset Load calibrations.

A precision TRL line section (shim) is provided to ensure higher effective directivity after calibration. All component flanges in these kits incorporate the use of precision indexing pins and holes for excellent measurement repeatability.

See the following *Calibration Kit Contents* section for information on included components and available kit options.

**NOTE:** This document, calibration constants software, and data sheet can be downloaded from our website: [maurymw.com](http://maurymw.com)

**NOTE:** Legacy analyzer software is not on our website but is available for purchase.

### ***Maintenance***

This calibration 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 or waveguide coupling screws. 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, as well as damage any mated devices.

### ***Calibration***

To maintain verification that a calibration 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.

### ***Supporting Test Port Adapters***

When configuring a test setup, be sure that damaging stresses are not applied to the connectors on the test set. This is particularly critical when the attached components are heavy or long. Always properly support the test port adapters being used.

### ***Electrostatic Discharge Precautions***

Protection against electrostatic discharge (ESD) is essential while inspecting, cleaning, or making connections to connectors attached to a static-sensitive circuit, such as those found inside test sets.

When handling the connectors on the test set, be aware that you are coming in contact with exposed center conductors that are connected directly to the static-sensitive internal circuits of the network analyzer. Make sure that you and your equipment are well-grounded before inspecting, cleaning, or making connections to test set ports. Standard ESD precautions, such as the use of grounded wrist straps and grounded antistatic mats, are recommended.



### Waveguide Flange Description

All calibration standards and verification devices in the WR75 series kits utilize the Maury Microwave Precision WR75 MPF75A & B. This flange design is mateable with the standard UBR120 flange, yet it provides a dramatic improvement in flange connection consistency, repeatability, and flange serviceability over the UBR120 design. These flanges incorporate two precision indexing holes and utilize slip fit indexing pins that provide the precise mating alignment required for consistent repeatable connections. Each kit includes a set of hex head bolts, hex nuts and indexing pins. The indexing pins are provided in two lengths. The long indexing pins are generally easier to use, but the short pins are also included for use in tight access situations or when it is intended that the pins be left in the flange coupling.

Refer to Maury Microwave data sheet [5E-007](#) (available on our web site) for further specifications on the Maury Microwave Precision WR75 MPF75A & B.

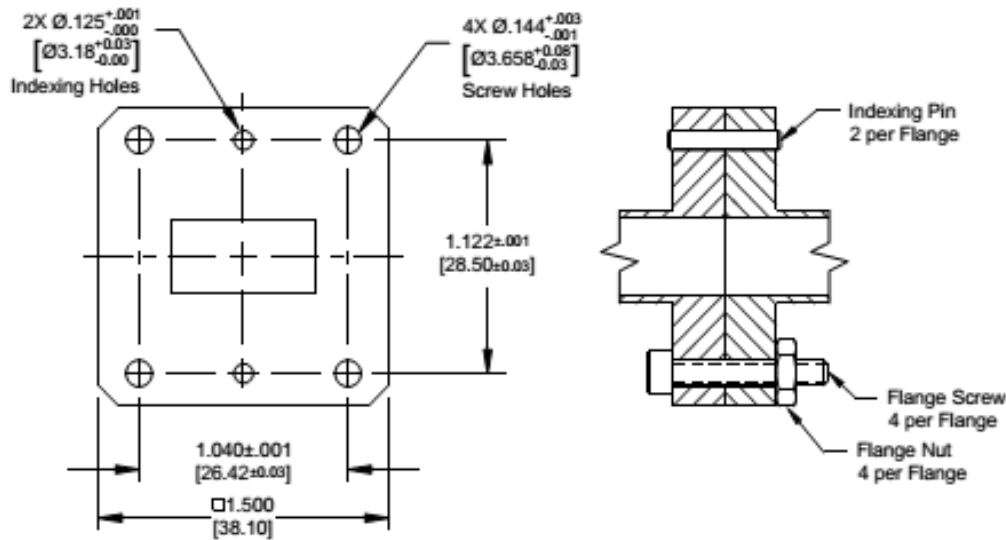


Figure 1. Flange with Indexing Pins

### Waveguide Flange Care

Waveguide flanges should be inspected prior to each use. For optimum results, they should be free of any imperfections, scratches, nicks, dirt, etc. When not in use, flanges should be covered with a protective flange cover.

Should a flange's mating surface become damaged, it should be repaired immediately before it is used any further.





## ***Using Your Verification Devices***

An easy way to check that your calibration went well is to measure source match. During each of the calibration methods, a short circuit was connected to the test port(s). Following calibration, if the short circuit is reconnected to the test port and the analyzer is set to measure S11 (displayed in dB), we'd expect to see a straight line with very little loss. If we inserted a straight section between the short and the test port, we'd expect to see a straight line with more loss, with the loss increasing with frequency. What you will actually see is some ripple caused by the residual reflections of the test port interacting with the reflections from the short. This ripple shows the combined effects of both source match and directivity. The amount of ripple usually ranges from 0.02 dB peak-to-peak (a very good calibration) to 1 dB peak-to-peak (not a very good calibration).

Source match can be measured as follows:

- a. Connect the straight section to the measurement port, terminated with the appropriate flat short.
- b. Measure the return loss and adjust the scale resolution to detect the ripple pattern on the Return Loss display (typically 0.1 - 0.2 dB, peak-to-peak).
- c. Measure the peak-to-peak amplitude of the ripple pattern. To adjust for slope, measure two peaks on each side of a valley and average.
- d. Use **Table 1** to convert peak-to-peak ripple to source match.



## Calibration Kit Contents

### Standard Components – WR75CK30

---

|      |                                 |            |
|------|---------------------------------|------------|
| 1 ea | Fixed Flush Short               | M344A      |
| 1 ea | Precision Shim (1/4 $\lambda$ ) | M322B0.311 |
| 1 ea | Fixed Termination               | M301A      |
| 1 ea | Hardware Kit                    | WR-1-6     |
| 1 ea | Indexing Pin Kit                | WR-2-3     |
| 1 ea | Instrument Case                 |            |

---

### Standard Components – WR75CK32

---

|      |                                 |            |
|------|---------------------------------|------------|
| 1 ea | Fixed Flush Short               | M344A      |
| 1 ea | Precision Shim (1/4 $\lambda$ ) | M322B0.311 |
| 1 ea | Fixed Termination               | M301A      |
| 1 ea | Straight Section (5 cm)         | M103A5     |
| 1 ea | Hardware Kit                    | WR-1-6     |
| 1 ea | Indexing Pin Kit                | WR-2-3     |
| 1 ea | Instrument Case                 |            |

---



---

General Information

(This page intentionally left blank)



## STANDARD DEFINITIONS

### *Anritsu Network Analyzers*

**Table 8.** Standard Definitions for Anritsu

| Waveguide Parameters     |           |
|--------------------------|-----------|
| Cutoff Frequency         | 7.868 GHz |
| Offset Length Of Short 1 | 0.000 mm  |
| Offset Length Of Short 2 | 7.8994 mm |

For specific loading instructions, see ***Anritsu loading instructions***, which can be downloaded from our website: [maurymw.com](http://maurymw.com).



## Keysight Network Analyzers

**Table 5.** Standard Definitions for Keysight

| Standard <sup>(1)</sup> |                                      | C0<br>x10 <sup>-15</sup><br>F | C1<br>x10 <sup>-27</sup><br>F/Hz | C2<br>x10 <sup>-36</sup><br>F/Hz <sup>2</sup> | C3<br>x10 <sup>-45</sup><br>F/Hz <sup>3</sup> | Fixed<br>or<br>Sliding<br><sup>(2)</sup> | Offset      |                                    |                             | Frequency<br>GHz   |     | Coax<br>or<br>W/G | Standard<br>Label       |
|-------------------------|--------------------------------------|-------------------------------|----------------------------------|---|---|--|-------------|------------------------------------|-----------------------------|--------------------|-----|-------------------|-------------------------|
| Type                    | Description                          | L0<br>x10 <sup>-12</sup><br>H | L1<br>x10 <sup>-24</sup><br>H/Hz | L2<br>x10 <sup>-33</sup><br>H/Hz <sup>2</sup> | L3<br>x10 <sup>-42</sup><br>H/Hz <sup>3</sup> |  | Delay<br>ps | Z <sub>0</sub> <sup>(3)</sup><br>Ω | Loss <sup>(4)</sup><br>GΩ/s | Min <sup>(5)</sup> | Max |                   |                         |
| Short                   | M344A Fixed Short                    |                               |                                  |   |   |  | 0           | 1.0                                | 0                           | 7.868              | 999 | W/G               | M344A                   |
| Short                   | M322B0.311Shim + M344A Fixed Short   |                               |                                  |   |   |  | 26.350      | 1.0                                | 0                           | 7.868              | 999 | W/G               | M322B0.311<br>+ M344A   |
| Thru                    | Thru (0 cm)                          |                               |                                  |   |   |  | 0           | 1.0                                | 0                           | 7.868              | 999 | W/G               | Thru <sup>(5)</sup>     |
| Delay\Thru              | M322B0.311 Shim (0.311inch)          |                               |                                  |   |   |  | 26.350      | 1.0                                | 0                           | 7.868              | 999 | W/G               | M322B0.311              |
| Load                    | M301 ( )                             |                               |                                  |   |   | Fixed                                    | 0           | 1.0                                | 0                           | 7.868              | 999 | W/G               | M301 ( )                |
| Load                    | M322B0.311 Shim + M301( ) Fixed Load |                               |                                  |   |   | Offset                                   | 26.350      | 1.0                                | 0                           | 7.868              | 999 | W/G               | M322B0.311<br>+ M301( ) |

<sup>(1)</sup> Open, short, load, delay/thru, or arbitrary impedance.

<sup>(2)</sup> Load or arbitrary impedance only.

<sup>(3)</sup> Z<sub>0</sub> normalized.

<sup>(4)</sup> Skin loss factor, normalized at 1 GHz.

<sup>(5)</sup> Test ports connected directly.

For specific loading instructions see **Keysight loading instructions**, which can be downloaded from our website: [maurymw.com](http://maurymw.com).



## Rhode & Schwarz Network Analyzers

**Table 9.** Standard Definitions for Rohde & Schwarz

|  |   |
|--|---|
| Short<br>Label = M344A<br>Min Freq = 7.868 GHz<br>Max Freq = 15.0 GHz<br>Length = 0.000 mm             | Reflect<br>Label = M344A<br>Min Freq = 7.868 GHz<br>Max Freq = 15.0 GHz<br>Length = 0 mm          |
| Offset Short<br>Label = Shim + M344A<br>Min Freq = 7.868 GHz<br>Max Freq = 15.0 GHz<br>Length = 7.9 mm | Through<br>Label = Thru (0 cm)<br>Min Freq = 7.868 GHz<br>Max Freq = 15.0 GHz<br>Length = 0 mm    |
| Match<br>Label = Fixed<br>Min Freq = 7.868 GHz<br>Max Freq = 15.0 GHz                                  | Line 1<br>Label = M322B0.311<br>Min Freq = 7.868 GHz<br>Max Freq = 15.0 GHz<br>Length = 7.8994 mm |

For specific loading instructions, see **Rohde & Schwarz loading instructions**, which can be downloaded from our website: [maurymw.com](http://maurymw.com).



(This page intentionally left blank)



**Table 1. Peak-to-Peak Ripple (dB) vs. Source Match vs. VSWR**

| P-P   | SM   | VSWR  | P-P   | SM   | VSWR  | P-P   | SM   | VSWR  | P-P   | SM   | VSWR  | P-P   | SM   | VSWR  |
|-------|------|-------|-------|------|-------|-------|------|-------|-------|------|-------|-------|------|-------|
| 0.001 | 84.8 | 1.000 | 0.051 | 50.7 | 1.006 | 0.102 | 44.7 | 1.012 | 0.205 | 38.6 | 1.024 | 0.455 | 31.8 | 1.053 |
| 0.002 | 78.8 | 1.000 | 0.052 | 50.5 | 1.006 | 0.104 | 44.5 | 1.012 | 0.210 | 38.4 | 1.024 | 0.460 | 31.7 | 1.054 |
| 0.003 | 75.3 | 1.000 | 0.053 | 50.3 | 1.006 | 0.106 | 44.3 | 1.012 | 0.215 | 38.2 | 1.025 | 0.465 | 31.6 | 1.054 |
| 0.004 | 72.8 | 1.000 | 0.054 | 50.2 | 1.006 | 0.108 | 44.2 | 1.012 | 0.220 | 38.0 | 1.025 | 0.470 | 31.5 | 1.055 |
| 0.005 | 70.8 | 1.001 | 0.055 | 50.0 | 1.006 | 0.110 | 44.0 | 1.013 | 0.225 | 37.8 | 1.026 | 0.475 | 31.4 | 1.055 |
| 0.006 | 69.2 | 1.001 | 0.056 | 49.8 | 1.006 | 0.112 | 43.8 | 1.013 | 0.230 | 37.6 | 1.027 | 0.480 | 31.3 | 1.056 |
| 0.007 | 67.9 | 1.001 | 0.057 | 49.7 | 1.007 | 0.114 | 43.7 | 1.013 | 0.235 | 37.4 | 1.027 | 0.485 | 31.2 | 1.057 |
| 0.008 | 66.7 | 1.001 | 0.058 | 49.5 | 1.007 | 0.116 | 43.5 | 1.013 | 0.240 | 37.3 | 1.028 | 0.490 | 31.1 | 1.057 |
| 0.009 | 65.7 | 1.001 | 0.059 | 49.4 | 1.007 | 0.118 | 43.4 | 1.014 | 0.245 | 37.1 | 1.028 | 0.495 | 31.0 | 1.058 |
| 0.010 | 64.8 | 1.001 | 0.060 | 49.2 | 1.007 | 0.120 | 43.2 | 1.014 | 0.250 | 36.9 | 1.029 | 0.500 | 30.9 | 1.058 |
| 0.011 | 64.0 | 1.001 | 0.061 | 49.1 | 1.007 | 0.122 | 43.1 | 1.014 | 0.255 | 36.7 | 1.030 | 0.505 | 30.9 | 1.059 |
| 0.012 | 63.2 | 1.001 | 0.062 | 49.0 | 1.007 | 0.124 | 43.0 | 1.014 | 0.260 | 36.6 | 1.030 | 0.510 | 30.8 | 1.060 |
| 0.013 | 62.5 | 1.001 | 0.063 | 48.8 | 1.007 | 0.126 | 42.8 | 1.015 | 0.265 | 36.4 | 1.031 | 0.515 | 30.7 | 1.060 |
| 0.014 | 61.9 | 1.002 | 0.064 | 48.7 | 1.007 | 0.128 | 42.7 | 1.015 | 0.270 | 36.2 | 1.031 | 0.520 | 30.6 | 1.061 |
| 0.015 | 61.3 | 1.002 | 0.065 | 48.6 | 1.007 | 0.130 | 42.6 | 1.015 | 0.275 | 36.1 | 1.032 | 0.525 | 30.5 | 1.061 |
| 0.016 | 60.7 | 1.002 | 0.066 | 48.4 | 1.008 | 0.132 | 42.4 | 1.015 | 0.280 | 35.9 | 1.032 | 0.530 | 30.4 | 1.062 |
| 0.017 | 60.2 | 1.002 | 0.067 | 48.3 | 1.008 | 0.134 | 42.3 | 1.015 | 0.285 | 35.8 | 1.033 | 0.535 | 30.4 | 1.063 |
| 0.018 | 59.7 | 1.002 | 0.068 | 48.2 | 1.008 | 0.136 | 42.2 | 1.016 | 0.290 | 35.6 | 1.034 | 0.540 | 30.3 | 1.063 |
| 0.019 | 59.2 | 1.002 | 0.069 | 48.0 | 1.008 | 0.138 | 42.0 | 1.016 | 0.295 | 35.5 | 1.034 | 0.545 | 30.2 | 1.064 |
| 0.020 | 58.8 | 1.002 | 0.070 | 47.9 | 1.008 | 0.140 | 41.9 | 1.016 | 0.300 | 35.3 | 1.035 | 0.550 | 30.1 | 1.064 |
| 0.021 | 58.4 | 1.002 | 0.071 | 47.8 | 1.008 | 0.142 | 41.8 | 1.016 | 0.305 | 35.2 | 1.035 | 0.555 | 30.0 | 1.065 |
| 0.022 | 58.0 | 1.003 | 0.720 | 47.7 | 1.008 | 0.144 | 41.7 | 1.017 | 0.310 | 35.0 | 1.036 | 0.560 | 30.0 | 1.066 |
| 0.023 | 57.6 | 1.003 | 0.073 | 47.5 | 1.008 | 0.146 | 41.5 | 1.017 | 0.315 | 34.9 | 1.037 | 0.565 | 29.9 | 1.066 |
| 0.024 | 57.2 | 1.003 | 0.074 | 47.4 | 1.009 | 0.148 | 41.4 | 1.017 | 0.320 | 34.8 | 1.037 | 0.570 | 29.8 | 1.067 |
| 0.025 | 56.8 | 1.003 | 0.075 | 47.3 | 1.009 | 0.150 | 41.3 | 1.017 | 0.325 | 34.6 | 1.038 | 0.575 | 29.7 | 1.067 |
| 0.026 | 56.5 | 1.003 | 0.076 | 47.2 | 1.009 | 0.152 | 41.2 | 1.018 | 0.330 | 34.5 | 1.038 | 0.580 | 29.7 | 1.068 |
| 0.027 | 56.2 | 1.003 | 0.077 | 47.1 | 1.009 | 0.154 | 41.1 | 1.018 | 0.335 | 34.4 | 1.039 | 0.585 | 29.6 | 1.068 |
| 0.028 | 55.9 | 1.003 | 0.078 | 47.0 | 1.009 | 0.156 | 41.0 | 1.018 | 0.340 | 34.3 | 1.040 | 0.590 | 29.5 | 1.069 |
| 0.029 | 55.6 | 1.003 | 0.079 | 46.9 | 1.009 | 0.158 | 40.9 | 1.018 | 0.345 | 34.1 | 1.040 | 0.595 | 29.5 | 1.070 |
| 0.030 | 55.3 | 1.003 | 0.080 | 46.8 | 1.009 | 0.160 | 40.8 | 1.019 | 0.350 | 34.0 | 1.041 | 0.600 | 29.4 | 1.070 |
| 0.031 | 55.0 | 1.004 | 0.081 | 46.6 | 1.009 | 0.162 | 40.6 | 1.019 | 0.355 | 33.9 | 1.041 | 0.605 | 29.3 | 1.071 |
| 0.032 | 54.7 | 1.004 | 0.082 | 46.5 | 1.009 | 0.164 | 40.5 | 1.019 | 0.360 | 33.8 | 1.042 | 0.610 | 29.2 | 1.071 |
| 0.033 | 54.4 | 1.004 | 0.083 | 46.4 | 1.010 | 0.166 | 40.4 | 1.019 | 0.365 | 33.6 | 1.042 | 0.615 | 29.2 | 1.072 |
| 0.034 | 54.2 | 1.004 | 0.084 | 46.3 | 1.010 | 0.168 | 40.3 | 1.019 | 0.370 | 33.5 | 1.043 | 0.620 | 29.1 | 1.073 |
| 0.035 | 53.9 | 1.004 | 0.085 | 46.2 | 1.010 | 0.170 | 40.2 | 1.020 | 0.375 | 33.4 | 1.044 | 0.625 | 29.0 | 1.073 |
| 0.036 | 53.7 | 1.004 | 0.086 | 46.1 | 1.010 | 0.172 | 40.1 | 1.020 | 0.380 | 33.3 | 1.044 | 0.630 | 29.0 | 1.074 |
| 0.037 | 53.4 | 1.004 | 0.087 | 46.0 | 1.010 | 0.174 | 40.0 | 1.020 | 0.385 | 33.2 | 1.045 | 0.635 | 28.9 | 1.074 |
| 0.038 | 53.2 | 1.004 | 0.088 | 45.9 | 1.010 | 0.176 | 39.9 | 1.020 | 0.390 | 33.1 | 1.045 | 0.640 | 28.8 | 1.075 |
| 0.039 | 53.0 | 1.004 | 0.089 | 45.8 | 1.010 | 0.178 | 39.8 | 1.021 | 0.395 | 33.0 | 1.046 | 0.645 | 28.8 | 1.076 |
| 0.040 | 52.8 | 1.005 | 0.090 | 45.7 | 1.010 | 0.180 | 39.7 | 1.021 | 0.400 | 32.9 | 1.047 | 0.650 | 28.7 | 1.076 |
| 0.041 | 52.6 | 1.005 | 0.091 | 45.6 | 1.011 | 0.182 | 39.6 | 1.021 | 0.405 | 32.7 | 1.047 | 0.655 | 28.6 | 1.077 |
| 0.042 | 52.3 | 1.005 | 0.092 | 45.5 | 1.011 | 0.184 | 39.5 | 1.021 | 0.410 | 32.6 | 1.048 | 0.660 | 28.6 | 1.077 |
| 0.043 | 52.1 | 1.005 | 0.093 | 45.5 | 1.011 | 0.186 | 39.5 | 1.022 | 0.415 | 32.5 | 1.048 | 0.665 | 28.5 | 1.078 |
| 0.044 | 51.9 | 1.005 | 0.094 | 45.4 | 1.011 | 0.188 | 39.4 | 1.022 | 0.420 | 32.4 | 1.049 | 0.670 | 28.4 | 1.079 |
| 0.045 | 51.7 | 1.005 | 0.095 | 45.3 | 1.011 | 0.190 | 39.3 | 1.022 | 0.425 | 32.3 | 1.050 | 0.675 | 28.4 | 1.079 |
| 0.046 | 51.6 | 1.005 | 0.096 | 45.2 | 1.011 | 0.192 | 39.2 | 1.022 | 0.430 | 32.2 | 1.050 | 0.680 | 28.3 | 1.080 |
| 0.047 | 51.4 | 1.005 | 0.097 | 45.1 | 1.011 | 0.194 | 39.1 | 1.022 | 0.435 | 32.1 | 1.051 | 0.685 | 28.3 | 1.080 |
| 0.048 | 51.2 | 1.006 | 0.098 | 45.0 | 1.011 | 0.196 | 39.0 | 1.023 | 0.440 | 32.0 | 1.051 | 0.690 | 28.2 | 1.081 |
| 0.049 | 51.0 | 1.006 | 0.099 | 44.9 | 1.011 | 0.198 | 38.9 | 1.023 | 0.445 | 31.9 | 1.052 | 0.695 | 28.1 | 1.082 |
| 0.050 | 50.8 | 1.006 | 0.100 | 44.8 | 1.012 | 0.200 | 38.8 | 1.023 | 0.450 | 31.8 | 1.052 | 0.700 | 28.1 | 1.082 |



## APPENDIX

### *Data Sheet Resources*

3H-001 – Waveguide Calibration Kits – Series Standard Kits  
<http://maurymw.com/pdf/datasheets/3H-081.pdf>

5E-030 – Precision Waveguide Flanges – MPF22 & MPF19  
<http://maurymw.com/pdf/datasheets/5E-030.pdf>



## CONTACTS

### **Corporate**

Maury Microwave Corporation  
2900 Inland Empire Boulevard  
Ontario, California 91764-4804  
United States of America

Tel. 909-987-4715  
Fax 909-987-5855  
Email [maury@maurymw.com](mailto:maury@maurymw.com)

### **Sales**

Tel. 909-204-3224  
Fax 909-987-1112  
Email [maury@maurymw.com](mailto:maury@maurymw.com)

### **Customer Support**

Tel. 909-204-3283  
Fax 909-987-1112  
Email [support@maurymw.com](mailto:support@maurymw.com)

**Website** <http://www.maurymw.com>

### **Web Resources**

Maury Calibration Kits  
[http://maurymw.com/Precision/VNA\\_Cal\\_Kits.php](http://maurymw.com/Precision/VNA_Cal_Kits.php)

Maury Precision Coaxial and Waveguide-to-Coaxial Adapters  
[http://maurymw.com/Finder/Adapter\\_Finder.php](http://maurymw.com/Finder/Adapter_Finder.php)

Maury Applications Notes Library & Technical Articles Archive  
<http://maurymw.com/Support/tech-support.php>

Maury Sales Representative Finder  
<http://maurymw.com/Support/find-sales-rep.php>

***Visit our website for additional product information and literature.***