Maury Microwave

Precision Calibration & Interconnect Solutions

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FALL 2013 EDITION

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- **Noise Receiver Modules**
  - 50 GHz Noise Receiver Modules
  - 50 GHz PNA-X Noise Receiver Modules
  - Millimeter-Wave Noise Receiver Modules
- **MACH$_{2.7}$™ Solid State Automated Tuners**
- **Precision Low-Loss Coaxial Triplexers & Diplexers**
- **Low-Loss Load Pull Test Fixtures**
- **Wide Matching Range Coaxial Slide Screw Tuners**
- **RF Device Characterization System Integration**
- **Turnkey Measurement Systems**
- **Integrated Load Pull and Noise Measurement Systems**
- **Mixed-Signal Active Load Pull Systems**
- **AMCAD Engineering's PIV/PLP Family of Pulsed IV Systems**

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Maury Precision Calibration Standards

Your Calibration, Measurement & Modeling Solutions Partner!

In This Volume:

Calibration Kits for Vector Network Analyzers

For precise, accurate calibration of Agilent, Anritsu, Rohde & Schwarz, and other network analyzers from DC to 110 GHz, Maury offers calibration-grade (metrology) cal kits in all popular connector types, as standard, expanded, fixed termination, TRL/LRL, and economy models.

Coaxial & Waveguide Calibration Standards

The calibration standards provided in Maury calibration-grade cal kits are also available for separate purchase as spares or replacement parts. Maury also makes the world's finest precision and reference air lines, fixed and sliding loads, shorts, opens and precision mismatches.

Coaxial Connector Gage Kits

Maury's analog and digital connector gage kits are offered in 30 gage types and more than 20 kit configurations. These kits provide everything needed to verify the critical interface dimensions of each connector in your test setup. Proper use of these gage kits prevents damage to your test set ports and DUT connectors, while ensuring the best possible electrical performance and most accurate measurements from your test setups.

Maury Coax & Waveguide-to-Coax Adapter Solutions

Maury now offers three lines of precision adapters including ***Test Essentials™ Lab Adapters***, offered at one of the industry's best price/performance ratios, are tailored for daily use in lab or field; ***ColorConnect™ Precision Adapters***, which take advantage of new manufacturing techniques to improved VSWR, thus bridging the gap between laboratory-grade and calibration-grade (metrology) adapters. ColorConnect™ adapters employ the proposed IEEE high-frequency connector/adapter color convention, becoming the first commercially available products to offer immediate and clear indication of mating compatibility; and ***Maury Calibration-Grade (Metrology) Adapters***. Maury calibration-grade (metrology) adapters are known for their quality, durability and repeatability. From 1.85mm to 7-16, and from WR360 to WR10. With the widest variety of precision coaxial and waveguide adapters of any supplier, world-wide, we have the adapter you need, no matter what test setup or application you use.

Maury Microwave/RF Cable Assembly Solutions

Maury's expanded Microwave/RF Cable Assemblies Solutions now include Maury ***Test Port Cable Assemblies*** designed specifically for use with commercial Vector Network Analyzers (VNAs) equipped with calibration-grade metrology NMD connectors; Maury's ***Stability™ Cable Assemblies*** designed specifically for phase-stable and amplitude-stable applications, where excellent measurement repeatability –even after cable flexure– is critical: ***Utility™ Cable Assemblies***, designed for general testing applications, Utility™ cables offer excellent value with their low cost, low insertion loss, excellent return loss, flexibility, and amplitude and phase stability.

Thermal and Cryogenic Noise Calibration Systems and Components

Maury Noise Calibration Systems (NCS) are self-contained, highly accurate sources of RF and microwave noise power that are used wherever noise source accuracy is critical, such as in noise figure and effective input noise temperature measurement, calibration of solid state noise sources, evaluation and verification of earth station receivers, and as radiometer reference sources.

Visit our web site for the latest information about the Maury Products in this catalog, and to learn more about our entire product line.

maurymw.com

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General Information

How To Order Maury Products

Orders may be placed directly with the factory or in care of your nearest Maury sales representative. For orders originating outside the United States, we recommend placing the order through your local Maury sales representative. Maury maintains an extensive network of sales representatives throughout the world. To find your local Maury sales representative use the interactive index on our web site at **maurymw.com/Support/find-sales-rep.php.**

Pricing and Quotations

Prices for Maury products are those prevailing when an order is placed except when the price is established by formal quotation. Maury Microwave reserves the right to change prices at any time without notice. Price and availability of products with custom or special features must be verified by a valid, formal factory quotation. Maury quotations are valid for a maximum of 30 days. Extensions beyond 30 days can be granted only by the factory.

Terms of Sale

Domestic terms are net 30 days from the date of invoice for customers with established credit F.O.B. Ontario, California. Please refer to Maury Form 228 for complete terms and conditions. For ***International*** sales, please refer to Maury Form 250. Sales to Canada are covered by Maury Form 251. These forms are available on request, or may be found on our web site in PDF format.

Shipment

All shipments are at the buyer's expense. Shipments are normally made using methods and carriers specified by the customer. In the absence of specific instructions, Maury will ship at our discretion by the most advantageous method. All shipments are F.O.B. the Maury factory in Ontario, California (U.S.A.) and, unless otherwise specified, will be insured at full value at the customer's expense. Shipments are packed to provide ample safety margin against transit damage, and there is no charge for regular packing requirements. Additional charges apply to MILSPEC preservation, packaging, packing and marking.

Product and Specifications Changes

The information, illustrations and specifications contained in this catalog were current at the time of publication. Maury Microwave is continually striving to upgrade and improve our product offering and therefore, reserves the right to change specifications, designs and models without notice and without incurring any obligation to incorporate new features on products previously sold.

Because products are changed or improved with time, please consult your local Maury representative, or our Sales Department, for current pricing and product information before placing orders.

Product Selection

Maury representatives and sales office personnel are well qualified to provide assistance in product selection, and current pricing and availability. Our factory applications engineers are ready to assist you with any technical or applications questions you may have.

Service and Support

Warranty

Maury Microwave is highly confident that our products will perform to the high levels that our customers have come to expect. As an expression of that confidence, our products are warranted as noted in the abbreviated warranty statements below. (For a complete statement of the hardware warranty, please see Form 228, Terms and Conditions of Sales. For a complete statement of the software warranty, please see Form 273, Maury License Agreement.)

Maury Microwave hardware products are warranted against defects in material and workmanship for a period of one year after delivery to the original purchaser. If a Maury manufactured hardware product is returned to the factory with transportation prepaid and it is determined by Maury that the product is defective and under warranty, Maury will service the product, including repair or replacement of any defective parts thereof. This constitutes Maury's entire obligation under this warranty.

Maury warrants that, for a period of ninety (90) days following purchase, software products, including firmware for use with and properly installed on a Maury designated hardware product, will operate substantially in accordance with published specifications, and that the media on which the product is supplied is free from defects in material and workmanship. Maury's sole obligation under this warranty is to repair or replace a nonconforming product and/or media, provided Maury is notified of nonconformance during the warranty period. Maury does not warrant that the operation of the product shall be uninterrupted or error-free, nor that the product will meet the needs of your specific application.

The warranty does not apply to defects arising from unauthorized modifications, misuse or improper maintenance of the product. Warranty service is available at our facility in Ontario, California.

Service Returns

Repair and calibration services are available for Maury products for as long as replacement parts are available. On some instruments, support services may be available for up to ten years.

Quality Profile

Maury Microwave Corporation enjoys a well-earned reputation for excellent, technically advanced products that are reliable, meet specifications, and provide a quality appearance. Maintaining and improving this reputation requires adherence to strict quality standards that are set forth in a formal Quality Department Manual. This manual is distributed to all Maury managers, inspectors, and technicians. The Quality Manual can be reviewed by our customers at our facility in Ontario, California.

Our inspection and calibration systems are in accord with MIL-I-45208A and MIL-STD-45662A, respectively. Our overall quality system has been approved through in-house surveys by many of our customers including the U.S. Government. Our laboratory is ANSI/NCSL Z540-1 compliant with traceability to NIST.

MAURY MICROWAVE CORPORATION IS AN

1SO 9001:2008/AS9100:2009 Rev C REGISTERED COMPANY.

About Maury Microwave

Corporate Profile

Maury and Associates was founded by Mario A. Maury, in Montclair, California on October 15, 1957. With the help of his sons, Mario A. Maury, Jr. and Marc A. Maury, the company earned a solid reputation in the microwave test, measurement and calibration industry. Today, after more than 54 years, we serve our customers as Maury Microwave Corporation. We have are dedicated to the pursuit of quality, and committed to providing the very best in customer service.

Markets Served

Maury Microwave serves all areas of the RF and microwave industry, providing a comprehensive line of automated tuners, microwave components and accessories that operate from DC to 110 GHz. This includes a wide range of test and measurement products used extensively by the wireless communication industry for power and noise characterization of transistors and amplifiers. Our precision calibration solutions are used for test and measurement applications and production testing. Maury also produces system components for ground based and airborne applications such as communications, EW/ECM systems, and radar.

Manufacturing Technologies

Our factory is equipped with the latest 7-axis CNC machines and can handle high volume production as well as high precision small-quantity manufacturing. We maintain a state-of-the-art microwave laboratory using the latest test equipment and vector network analyzers to support our test and calibration operations. Our in-house manufacturing and testing capabilities allow us to provide products tailored to our customers' specific requirements.

Strategic Alliances

As a leader in the RF and microwave calibration and measurement field, Maury has long been recognized for the accuracy, repeatability, and stability of our products. Agilent Technologies acknowledged this in September, 2001 by inviting Maury Microwave to become a Channel Partner for device characterization solutions. The ongoing success of that relationship led to Maury's current recognition as an Agilent Global Solutions Partner. Maury has strategic alliances with AMCAD Engineering of Limoges, France and Anteverta Microwave B.V., of Delft, Netherlands (see page 18). We also enjoy close business ties with Cascade Microtech of Beaverton, Oregon.

Technical Services

Our extensive knowledge and experience with calibration and measurement requirements provides the expertise necessary for producing high quality products. Maury Calibration and Repair Services are available for every product we make, and are performed in a temperature-controlled environment with the latest in measurement and verification equipment.

Products & Technologies

Maury makes RF and microwave devices that cover a range from DC to 110 GHz, primarily addressing test and measurement applications. Coaxial components are available to 67 GHz in most popular line sizes and we also manufacture waveguide components from WR650 to WR10.

Maury's extensive line of VNA calibration kits also supports

Agilent's PNA and ENA series, as well as Rohde and Schwarz ZV series and Anritsu 37000 series and Vector Star network analyzers. Also, new digital connector gage kits are now available in 3.5mm/2.92mm and 2.4mm/1.85mm combination models.

Facilities

Located in the City of Ontario, California, about 40 miles due east of Los Angeles and just north of the San Bernardino Freeway (Interstate 10), our 96,000 square foot facility is within minutes of the Ontario International Airport (ONT). Here, we make the best microwave products in the market.

Maury's Strategic Alliances

In The Test & Measurement Industry

Working Together To Provide The Right Solutions For Your Applications

Agilent Technologies, Inc.

Agilent Technologies

Global Solutions Partner

Agilent's electronic measurement products provide standard and customized electronic measurement instruments and systems, monitoring, management and optimization tools for communications networks and services, software design tools and related services that are used in the design, development, manufacture, installation, deployment and operation of electronics equipment and communications networks and services.

Agilent RF & Microwave test equipment allow Maury's Engineering Experts to provide customer needs with high precision and advanced services (pulsed IV/RF measurements, Load-Pull characterization — CW and pulsed, two-tones, etc.), and are used to support the R&D engineers developing new characterization techniques.

Moreover, as Agilent's solutions partner Maury works closely with Agilent on the development of new applications for the PNA-X which take advantage of its advanced features and extend and enhance its capabilities into high-power, high-speed and 50 ohm environments.

Anteverta Microwave

anteverta microwave

Anteverta microwave provides pioneering solutions in the fields of device characterization and high performance power amplifier design. We seek to offer the industrial and R&D world with system solutions addressing the most demanding needs in terms of speed, accuracy and multifunctional capabilities.

Anteverta microwave was launched in March 2010 as a spin-off from the Delft University of Technology in The Netherlands. Anteverta microwave was born as the development of a decade of successful research in the fields of large signal device characterization and high efficiency/linearity PA design. In May 2010 Anteverta microwave licensed its products to Maury Microwave Corporation to merge its innovative side with the strengths of the most reliable provider of non-linear characterization systems.

AMCAD Engineering

AMCAD Engineering

Advanced Modeling for Computer-Aided Design

AMCAD is a provider of new RF & Microwave solutions. Founded in 2004 with Headquarters and Lab in Limoges, France, its founders have brought together a multi-disciplinary and high skilled team.

Core Activities:

Development and provision of solutions and tools for semiconductor professionals, with emphasis on Component Measurements and Modeling, Circuit Design and Systems Behavioral Modeling. AMCAD Products include Advanced Pulsed IV / RF systems and IVCAD data management software. AMCAD's Pulsed IV/RF System is an advanced components characterization system that is essential to semiconductor technology development, device reliability and lifetime testing, and semiconductor device modeling. Its key features include 10A-240V pulse generation, pulse widths down to 200ns, high precision current and voltage measurement, synchronized S2P capabilities to 40 GHz, and self-heating and trapping phenomena characterization; all of which makes it the idea system for modeling a wide range of devices

Maury Microwave Corporation
ISO 9001:2008 — AS9100:2009 Rev C Documentation

Maury Microwave Corporation is registered as conforming to ISO 9001:2008 with AS9100:2009 Rev C for Design, Manufacturing and Servicing of Microwave Based Measuring and Testing Equipment for the Aerospace, Defense and Wireless Telecom Industries.

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ANAB ACCREDITED
Accredited by member of the IAF MLA for QMS

Certificate No. 3867 (Reissued May 8, 2013- 2 Copies)
January 12, 2012 through January 11, 2015

Certificate of Registration

This is to certify that the Quality Management System of

Maury Microwave
Your Calibration, Measurement & Modeling Solutions Partner

2900 Inland Empire Boulevard, Ontario, California 91764 USA
Site definition: Single

Has been assessed by EAGLE Registrations Inc. and
conforms to the following standard:

ISO 9001:2008 with AS9100:2009 Rev C

This assessment was performed in accordance with the requirements of AS9104/1:2012
EAGLE Registrations Inc. is accredited under the aerospace Registrar Management Program

Scope of Registration

Design Manufacturing and Servicing of Microwave Based Measuring and Testing Equipment for the Aerospace, Defense and Wireless Telecom Industries.

Chief Technical Officer

Calibration and Repair Services

Calibration Services

At Maury Microwave, our commitment to quality doesn't end with the sale of a product. In our state-of-the-art microwave laboratory, we offer both ANSI/NCSL Z540-1 (MIL-STD-45662A) calibration and commercial level calibration services for every product we produce. Our laboratory is ANSI/NCSL Z540-1 ISO 10012-1 compliant with traceability to NIST (National Institute of Standards and Technology).

Each Maury Microwave product is shipped with a certificate of conformance which assures that it has been tested and found to be within operational tolerances. As these products are used, changes can occur which may result in an out-of-tolerance condition. Periodic calibrations are therefore recommended to maintain functional integrity. We are happy to perform the calibrations you need at a reasonable cost.

Please contact our Calibration and Repair – Measurement Services Department to obtain quotations for the specific calibration services you require. Quoted prices will cover the cost of all applicable measurements and include written calibration reports documenting the mechanical and electrical data. If parts are out of tolerance, the cost of repair or replacement will be quoted for your approval prior to the start of any additional work.

It is highly recommended that the following items be maintained on a 12-month re-calibration cycle:

- Calibration Kits
- Verification Kits
- Coaxial Components for Laboratory Use
- Waveguide Components for Laboratory Use
- Automated Tuner Systems
- Noise Calibration Systems (Cryogenic, Thermal and Ambient Terminations) Mechanical Products
- Torque Wrenches
- Connector Gages

Repair Services

Maury products are renown for their ruggedness and long service life, but over time your Maury products may need repair. This may be detected during annual re-calibration and refurbishment. As the original equipment manufacturer, we understand the critical performance criteria of your measurement equipment. When repairs are necessary, we will always provide you with an honest evaluation of each and every Maury part. We will also provide you with options and our best recommendation for restoring your parts to their optimum performance.

Annual re-calibration and servicing guarantees:

- Accuracy and Confidence in your Network Analyzer Measurements
- Precision Connector Mating
- Verification of Critical Mechanical and Electrical Specifications
- All Interfaces meet "As New" Mechanical Specifications to Ensure Predictable S-Parameter Performance
- Prolonged Life of Both Maury Measurement Standards and Your Network Analyzers
- Confidence That Your Maury Product Will Be As Precise As When First Delivered
- Refurbishment Done Right and Done Here In Our Factory
- Guaranteed Genuine Maury Parts and Quality
- We Design It, Build It, Calibrate It and Repair It.

Benefits of Maury Calibration and Repair:

- Calibration and Repairs Performed Directly By The OEM (No Middleman Delays or Mark-Ups!)
- Complete Confidence In Your Measurements
- Protects Your Costly Network Analyzer Investment
- Maintains Your ANSI/ISO Compliance and NIST Traceability

VNA Calibration Kit Finder

Use the chart below to find the page(s) in this catalog which have information about Maury VNA Calibration Kits

Cal Kit Information Finder

Locate the right catalog page(s) for the kit you need

DUT CONNECTOR	SOLT Kits								SSLT Kits		TRL/LRL Kits
	• Standard Coaxial (Sliding Load) Kits	• Expanded Coaxial (Connector Gages) Kits	• Fixed Termination Coaxial Kits	• Fixed Single-Sex Coaxial Kits	• Economy Coaxial Kits	• Standard Waveguide Kits	• Economy Waveguide Kits	• Optimized Waveguide Kits	• Coaxial Kits	• Coaxial Economy Kits	• Waveguide Kits
• 1.85mm									26		
• 2.4mm	26		27	27					28		
• 2.92mm (K)	30		31						32		
• 3.5mm	34	34	35		63				36		
• 7mm	38		39						41	63	
• Type N (50 ohm)	42		43		63				44		
• Type N (75 ohm)			46-47								
• TNC	48		49		63						
• AFTNC	50		50								
• TNCA	52		52								
• BNC (50 ohm)			54		63						
• BNC (75 ohm)			55	55							
• OSP™	56		56	57							
• 14mm		58									
• 7-16			59	60					61		
• Rectangular Waveguide						64	67				68
• Millimeter Waveguide							66	65			68

Other, less common connector types, such as BZ, ZMA, C, HN, SC, Multiport and EIA 1-5/8 are also available as Special Calibration Kits (see page 23).

To order any of these Special Calibration Kits, please contact our Sales Department.

Ordering Maury Cal Kits by Model Numbers

Ordering Options

To order a kit configured to match your VNA model and specific application, go to the page(s) indicated in the matrix chart above. There you will find a diagram like the one below which explains how to order options by adding the final two digits to the kit model number.

1. Find the row in the first column on the left in the chart above for your DUT connector type.
2. Follow that row across to the column for the type or method of calibration you want to do. (See the detailed methodology information on the reverse of this page.) The number indicates the catalog page with the proper Maury kit for your needs.
3. In the Ordering Options chart on the page for your kit, locate the column for your VNA model and follow it down to the row for your VNA test port connector type.
4. Add the numbers shown to the end of the kit model number to specify the adapter and software options you desire.

Network Analyzer Calibration Methodologies

Why do we need to calibrate?

Imperfections exist in even the finest test equipment and, if uncorrected, these imperfections will cause the equipment to yield less than ideal measurements. The basis of network analyzer error correction is the measurement of known electrical standards, such as a through, open circuit, short circuit, and precision load impedance. By calibrating your network analyzer with these standards, you can compensate for its inherent imperfections. The information below addresses some of the most critical factors in VNA calibration, ending with a brief survey of the more widely used calibration methodologies that can be performed with Maury Precision VNA Calibration Kits.

Calibration Procedures

Calibration procedures include the popular Short-Open-Load or Short-Open-Load-Thru (SOLT) calibration technique, SSLT for waveguide, and Thru-Reflect-Line (TRL).

Sources and Types of Errors

All measurement systems, including those employing network analyzers, have three types of measurement errors:

- Systematic errors
- Random errors
- Drift errors

Systematic errors are caused by imperfections in the test equipment and test setup. If these errors do not vary over time, they can be characterized through calibration and mathematically removed during the measurement process.

Error Correction

Vector error correction is the more thorough method of removing systematic errors. This type of error correction requires a network analyzer capable of measuring (but not necessarily displaying) phase as well as magnitude, and a set of calibration standards with known, precise electrical characteristics.

The vector-correction process requires the open, short, load, and sometimes thru calibration standards. The two main types of vector error correction are the one-port and two-port calibrations.

One-Port Calibration

A one-port calibration can measure and minimize three systematic error terms (directivity, source match, and reflection tracking) from reflection measurements. Three known calibration standards must be measured, such as a Short, Open, and a Load (the load value is usually the same as the characteristic impedance of the test system, generally either 50 or 75 ohm). One-port calibration makes it possible to derive the DUT's actual reflection S-parameters.

Two-Port Error Correction

Two-port error correction yields the most complete calibration because it accounts for the three major sources of systematic error addressed by one-port calibration at both ports of a two-port DUT. Traditional full two-port calibrations utilize three impedance standards and one transmission standard to define the calibrated reference plane. These standards, typically a Short, Open, Load, and Thru, make up the SOLT calibration kit. The most common Thru used is the test ports connected directly together.

TRL Calibration

Following SOLT in popularity, the next most common form of two-port calibration is called a Thru-Reflect-Line (TRL) calibration. TRL corrects the same error terms as a SOLT calibration, although it uses different calibration standards.

Other variations of TRL are Line-Reflect-Line (LRL), (LRM) based on Line-Reflect-Match (load) calibration standards or Thru-Reflect-Match (TRM) calibration standards.

In non-coaxial applications such as waveguide, TRL usually achieves better source match and load match corrections than SOLT. While not as commonly used, coaxial TRL can also provide more accuracy than SOLT, but only if very-high quality coaxial transmission lines (such as beadless airlines) are used.

Maury Microwave includes precision beadless air lines in our coaxial TRL calibration kits providing the capability to perform the most accurate calibration possible.

Why use Sliding Loads?

When performing a SOL, SOLT, or SSLT (waveguide) calibration the impedance standard is the Load. At frequencies above 2 GHz (4 GHz for 2.4mm) sliding loads are more accurate impedance standards. Therefore Sliding Loads will provide a better calibration at higher frequencies. (Reduced directivity error)

A summary of these calibrations is shown below:

One-port calibration methods

(**SOL**) **S**hort-**O**pen-**L**oad calibration

– Response calibration for measuring VSWR/Return Loss.

(**SSL**) **S**hort-**S**hort-**L**oad calibration

– Calibration for measuring VSWR/Return Loss in waveguide applications

Two-Port full calibration methods

(**SOLT**) **S**hort-**O**pen-**L**oad-**T**hru

– Full two-port calibration for performing forward and reverse transmission and reflections measurements.

(**SSLT**) **S**hort-**S**hort-**L**oad-**T**hru

– Full two-port calibration for performing forward and reverse transmission and reflections measurements.

(**TRL**) **T**hru-**R**eflect-**L**ine

– Full two-port calibration for performing forward and reverse transmission and reflections measurements.

Maury VNA Calibration Kits

General Information

Features

- *Broad VNA Coverage*
- *Accurate VNA Calibration*
- *DC to 110 GHz*
- *All Popular Coaxial Connector Types and Waveguide Flange Sizes*
- *Standard Kits, Fixed Termination Kits, Expanded Kits, and Economy Kits are Offered for most DUT connector types*

General

When properly calibrated against known standards, Vector Network Analyzers (VNAs), provide the most accurate means of determining the one- and two-port network characteristics of RF and microwave devices. Calibration effectiveness (a VNA's ability to reduce error terms to negligible values) critically and ultimately depends on the quality and integrity of the calibration standards used.

To help maximize calibration effectiveness, Maury produces a comprehensive line of coaxial and waveguide VNA calibration kits which incorporate accurate, stable, and precise calibration standards for a broad range of VNA models. When properly used, these kits ensure a true evaluation of VNA performance.

Maury kits offer a range of performance and cost options which provide users with choices that are both technically and economically suitable for a variety of intended application.

Coaxial kits are available for testing VNAs fitted with any of the modern, popular connectors, including: 1.85mm, 2.4mm, 2.92mm (K), 3.5mm (also used for SMA testing), Type N, TNC (and AFTNC) , BNC, 7mm, 14mm (formerly GR900), and 7-16.

Other, less common connector types, such as BZ and ZMA are also available as Special Calibration Kits.

Maury also produces kits for OSP™[1], C, SC, HN and EIA connectors (7/8, 1-5/8, and 3-1/8). Please contact our Sales Department if you have a requirement in any of these connector types.

Waveguide kits are available in all common, standard rectangular sizes from WR430 (1.7 to 2.6 GHz) through WR10 (75 to 110 GHz). Maury has also produced kits in less common rectangular size such as WR102 (7 to 11 GHz) and in half-height waveguide. If you require a calibration kit in a nonstandard or rarely used waveguide type please contact our Sales Department.

Special Calibration Kits

Maury frequently configures unique or highly specialized calibration kits based on customer-specified component lists. Whether in coax or waveguide, Maury can provide custom calibration kits to meet your exact needs. Customizing may include special packaging; addition, deletion or substitution of components; single sex coaxial kit configurations; and special waveguide flanges. Maury also offers several coaxial and waveguide kits that are configured in economy versions, made up of the minimum number of components necessary to provide an accurate calibration of specified VNA. If your calibration needs are not covered by our standard or expanded kits, our sales department can assist you in defining a special configuration.

Special Packaging

Most of our calibration kits are housed in foam-lined wooden instrument cases. In some applications, more rugged or specialized packaging may be required. Maury offers special packaging options which include a molded plastic case for “assembly line” use, extremely small cases for single sex coaxial kits, and a briefcase configuration for field use.

Component Changes

Calibration kits can be configured to include the exact components needed for your VNA calibration. Coax-to-coax and waveguide-to-coax adapters can be changed to meet your interface needs. Reference air lines, sliding loads, gage kits, etc., can also be added or deleted.

Single Sex Coaxial Kits

Most of Maury's standard or expanded calibration kits include male and female components. Maury also offers single sex kits which are very economical alternatives for production line calibrations that require only a single sex version of a particular connector.

Special Waveguide Flanges

European designation, half-height or special index pin/bolt pattern waveguide flanges can be incorporated into a special kit. Please provide a flange drawing that describes your special flange when requesting a price quote.

If you do not find a kit to meet your calibration needs, please contact our Sales Department or your local Maury representative for assistance.

[1] "OSP™" is the M/A-Com Omni-Spectra designation. See Maury data sheet 5E-065 for interface details.

1.85mm TRL/LRL VNA Calibration Kits

7860A Series


7860A07

Features

- *1.85mm Connectors*
- *TRL/LRL Calibrations*
- *DC to 67 GHz (Operates DC to 70 GHz)*
- *Broad VNA Coverage*

Description

These precision 1.85mm calibration kits are designed for use with a broad range of vector network analyzers (VNAs). The components in the kits are configured for use in making error-corrected TRM/TRL/LRL measurements of devices supplied with 1.85mm connectors, from DC to 67 GHz.

Each kit includes a full complement of calibration standards (shorts, opens, and fixed loads) and can be configured for any combination of VNA or test set/cable connectors. User-specified VNA software and a set of adapters are included. All kit components come housed in an attractive, foam-lined, wood instrument case.

TRM/TRL/LRL Calibration

The 7860A series kits are configured for three calibration methods (TRM/TRL/LRL). Source match can also be measured using the 3.00cm air line with the short circuit. The table below shows the frequency ranges, calibration methods, and the standards used to perform a complete 2-port calibration to 67 GHz.

FREQUENCY RANGE	CALIBRATION METHOD	CALIBRATION STANDARDS
DC – 800 MHz	TRM	Fixed Termination
800 MHz – 4.0 GHz	TRL	3.00cm air line
4.0 GHz – 13.0 GHz	TRL	0.96cm air line
13.0 GHz – 67.0 GHz	LRL	0.96cm & 1.15cm air lines

Components Included in 7860A Kits

QUANTITY	DESCRIPTION	MODEL
1	1.85mm female to male air line (0.96cm)	7843S0.96
1	1.85mm female to male air line (1.15cm)	7843S1.15
1	1.85mm female to male air line (3.00)	7843S3.00
1	1.85mm female fixed short	7846A
1	1.85mm male fixed short	7847A
1	1.85mm female fixed termination	7831A1
1	1.85mm male fixed termination	7831B1
1	Torque wrench (8 in. lbs)	8799A1
1	5/16-inch double end wrench	—
1	3/16-inch double end wrench	—
1	VNA software media (flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the ***Ordering Options*** below. (See page 25 for adapter set composition.)

Recommended Accessories

A048A Digital connector gage kit (thread-on type) See page 112.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 7860A kit configured with the adapters and software needed for use with an Agilent PNA that has 1.85mm or 2.4mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 25)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
1.85mm or 2.4mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
	2	20	21	24	25	27	29
2.92mm or 3.5mm[1]	3	30	31	34	35	37	39

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-053.

1.85mm VNA Calibration Kit Adapter Sets

7850Z1, 7850Z2, & 7850Z3 Sets

Features

- *DC to 67 GHz (Usable to 70 GHz)*
- *High Performance*
- *Phase Matched Within Connector Types*

Description

The NMD1.85mm test port adapters in these sets are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision 1.85mm adapters are of minimum length and feature low VSWR with low insertion loss. The sets described on this page are configured to provide users with the ability to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered in separately boxed sets, as options shipped with their corresponding VNA calibration kits, or as individual adapters (by model number) to serve as replacement parts or spares.

Adapters Included in 7850Z1 Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	1	NMD1.85mm female to 1.85mm female	7809A1
	1	NMD1.85mm female to 1.85mm male	7809A2
	1	1.85mm female to 1.85mm female	7821A
	1	1.85mm male to 1.85mm male	7821B
	1	1.85mm female to 1.85mm male	7821C

Adapters Included in 7850Z2 Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
2	1	1.85mm female to 1.85mm female	7821A
	1	1.85mm male to 1.85mm male	7821B
	1	1.85mm female to 1.85mm male	7821C

Adapters Included in 7850Z3 Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
3	1	1.85mm female to 2.92mm female	7826A
	1	1.85mm female to 2.92mm male	7826B
	1	1.85mm male to 2.92mm female	7826C
	1	1.85mm male to 2.92mm male	7826D

Maury also offers 1.85mm between series precision adapters and Test Port adapters in the following configurations. See pages 119-122 for specifications:

- 1.85mm to 2.4mm, 1.85mm to 2.92mm and 1.85mm to 3.5mm
- NMD1.85mm (f) to 1.85mm (f/m)
- NMD1.85mm (f) to NMD1.85mm (m)
- NMD1.85mm (f)) to NMD2.4mm (m)
- NMD1.85mm (f) to 2.92mm (f/m)
- NMD1.85mm (f) to 3.5mm (f/m)
- NMD1.85mm (f) to 7mm
- NMD1.85mm (f) to Type N (f/m)

Adapter Specifications

The Maury precision 1.85mm in-series adapters and the NMD1.85mm test port adapters included in these sets have the following specifications:

Ruggedized Test Port Adapters

Models 7809A1 and 7809A2 *(for more detail see page 119)*

Frequency Range . . . . . DC to 70.0 GHz

Maximum VSWR:

DC to 26.5 GHz . . . . . ≤ 1.10

26.5 to 40.0 GHz . . . . . ≤ 1.15

40.0 to 67.0 GHz . . . . . ≤ 1.20

Nominal Impedance . . . . . 50 ohm

Precision 1.85mm Adapters

Models 7821A/B/C *(for more detail see pages 120-121)*

Frequency Range . . . . . DC to 70.0 GHz

Maximum VSWR:

DC to 26.5 GHz . . . . . ≤ 1.06

26.5 to 40.0 GHz . . . . . ≤ 1.10

40.0 to 67.0 GHz . . . . . ≤ 1.15

Nominal Impedance . . . . . 50 ohm

Models 7826A/B/C/D *(for more detail see pages 120-121)*

Frequency Range . . . . . DC to 70.0 GHz

Maximum VSWR:

DC to 4.0 GHz . . . . . ≤ 1.05

4.0 to 20.0 GHz . . . . . ≤ 1.08

20.0 to 40.0 GHz . . . . . ≤ 1.12

Nominal Impedance . . . . . 50 ohm

2.4mm VNA Calibration Kits

7950A Series Standard Kits

7950A07

Features

- *2.4mm Connectors*
- *DC to 50 GHz*
- *Supports Sliding Load SOLT Calibration*
- *Broad VNA Coverage*

Description

These 2.4mm calibration kits are designed for use with a broad range of Vector Network Analyzers (VNAs). The components in the kits are configured for use in making error-corrected measurements of devices supplied with 2.4mm connectors, from DC to 50 GHz. Each kit includes a full complement of calibration standards (as listed at right) and can be configured for any combination of VNA or test set/cable connectors. All kit components come housed in an attractive, foam-lined, wood instrument case.

Connector Description

The precision 2.4mm connectors are miniature, instrument grade, air-interface connectors that operate mode free up to 50 GHz, and comply with IEEE standard 287 general precision connector, instrument grade—GPC2.4. For interface specifications please refer to Maury data sheet 5E-064.

Recommended Accessories

A048A Digital connector gage kit (thread-on type). See page 112.

Components Included in 7950A Kits

QUANTITY	DESCRIPTION	MODEL
1	2.4mm female fixed short	7946A
1	2.4mm male fixed short	7946B
1	2.4mm female open	7948A1
1	2.4mm male open	7948B1
1	2.4mm female fixed termination	7931A1
1	2.4mm male fixed termination	7931B1
1	2.4mm female sliding termination	7935A
1	2.4mm male sliding termination	7935B
1	Sliding termination pin depth adjustment tool	8777S02
1	Torque wrench (8 in. lbs)	8799A1
1	5/16-inch double end wrench	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 29 for specifications.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 7950A kit configured with the adapters and software needed for use with an Agilent PNA that has 1.85mm or 2.4mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 29)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
1.85mm or 2.4mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
	2	20	21	24	25	27	29

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-050.

2.4mm VNA Calibration Kits

7950B/F/M Fixed Termination Kits

7950B07

Features

- *2.4mm Connectors*
- *DC to 50 GHz*
- *High Performance*
- *Broad VNA Coverage*

Description

These precision 2.4mm connector calibration kits are designed for use with a broad range of vector network analyzers (VNA). With these kits, you can make error-corrected measurements of devices equipped with 2.4mm connectors from DC to 50 GHz.

Each kit includes a full complement of calibration standards (shorts, opens, and fixed loads) and can be configured for any combination of VNA or test set/cable connectors. User-specified VNA software and a set of adapters are included. All kit components come housed in an attractive, foam-lined, wood instrument case.

Connector Description

The precision 2.4mm connectors on the components in this kit are miniature, instrument grade, air-interface connectors that operate mode free up to 50 GHz, and comply with IEEE standard 287 general precision connector, instrument grade GPC2.4. For interface specifications please refer to Maury data sheet 5E-064.

Recommended Accessories

A048A Digital connector gage kit (thread-on type). See page 112.

Components Included in 7950B Kits

QUANTITY	DESCRIPTION	MODEL
1	2.4mm female fixed short	7946A*
1	2.4mm male fixed short	7946B**
1	2.4mm female open	7948A1*
1	2.4mm male open	7948B1**
1	2.4mm female fixed termination	7931A1*
1	2.4mm male fixed termination	7931B1**
1	Torque wrench (8 in. lbs)	8799A1
1	3/16-inch double end wrench	—
1	5/16-inch double end wrench	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 29 for adapter specifications.)

*Included in 7950F single sex kits but not in 7950M single sex kits.

**Included in 7950M single sex kits but not in 7950F single sex kits.

Components Included in 7950F/M Kits

7950F and 7950M are single sex kits which include the components listed above, but only those with female (7950F) or male (7950M) connectors respectively.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 7950B kit configured with the adapters and software needed for use with an Agilent PNA that has 1.85mm or 2.4mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 29)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
1.85mm or 2.4mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
	2	20	21	24	25	27	29

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-050.

2.4mm TRL/LRL VNA Calibration Kits

7960A Series Tri-Kits

Features

- *Supports TRM/TRL/LRL, SOLT, and Short-Open-(Air Line + Load) Calibrations*
- *Gated Air Line*
- *Fixed Load*
- *DC to 50 GHz*

7960A07

Description

These 2.4mm calibration kits are designed for use with a range of vector network analyzers (VNA). With these kits, you can make error-corrected measurements of devices equipped with 2.4mm connectors from DC to 50.0 GHz.

TRM/TRL/LRL Calibration

Maury TRL/LRL calibration kits are tri-kits that contain the components needed to perform three types of calibrations (TRM/TRL/LRL, SOLT, and short-open-(air line + load). Source match can also be measured using the 6.25cm air line and provided short circuit. The table below shows the frequency ranges, calibration methods, and the standards used to perform a complete 2-port calibration to 50 GHz.

FREQUENCY RANGE	CALIBRATION METHOD	CALIBRATION STANDARDS
DC – 400 MHz	TRM	Fixed Termination
400 MHz – 2.0 GHz	TRL	6.25cm air line
2.0 GHz – 10.0 GHz	TRL	1.25cm air line
10.0 GHz – 50.0 GHz	LRL	1.25cm & 1.50cm air lines

Components Included in 7960A Kits

QUANTITY	DESCRIPTION	MODEL
1	2.4mm female to male air line (1.25cm)	7943S1.25
1	2.4mm female to male air line (1.50cm)	7943S1.50
1	2.4mm female to male air line (6.25cm)	7943S6.25
1	2.4mm female open	7948A1
1	2.4mm male open	7948B1
1	2.4mm female fixed short	7946A
1	2.4mm male fixed short	7946B
1	2.4mm female fixed termination	7931A1
1	2.4mm male fixed termination	7931B1
1	Torque wrench (8 in. lbs)	8799A1
1	3/16-inch double end wrench	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 29 for adapter specifications.)

Recommended Accessories

A048A Connector gage kit (thread-on type). See page 112.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 7960A kit configured with the adapters and software needed for use with an Agilent PNA that has 1.85mm or 2.4mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 29)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
1.85mm or 2.4mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
	2	20	21	24	25	27	29

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-051.

2.4mm VNA Calibration Kit Adapter Sets

7950Z3 & 7950Z4 Sets

Features

- *NMD2.4mm to 2.4mm and 2.4mm In-Series Adapters*
- *DC to 50 GHz*
- *High Performance*
- *Phase Matched Within Connector Types*

Description

The NMD2.4mm test port adapters in these sets are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision 2.4mm adapters are feature low VSWR and low insertion loss and are of minimum length. The sets described on this page are configured to provide users with the ability to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered in separately boxed sets, as options shipped with their corresponding VNA calibration kits, or as individual adapters (by model number) to serve as replacement parts or spares.

Adapters Included in 7850Z3 Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	1	NMD2.4mm female to 2.4mm female	7909A1
	1	NMD2.4mm female to 2.4mm male	7909A2
	1	2.4mm female to 2.4mm female	7921A
	1	2.4mm male to 2.4mm male	7921B
	1	2.4mm female to 2.4mm male	7921C

Adapters Included in 7850Z4 Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
2	1	2.4mm female to 2.4mm female	7921A
	1	2.4mm male to 2.4mm male	7921B
	1	2.4mm female to 2.4mm male	7921C

Maury also offers 2.4mm between series precision adapters and Test Port adapters in the following configurations. See pages 122-124 for specifications:

- 2.4mm to 2.92mm
- 2.4mm to 3.5mm
- 2.4mm to 7mm
- 2.4mm to Type N
- NMD2.4mm (f) to 1.85mm (m)
- NMD2.4mm (f) to 2.4mm (f/m)
- NMD2.4mm (f)) to NMD2.4mm (m)
- NMD2.4mm (f) to 2.92mm (f/m)
- NMD2.4mm (f) to 3.5mm (f/m)
- NMD2.4mm (f) to 7mm
- NMD2.4mm (f) to Type N (f/m)

Adapter Specifications

The Maury precision 2.4mm in-series adapters and the NMD2.4mm test port adapters included in these sets have the following specifications:

Ruggedized Test Port Adapters

Models 7909A1 and 7909A2 *(for more detail see page 122)*

Frequency Range . . . . . DC to 50.0 GHz

Maximum VSWR:

DC to 4.0 GHz 1.05

4.0 to 20.0 GHz 1.08

20.0 to 50.0 GHz 1.12

Nominal Impedance . . . . . 50 ohm

Precision 2.4mm Adapters

Models 7921A/B/C *(for more detail see page 123)*

Frequency Range . . . . . DC to 50.0 GHz

Maximum VSWR:

DC to 26.5 GHz 1.06

26.5 to 40.0 GHz 1.10

40.0 to 50.0 GHz 1.15

Nominal Impedance . . . . . 50 ohm

Note: Adapter options for single sex kits (7950F and 7950M) contain only the appropriate female or male adapters.

2.92mm (K) VNA CALIBRATION KITS

8770C Standard Kits

Features

- *2.92mm (K) Connectors*
- *DC to 40 GHz*
- *High Performance Sliding Terminations*
- *Verified Kit Performance*

Description

These precision 2.92mm (K) connector calibration kits can be used with a range of Vector Network Analyzers (VNAs) to make error-corrected measurements of devices equipped with K connectors from DC to 40 GHz. Each kit includes a full complement of calibration standards (listed at right) and can be configured for a number of VNA or test set/cable connector combinations. All kit components are housed in an attractive foam-lined wooden instrument case. Each kit is tested for 100% compliance to the following kit specifications and a performance verification report is provided.

Specifications for 8770C Series Kits

Frequency Range . . . . . DC to 40.0 GHz
Minimum Directivity:
DC to 20.0 GHz . . . . . 42 dB
20.0 to 40.0 GHz . . . . . 40 dB
Minimum Source Match:
DC to 20.0 GHz . . . . . 40 dB
20.0 to 40.0 GHz . . . . . 35 dB
Nominal Impedance. . . . . 50 ohm

Connector Description

The K connector is a precision miniature 2.92mm air line interface connector that operates mode free to 40 GHz. It is fully mateable with SMA and 3.5mm connectors. This interface was first introduced by Maury in 1974 as the MPC3 connector and reintroduced as the K connector by Wiltron in 1984. For interface specifications please refer to Maury data sheet 5E-063.

Components Included in 8770C Kits

QUANTITY	DESCRIPTION	MODEL
1	2.92mm female fixed short	8771F1
1	2.92mm male fixed short	8772F1
1	2.92mm female open	8773A1
1	2.92mm male open	8773B1
1	2.92mm female fixed termination	8775A2
1	2.92mm male fixed termination	8775B2
1	2.92mm female sliding termination	8777A1
1	2.92mm male sliding termination	8777B1
1	5/16-in. torque wrench (8 in. lbs)	8799A1
1	Sliding termination pin depth adjustment tool	8777S02
1	5/16-inch double end wrench	—
1	7/16-inch double end wrench	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 33 for specifications.)

Recommended Accessories

A050A Digital connector gage kit (thread-on type). See page 112.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8770C kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 33)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
7mm	2	20	21	24	25	27	29
1.85mm or 2.4mm[1]	3	30	31	34	35	37	39
	4	40	41	44	45	47	49

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-034C and 2Z-058.

2.92mm (K) VNA Calibration Kits

8770D Fixed Termination Kits

Features

- *2.92mm (K) Connectors*
- *DC to 40 GHz*
- *Broad VNA Coverage*
- *Fixed Load Calibration*

Description

These 2.92mm (K) calibration kits are designed for use with a range of vector network analyzers (VNA). With these kits, you can make error-corrected measurements of devices equipped with 2.9mm (K) connectors from DC to 40.0 GHz.

Each kit includes a full complement of calibration standards (shorts, opens and fixed loads) and can be configured for a number of VNA or test set/cable connector combinations. All kit components, including the VNA software and operating instructions, are housed in an attractive foam-lined wooden instrument case. Each kit is tested for 100% compliance to kit specifications and a performance verification report is provided.

Connector Description

The K connector is a precision miniature 2.92mm air line interface connector that operates mode free to 40 GHz. It is fully mateable with SMA and 3.5mm connectors. This interface was first introduced by Maury in 1974 as the MPC3 connector and reintroduced as the K connector by Wiltron in 1984. For interface specifications please refer to Maury data sheet 5E-063.

Recommended Accessories

A050A Digital connector gage kit (thread-on type). See page 112.

8799A1 Torque wrench, 5/16-inch (8 in. lbs). See page 114.

Components Included in 8770D Kits

QUANTITY	DESCRIPTION	MODEL
1	2.92mm female fixed short	8771F1
1	2.92mm male fixed short	8772F1
1	2.92mm female open	8773A1
1	2.92mm male open	8773B1
1	2.92mm female fixed termination	8775A2
1	2.92mm male fixed termination	8775B2
1	5/16-inch double end wrench	—
1	7/16-inch double end wrench	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 33 for specifications.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8770D kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 33)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
7mm	2	20	21	24	25	27	29
1.85mm or 2.4mm[1]	3	30	31	34	35	37	39
	4	40	41	44	45	47	49

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-052 and 2Z-058.

2.92mm (K) TRL/LRL VNA Calibration Kits

8760A Series Tri-Kits

Features

- *TRL/LRL Calibrations*
- *SOLT (Short-Open-Load-Thru)*
- *Gated Air Line*
- *DC to 40 GHz*
- *Agilent PNA Versions are Available*

8760A07

Description

These 2.9mm (K) calibration kits are designed for use with a range of vector network analyzers (VNAs). With these kits, you can make error-corrected measurements of devices equipped with 2.9mm (K) connectors from DC to 40.0 GHz.

TRM/TRL/LRL Calibration

Maury TRL/LRL calibration kits contain the components needed to perform TRL calibrations (TRM/TRL/LRL). Source match can also be measured using the 3.00cm air line and provided short circuit. The following table shows the frequency ranges, calibration methods, and the standards used to perform a complete 2-port calibration to 40 GHz.

FREQUENCY RANGE	CALIBRATION METHOD	CALIBRATION STANDARDS
DC – 800 MHz	TRM	Fixed Termination
160 – 800 MHz	TRL	15cm air line
800 MHz – 2.5 GHz	TRL	5cm air line
2.5 GHz – 12.5 GHz	LRL	5cm & 6cm air lines
12.5 GHz – 40 GHz	LRL	5cm & 5.25cm air lines

Components Included in 8760A Kits

QUANTITY	DESCRIPTION	MODEL
1	2.92mm female to male air line (15cm)	8774C15
1	2.92mm female to male air line (5cm)	8774C5
1	2.92mm female to male air line (6cm)	8774C6
1	2.92mm female to male air line (5.25cm)	8774C5.25
1	2.92mm female open	8773A1
1	2.92mm male open	8773B1
1	2.92mm female fixed short	8771F1
1	2.92mm male fixed short	8772F1
1	2.92mm female fixed termination	8775A2
1	2.92mm male fixed termination	8775B2
2	5/16-inch double end wrenches	—
1	7/16-inch double end wrench	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 33 for details.)

Recommended Accessories

A050A Digital connector gage kit (thread-on type). See page 112.
8799A1 Torque wrench, 5/16-inch (8 in. lbs). See page 114.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8760A kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 33)	VNA SOFTWARE OPTIONS					
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	0	—	01	04	05	07	09
	1	10	11	14	15	17	19
7mm	2	20	21	24	25	27	29
1.85mm or 2.4mm[1]	3	30	31	34	35	37	39
	4	40	41	44	45	47	49

1 1.85mm and 2.4mm connectors are fully mateable, as are 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-052 and 2Z-058.

2.92mm (K) VNA Calibration Kit Adapter Sets

8770Z1/Z2/Z3/Z4 Sets

Features

- *DC to 40 GHz*
- *High Performance*
- *Phase Matched Within Model Series*

Description

The NMD2.92mm test port adapters in these sets are designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision 2.92mm adapters feature low VSWR with low insertion loss and are of minimum length. The sets described here are configured to allow users to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered in separately boxed sets, as options shipped with their corresponding VNA calibration kits, or individually (by model number) as replacement parts or spares.

Adapters Included in 8770Z1 (2.92mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	1	NMD2.92mm female to 2.9mm (K) female	8719A
	1	NMD2.92mm female to 2.9mm (K) male	8719B
	1	2.9mm (K) female to 2.9mm (K) female	8714A2
	1	2.9mm (K) male to 2.9mm (K) male	8714B2
	1	2.9mm (K) female to 2.9mm (K) male	8714C2

Adapters Included in 8770Z2 (7mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
2	2	7mm to 2.9mm (K) female	8725A
	2	7mm to 2.9mm (K) male	8725B

Adapters Included in 8770Z3 (2.4mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
3	1	NMD2.4mm female to 2.9mm (K) female	7909F1
	1	NMD2.4mm female to 2.9mm (K) male	7909F2
	1	2.9mm (K) female to 2.4mm female	7926A
	1	2.9mm (K) male to 2.4mm female	7926B
	1	2.9mm (K) female to 2.4mm male	7926C
	1	2.9mm (K) male to 2.4mm male	7926D

Adapters Included in 8770Z10 (2.92mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
4	1	NMD2.4mm female to 2.9mm (K) female	7909F1
	1	NMD2.4mm female to 2.9mm (K) male	7909F2
	1	2.9mm (K) female to 2.9mm (K) female	8714A2
	1	2.9mm (K) male to 2.9mm (K) male	8714B2
	1	2.9mm (K) female to 2.9mm (K) male	8714C2

Models 8725A/B *(for more detail see page 127)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.05
4.0 to 12.0 GHz 1.07
12.0 to 18.0 GHz 1.10

Adapter Specifications

The Maury precision 2.92mm in-series and between series adapters and the NMD2.92mm test port adapters included in these sets are 50 ohm adapters that have the following specifications:

Ruggedized Test Port Adapters

Models 8719A and 8719B *(for more detail see page 125)*
Frequency Range . . . . . DC to 40.0 GHz
Maximum VSWR:
DC to 4.0 GHz . . . . . ≤ 1.05
4.0 το 20.0 GHz . . . . . ≤ 1.08
20.0 to 40.0 GHz . . . . . ≤ 1.12

Models 7909F1 and 7909F2 *(for more detail see page 122)*
Frequency Range . . . . . DC to 40.0 GHz
Maximum VSWR:
DC to 20.0 GHz . . . . . ≤ 1.10
20.0 to 40.0 GHz . . . . . ≤ 1.16

Precision 2.9mm (K) Adapters

Models 8714A2/B2/C2 *(for more detail see page 126)*
Frequency Range . . . . . DC to 40.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.05
4.0 to 20.0 GHz 1.08
20.0 to 40.0 GHz 1.12

Models 7926A/B/C/D *(for more detail see page 124)*
Frequency Range . . . . . DC to 40.0 GHz
Maximum VSWR:
DC to 4.0 GHz . . . . . ≤ 1.05
4.0 to 20.0 GHz . . . . . ≤ 1.08
20.0 to 50.0 GHz . . . . . ≤ 1.12

8725A

8725B

3.5mm VNA Calibration Kits

8050A Standard Kits & 8050Y Expanded Kits

Features

- *3.5mm In-Series Adapters and 2.4mm to 3.5mm Between-Series Adapters*
- *DC to 26.5 GHz*
- *Sliding Terminations*
- *In-Series Phase Matched Adapters*

Description

The 8050A standard kits and the 8050Y expanded kits are 3.5mm calibration kits designed for use with vector network analyzers (VNAs) equipped with 3.5mm, 2.92mm or 2.4mm, or 1.85mm test set connectors and cables. With these kits, you can make error-corrected measurements of devices supplied with either 3.5mm or SMA connectors from DC to 26.5 GHz

Each kit includes a full complement of calibration standards (shorts, opens, sliding and fixed loads). All required calibration standards, adapters and accessories, the VNA software and operating instructions, come housed in an attractive foam-lined wooden instrument case. The expanded kits also include female and male connector gages and standards for checking contact pin location prior to connecting these instruments.

Connector Description

The precision 3.5mm connectors on the components in this kit are miniature, instrument grade, air-interface connectors that operate mode free up to 34 GHz, and comply with the IEEE standard 287 general precision connector, instrument grade 3.5. They are mating compatible with SMA and 2.92mm connectors. For detailed interface specifications please refer to Maury data sheet 5E-062.

8050A17

Components Included in 8050A/Y Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm female fixed short	8046F
1	3.5mm male fixed short	8047F
1	3.5mm female open	8048A1
1	3.5mm male open	8048B1
1	3.5mm female fixed termination	8031A4
1	3.5mm male fixed termination	8031B4
1	3.5mm female sliding termination	8037A
1	3.5mm male sliding termination	8037B
1	Sliding termination pin depth adjustment tool	8777S02
1	5/16-inch torque wrench (8 in. lbs)	8799A1*
1	2.92mm/3.5mm female connector gage	A050A1*
1	2.92mm/3.5mm male connector gage	A050A2*
1	2.92mm/3.5mm female master gage	A050A3*
1	2.92mm/3.5mm male master gage	A050A4*
1	5/16-inch double end wrench**	—
1	VNA software (on 3.5-in. disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 37 for details.)

* Included in 8050Y expanded kits. Not included in 8050A standard kits.
** Two (2) 5/16-inch double end wrenches are included in 8050A kits.

Recommended Accessories (for 8050A)

A050A Digital connector gage kit (thread-on type). See page 112.
8799A1 Torque wrench, 5/16-inch (8 in. lbs). See page 114.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8050A kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 37)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	0	—	01	02	04	05	07	09
	1	10	11	12	14	15	17	19
2.4mm or 1.85mm[1]	2	20	21	22	24	25	27	29
Type N	3	30	31	32	34	35	37	39

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.
2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-031C and 2Z-059.

3.5mm VNA Calibration Kits

8050B Fixed Termination Kits


8050B07

Features

- *3.5mm Connectors*
- *DC to 26.5 GHz*
- *Verified Kit Performance*
- *Broad VNA Coverage*
- *In-Series Phase Matched Adapters*

Description

These 3.5mm calibration kits are designed for use with a range of vector network analyzers (VNA). With these kits, you can make error-corrected measurements of devices equipped with 3.5mm connectors from DC to 26.5 GHz.

Each kit includes a full complement of calibration standards (shorts, opens and fixed loads) and can be configured for a number of VNA or test set/cable connector combinations. All kit components, including the VNA software and operating instructions, are housed in an attractive foam-lined wooden instrument case.

Connector Description

The precision 3.5mm connectors on the components in this kit are miniature, instrument grade, air-interface connectors that operate mode free up to 34 GHz, and comply with the IEEE standard 287 general precision connector, instrument grade 3.5. They are mating compatible with SMA and 2.92mm connectors. For detailed interface specifications please refer to Maury data sheet 5E-062.

Components Included in 8050B Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm female fixed short	8046F
1	3.5mm male fixed short	8047F
1	3.5mm female open	8048A1
1	3.5mm male open	8048B1
1	3.5mm female fixed termination	8031A5
1	3.5mm male fixed termination	8031B5
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 37 for details.)

Recommended Accessories

A050A Digital connector gage kit (thread-on type). See page 112.

8799A1 Torque wrench, 5/16-inch (8 in. lbs). See page 114.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8050B kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 37)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	0	—	01	02	04	05	07	09
	1	10	11	12	14	15	17	19
2.4mm or 1.85mm[1]	2	20	21	22	24	25	27	29
Type N	3	30	31	32	34	35	37	39

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-059.

3.5mm TRL/LRL VNA Calibration Kits

8060A Tri-Kits

Features

- *TRL/LRL Calibrations*
- *SOLT (Short-Open-Load-Thru)*
- *Gated Air Line*
- *DC to 34 GHz*


8060A17

Description

These 3.5mm vector network analyzer (VNA) calibration kits are designed for use with a range of Agilent , Rohde & Schwarz and Anritsu VNAs. The components in the kits are configured for use in making error-corrected TRL/LRL measurements of devices supplied with 3.5mm connectors, from DC to 34 GHz.

TRM/TRL/LRL Calibration

Maury TRL/LRL calibration kits are tri-kits that contain the components needed to perform three types of calibrations (TRM/TRL/LRL, SOLT, and short-open-(air line + load). Source match can also be measured using the 15cm air line and provided short. The following table shows the frequency ranges, calibration methods, and the standards used to perform a complete 2-port calibration to 34 GHz.

FREQUENCY RANGE	CALIBRATION METHOD	CALIBRATION STANDARDS
DC – 800 MHz	TRM	Fixed Termination
160 – 800 MHz	TRL	15cm air line
800 MHz – 2.5 GHz	TRL	5cm air line
2.5 GHz – 12.5 GHz	LRL	5cm & 6cm air lines
12.5 GHz – 34 GHz	LRL	5cm & 5.3cm air lines

Components Included in 8060A Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm female to male air line (15cm)	8043S15
1	3.5mm female to male air line (5cm)	8043S5
1	3.5mm female to male air line (6cm)	8043S6
1	3.5mm female to male air line (5.3cm)	8043S5.3
1	3.5mm female fixed short	8046F
1	3.5mm male fixed short	8047F
1	3.5mm female open	8048A1
1	3.5mm male open	8048B1
1	3.5mm female fixed termination	8031A5
1	3.5mm male fixed termination	8031B5
2	5/16-inch double end wrenches	—
1	VNA software on 3.5-in. disk or flash drive	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 37 for details.)

Recommended Accessories

A050A Digital connector gage kit (thread-on type). See page 112.

8799A1 Torque wrench, 5/16-inch (8 in. lbs). See page 114.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8060A kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 37)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	0	—	01	02	04	05	07	09
	1	10	11	12	14	15	17	19
2.4mm or 1.85mm[1]	2	20	21	22	24	25	27	29
Type N	3	30	31	32	34	35	37	39

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-045.

3.5mm VNA Calibration Kit Adapter Sets

8050Z1 & 8050Z2 Sets

Features

- *3.5mm In-Series Adapters and 2.4mm to 3.5mm Between Series Adapters*
- *DC to 34 GHz*
- *High Performance*
- *Phase Matched Within Model Series*

Description

The precision 3.5mm adapters in these sets feature low VSWR and low insertion loss and are of minimum length. The sets described on this page are configured to provide users with the ability to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered in separately boxed sets, as options shipped with their corresponding VNA calibration kits, or as individual adapters (by model number) to serve as replacement parts or spares.

Adapters Included in 8050Z1 Sets

TEST PORT ADAPTER OPTION 1	QTY	DESCRIPTION	MODEL
	1	3.5mm female to 3.5mm female	8021A2
	1	3.5mm male to 3.5mm male	8021B2
	1	3.5mm female to 3.5mm male	8021C2

Adapters Included in 8050Z2 Sets

TEST PORT ADAPTER OPTION 2	QTY	DESCRIPTION	MODEL
	1	2.4mm female to 3.5mm female	7927A
	1	2.4mm female to 3.5mm male	7927B
	1	2.4mm male to 3.5mm female	7927C
	1	2.4mm male to 3.5mm male	7927D

Adapters Included in 8050Z3 Sets

TEST PORT ADAPTER OPTION 3	QTY	DESCRIPTION	MODEL
	1	3.5mm female to type N female	8023A
	1	3.5mm female to type N male	8023B1
	1	3.5mm male to type N female	8023C
	1	3.5mm male to type N male	8023D1

Adapter Specifications

The Maury precision 3.5mm in-series adapters and 2.4mm to 3.5mm adapters included in these sets have the following specifications:

Precision 3.5mm Adapters

Models 8021A2/B2/C2 *(for more detail see page 129)*

Frequency Range . . . . . DC to 34.0 GHz
Maximum VSWR:
- DC to 18.0 GHz 1.05
- 18.0 to 26.5 GHz 1.08
- 26.5 to 34.0 GHz 1.12

Nominal Impedance . . . . . 50 ohm

Precision 2.4mm to 3.5mm Adapters

Models 7927A/B/C/D *(for more detail see page 124)*

Frequency Range . . . . . DC to 34.0 GHz
Maximum VSWR:
- DC to 18.0 GHz 1.06
- 18.0 to 26.5 GHz 1.08
- 26.5 to 34.0 GHz 1.12

Nominal Impedance . . . . . 50 ohm

Models 8023A/B1/C/D1 *(for more detail see page 131)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
- DC to 4.0 GHz . . . . . ≤ 1.065
- 4.0 to 18.0 GHz . . . . . ≤ 1.13

Nominal Impedance . . . . . 50 ohm

7mm VNA Calibration Kits

2650A Standard Kits

Features

- *Sliding Termination*
- *SOLT (Short-Open-Load-Thru)*
- *Broad VNA Coverage*
- *DC to 18 GHz*

Description

These calibration kits are designed for use with vector network analyzers equipped with 7mm, 3.5mm, 2.92mm, 2.4mm or 1.85mm test set connectors and cables. With these kits, you can make error-corrected measurements of devices supplied with 7mm connectors from DC to 18 GHz.

Each kit includes the full complement of calibration standards needed to support sliding load calibrations, and can be configured for any combination of supported VNA or test set/cable connectors. All calibration standards, adapters and optional accessories (if ordered), plus the operating Instructions, are shipped in an attractive, foam-lined, wood instrument case. All 2650A series kits include VNA software constants on a 3.5-inch disk or USB flash drive.

Connector Description

7mm connectors are precision air interface hermaphroditic connectors that are rated from DC to 18 GHz. They have an air line size of 0.1197 inner conductor diameter and a 0.2756 outer conductor diameter. There are basically two configurations; 1) GPC7 (commonly referred to as APC7) which incorporates a bead support and, 2) LPC7A which is a beadless connector. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). See Maury data sheet 5E-060 for interface dimensions.

Components Included in 2650A Kits

QUANTITY	DESCRIPTION	MODEL
1	7mm fixed short	2615D3
1	7mm open	2616D3
1	7mm sliding termination	2517H
2	7mm fixed terminations	2610F
1	7mm connector gage (push-on type)	A028
1	7mm master gage (push-on type)	A028D2
1	3/4-inch hex torque wrench (12 in. lbs)	2698C2
1	Collet extractor	2697S5
1	7mm six-slot collets (spare parts)	2680S2
1	VNA software (3.5-inch disk or USB flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 41 for details.)

Recommended Accessories

2649 Series	Offset Shorts. (See page 89.)
2611 Series	Precision Mismatches. (See page 107.)
2654A/B	Two-Port Standards Set. (See page 111.)
2653S30	Air Line. (See page 103.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 2650A kit configured with the adapters and software needed for use with an Agilent PNA that has NMD3.5mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE ABOVE)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
7mm	0	—	01	02	04	05	07	09
3.5mm or 2.92mm[1]	1	10	11	12	14	15	17	19
	2	20	21	22	24	25	27	29
2.4mm or 1.85mm[1]	3	30	31	32	34	35	37	39
	4	40	41	42	44	45	47	49

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-060.

7mm VNA Calibration Kits

2650B Fixed Termination Kits


2650B11

Features

- *Fixed Termination*
- *SOLT (Short-Open-Load-Thru)*
- *Broad VNA Coverage*
- *DC to 18 GHz*

Description

These calibration kits are designed for use with vector network analyzers equipped with 7mm, 3.5mm, 2.92mm, 2.4mm or 1.85mm test set connectors and cables. With these kits, you can make error-corrected measurements of devices supplied with 7mm connectors from DC to 18 GHz.

Each kit includes a full complement of calibration standards needed to support fixed load calibrations, and can be configured for any combination of supported VNA or test set/cable connectors. All calibration standards, adapters and optional accessories (if ordered), plus the operating Instructions, are shipped in an attractive, foam-lined, wood instrument case. All 2650B series kits include VNA software constants on a 3.5-inch disk or USB flash drive.

Connector Description

7mm connectors are precision air interface hermaphroditic connectors that are rated from DC to 18 GHz. They have an air line size of 0.1197 inner conductor diameter and a 0.2756 outer conductor diameter. There are basically two configurations; 1) GPC7 (commonly referred to as APC7) which incorporates a bead support and, 2) LPC7A which is a beadless connector. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). See Maury data sheet 5E-060 for interface dimensions.

Components Included in 2650B Kits

QUANTITY	DESCRIPTION	MODEL
1	7mm fixed short	2615D3
1	7mm open	2616D3
2	7mm fixed terminations	2610F
1	VNA software (3.5-inch disk or USB flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 41 for details.)

Recommended Accessories

A028 7mm connector gage kit (push-on type). See page 113.

2698C2 Torque wrench, 5/16-inch (8 in. lbs). See page 114.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 2650B kit configured with the adapters and software needed for use with an Agilent PNA that has NMD3.5mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE ABOVE)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
7mm	0	—	01	02	04	05	07	09
3.5mm or 2.92mm[1]	1	10	11	12	14	15	17	19
	2	20	21	22	24	25	27	29
2.4mm or 1.85mm[1]	3	30	31	32	34	35	37	39
	4	40	41	42	44	45	47	49

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-060.

7mm TRL/LRL VNA Calibration Kits

2660B Tri-Kits

Features

- *TRL/LRL Calibrations*
- *SOLT (Short-Open-Load-Thru)*
- *Gated Air Line*
- *DC to 18 GHz*

2660B17

Description

This Maury Tri-kit is capable of performing three types of calibrations: 1) TRM, TRL, and LRL two-port from DC to 18 GHz; 2) SOLT (short-open-load-thru) 1-port or 2-port; and 3) Short-open-(air line + load) 1-port calibration for gated measurements.

TRM/TRL/LRL Calibration

Maury TRL/LRL calibration kits contain the components needed to perform TRL calibrations (TRM/TRL/LRL). Source match can also be measured using the 15.00cm air line and provided short circuit.

Recommended Accessories

A028	Connector gage kit (push-on type). (See page 113.)
A028D	Connector gage kit (thread-on type). (See page 113.)
8799A1	Torque wrench, 5/16-inch (8 in. lbs). (See page 114.)
2698C2	Torque wrench, 3/4-inch (12 in. lbs). (See page 114.)

Components Included in 2660B Kits

QUANTITY	DESCRIPTION	MODEL
1	7mm air line (3.12cm)	2653S3.12
1	7mm air line (0.6cm)	2653L
1	7mm air line (15cm)	2653S15
1	7mm fixed short	2615D3
1	7mm open	2616D3
2	7mm fixed termination	2610F
1	VNA software (3.5-inch disk or USB flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 41 for details.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 2660B kit configured with the adapters and software needed for use with an Agilent PNA that has NMD3.5mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE ABOVE)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
7mm	0	—	01	02	04	05	07	09
3.5mm or 2.92mm[1]	1	10	11	12	14	15	17	19
	2	20	21	22	24	25	27	29
2.4mm or 1.85mm[1]	3	30	31	32	34	35	37	39
	4	40	41	42	44	45	47	49

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-060.

7mm VNA Calibration Kit Adapter Sets

2650Z1/Z2/Z3/Z4 Sets

Features

- DC to 18 GHz
- High Performance
- Phase Matched Within Model Series

Description

The NMD2.4 and NMD3.5 test port adapters in these sets are designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision adapters feature low VSWR with low insertion loss and are of minimum length. The sets described here are configured to allow users to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered in separately boxed sets, as options shipped with their corresponding VNA calibration kits, or individually (by model number) as replacement parts or spares.

Adapters Included in 2650Z1 (NMD3.5) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	2	NMD3.5mm female to 7mm	2633C

Adapters Included in 2650Z2 (3.5mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
2	1	3.5mm female to 7mm	8022A2
	1	3.5mm male to 7mm	8022B2

Adapters Included in 2650Z3 (NMD2.4) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
3	2	NMD2.4mm female to 7mm	7909C

Adapters Included in 2650Z4 (2.4mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
4	1	2.4mm female to 7mm	7922A
	1	2.4mm male to 7mm	7922B

Adapter Specifications

The Maury precision 7mm in-series and between series adapters and the NMD3.5 and NMD2.4 test port adapters included in these sets are 50 ohm adapters that have the following specifications:

Ruggedized Test Port Adapters

Model 2633C Ruggedized Test Port Adapters (See page 128)

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR . . . . . ≤ 1.024 + 0.003f (GHz)

Models 7909C *(for more detail see page 122)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz . . . . . ≤ 1.05
4.0 to 12.0 GHZ . . . . . ≤ 1.07
12.0 to 18.0 GHz . . . . . ≤ 1.10

Precision 3.5mm to 7mm Adapters

Models 8022A2/B2 (See page 131)

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 18.0 GHz 1.08

Precision 2.4mm to 7mm Adapters

Models 7922A/B *(for more detail see page 124)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.03
4.0 to 12.0 GHz 1.07
12.0 to 18.0 GHz 1.08

Type N VNA Calibration Kits

8850A Standard Kits

Features

- *Broad VNA Coverage*
- *Sliding Termination with Interchangeable Female/Male Connectors*
- *DC to 18 GHz*

Description

These precision type N calibration kits are designed for use with a broad range of vector network analyzers (VNA). With these kits, you can make error-corrected measurements of devices equipped with type N connectors from DC to 18.0 GHz. Each kit includes the opens, shorts and fixed and sliding loads listed at right and can be configured for any combination of VNA or test set/cable connectors. Each kit include a 3.5″ disk or flash drive containing the VNA software constants. All kit components come housed in an attractive, foam-lined, wood instrument case.

Type N Connector Description

The precision type N connectors on these components are instrument grade, air-interface connectors that are rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N). The connectors are normally made with stainless steel bodies with heat treated gold-plated beryllium copper contacts. For interface specifications see Maury data sheet 5E-049.

Components Included in 8850A Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N female fixed offset short	8806C
1	Type N male fixed offset short	8807C
1	Type N female open	8809B1
1	Type N male open	8810B1
1	Type N female fixed termination	2510A7
1	Type N male fixed termination	2510B7
1	Type N female/male sliding termination (converts between type N female and male)	2517A02
1	VNA software media (3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—
1	Double ended flat wrench (1/2-inch & 9/16-inch)	—

Note: 8850A kits also include a set of adapters that is user specified per the Ordering Options below. (See page 45 for details.)

Recommended Accessories

Torque wrench (See page 114.)

2698C2 3/4-inch torque wrench (12 in. lbs)

Connector Gage Kits (See page 112-113.)

A020K Digital connector gage kit (thread-on type)

Adapters

8828A/B/C Type N in-series phase matched adapters. (See page 134.)

7909D1/D2 Type N to NMD2.4mm test port adapters. (See page 122.)

7923A/B/C/D Type N to 2.4mm phase matched adapters. (See page 125.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8850A kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm (K) test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 45)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	1	10	11	12	14	15	17	19
7mm	2	20	21	22	24	25	27	29
2.4mm or 1.85mm[1]	3	30	31	32	34	35	37	39
Type N	4	40	41	42	44	45	47	49

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheets 2Z-061.

Type N VNA Calibration Kits

8850B Fixed Termination Kits

Features

- *Broad VNA Coverage*
- *Fixed Female & Male Terminations*
- *DC to 18 GHz*

Description

These fixed load kits are designed for use with a broad range of vector network analyzers (VNA). They can be used to make error-corrected measurements of devices equipped with type N connectors from DC to 18.0 GHz. Each kit includes the opens, shorts and loads listed at right and can be configured for any combination of VNA or test set/cable connectors. Each kit include a 3.5″ disk or flash drive containing the VNA software constants. All kit components come housed in an attractive, foam-lined, wood instrument case.

Type N Connector Description

The precision type N connectors on these components are instrument grade, air-interface connectors that are rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N). The connectors are normally made with stainless steel bodies with heat treated gold-plated beryllium copper contacts. For interface specifications see Maury data sheet 5E-049.

Components Included in 8850B Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N female fixed offset short	8806C
1	Type N male fixed offset short	8807C
1	Type N female open	8809B1
1	Type N male open	8810B1
1	Type N female fixed termination	2510A7
1	Type N male fixed termination	2510B7
1	VNA software media (3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: These fixed termination kits DO NOT include adapters. Adapters must be ordered separately (see ***Recommended Accessories*** below).

(See also the Adapter Specifications on page 45.)

Recommended Accessories

Torque wrench (See page 114.)

2698C2	3/4-inch torque wrench (12 in. lbs)

Connector Gage Kits (See page 112-113.)

A020A	Connector gage kit (push-on type)
A020D	Connector gage kit (thread-on type)
A020K	Digital connector gage kit (thread-on type)

Adapters

8828A/B/C	Type N in-series phase matched adapters. (See page 134.)
8829A/B	NMD3.5mm to Type N test port adapters. (See page 128.)
7909D1/D2	Type N to NMD2.4mm test port adapters. (See page 122.)
7923A/B/C/D	Type N to 2.4mm phase matched adapters. (See page 125.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8850B kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm (K) test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 45)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
3.5mm or 2.92mm[1]	1	10	11	12	14	15	17	19
7mm	2	20	21	22	24	25	27	29
2.4mm or 1.85mm[1]	3	30	31	32	34	35	37	39
Type N	4	40	41	42	44	45	47	49

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheets 2Z-061.

Type N TRL/LRL VNA Calibration Kits

8860A Tri-Kits

Features

- *TRL/LRL Calibrations*
- *SOLT (Short-Open-Load-Thru)*
- *Gated Air Line*
- *DC to 18 GHz*

Description

These type N Vector Network Analyzer (VNA) calibration kits are designed for use with a range of popular VNAs. The components in the kits are configured for use in making error-corrected TRL/LRL measurements of devices supplied with type N connectors, from DC to 18.0 GHz.

TRM/TRL/LRL Calibration

Maury TRL/LRL calibration kits contain the components needed to perform TRL calibrations (TRM/TRL/LRL). Source match can also be measured using the 15cm air line and provided short circuit. The following table shows the frequency ranges, calibration methods, and the standards used to perform a complete 2-port calibration to 18 GHz.

FREQUENCY RANGE	CALIBRATION METHOD	CALIBRATION STANDARDS
DC – 800 MHz	TRM	Fixed Termination
160 – 800 MHz	TRL	15cm air line
800 MHz – 4.0 GHz	TRL	3.12cm air line
4.0 GHz – 18.0 GHz	LRL	3.12cm & 3.82cm air lines

Components Included in 8860A Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N female to male air line (3.12cm)	2553T3.12
1	Type N female to male air line (3.82cm)	2553T3.82
1	Type N female to male air line (15cm)	2553T15
1	Type N female fixed short circuit	8806C
1	Type N female fixed short circuit	8806G
1	Type N male fixed short circuit	8807C
1	Type N female open circuit	8809B1
1	Type N male open circuit	8810B1
1	Type N female fixed termination	2510A6
1	Type N male fixed termination	2510B6
1	VNA software (on 3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 45 for details.)

Recommended Accessories

A020A Connector gage kit (thread-on type). (See page 113.)
A020A Connector gage kit (thread-on type). (See page 113.)
2698C2 Torque wrench, 3/4-inch (12 in. lbs). (See page 114.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8860A kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm (K) test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 45)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
—	0	—	01	02	04	05	07	09
3.5mm or 2.92mm[1]	1	10	11	12	14	15	17	19
2.4mm or 1.85mm[1]	2	20	21	22	24	25	27	29
7mm	3	30	31	32	34	35	37	39
Type N	4	40	41	42	44	45	47	49

1 3.5mm and 2.92mm connectors are fully mateable, as are 1.85mm and 2.4mm connectors. The resulting junction is calibrated out and is not critical.

2 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-061.

Type N VNA Calibration Kit Adapter Options

8850 and 8860 3.5mm, 2.4mm, 7mm and Type N Sets

Features

- *NMD3.5mm to Type N, NMD2.4mm to Type N, Type N In-Series & Type N Between-Series Adapters*
- *DC to 18 GHz*
- *High Performance*
- *Phase Matched Within Each Set*

Description

The NMD2.4mm, and NMD2.4mm test port adapters in these sets are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision 3.5mm, 7mm, and 2.4mm adapters feature low VSWR, low insertion loss and are of minimum length. The sets described on this page are configured to provide users with the ability to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered in separately boxed sets, as options shipped with their corresponding VNA calibration kits, or as individual adapters (by model number) to serve as replacement parts or spares.

Adapter Options for 8850 Cal Kits

Adapters Included in 3.5mm Sets

	QUANTITY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 1	1	NMD3.5mm female to type N female	8829A
	1	NMD3.5mm female to type N male	8829B
	1	Type N female to 3.5mm female	8023A
	1	Type N male to 3.5mm female	8023B1
	1	Type N female to 3.5mm male	8023C
	1	Type N male to 3.5mm male	8023D1

Adapters Included in 7mm Sets

	QUANTITY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 2	2	7mm to type N female	2606C
	2	7mm to type N male	2606D

Adapters Included in 2.4mm Sets

	QUANTITY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 3	1	NMD2.4mm female to type N female	7909D1
	1	NMD2.4mm female to type N male	7909D2
	1	Type N female to 2.4mm female	7923A
	1	Type N male to 2.4mm male	7923B
	1	Type N female to 2.4mm male	7923C
	1	Type N male to 2.4mm male	7923D

Adapters Included in Type N Sets

	QTY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 4	1	Type N female to Type N female	8828A
	1	Type N male to Type N male	8828B
	1	Type N female to Type N male	8828C

Adapter Specifications

Models 8828A, 8828B and 8828C *(for more detail see page 134)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.03
4.0 to 10.0 GHz 1.05
10.0 to 18.0 GHz 1.09
Nominal Impedance . . . . . 50 ohm

Models 8829A and 8829B *(for more detail see page 128)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 6.0 GHz 1.04
6.0 to 18.0 GHz 1.08
Nominal Impedance . . . . . 50 ohm

Models 7909D1 and 7909D2 *(for more detail see page 122)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 6.0 GHz 1.06
6.0 to 18.0 GHz 1.10
Nominal Impedance . . . . . 50 ohm

Models 8023A/B1/C/D1 *(for more detail see page 131)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.065
4.0 to 18.0 GHz 1.13
Nominal Impedance . . . . . 50 ohm

Models 2606C/D *(for more detail see page 133)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.03
4.0 to 9.0 GHz 1.04
9.0 to 18.0 GHz 1.07
Nominal Impedance . . . . . 50 ohm

Models 7923A/B/C/D *(for more detail see page 124)*
Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:

Adapter Options for 8860 Cal Kits

Adapters Included in 8860 (3.5mm) Sets

	QUANTITY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 1	1	3.5mm female to type N female	8023A
	1	3.5mm female to type N male	8023B1
	1	3.5mm male to type N female	8023C
	1	3.5mm male to type N male	8023D1

Adapters Included in 8860 (2.4mm) Sets

	QUANTITY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 2	1	2.4mm female to type N female	7923A
	1	2.4mm male to type N male	7923B
	1	2.4mm male to type N female	7923C
	1	2.4mm male to type N male	7923D

Adapters Included in 8860 (7mm) Sets

	QUANTITY	DESCRIPTION	MODEL
TEST PORT ADAPTER OPTION 3	2	7mm to type N female	2606C
	2	7mm to type N male	2606D

Type N VNA Calibration Kits

8880A/B 75 ohm Fixed Termination

Features

- *75 ohm Kits*
- *Simple Fixed Load Calibration*
- *Broad VNA Coverage*

Description

Maury's 8880 series calibration kits are designed for calibrating Vector Network Analyzers (VNAs) from DC to 2.0 GHz that will be used to make 75 ohm type N connector measurements.

A full complement of calibration standards (opens, shorts and fixed terminations, female and male) are included in the 8880A and 8880B kits. In addition, the 8880B kit includes three (3) in-series adapters that are phase matched for accurate measurements of non-insertable devices.

In each kit the components are housed in a foam-lined wooden instrument case. Operating instructions are included with the calibration standard constants so that they can be keyed in from the VNA's front panel. Optional VNA software specific to your VNA make and model is sold separately (see ***Supported VNAs*** below).

Connector Description

The type N 75 ohm connectors on the components in these kits are a precision version of type N 75 ohm connectors, developed by Maury, which meets all applicable requirements of IEC169-16. They exhibit extremely low VSWR, and although specified to 2.0 GHz, they can be used at much higher frequencies. The male connectors are provided with a 3/4" hex coupling nut so the junctions can be properly torqued to 12 in/lbs. For interface specifications see Maury data sheet 5E-049.

Supported VNAs

Maury's 8880 series calibration kits are ideal for calibrating Agilent's 75 ohm VNAs (i.e., 8752B or 8753C with 85046B, 85044B test sets or 11850D splitters). With appropriate adapters (included in the 8880B kits) these kits can also be used with 50ohm VNAs (e.g., Agilent 8510C, 8719/20/22, Anritsu 37000 series, and Rohde & Schwarz ZV series) to make 75 ohm measurements.

Software media containing the calibration constants for your make and model VNA can be ordered separately per the table below.

VNA MAKE AND MODEL	SOFTWARE OPTION NUMBER
Rohde & Schwarz ZV Series	11
Agilent ENA Series	12
Agilent 8510C	14
Agilent 8719/20/22	15
Agilent PNA Series	17
Anritsu 37000*	19

* Anritsu's Vector Star family of VNA also works with software option 19.

Key Literature: Maury data sheet 2Z-035.

Components Included in 8880A/B Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N 75 ohm female fixed short	8884A
1	Type N 75 ohm male fixed short	8884B
1	Type N 75 ohm female open	8885A
1	Type N 75 ohm male open	8885B
1	Type N 75 ohm female fixed termination	8883A
1	Type N 75 ohm male fixed termination	8883B
1	Type N 75 ohm female to female adapter	8882A*
1	Type N 75 ohm male to male adapter	8882B*
1	Type N 75 ohm female to male adapter	8882C*
1	Operating Instructions (manual)	—
1	Instrument case	—

* In-series, phase matched adapters included in 8850B kits, but not in 8850A kits.

Recommended Adapters

In-Series Phase Matched Adapters (See page 135.)
Between-Series Adapters (75 ohm to 50 ohm) (See page 137.)

Warning: Do not mate a 75 ohm type N connector to a 50 ohm type N connector.

Recommended Accessories

Torque wrench (See page 114.)

2698C2 3/4-inch torque wrench (12 in. lbs)

Connector Gage Kits (See page 113.)

A020A Connector gage kit (push-on type)
A020D Connector gage kit (thread-on type)
A020G 75 ohm type N connector gage kit (push-on type)

Utility Boxes

8880X2 Foam-lined utility box (houses up to 12 adapters)

Type N VNA Calibration Kits

8880A/B 75 ohm Fixed Termination Kits

Kit Component Specifications

Fixed Terminations

Models 8883A and 8883B (See also page 75.)

Frequency Range . . . . . DC to 2.0 GHz
Maximum VSWR. . . . . 1.01 (46 dB minimum return loss)
Nominal Impedance . . . . . 75 ohm
Power Handling . . . . . 1 watt CW

Fixed Shorts

Models 8884A and 8884B (See also page 93.)

Frequency Range . . . . . DC to 2.0 GHz
Reflection Coefficient . . . . . 0.98 minimum
Nominal Impedance . . . . . 75 ohm

Opens

Models 8885A and 8885B (See also page 99.)

Frequency Range . . . . . DC to 2.0 GHz
Reflection Coefficient . . . . . 0.98 minimum
Phase Accuracy . . . . . ± 2.0 degrees
Nominal Impedance . . . . . 75 ohm

Type N 75 ohm Phase Matched In-Series Adapters

(Included in 8880B Kits; Not Included in 8880A Kits)

Models 8882A/B/C (See also page 137.)

Frequency Range . . . . . DC to 2.0 GHz
Maximum VSWR 1.03
Nominal Impedance . . . . . 75 ohm

Specifications for Accessories

Type N 75 ohm Between-Series Adapters

(Adapting to various 50 ohm connector types)

Models 8882E1/E2 (See also page 137.)

Frequency Range . . . . . DC to 2.0 GHz
Typical VSWR 1.05
Nominal Impedance . . . . . 75 ohm

Models 8882G11/G12/G21/G22 (See also page 137.)

Frequency Range . . . . . DC to 2.0 GHz
Typical VSWR 1.05
Nominal Impedance . . . . . 75 ohm

Models 8882D1/D2 (See also page 137.)

Frequency Range . . . . . DC to 2.0 GHz
Typical VSWR 1.05
Nominal Impedance . . . . . 75 ohm

Models 8882F11/F12/F21/F22 (See also page 137.)

Frequency Range . . . . . DC to 2.0 GHz
Typical VSWR 1.05
Nominal Impedance . . . . . 75 ohm

Other Recommended Accessories

Model 2698C2 Torque wrench (See also page 114.)

Wrench Size . . . . . 3/4-inch Hex
Reset Torque . . . . . 12 (± 0.4) in. lbs
Handle Color . . . . . Blue

Model A020A Connector Gage Kit (See also page 113.)

Connector Type(s) . . . . . Type N (50 ohm) female and male
Dial Resolution (Inches) 0.00025
Gages in Kit . . . . . One
Interface . . . . . Hand-held Push-on

Model A020D Connector Gage Kit (See also page 113.)

Connector Type(s) . . . . . Type N (50 ohm) female and male
Dial Resolution (Inches) 0.0001
Gages in Kit . . . . . Two
Interface . . . . . Metrology Grade Thread-on

Model A020G Connector Gage Kit (See also page 113.)

Connector Type(s) . . . . . Type N (75 ohm) female and male
Dial Resolution (Inches) 0.0001
Gages in Kit . . . . . One
Interface . . . . . Hand-held Push-on

TNC VNA Calibration Kits

8650E Standard Kits

Features

- *Precision TNC Connectors*
- *Sliding Load Calibration*
- *Broad VNA Coverage*
- *DC to 18 GHz*

Description

These precision TNC calibration kits are designed for use with a broad range of Vector Network Analyzers (VNAs) and are used to make error-corrected measurements of devices supplied with TNC connectors from DC to 18.0 GHz. Each kit is supplied with a full complement of calibration standards (shorts, opens, sliding and fixed loads) and can be configured for any combination of VNA or test set/cable connectors. By indicating the appropriate option number with your order, you can specify the desired adapter set and software medium to be included in the kit. All required calibration standards, applicable adapters and accessories, along with software media containing the VNA software and operating instructions, are housed in an attractive foam-lined wooden instrument case.

Connector Description

The TNC connectors (MPC/TNC) on the components in this kit are precision stainless steel connectors that mate with MIL-C-39012 and MIL-T-81490 connectors. They are low VSWR connectors rated from DC to 18.0 GHz. For interface specifications see Maury data sheet 5E-053.

Adapters Included in 7mm Sets (See page 133)

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	2	7mm to TNC female	2622A1
	2	7mm to TNC male	2622B

Recommended Adapters

In-Series Adapters (See page 139.)

232A2	TNC female to female	232C2	TNC female to male
232B2	TNC male to male		

Components Included in 8650 Kits

QUANTITY	DESCRIPTION	MODEL
1	TNC female fixed short circuit	8615A
1	TNC male fixed short circuit	8615B
1	TNC female open circuit	8609B
1	TNC male open circuit	8610B
1	TNC female sliding termination	452A1
1	TNC male sliding termination	452B1
1	TNC female fixed termination	332E
1	TNC male fixed termination	332F
1	VNA software (on 3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

All kits also include a set of user-specified adapters per the Ordering Options below.

Adapters Included in 3.5mm Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
3	1	NMD3.5mm female to TNC female	8619A
	1	NMD3.5mm female to TNC male	8619B
	1	3.5mm female to TNC female	8025A1
	1	3.5mm female TNC male	8025B1
	1	3.5mm male to TNC female	8025C1
	1	3.5mm male to TNC male	8025D1

Recommended Accessories

2698G1 0.562 hex torque wrench (12 in. lbs). (See page 114.)

A012A Connector gage kit (push-on type). (See page 113.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8650E kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE ABOVE)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[2]
7mm	1	10	11	12	14	15	17	19
3.5mm or 2.92mm[1]	3	30	31	12	34	35	37	39

[1] 3.5mm and 2.92mm connectors. The resulting junction is calibrated out and is not critical.

[2] Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheets 2Z-023E and 2Z-023H.

TNC VNA Calibration Kits

8650P Fixed Termination Kits

Features

- *Single Fixed Load Calibration*
- *Precision TNC Connectors*

Description

Maury's 8650P calibration kits are designed for calibrating Vector Network Analyzers (VNAs) for measuring devices equipped with TNC connectors from DC to 18.0 GHz. Each kit is supplied with a full complement of calibration standards (shorts, opens, sliding and fixed loads, and can be configured for any VNA version. All required calibration standards, along with VNA software provided on a 3.5-inch data disk or flash drive, in an attractive foam-lined wood instrument case.

Components Included in 8650P Kits

QUANTITY	DESCRIPTION	MODEL
1	TNC female fixed short	8615A
1	TNC male fixed short	8615B
1	TNC female open	8609B
1	TNC male open	8610B
1	TNC female fixed termination	332E
1	TNC male fixed termination	332F
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: These fixed termination kits DO NOT include adapters. Adapters must be ordered separately (see ***Recommended Adapters*** below).

Recommended Adapters

In-Series Adapters (See page 139.)

232A11 TNC female to TNC female adapter
232B11 TNC male to TNC male adapter
232C11 TNC female to TNC male adapter

Between Series Adapters – 7mm to TNC (See page 133.)

2622A1 7mm to TNC female adapter
2622B1 7mm to TNC male adapter

Between Series Adapters – Type N to TNC (See page 136.)

8817A Type N female to TNC female adapter
8817B Type N female to TNC male adapter
8817C Type N female to TNC female adapter
8817D Type N male to TNC male adapter

Between Series Adapters – 3.5mm to TNC (See page 131.)

8025A1 Type N female to TNC female adapter
8025B1 Type N female to TNC male adapter
8025C1 Type N female to TNC female adapter
8025D1 Type N male to TNC male adapter

Ruggedized Test Port Adapters – NMD3.5mm to TNC (See page 128.)

8619A NMD3.5mm female to TNC female adapter
8619B NMD3.5mm female to TNC male adapter

Key Literature: Maury data sheet 2Z-023P.

Connector Description

The TNC connectors (MPC/TNC) on the components in this kit are precision stainless steel connectors that mate with MIL-C-39012 and MIL-T-81490 connectors. They are low VSWR connectors rated from DC to 18.0 GHz. For interface specifications see Maury data sheet 5E-053.

Recommended Accessories

Torque wrench (See page 114.)

262698G1 0.562 hex torque wrench (12 in. lbs)

Connector Gage Kit (See page 113.)

A012A Connector gage kit (push-on type)

Available Kits

VNA MAKE AND MODEL	MAURY CAL KIT MODEL*
Kits without software	8650P10
Rohde & Schwarz ZV Series	8650P11
Agilent ENA Series	8650P12
Agilent 8510C	8650P14
Agilent 8719/20/22	8650P15
Agilent PNA series	8650P17
Anritsu 37000	8650P19**

* These fixed termination kits **DO NOT** include adapters. Adapters must be ordered separately.

** The VNA software provided with the 8850B19 kits is also compatible with the Anritsu Vector Star family of VNAs.

AFTNC VNA Calibration Kits

8680A Standard Kits & 8680B Fixed Termination Kits

Features

- *MIL-C-87104/2 AFTNC Interface*
- *Rated to 20 GHz*
- *Sliding Load and Fixed Load Kits*
- *Multiple VNA Support*

Description

Maury 8680 calibration kits provide the necessary standards and accessories required to accurately calibrate network analyzers up to 20 GHz for error-corrected measurements of devices equipped with AFTNC connectors. Each kit includes a full complement of calibration standards (as listed at right) and can be configured for any combination of VNA or test set/cable connectors. The "A" model full kits include both sliding and fixed terminations while the "B" model economy kits include only fixed terminations. All kit components are supplied in an attractive foam-lined wooden instrument case.

Connector Description

The Maury AFTNC connectors supplied in this kit fully comply with the interface requirements of MIL-C-87104/2. The male connector utilizes a solid outer conductor configuration to provide consistent measurement results. All connector bodies are fabricated from stainless steel for strength and wear resistance. These connectors were developed using optimized HFSS simulation to provide extremely low VSWR, and they are rated to 20 GHz. For interface specifications on these connectors, please refer to Maury data sheet 5E-056.

Recommended Accessories

2698G1 0.562 hex torque wrench (12 in. lbs). (See page 114.)

A012E Connector gage kit (push-on type). (See page 113.)

8680A37

Components Included in 8680A/B Kits

QUANTITY	DESCRIPTION	MODEL
1	AFTNC female fixed short circuit	8686A
1	AFTNC male fixed short circuit	8687A
1	AFTNC female open circuit	8685A
1	AFTNC male open circuit	8685B
1	AFTNC female sliding termination	8683A*
1	AFTNC male sliding termination	8683B*
1	AFTNC female fixed termination	8684A
1	AFTNC male fixed termination	8684B
1	VNA software disk	—
1	Operating Instructions (manual)	—
1	Instrument case	—

* Included in the 8680A standard kits and not included in the 8680B fixed termination kits.

Recommended Adapters

In-Series, Phase Matched Adapters (See page 139.)

8688A AFTNC female to female

8688B AFTNC male to male

8688C AFTNC female to male

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8680A kit configured with the adapters and software needed for use with an Agilent PNA that has 7mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 49)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[3]
AFTNC[1]	0	—	01	02	04	05	07	09
7mm	1	10	11	12	14	15	17	19
Type N	2	20	21	22	24	25	27	29
3.5mm or 2.92mm[2]	3	30	31	32	34	35	37	39

1 Adapters are not included with these AFTNC test port options, but may be ordered separately. See page 51 and 139.

2 3.5mm and 2.92mm connectors are fully mateable. The resulting junction is calibrated out and is not critical.

3 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-062.

AFTNC VNA Calibration Kit Adapter Options

7mm, Type N, & 3.5mm Sets

Features

- *AFTNC to 7mm, AFTNC to Type N, and AFTNC to 3.5mm Adapters*
- *DC to 20 GHz*
- *High Performance*
- *Phase Matched Within Each Set*

Description

The NMD3.5mm test port adapters in these sets are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision 7mm, Type N, and 3.5mm adapters feature low VSWR, low insertion loss and are of minimum length. The sets described on this page are configured to provide users with the ability to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered as options shipped with their corresponding VNA calibration kits, or as individual adapters (by model number) to serve as replacement parts or spares.

Adapters Included in 7mm Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	2	7mm to AFTNC female	8892A
	2	7mm to AFTNC male	8892B

Adapters Included in Type N Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
2	1	Type N female to AFTNC female	8694A
	1	Type N female to AFTNC male	8694B
	1	Type N male to AFTNC female	8694C
	1	Type N male to AFTNC male	8694D

Adapters Included in 3.5mm Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
3	1	NMD3.5mm female to AFTNC female	8691A
	1	NMD3.5mm female to AFTNC male	8691B
	1	3.5mm female to AFTNC female	8682A
	1	3.5mm female to AFTNC male	8682B
	1	3.5mm male to AFTNC female	8682C
	1	3.5mm male to AFTNC male	8682D

Adapter Specifications

The Maury precision AFTNC adapters and the NMD3.5mm test port adapters included in these sets conform to the following:

Ruggedized Test Port Adapters

Models 8691A and 8691B *(For more detail see page 128.)*

Frequency Range . . . . . DC to 20.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.04
- 4.0 to 20.0 GHz 1.10

Nominal Impedance . . . . . 50 ohm

Precision 3.5mm to AFTNC Adapters

Models 8682A/B/D/C *(For more detail see page 131.)*

Frequency Range . . . . . DC to 20.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.04
- 4.0 to 12.0 GHz 1.06
- 12.0 to 20.0 GHz 1.08

Nominal Impedance . . . . . 50 ohm

Precision Type N to AFTNC Adapters

Models 8694A/B/C/D *(For more detail see page 136.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.04
- 4.0 to 8.0 GHz 1.06
- 8.0 to 18.0 GHz 1.08

Nominal Impedance . . . . . 50 ohm

Precision 7mm to AFTNC Adapters

Models 8692A/B *(For more detail see page 133.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.04
- 4.0 to 18.0 GHz 1.06

Nominal Impedance . . . . . 50 ohm

Precision AFTNC In-Series Adapters

Models 8688A/B/C *(For more detail see page 139.)*

Frequency Range . . . . . DC to 20.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.04
- 4.0 to 8.0 GHz 1.08
- 8.0 to 20.0 GHz 1.12

Nominal Impedance . . . . . 50 ohm

TNCA VNA Calibration Kits

8670A Standard Kits & 8670B Fixed Termination Kits

Features

- *MIL-STD 348A TNCA Interface*
- *Rated to 20 GHz*
- *Sliding Load and Fixed Load Kits*
- *Multiple VNA Support*

Description

Maury 8670 calibration kits provide the necessary standards and accessories required to accurately calibrate network analyzers up to 20 GHz for error-corrected measurements of devices equipped with TNCA connectors.

Each kit includes a full complement of calibration standards (as listed at right) and can be configured for any combination of VNA or test set/cable connectors. The "A" model full kits include both sliding and fixed terminations while the "B" model economy kits include only fixed terminations. All kit components are supplied in an attractive foam-lined wooden instrument case.

Connector Description

The Maury TNCA connectors supplied in this kit fully comply with the interface requirements of MIL-STD 348A. The male connector utilizes a solid outer conductor configuration to provide consistent measurement results. All connector bodies are fabricated from stainless steel for strength and wear resistance. These connectors are rated to 20 GHz. For interface specifications on these connectors, please refer to Maury data sheet 5E-058.

8670A37

Components Included in 8670A/B Kits

QUANTITY	DESCRIPTION	MODEL
1	TNCA female fixed short circuit	8676A
1	TNCA male fixed short circuit	8677A
1	TNCA female open circuit	8675A
1	TNCA male open circuit	8675B
1	TNCA female sliding termination	8673A*
1	TNCA male sliding termination	8673B*
1	TNCA female fixed termination	8674A
1	TNCA male fixed termination	8674B
1	VNA software (on 3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

* Included in the 8670A standard kits and not included in the 8670B fixed termination kits.

Recommended Accessories

2698G1 0.562 hex torque wrench (12 in. lbs). (See page 114.)

A012E Connector gage kit (push-on type). (See page 113.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8670A kit configured with the adapters and software needed for use with an Agilent PNA that has 3.5mm or 2.92mm (K) test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 49)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[3]
TNCA[1]	0	—	01	02	04	05	07	09
7mm	1	10	11	12	14	15	17	19
Type N	2	20	21	22	24	25	27	29
3.5mm or 2.92mm[2]	3	30	31	32	34	35	37	39

1 Adapters are not included with these TNCA test port options, but may be ordered separately. See page 53.

2 3.5mm and 2.92mm connectors are fully mateable. The resulting junction is calibrated out and is not critical.

3 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-067.

TNCA VNA Calibration Kit Adapter Options

7mm, Type N, & 3.5mm Sets

Features

- *TNCA to 7mm, TNCA to Type N, and TNCA to 3.5mm Adapters*
- *DC to 20 GHz*
- *High Performance*
- *Phase Matched Within Each Set*

Description

The NMD3.5mm test port adapters in these sets are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets. The precision 7mm, Type N, and 3.5mm adapters feature low VSWR, low insertion loss and are of minimum length. The sets described on this page are configured to provide users with the ability to tailor their Maury calibration kit for use with specific VNAs. These adapters may be ordered as options shipped with their corresponding VNA calibration kits, or as individual adapters (by model number) to serve as replacement parts or spares.

Adapters Included in 7mm Sets

TEST PORT ADAPTER OPTION 1	QUANTITY	DESCRIPTION	MODEL
	2	7mm to TNCA female	8696A
	2	7mm to TNCA male	8696B

Adapters Included in Type N Sets

TEST PORT ADAPTER OPTION 2	QUANTITY	DESCRIPTION	MODEL
	1	Type N female to TNCA female	8697A
	1	Type N female to TNCA male	8697B
	1	Type N male to TNCA female	8697C
	1	Type N male to TNCA male	8697D

Adapters Included in 3.5mm Sets

TEST PORT ADAPTER OPTION 3	QUANTITY	DESCRIPTION	MODEL
	1	NMD3.5mm female to TNCA female	8679A
	1	NMD3.5mm female to TNCA male	8679B
	1	3.5mm female to TNCA female	8672A
	1	3.5mm female to TNCA male	8672B
	1	3.5mm male to TNCA female	8672C
	1	3.5mm male to TNCA male	8672D

Adapter Specifications

The Maury precision TNCA adapters and the NMD3.5mm test port adapters included in these sets conform to the following:

Test Port Adapters

Models 8679A and 8679B *(For more detail see page 128.)*

Frequency Range . . . . . DC to 20.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 20.0 GHz 1.10
Nominal Impedance . . . . . 50 ohm

Precision 3.5mm to TNCA Adapters

Models 8672A/B/D/C *(For more detail see page 131.)*

Frequency Range . . . . . DC to 20.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 12.0 GHz 1.06
12.0 to 20.0 GHz 1.08
Nominal Impedance . . . . . 50 ohm

Precision Type N to TNCA Adapters

Models 8697A/B/C/D *(For more detail see page 136.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 8.0 GHz 1.06
8.0 to 18.0 GHz 1.08
Nominal Impedance . . . . . 50 ohm

Precision 7mm to TNCA Adapters

Models 8696A/B *(For more detail see page 133.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 18.0 GHz 1.06
Nominal Impedance . . . . . 50 ohm

Precision TNCA In-Series Adapters

Models 8678A/B/C *(For more detail see page 136.)*

Frequency Range . . . . . DC to 20.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 8.0 GHz 1.08
8.0 to 20.0 GHz 1.12
Nominal Impedance . . . . . 50 ohm

BNC VNA Calibration Kits

8550E/F/G 50 ohm Fixed Termination Kits

8550E17

Features

- *Precision BNC Connectors*
- *DC to 10 GHz*
- *Fixed Load Calibration*
- *Multiple VNA Support*

Description

These BNC calibration kits provide a convenient, accurate means of calibrating Vector (VNA) for measuring devices with BNC connectors at 50 ohm reference impedance. These kits are provided with fixed terminations and are generally used at frequencies up to 10 GHz.

Each kit in the 8550 series includes all the basic standards necessary for calibrating your VNA. All the included calibration standards (listed at right) are provided in a foam-lined wooden instrument case, along with the Operating Instructions. The VNA software for supported VNA models are provided on 3.5-inch data disk or flash drive for simplified loading into your analyzer.

Supported VNAs

Maury's 8550 series calibration kits are ideal for use in calibrating many popular VNAs (i.e., Agilent 8510C, 8719/20/22, 8753C, and PNA series; Anritsu 37000; and Rohde & Schwarz ZV series). The table below lists the supported VNA makes and models with their corresponding software option numbers. To order an 8850 series kit configured with the VNA software you need, simply add the appropriate two digit number to the end of the kit model number.

Example: To order a cal kit configured for use with an Agilent PNA equipped with 3.5mm test ports, add the software option number (17) to the end of the kit model number from the Available Kits table at left (8550F). The complete model number to show on your order for this configuration is 8550F17.

VNA MAKE AND MODEL	SOFTWARE OPTION NUMBER
Rohde & Schwarz ZV Series	11
Agilent ENA Series	12
Agilent 8510C	14
Agilent 8719/20/22	15
Agilent PNA Series	17
Anritsu 37000*	19

Note: Anritsu's Vector Star family of VNA also works with software option 19.

Key Literature: Maury data sheet 2Z-029B.

Components Included in 8550 Kits

QUANTITY	DESCRIPTION	MODEL
1	50 ohm BNC female fixed short	361N2
1	50 ohm BNC male fixed short	361P2
1	50 ohm BNC female open	371N2
1	50 ohm BNC male open	371P2
1	50 ohm BNC female fixed termination	351A2
1	50 ohm BNC male fixed termination	351B2
1	Operating Instructions (manual)	—
1	VNA software (on 3.5" disk or flash drive)	—
1	Instrument case	—

Each kit also includes the adapters shown in the ***Available Kits*** table below.

VNA TEST PORT TYPES	MAURY KIT MODEL NO.	ADAPTERS INCLUDED IN KITS*		
		QTY	MODELS	DESCRIPTION
7mm	8550E	2	2621A1	7mm to BNC female
		2	2621B1	7mm to BNC male
3.5mm or 2.92mm (K)[1]	8550F	1	8028A	3.5mm fem to BNC fem
		1	8028B	3.5mm fem to BNC male
		1	8028C	3.5mm male to BNC fem
		1	8028D	3.5mm male to BNC male
Type N	8550G	1	8821A1	Type N fem to BNC fem
		1	8821B1	Type N fem to BNC male
		1	8821C1	Type N male to BNC fem
		1	8821D1	Type N male to BNC male

[1] 3.5mm and 2.92mm connectors are fully mateable. The resulting junction is calibrated out and is not critical.

* For detailed information about these adapters see page 133 (for 2621 series), page 131 (for 8028 series) or page 136 (for 8821 series models).

BNC VNA Calibration Kits

8580A 75 ohm Fixed Termination Kits

Features

- *Precision BNC Connectors*
- *DC to 3 GHz*
- *Fixed Load Calibration*
- *Multiple VNA Support*

Description

These BNC calibration kits provide a convenient, accurate means of calibrating Vector (VNA) and Scalar (PNA) Network Analyzers for measuring devices with BNC connectors at 75 ohm reference impedance. These kits are provided with fixed terminations and are generally used at frequencies up to 3 GHz.

The 8580A kit includes all the basic standards (both female and male) necessary for calibrating your VNA/PNA. The 8580A01 and the 8580A02 are single-sex kits which include only female or male standards, respectively. In-series and test port adapters to type N and 7mm are also available.

Each kit is provided with all the included calibration standards (listed below and at right) housed in a foam-lined wooden instrument case, along with the Operating Instructions. The VNA software for supported VNA/PNA models are included in the Operating Instructions and may be easily keyed in through the front panel.

Components Included in 8580A Kits

QUANTITY	DESCRIPTION	MODEL
1	75 ohm BNC female fixed short	8584A
1	75 ohm BNC male fixed short	8584B
1	75 ohm BNC female open	8585A
1	75 ohm BNC male open	8585B
1	75 ohm BNC female fixed termination	8583A
1	75 ohm BNC male fixed termination	8583B
1	Operating Instructions (manual)	—
1	Instrument case	—

Recommended Adapters

In-Series, Phase Matched Adapters (See page 133.)

8582D1 7mm to BNC 75 ohm female adapter

8582D2 7mm to BNC 75 ohm male adapter

Key Literature: Maury data sheet 2Z-036.

8580A02

8580A01/02 75 ohm Single Sex Fixed Termination Kits

Components Included in 8580A01 Female Kits

QUANTITY	DESCRIPTION	MODEL
1	75 ohm BNC female fixed short	8584A
1	75 ohm BNC female open	8585A
1	75 ohm BNC female fixed termination	8583A
1	Operating Instructions (manual)	—
1	Instrument case	—

Components Included in 8580A02 Male Kits

QUANTITY	DESCRIPTION	MODEL
1	75 ohm BNC male fixed short	8584B
1	75 ohm BNC male open	8585B
1	75 ohm BNC male fixed termination	8583B
1	Operating Instructions (manual)	—
1	Instrument case	—

Warning: Do not mate a 75 ohm BNC connector to a 50 ohm BNC connector. Serious damage may result.

OSP™ VNA Calibration Kits

8780A Standard Kits & 8780B Fixed Termination Kits


8780A17

Features

- *OSP™ Connectors*
- *Precision Coupling*
- *Sliding Load and Fixed Load Calibration*
- *DC to 18.0 GHz*

Description

These calibration kits are designed for use in calibrating vector network analyzers (VNAs) for making error-corrected measurements of devices with OSP™ blind-mate connectors from DC to 18.0 GHz. The positive coupling system featured in these connectors permits standards to be mated using a calibrated torque wrench. This provides precise repeatability of each calibration interface and significantly improves accuracy compared to non-captivated, blind-mate interfaces.
The the 8780A standard kits include fixed shorts, opens, fixed and sliding loads, a torque wrench, an open-end wrench, and a 3.5 inch data disk or flash drive that provides the VNA software for your specific VNA. The 8780B fixed termination kits have the same components but lack the sliding loads. Each kit comes in a foam-lined wooden instrument case with operating instructions.

Connector Description

The connectors on these components are Maury precision LCP/OSP™ connectors that are mating compatible with standard OSP™ and Dynawave/Dynamate™ series blind-mate connectors. They are low VSWR connectors rated from DC to 18 GHz. For interface specifications see Maury data sheet 5E-065.

Recommended Accessories

Connector Gage Kits (See page 113.)

A039C Connector gage kit (push-on type)

Components Included in 8780A/B Kits

QUANTITY	DESCRIPTION	MODEL
1	OSP™ female fixed offset short	8781A
1	OSP™ male fixed offset short	8781B
1	OSP™ female open	8782A
1	OSP™ male open	8782B
1	OSP™ female fixed termination	8783A
1	OSP™ male fixed termination	8783B
1	OSP™ sliding termination (with interchangeable female and male connectors)	8784D*
1	9/16-inch hex torque wrench (8 in. lbs)	2698H1
1	5/16-inch open-end wrench	8770Z6
1	7/16-inch open-end wrench	8770Z7
1	VNA software (on 3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: These kits also include a set of phase matched 3.5mm or 7mm user-specified adapters per the Ordering Options below. (See page 55.)

* Included in 8780A standard kits; not included in 8780B fixed termination kits.

Recommended Adapters

Phase Matched Adapters (See page 138.)

8787J Type N female to OSP™ female
8787K Type N male to OSP™ male

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 8780A kit configured with the adapters and software needed for use with an Agilent PNA that has OSP™ test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 55)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
OSP™	0	—	01	02	04	05	07	09
7mm	1	10	11	12	14	15	17	19
3.5mm	2	20	21	22	24	25	27	29

[1] Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-037.

OSP™ is a trademark of M/A-Com. Dynamate™ is a trademark of Dynawave, Inc.

OSP™ VNA Calibration Kits

8780F/M Single-Sex Fixed Termination Kits

Description

These kits are offered as a lower-cost single-sex alternative for users who don't need all of the components in the 8780A/B kits. The 8780F kits include only female standards and the 8780M kits include only male standards. (See the list at right.) Each kit comes in a foam-lined wood instrument case with operating instructions. The VNA software for specific VNAs are included in the operating instructions and can be keyed in from the front panel of the VNA.

Components Included in 8780F/M Kits

QUANTITY	DESCRIPTION	MODEL
1	OSP™ female fixed short	8771A*
1	OSP™ male fixed short	8771B**
1	OSP™ female open	8782A*
1	OSP™ male open	8782B**
1	OSP™ female fixed termination	8783A*
1	OSP™ male fixed termination	8783B**
1	Operating Instructions (manual)	—
1	Instrument case	—

* Included in 8780F kits; not included in 8780M kits.
** Included in 8780M kits; not included in 8780F kits.

Adapter Set Options for 8780F/M Kits

To order a set of phase matched adapters for the 8780F or M kits add one of the two-digit option numbers in the table below to the basic kit model number.

NETWORK ANALYZER TEST PORT TYPE	TEST PORT ADAPTER SET OPTIONS	Adapters Included in each Set				
		For 8780F Kits		For 8780M Kits		
7mm	10	2 ea. 7mm to OSP™ male adapters 1 ea. 7mm to OSP™ female adapter	8787H 8787G	2 ea. 7mm to OSP™ female adapters 1 ea. 7mm to OSP™ male adapter	8787G 8787H
7mm	11	1 ea. 7mm to OSP™ male adapter	8787H	1 ea. 7mm to OSP™ female adapter	8787G
3.5mm	20	2 ea. 3.5mm female to OSP™ male adapters 1 ea. 3.5mm female to OSP™ female adapter	8787S 8787Q	2 ea. 3.5mm female to OSP™ female adapters 1 ea. 3.5mm female to OSP™ male adapter	8787Q 8787S
3.5mm	21	1 ea. 3.5mm female to OSP™ male adapter	8787S	1 ea. 3.5mm female to OSP™ female adapter	8787Q
Type N	30	2 ea. Type N male to OSP™ male adapters 1 ea. Type N male to OSP™ female adapter	8787K 8787J	2 ea. Type N male to OSP™ female adapters 1 ea. Type N male to OSP™ male adapter	8787J 8787K
Type N	31	1 ea. Type N male to OSP™ male adapter	8787K	1 ea. Type N male to OSP™ female adapter	8787J

Adapter Set Options for 8780A/B Kits

Adapters Included in 8780Z5 (7mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
1	2	7mm to OSP™ female	8787G
	2	7mm to OSP™ male	8787H

Adapters Included in 8780Z6 (3.5mm) Sets

TEST PORT ADAPTER OPTION	QUANTITY	DESCRIPTION	MODEL
2	1	3.5mm female to OSP™ female	8787Q
	1	3.5mm male to OSP™ female	8787R
	1	3.5mm female to OSP™ male	8787S
	1	3.5mm male to OSP™ male	8787T

Note: All of the adapters within each set are phase matched (same electrical length) so they may be interchanged for measurement of non-insertable devices.

Adapter Specifications

The Maury precision adapters included in these sets conform to the following:

Precision 3.5mm to OSP™ Adapters

Models 8787Q/R/S/T *(For more detail see page 138.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 18.0 GHz 1.08
Nominal Impedance . . . . . 50 ohm

Precision Type N to OSP™ Adapters

Models 8787J/K *(For more detail see page 138.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.065
4.0 to 18.0 GHz 1.13
Nominal Impedance . . . . . 50 ohm

Precision 7mm to OSP™ Adapters

Models 8787G/H *(For more detail see page 138.)*

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.04
4.0 to 18.0 GHz 1.08
Nominal Impedance . . . . . 50 ohm

Key Literature: Maury data sheet 2Z-037.

14mm VNA Calibration Kits

2450 Series Expanded Kits


2450F17

Features

- *Sliding Terminations*
- *Includes Torque Wrench*
- *Includes Connector Gage Kit*
- *Includes Test Port Adapters*

Description

These calibration kits are expanded kits designed for calibrating vector network analyzers (VNAs) equipped with 3.5mm, 2.92mm or 7mm test set connectors and cables, which will be used in making error-corrected measurements of devices with 14mm connectors from DC to 8.5 GHz.

Each kit includes a full complement of calibration standards and accessories (shorts, opens, sliding and fixed loads, torque wrench, connector gages, 3.5mm to 14mm adapters, and a 14mm contact installation/extraction tool with spare contacts). Also included is the software needed (on a 3.5" data disk or flash drive) from which it may easily be loaded into your VNA.

Connector Description

The MPC14 precision 14mm connector is essentially equivalent to, and mating compatible with, GR900 type connectors. It features an improved hex knurl coupling nut and an improved center conductor inner contact (model 2481A). The coupling nut has a 1.00 inch hex for accurate tightening with a torque wrench, and the knurled knob provides a positive grip for finger tightening.

Available Kits

NETWORK ANALYZER TEST PORT TYPE	VNA MANUFACTURER AND MODEL	MAURY KIT MODEL
3.5mm or 2.92mm (K)[1]	Rohde & Schwarz ZV series	2450F11
	Agilent ENA series	2450F12
	Agilent 8510C	2450F14
	Agilent PNA series	2450F17
	Anritsu 37000	2450F19[2]

1 3.5mm and 2.92mm (K) connectors are fully mateable. The resulting junction is calibrated out and is not critical.

2 The software included in this kit is also fully compatible with the Anritsu Vector Star family of VNA.

Components Included in 2450 Kits

QUANTITY	DESCRIPTION	MODEL
1	14mm fixed short	2415D1
1	14mm open	2416D1
1	14mm sliding termination	2408A1
2	14mm fixed termination	2410A
1	14mm to NMD3.5mm female adapter	2433A1
1	14mm to 3.5mm female adapter	2407A1
1	14mm to 3.5mm male adapter	2407B1
1	14mm Connector Gage Kit (push-on type)	A024
1	1.00 inch hex torque wrench (12 in. lbs)	2498T1
1	Contact installation/extraction tool	2481S3
2	14mm contacts (spare parts)	2481A
1	VNA software (on 3.5" disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Recommended Accessories

2453A 30cm beadless air line. (See page 105.)

2607A1 14mm to 7mm adapter. (See page 133.)

7909H NMD2.4mm female to NMD3.5mm male adapter. (See page 122.)

Key Literature: Maury data sheet 2Z-021C.

7-16 VNA Calibration Kits

2750B Fixed Termination Kits

Features

- *Precision 7-16 Connectors*
- *Rated DC to 7.5 GHz; Usable to 8 GHz*
- *Fixed Load Calibration*
- *Low Torque Coupling*

2750B27

Description

The 2750 series calibration kits operate up to 7.5 GHz for making error-corrected measurements of devices with 7-16 connectors. The 2750B kits consist of the male and female 7-16 fixed load calibration standards needed to calibrate supported vector network analyzers (VNAs), and the VNA software on 3-1/2" data disk, supplied with the operating instructions (manual) in a foam-lined wood instrument case.

Connector Description

The 7-16 connectors found on the components in these kits are rugged, calibration grade connectors that exceed the requirements for IEC169-4 reference grade and BSEN122190 grade 0 specifications. They feature a thicker dielectric bead to eliminate deflection, retracted threads on the female connector to eliminate the need to apply excessive torque during calibration and test, and tighter tolerance control than called for in the IEC and BSEN specifications to reduce uncertainties.

Supported VNAs

Maury's 2750B calibration kits are ideal for use in calibrating many popular VNAs (i.e., Agilent 8510C, 8719/20/22, 8753C, and PNA series; Anritsu 37000; and Rohde & Schwarz ZV series).

Components Included in 2750B Kits

QUANTITY	DESCRIPTION	MODEL
1	7-16 female fixed short	2714A
1	7-16 male fixed short	2714B
1	7-16 female open	2716A
1	7-16 male open	2716B
1	7-16 female fixed termination	2710A
1	7-16 male fixed termination	2710B
1	1-1/6-inch torque wrench (20 in. lbs)	2698K1
1	15/16-inch open-end wrench	2750Z3
1	VNA software (on 3.5-inch disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 62 for details.)

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 2750B kit configured with the adapters and software needed for use with an Agilent PNA that has type N test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 60)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
7-16	0	—	01	02	04	05	07	09
7mm	1	10	11	12	14	15	17	19
Type N	2	20	21	22	24	25	27	29

1 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-041.

7-16 VNA Calibration Kits

2750F/M Single-Sex Fixed Termination Kits

Features

- *Precision 7-16 Connectors*
- *DC to 7.5 GHz*
- *Fixed Load Calibration*
- *Low Torque Coupling*

Description

The 2750F/M calibration kits are an economical alternative to the 2750B fixed termination kit, designed for the user who only needs calibration standards in one sex. The kits consist of the female (2750F) or male (2750M) 7-16 fixed load calibration standards needed to calibrate supported vector network analyzers (VNAs) for making error-corrected measurement of devices with 7-16 connectors. The VNA software are supplied in the operating instructions and can be manually keyed-in through the VNA front panel. All of the components are provided in a foam-lined wooden instrument case.

Connector Description

See the Connector Description for these connectors on page 57.

Supported VNAs

Maury's 2750F/M calibration kits are ideal for use in calibrating many popular VNAs (i.e., Agilent 8510C, 8719/20/22, 8753C, and PNA series; Anritsu 37000; and Rohde & Schwarz ZV series).

Components Included in 2750F/M Kits

QUANTITY	DESCRIPTION	MODEL
1	7-16 female fixed short	2714A*
1	7-16 male fixed short	2714B**
1	7-16 female open	2716A*
1	7-16 male open	2716B**
1	7-16 female fixed termination	2710A*
1	7-16 male fixed termination	2710B**
1	VNA software (on 3.5-inch disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 62 for details.)

* Included in female kits only. ** Included in male kits only.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 2750F kit configured with the adapters and software needed for use with an Agilent PNA that has 7mm test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 60)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
7-16	0	—	01	02	04	05	07	09
Type N Female	1	10	11	12	14	15	17	19
Type N Male	2	20	21	22	24	25	27	29
7mm	3	30	31	32	34	35	37	39
Type N Female	4	40	41	42	44	45	47	49
Type N Male	5	50	51	52	54	55	57	59
7mm	6	60	61	62	64	65	67	69

[1] Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-041.

7-16 TRL/LRL VNA Calibration Kits

2760B Tri-Kits

Features

- *SOLT (Short-Open-Load-Thru)*
- *Rated to 7.5 GHz, Usable to 8.0 GHz*
- *Gated Air Line*
- *TRL/LRL Calibrations*
- *Low Torque Coupling*

Description

These kits feature both female and male standards, a torque wrench and an open-end wrench for precise, repeatable connections, and adapter sets and VNA software on computer media. The each kit contains the components listed at the right, shipped together in a foam-lined wooden instrument case. Air lines are shipped separately as a set (2735A) in their own wooden instrument case (as shown in photo above). See page 105 for air line specifications.

Connector Description

The 7-16 connectors found on the components in these kits are rugged, calibration grade connectors that exceed the requirements for IEC169-4 reference grade and BSEN122190 grade 0 specifications. They feature a thicker dielectric bead to eliminate deflection, retracted threads on the female connector to eliminate the need to apply excessive torque during calibration and test, and tighter tolerance control than called for in the IEC and BSEN specifications to reduce uncertainties.

Components Included in 2760B Kits

QUANTITY	DESCRIPTION	MODEL
1	7-16 female to male air line, 6cm	2735A6.0
1	7-16 female to male air line, 7.5cm	2735A7.5
1	7-16 female to male air line, 30cm	2735A30
1	7-16 female fixed short	2714A
1	7-16 male fixed short	2714B
1	7-16 female open	2716A
1	7-16 male open	2716B
1	7-16 female fixed termination	2710A
1	7-16 male fixed termination	2710B
1	1-1/16-inch torque wrench (12 in. lbs)	2698K1
1	15/16-inch open end wrench	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit also includes a set of adapters that is user specified per the Ordering Options below. (See page 62 for details.)

TRM/TRL/LRL Calibration

Maury TRL/LRL calibration kits are Tri-kits containing the components needed to perform three types of calibrations (TRM/TRL/LRL, SOLT, and short-open-(air line + load). Source match can also be measured using the 6cm air line and provided short.

The reference air lines listed above are also sold as the model 2735K 7-16 air line kit (see page 105), which includes all three air lines housed in a foam-lined wood instrument case. This kit adds full 2-port TRL/LRL (Through-Reflect-Line, Line-Reference-Line) calibration capability to the 2750B standard kits.

Ordering Options

To specify the test port adapter and VNA software options you need, simply add two digits to the end of the kit model number as shown at right. The first digit is the test port adapter option number, and the second is the VNA software option number as found in the table below. The example provided in the diagram shows the combination of numbers needed to order a 2760B kit configured with the adapters and software needed for use with an Agilent PNA that has type N test ports.

VNA TEST PORT TYPE	TEST PORT ADAPTER OPTIONS (SEE PAGE 60)	VNA SOFTWARE OPTIONS						
		KITS WITHOUT SOFTWARE OPTION 0	ROHDE & SCHWARZ ZV SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
7-16	0	—	01	02	04	05	07	09
7mm	1	10	11	12	14	15	17	19
Type N	2	20	21	22	24	25	27	29

1 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 2Z-044, and 2X-224.

7-16 VNA Calibration Kit Adapter Sets

7-16 In-Series and 3.5mm, 7mm, and Type N Between-Series Sets

Features

- *7mm to 7-16, and Type N to 7-16 Between Series Adapters*
- *7-16 to 7-16 In-Series Adapters*
- *Phase Matched within Each Series*
- *DC to 7.5 GHz (Usable to 8.0 GHz)*

Description

The precision 7-16 adapters in these sets feature low VSWR, low insertion loss and are of minimum length. Test port adapters are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets. All of these adapters may be ordered in separately boxed sets (as described below), as options shipped with Maury VNA calibration kits, or as individual adapters (by model number).

Recommended Accessories for 7-16 Kits

Connector Gage Kits *(See page 113.)*
A041A 7-16 Connector gage kit (push-on type)

Torque Wrench *(See page 114.)*
2698K1 7-16, 1-1/16-inch (20 in. lbs)

Adapter Specifications

The precision in-series and between-series adapters in these sets have a 50 ohm nominal impedance and a frequency range of DC to 7.5 GHz. Within each series they are phase matched (have the same electrical length), making them interchangeable for measurement of non-insertable devices. VSWR for each model is as follows:

Precision 7-16 In-Series Adapters

Models 2712A/B/C *(For more detail see page 141.)*
Maximum VSWR 1.025

Precision 7-16 Between Series Adapters

Models 2706A/B/C/D/E/F *(For more detail see page 141.)*
Maximum VSWR 1.03
Models 2707A/B/C *(For more detail see page 141.)*
Maximum VSWR 1.03

Ruggedized Test Port Adapters

Models 2706E/F *(For more detail see page 141.)*
Maximum VSWR 1.03

3.5mm to 7-16 Adapters (sold separately)

Models 2705A/B/C/D *(For more detail see page 141.)*
Maximum VSWR 1.04

Adapter Options for 2750B Cal Kits

Adapters Included in 2750Z4 (7mm) Sets

TEST PORT ADAPTER OPTION 1	QUANTITY	DESCRIPTION	MODEL
	2	7mm to 7-16 female	2707A
	2	7mm to 7-16 male	2707B

Adapters Included in 2750Z5 (Type N) Sets

TEST PORT ADAPTER OPTION 2	QUANTITY	DESCRIPTION	MODEL
	1	Type N female to 7-16 female	2706A
	1	Type N male to 7-16 female	2706B
	1	Type N female to 7-16 male	2706C
	1	Type N male to 7-16 male	2706D

Adapter Options for 2760B TRL Kits

Adapters Included in 7mm Sets

TEST PORT ADAPTER OPTION 1	QUANTITY	DESCRIPTION	MODEL
	2	7mm to 7-16 female	2707A
	2	7mm to 7-16 male	2707C

Adapters Included in Type N Sets

TEST PORT ADAPTER OPTION 2	QUANTITY	DESCRIPTION	MODEL
	1	Type N female to 7-16 female	2706A
	1	Type N male to 7-16 female	2706B
	1	Type N female to 7-16 male	2706E
	1	Type N male to 7-16 male	2706F

Adapter Options for 2750F and 2750M Single-Sex Cal Kits

Adapters Included in 2750F Options 1 – 6

OPTION	QUANTITY	DESCRIPTION	MODEL
1	2	Type N male to 7-16 male	2706D
	1	Type N male to 7-16 female	2706B
2	2	Type N female to 7-16 male	2706C
	1	Type N female to 7-16 female	2706A
3	2	7mm to 7-16 male	2707B
	1	7mm to 7-16 female	2707A
4	1	Type N male to 7-16 male	2706D
5	1	Type N female to 7-16 male	2706C
6	1	7mm to 7-16 male	2707B

Adapters Included in 2750M Options 1 – 6

OPTION	QUANTITY	DESCRIPTION	MODEL
1	2	Type N male to 7-16 female	2706B
	1	Type N male to 7-16 male	2706D
2	2	Type N female to 7-16 female	2706A
	1	Type N female to 7-16 male	2706C
3	2	7mm to 7-16 female	2707A
	1	7mm to 7-16 male	2707B
4	1	Type N male to 7-16 female	2706B
5	1	Type N female to 7-16 female	2706A
6	1	7mm to 7-16 female	2707A

[1] These special short-faced test port adapters are required when using precision beadless air lines.

Key Literature: Maury data sheets 2Z-041 and 2Z-045.

Economy VNA Calibration Kits

Single- or Dual-Sex Fixed Termination Kits

Features

- *Fixed Load Calibration*
- *3.5mm, Type N, TNC and BNC Connectors*
- *Rugged Plastic Instrument Case*
- *DC to 26.5 GHz* [1]

Description

This series of low cost fixed load calibration kits covers frequencies from DC to 26.5 GHz[1]. The kits contain the standards needed to calibrate scalar or vector network analyzers and are housed in rugged, molded plastic cases. The increased durability of the cases makes these kits ideal for field service use. The VNA software provided in the operating instructions manual can be keyed in from the front panel of the analyzer. The kits are available in female/male dual-sex configurations or in single-sex female or male configurations.

Available Kits

Select the calibration kit number for the appropriate network analyzer test port connector type.

NETWORK ANALYZER TEST PORT TYPE	MAURY KIT MODEL		
	Female Only	Male Only	Female and Male
3.5mm	8050Q01	8050Q02	8050Q03
Type N	8850Q01	8850Q02	8850Q03
BNC	8550Q01	8550Q02	8550Q03
TNC	8650Q01	8650Q02	8650Q03

Recommended Adapters for these Kits

Phase Matched Adapters (See pages 131, 134 and 136.)

8023B1	3.5mm female to type N male
8023D1	3.5mm male to type N male
8022A2	3.5mm female to 7mm
8022B2	3.5mm male to 7mm
8828A	Type N female to type N female
8828B	Type N male to type N male
8828C	Type N female to type N male
8821C	BNC female to type N male
8821D	BNC male to type N male

In-Series Adapters (See page 139.)

232A2	TNC female to TNC female
232B2	TNC male to TNC male
232C2	TNC female to TNC male

8550Q02 8050Q03

Components Included in Economy Kits

QUANTITY	DESCRIPTION
1	Female fixed short *
1	Male fixed short **
1	Female open *
1	Male open **
1	Female fixed termination*
1	Male fixed termination**
1	Operating Instructions (manual)
1	Instrument case

* Included in female single-sex kits and dual-sex kits; excluded from male single-sex kits.

** Included in Male Single-sex kits and dual-sex kits; excluded from female single-sex kits.

Recommended Accessories for these Kits

Connector Gage Kits (See page 113.)

A034B	3.5mm Connector gage kit (push-on type)
A034E	3.5mm Connector gage kit (thread-on type)
A020A	Type N Connector gage kit (push-on type)
A020D	Type N Connector gage kit (thread-on type)
A012A	BNC Connector gage kit (push-on type)

Torque Wrenches (See page 114.)

8799A1	3.5mm, 5/16-inch (8 in. lbs)
2698C2	Type N, 3/4-inch hex (12 in. lbs)

Economy TRL Calibration Kits - 7mm

Need a 7mm Economy TRL Kit? Maury offers the following:

FREQUENCY RANGE (GHz)	VNA MAKE & MODEL — MAURY KIT MODEL NUMBER				
	WITHOUT SOFTWARE	R&S ZV SERIES	AGILENT 8510C	AGILENT 8719/20/22	AGILENT PNA SERIES
0.8 – 18.0	2660Q10	2660Q11	2660Q14	2660Q15	2660Q17
0.8 – 4.0	2660Q20	2660Q21	2660Q24	2660Q25	2660Q27

This series of low cost TRL calibration kits covers frequencies from 800 MHz to 18 GHz, or 800 MHz to 4 GHz, and contain the short and air lines needed to perform TRL calibration of vector network analyzers and devices equipped with 7mm connectors. Kit components are provided in foam-lined wood instrument cases. For more information please contact the Maury Sales Department. See also Maury data sheet 2Z-042.

[1] 3.5mm operates to 26.5 GHz, type N/TNC to 18 GHz and BNC to 10 GHz.

Waveguide VNA Calibration Kits

7005E Standard Kits

Features

- *1.12 to 50 GHz*
- *WR650 Through WR22*
- *Fixed and Sliding Load Calibration*
- *Agilent, Anritsu and Rohde & Schwarz VNAs Supported*

K7005E57 WR42

Description

These 7005E Standard Waveguide Calibration Kits are designed to provide accurate calibration of vector network analyzers (VNAs) used for measurements in standard rectangular waveguide from 1.12 to 50 GHz (WR650–WR22). Each kit includes all the components needed for accurate calibration of most VNAs plus a user-specified set of adapters and a high precision sliding termination (in a machined housing) to ensure high effective directivity after calibration. Precision straight sections and a fixed (reference plane) short are also included as verification standards.

Flange Description

The Maury Precision Flanges (MPF) on these components have precision indexing holes and indexing pins for precise mating alignment that maximizes measurement repeatability. They conform to all EIA WR standards for rectangular or round waveguide flanges.

Components Included in 7005E Kits

QUANTITY	DESCRIPTION	MODEL
1	Fixed (reference plane) short	344 series
1	1/8λ offset short	340 series
1	3/8λ offset short	340 series
1	Precision fixed termination	301 series
1	High precision sliding termination	314 series
1	Straight section (rectangular)	101/2 series
1	Flange hardware (including indexing pin set)	—
1	VNA software (3.5-inch disk or flash drive)	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Each kit includes a set of user-specified adapters per the ***Ordering Options***.

Ordering Options

To specify waveguide band, test port adapter and VNA software options, add a letter (for the desired bandwidth) to the front of the kit model number and add a two digit number to the end of the kit model number (as shown in the diagram at right). The first digit is the test port adapter option number, and the second is the VNA software option number (from the table below). The diagram shows the waveguide band prefix, kit model number, adapter option and VNA software option numbers to order an "R" band 7005E kit for use with an Agilent PNA.

WAVEGUIDE BAND (Model Prefix)	FREQUENCY RANGE (GHz)	WAVEGUIDE DESIGNATION (EIA WR NO.)	TEST PORT ADAPTER SET OPTIONS	VNA SOFTWARE OPTIONS						
				KITS W/O SOFTWARE OPTION 0	ROHDE & SCHWARZ ZVA/B SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
L	1.12 – 1.70	WR650	1	0	1	2	4	5	7	9
R	1.70 – 2.60	WR430	1 or 2	0	1	2	4	5	7	9
S	2.60 – 3.95	WR284	1, 2, 3, or 6	0	1	2	4	5	7	9
E	3.30 – 4.90	WR229	1, 2 or 3	0	1	2	4	5	7	9
G	3.95 – 5.85	WR187	1, 2 or 3	0	1	2	4	5	7	9
F	4.90 – 7.05	WR159	1, 2 or 3	0	1	2	4	5	7	9
C	5.85 – 8.20	WR137	1, 2 or 3	0	1	2	4	5	7	9
H	7.05 – 10.0	WR112	1, 2 or 3	0	1	2	4	5	7	9
X	8.20 – 12.4	WR90	1, 2 or 3	0	1	2	4	5	7	9
M	10.0 – 15.0	WR75	1, 2 or 3	0	1	2	4	5	7	9
P	12.4 – 18.0	WR62	1, 2 or 3	0	1	2	4	5	7	9
N	15.0 – 22.0	WR51	3 or 5	0	1	2	4	5	7	9
K	18.0 – 26.5	WR42	3 or 5	0	1	2	4	5	7	9
U	26.5 – 40.0	WR28	4 or 5	0	1	—	4	5	7	9
J	33.0 – 50.0	WR22	5	0	1	—	4	5	7	9

TEST PORT ADAPTER SET OPTIONS (One of these sets is included in each kit, per user specification.)	
	OPTION 0: To order kits with no adapters add a zero after the model number, before the Software Option number.
	OPTION 1: 2 ea. waveguide (WG) to 7mm right angle launch (RAL); 1 ea. WG to 7mm end launch (EL).
	OPTION 2: 1 ea. WG to 7mm RAL; 2 ea. WG to 7mm EL.
	OPTION 3: 1 ea. WG to 3.5mm female RAL; 1 ea. WG to 3.5mm male RAL; 1 ea. WG to 3.5mm EL (NMD3.5f in F-K bands).
	OPTION 4: 1 ea. WG to 2.92mm female RAL; 1 ea. WG to 2.2.92mm male RAL; 1 ea. WG to 2.92mm female EL.
	OPTION 5: 1 ea. WG to 2.4mm female RAL; 1 ea. WG to 2.4mm male RAL; 1 ea. WG to 2.4mm female EL (Not included for N band).
	OPTION 6: 1 ea. WG to type N female RAL; 1 ea. WG to type N male RAL; 1 ea. WG to type N female EL.

Key Literature: Maury data sheet 3H-001.

[1] Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Optimized Millimeter Waveguide VNA Calibration Kits

7005G Optimized Kits

Features

- *26.5 to 110 GHz*
- *WR28 Through WR10*
- *Fixed and Sliding Load Calibration*
- *Optimized Directivity & Source Match*

U7005G17 WR28

Description

The 7005G kits are high precision kits featuring optimized standards and VNA software, which provide highly accurate calibration (for measurements in rectangular waveguide) of Agilent 8510C. 8719/20/22, 8753, and PNA series, Anritsu 37000 and Vector Star, or Rohde & Schwarz ZV series vector network analyzers (VNAs) equipped with external millimeter waveguide test heads or modules. Kits are available for the Agilent VNAs from 26.5 to 110 GHz, and for the Anritsu 37000/ Vector Star family from 33 to 110 GHz. Each kit includes all the components needed for accurate calibration of these VNAs as listed at the right. The high precision sliding terminations included in these kits features machined housings; ensuring high effective directivity after calibration. For kits in WR22 and smaller sizes, these sliding terminations are equipped with a micrometer drive so that load positions can be easily and smoothly set. The precision straight section and fixed (reference plane) shorts in these kits can be used as verification standards. All component flanges have precision indexing holes and removable indexing pins for excellent measurement repeatability. The millimeter waveguide flanges in the WR22 and smaller sizes are of a unique Maury-pioneered design featuring a raised outer rim to prevent the flanges from cocking during connection, which can mate with compatible UG ***/U flanges.

Optimized Directivity and Source Match

All 7005G kits are configured for the Short-Short-Load-Thru (SSLT) calibration method using offset shorts and a sliding termination. The sliding termination housings are calibrated for return loss and then selected for compliance with directivity specification. The offset shorts are calibrated and the calibration coefficients are optimized for compliance with the source match specification. The calibration data is provided in a calibration report supplied with each kit. Since the constants are optimized, the data supplied with each kit is unique to that individual kit.

Components Included in 7005G Kits

QUANTITY	DESCRIPTION
2	Test port adapters
1	Fixed (reference plane) short (verification standard)
1	1/8λ high precision offset short
1	3/8λ high precision offset short
1	Precision fixed termination
1	High precision sliding termination
1	Precision straight section (verification standard)
1	Flange hardware (including the indexing pin set)
1	Flange tool set
1	Optimized VNA software (on 3.5" disk, flash drive or cartridge)
1	Operating Instructions (manual)
1	Instrument case

Note: Additional adapters may be ordered separately.

Ordering Options

To specify waveguide band, test port adapter and VNA software options, add a letter (for the desired bandwidth) to the front of the kit model number and add a two digit number to the end of the kit model number (as shown in the diagram at right). The first digit is the test port adapter option number, and the second is the VNA software option number (from the table below). The diagram shows the waveguide band prefix, kit model number, adapter option and VNA software option numbers to order an "U" band 7005G kit for use with an Agilent PNA.

WAVEGUIDE BAND (Model Prefix)	FREQUENCY RANGE (GHz)	WAVEGUIDE DESIGNATION (EIA WR NO.)	TEST PORT ADAPTERS PROVIDED	VNA SOFTWARE OPTIONS			
				ROHDE & SCHWARZ ZVA/B SERIES OPTION 1	AGILENT 8510C OPTION 4	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
U	26.5 – 40.0	WR28	2 U103A1.375	11	14	17	19
J	33.0 – 50.0	WR22	2 J115B1	11	14	17	19
V	50.0 – 75.0	WR15	2 V115C	11	14	17	19
Y	60.0 – 90.0	WR12	2 Y115B	11	14	17	19
Z	75.0 – 110.0	WR10	2 Z115A	11	14	17	19

1 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 3H-068. For Test Port Adapter specifications see page 145.

Millimeter Waveguide VNA Calibration Kits

7005M Economy Kits

Features

- *26.5 to 110 GHz*
- *WR28 Through WR10*
- *Fixed or Sliding Load Calibration*
- *SSLLT Configured*

V7005M17 WR15

Description

The 7005M series kits are economical, cost effective kits designed to provide accurate calibration (for measurements in rectangular waveguide) of Agilent 8510C. 8719/20/22, 8753, and PNA series, Anritsu 37000, or Rohde & Schwarz ZV series vector network analyzers (VNAs) equipped with external millimeter waveguide test heads or modules. Kits are available for the Agilent VNAs from 26.5 to 110 GHz, and for the Anritsu 37000 from 33 to 110 GHz.

Each kit includes all the components needed for accurate calibration of these VNAs as listed at the right. The 7005M kits come with a precision fixed termination. The precision straight section and fixed (reference plane) short in these kits can be used as verification standards.

All component flanges have precision indexing holes and removable indexing pins for excellent measurement repeatability. The Millimeter waveguide flanges in the WR22 and smaller sizes are of a unique Maury-pioneered design featuring a raised outer rim to prevent the flanges from cocking during connection. These flanges will mate with corresponding UG ( )/U flanges.

Components Included in 7005M Kits

QTY	DESCRIPTION
1	Fixed (reference plane) short (calibration and verification standard)
1	Precision straight section (verification standard)
1	1/4λ waveguide straight section (shim)
1	Precision fixed termination
1	Flange hardware (including the indexing pin set)
1	Flange tool set
1	VNA software (on 3.5" disk or flash drive)
1	Operating Instructions (manual)
1	Instrument case

Note: Additional adapters may be ordered separately.

Calibration Method

The 7005M series kits for the Agilent VNAs are configured for the Short-Short-Load-Load-Thru (SSLLT) calibration method using a fixed short, a fixed precision termination, and a 1/4λ shim.

Ordering Options

To specify the waveguide band, test port adapter and VNA software options you need, add a letter (designating the desired bandwidth) to the front of the kit model number and add a two digit number to the end of the kit model number (as shown in the diagram at right). The first digit is the test port adapter option number, and the second is the VNA software option number (from the table below). The example in the diagram shows the waveguide band prefix, kit model number, adapter option and VNA software option numbers to order an "U" band 7005M kit for use with an Agilent PNA.

WAVEGUIDE BAND (Model Prefix)	FREQUENCY RANGE (GHz)	WAVEGUIDE DESIGNATION (EIA WR NO.)	TEST PORT ADAPTERS PROVIDED	VNA SOFTWARE OPTIONS		
				AGILENT 8510C OPTION 14	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
U	26.5 – 40.0	WR28	2 U103A1.375	14	17	—
J	33.0 – 50.0	WR22	2 J115B1	14	17	19
V	50.0 – 75.0	WR15	2 V115C	14	17	19
Y	60.0 – 90.0	WR12	2 Y115B	14	17	19
Z	75.0 – 110.0	WR10	2 Z115A	14	17	19

1 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 3H-071.

Waveguide VNA Calibration Kits

7006A Economy Kits

Features

- *2.6 to 40 GHz*
- *WR284 Through WR28*
- *Sliding Load Calibration*
- *Agilent, Anritsu and Rohde & Schwarz VNAs Supported*

Q7006A17 WR34

Description

The 7006A Kits are economical, cost-effective kits designed to provide accurate calibration of vector network analyzers (VNAs) that are equipped with 3.5mm or 2.4mm connectors. They are used for making measurements in standard rectangular waveguide from 2.6 to 40 GHz (WR284 to WR28). Each kit includes all the components needed for accurate calibration of most VNAs with a user-specified set of adapters and a precision sliding termination. In addition to these components (listed at right), kits for Anritsu VNAs also include two (2) fixed shorts.

Flange Description

The Maury Precision Flanges (MPF) on these components have precision indexing holes and indexing pins for precise mating alignment that maximizes measurement repeatability. They conform to all EIA WR standards for rectangular or round waveguide flanges.

Components Included in 7006A Kits

QUANTITY	DESCRIPTION	MODEL
1	Fixed (reference plane) short	344 series
1	1/4λ straight section	322 series
1	Precision sliding termination	313/4 series
1	WG to NMD 3.5mm female end launch adapter*	230/3 series
1	WG to 3.5mm male right angle launch adapter*	200/10 series
1	Flange hardware (including the indexing pin set)	—
1	3.5-inch data disk with VNA software	—
1	Operating Instructions (manual)	—
1	Instrument case	—

Note: Additional adapters may be ordered separately.

*WR34 and WR28 kits replace these adapters with two 2.4mm female right angle launch adapters.

Ordering Options

To specify the waveguide band, test port adapter and VNA software options you need, add a letter (designating the desired bandwidth) to the front of the kit model number and add a two digit number to the end of the kit model number (as shown in the diagram at right). The first digit is the test port adapter option number, and the second is the VNA software option number (from the table below). The example in the diagram shows the waveguide band prefix, kit model number, adapter option and VNA software option numbers to order an "S" band 7006A kit for use with an Agilent PNA.

WAVEGUIDE BAND (Model Prefix)	FREQUENCY RANGE (GHz)	WAVEGUIDE DESIGNATION (EIA WR NO.)	TEST PORT ADAPTERS PROVIDED IN KITS	VNA SOFTWARE OPTIONS						
				KITS W/O SOFTWARE OPTION 0	ROHDE & SCHWARZ ZVA/B SERIES OPTION 1	AGILENT PNA SERIES OPTION 7	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 9[1]
S	2.60 – 3.95	WR284	1 S230K1 & 1 S200B1	0	11	12	14	15	17	19
E	3.30 – 4.90	WR229	1 E230K1 & 1 E200B1	0	11	12	14	15	17	19
G	3.95 – 5.85	WR187	1 G230K1 & 1 G200B1	0	11	12	14	15	17	19
F	4.90 – 7.05	WR159	1 F230K1 & 1 F200B1	0	11	12	14	15	17	19
C	5.85 – 8.20	WR137	1 C230K1 & 1 C200B1	0	11	12	14	15	17	19
H	7.05 – 10.0	WR112	1 H230K1 & 1 H200B1	0	11	12	14	15	17	19
X	8.20 – 12.4	WR90	1 X230K1 & 1 X200B2	0	11	12	14	15	17	19
M	10.0 – 15.0	WR75	1 M230K1 & 1 M200B2	0	11	12	14	15	17	19
P	12.4 – 18.0	WR62	1 P230K1 & 1 P200B2	0	11	12	14	15	17	19
N	15.0 – 22.0	WR51	1 N230K3 & 1 N200B2	0	11	12	14	15	17	19
K	18.0 – 26.5	WR42	1 K230K6 & 1 N200B8	0	11	12	14	15	17	19
Q	22.0 – 33.0	WR34	2 Q236A1	0	11	—	14	15	17	19
U	26.5 – 40.0	WR28	2 U236A6	0	11	—	14	15	17	19

NOTE: To order your kit with no adapters add a "0" (zero) to the model number instead of a "1" before the VNA Software Option Suffix.

[1] Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

Key Literature: Maury data sheet 3H-057A.

Waveguide TRL VNA Calibration Kits

7007H Kits

H7007H17
WR112

Features

- *1.7 to 50 GHz*
- *WR430 Through WR10*
- *Fixed Load Calibration*
- *TRL and SSLT Configured*

Description

The 7007H model series are waveguide kits designed to provide accurate Thru-Reflect-Line (TRL) calibrations of vector network analyzers for measurements in rectangular waveguide at frequencies from 1.7 to 50.0 GHz (WR430 through WR22).

As shown in the adjacent table, the 7007H series calibration kits provide all the necessary devices for an accurate TRL calibration of the appropriate VNA. In addition to TRL calibrations, the 7007H series can also make Short-Short-Load-Thru (SSLT) and offset load calibrations.

All kit component flanges have precision indexing holes for excellent measurement repeatability (indexing pins are provided with the kit).

Components Included in 7007H Kits

QUANTITY	DESCRIPTION
2	Waveguide to Coaxial right angle launch test port adapters
1	Fixed (reference plane) short (verification standard)*
2	Precision fixed terminations
1	1/4λ high precision straight section
1	Flange hardware (including the indexing pin set)
1	VNA software (on 3.5" disk or flash drive)
1	Operating Instructions (manual)
1	Instrument case

Note: Additional adapters may be ordered separately.

* Kits for the Anritsu 37000/Vector Star VNAs include two (2) fixed (reference plane) shorts.

Ordering Options

To specify the waveguide band, test port adapter and VNA software options you need, add a letter (designating the desired bandwidth) to the front of the kit model number and add a two digit number to the end of the kit model number (as shown in the diagram at right). The first digit is the test port adapter option number, and the second is the VNA software option number (from the table below). The example in the diagram shows the waveguide band prefix, kit model number, adapter option and VNA software option numbers to order an "R" band 7007H kit for use with an Agilent PNA.

WAVEGUIDE BAND (Model Prefix)	FREQUENCY RANGE (GHz)	WAVEGUIDE DESIGNATION (EIA WR NO.)	TEST PORT ADAPTERS PROVIDED**		VNA SOFTWARE OPTIONS						
			QTY	MODEL	KITS W/O SOFTWARE OPTION 0	ROHDE&SCHWARZ ZVA/B SERIES OPTION 1	AGILENT ENA SERIES OPTION 2	AGILENT 8510C OPTION 4	AGILENT 8719/20/22 OPTION 5	AGILENT PNA SERIES OPTION 7	ANRITSU 37000 OPTION 91
L	1.12 – 1.17	WR650	2	L209A1 (W/G to 7mm)	0	11	12	14	15	17	19
R	1.70 – 2.60	WR430	2	R209A2 (W/G to 7mm)	0	11	12	14	15	17	19
S	2.60 – 3.95	WR284	2	S209C2 (W/G to 7mm)	0	11	12	14	15	17	19
E	3.30 – 4.90	WR229	2	E209C2 (W/G to 7mm)	0	11	12	14	15	17	19
G	3.95 – 5.85	WR187	2	G209C2 (W/G to 7mm)	0	11	12	14	15	17	19
F	4.90 – 7.05	WR159	2	F209C2 (W/G to 7mm)	0	11	12	14	15	17	19
C	5.85 – 8.20	WR137	2	C209C2 (W/G to 7mm)	0	11	12	14	15	17	19
H	7.05 – 10.0	WR112	2	H209D2 (W/G to 7mm)	0	11	12	14	15	17	19
X	8.20 – 12.4	WR90	2	X209D2 (W/G to 7mm)	0	11	12	14	15	17	19
M	10.0 – 15.0	WR75	2	M209D2 (W/G to 7mm)	0	11	12	14	15	17	19
P	12.4 – 18.0	WR62	2	P209D2 (W/G to 7mm)	0	11	12	14	15	17	19
N	15.0 – 22.0	WR51	2	N200A2 (W/G to 3.5mm f)	0	11	12	14	15	17	19
K	18.0 – 26.5	WR42	2	K200A1 (W/G to 3.5mm f)	0	11	12	14	15	17	19
Q	22.0 – 33.0	WR34	2	Q236A1 (W/G to 2.4mm f)	0	11	—	14	15	17	19
U	26.5 – 40.0	WR28	2	U236A6 (W/G to 2.4mm f)	0	11	—	14	15	17	19
J	33.0 – 50.0	WR22	2	J236A3 (W/G to 2.4mm f)	0	11	—	14	15	17	19
V	50.0 – 75.0	WR15	2	V115C Test Port Adapters	0	11	—	14	15	17	19
Y	60.0 – 90.0	WR12	2	Y115B Test Port Adapters	0	11	—	14	15	17	19
Z	75.0 – 110.0	WR10	2	Z115A Test Port Adapters	0	11	—	14	15	17	19

1 Option 9 software is also fully compatible with the Anritsu Vector Star family of VNAs.

** Indicate adapter option 0 (zero) to order kits without adapters.

Key Literature: Maury data sheet 3H-080.

VNA Calibration Kit Components Finder

Use the chart below to find the page(s) in this catalog which have information about Maury VNA Calibration Kit Components

Cal Kit Components Information Finder Connector Type	• Fixed Terminations	• Sliding Terminations	• Fixed Flush & Fixed Offset Shorts	• Sliding Shorts	• Opens	• Air Lines (Beadless)	• Air Lines (Bead Supported)	• Precision Mismatches	• Two-Port Mismatch Sets	• Two-Port Mismatch Standards	• Two-Port Standards Sets	• CConnector Gage Kits *	• Torque Wrenches
• 1.85mm	72	82	86		99	100						112-13	114
• 2.4mm	72	82	87		99	101		106	108			112-13	114
• 2.92mm	73	82	87	96	99	101		106	108			112-13	114
• 3.5mm	73	82, 84	88	96	99	102	102	106	108		92	112-13	114
• 7mm	74	83, 84	89	96, 97	99	103	103	106	107-8		93	113	114
• Type N (50 ohm)	74	83, 84	90	96, 97	99	104	104	106	107-8			113	114
• Type N (75 ohm)	75		93		99							113	114
• C	76		93									113	
• HN	76		93										
• SC	76		93									113	114
• BNC (50 ohm)	76		93		99							113	
• BNC (75 ohm)	75		93		99							113	
• TNC	77	83	90		99			107	107			113	114
• AFTNC	77	83	91		99							113	114
• TNCA	77	83	91		99							113	114
• SMA		83		97								113	114
• OSP™	78		92		99							113	114
• 14mm (GR 900 Equiv.)	79	83	92			105		107				113	114
• 7-16	79		93		99	105						113	114
• Waveguide Components	80	85	94, 95	98						109			

* Maury also offers connector gages and gage kits for ZMA/BZ and Multiport connectors. Digital gages and gage kits are available for 1.85mm/2.4mm and 2.92mm (K)/3.5mm connectors. See their listings on page 112-113.

Maury Cal Kit Components

General Information

Fixed Terminations

Maury fixed terminations are precision "fixed" loads that are used to introduce known VSWR into 50 ohm transmission systems. They are available in various frequency ranges with specific VSWR maximums, and are designed for general laboratory use, or as calibration standards for performing Z_0 calibrations (especially at low frequencies) on network analyzers (VNAs).

Sliding Terminations

Maury sliding terminations ("sliding loads") consist of a precision, movable, tapered termination in a highly accurate, air dielectric transmission line. They are basic tools for making precision microwave measurements, such as "load separation", in which the reflection from the terminating element can be separated from that of the test device. Load separation using sliding loads is a key element in the calibration of VNAs. The technique is also used to measure the reflection from two-port devices (particularly "non-insertable" devices like waveguide-to-coax adapters) and to measure the directivity of directional couplers.

Maury's sliding terminations are available in metrology grade and high precision units with integral, dedicated connectors; precision units which permit changing the sex of the connector within the same connector series; and modular instruments which permit changing the connector type.

Fixed Flush and Fixed Offset Shorts

Fixed flush and fixed offset shorts are used to establish reference planes in transmission systems and as calibration standards for VNAs. Shorts with an offset of 2.498cm are often used to evaluate the calibration effectiveness of a VNA.

The shorting plane of fixed flush shorts is at the connector reference plane or at some offset established by another component, (typically an open). The shorting plane of some fixed offset shorts can also be relative to that established by another short with a nominal zero offset.

Sliding Shorts

A sliding short is a movable short circuit termination in a precision air line which is used in laboratory measurement applications, such as establishing a reference plane in a transmission system, as tuning elements in the development of microwave components (mixers, amplifiers, etc.), and in tuning high precision CW reflectometer systems. They are also important as calibration standards for calibrating VNAs, PNAs, and ENAs, when they are to be used for measuring highly reflective devices.

Maury coaxial sliding shorts feature a precision transmission structure (air line), consistent low noise contacts on the inner and outer conductors, and a precision connector. Maury sliding shorts are available as modular units with interchangeable connectors, high precision devices with dedicated connectors, and rugged general purpose units.

Opens

Shielded, coaxial open circuit terminations (opens) are used in calibrating VNAs. Their function is to provide a nominal 180° phase offset from a compatible reference short circuit over a broad range of frequencies.

Shielding the open essentially eliminates radiation losses; but creates a residual frequency-sensitive capacitance. An accurate knowledge of the open circuit effective capacitance is essential to an accurate calibration of the analyzer.

Maury opens are characterized for effective capacitance versus frequency by means of a fourth order polynomial curve fit, and the nominal capacitance coefficients are provided with each unit. We offer several innovative designs that improve the consistency and repeatability of the capacitance coefficients, resulting in improved effective source match of calibrated VNAs.

Air Lines (Beaded and Beadless)

Precision or reference air lines are air-dielectric transmission lines with highly accurate dimensions that can be used as fundamental impedance standards and to establish reference positions in measurement and calibration applications.

Maury air lines are available with both bead supported and beadless connectors. Beadless lines offer better impedance and electrical length accuracies and lower VSWR, while beaded lines offer greater convenience.

Precision Mismatches and Mismatch Air Line Sets

Maury precision standard mismatches are fixed terminations that can be used to calibrate swept reflectometers, verify network analyzer calibration, establish impedance references in TDR measurements, and have other general laboratory uses. They are made with thin film resistors and a unique grounding method that ensures stable operation. Calibration data is provided for all units at 1 GHz intervals from 2 GHz to the applicable upper frequency limit.

Maury mismatch air line sets are two-port, 1/4λ VSWR standards consisting of coaxial air lines with precision outer conductors, beadless connectors, and a set of inner conductors with increasing diameters. They produce accurately known reflection coefficents, which are directly calculable from and traceable to air line dimensions. These sets are extremely stable and easy to use in many applications. Their simple geometry allows direct calculation of reflection, loss, transfer and group delay characteristics, making them ideally suited for checking the performance and accuracy of VNAs.

Connector Gage Kits

Maury's connector gage kits provide an easy to use, direct reading, self-checking, and accurate way to measure the critical linear interface dimensions of most coaxial connectors. Their use helps ensure the best electrical performance and accuracy of your test instruments and DUTs, and allows you to avoid serious damage to their connectors.

Precision Fixed Terminations

General Information

Fixed Terminations

A precision fixed termination (or load) consists of an immovable, (fixed) termination which, when mated to the end of a transmission line or cable, absorbs nearly all of the signal energy traveling toward it. An ideal "matched" condition exists when a termination with an impedance value of Z_0, is connected to the end of a transmission line or cable that also has a characteristic impedance of Z_0. Such an ideal "matched" condition (one with no mismatch between the termination and its mated line or cable) is critical if a voltage standing wave ratio (VSWR) of 1.0:1 is to be achieved in a system with a 50 or 75 ohm impedance value. Simply put, the more closely the 1.0:1 ratio is approached, the more accurate the measurements that can be made from a system.

Maury precision fixed terminations are designed to exacting specifications and are as close to the ideal impedance as it is mechanically possible to make them. The following pages (70 through 78) provide detailed information about the various types of precision fixed terminations offered by Maury. Most are normally sold as components of Maury VNA calibration kits, but may also be purchased separately as replacement parts or spares.

Precision Fixed Terminations

1.85mm (7831/32 series) and 2.4mm (7931 series)

Features

- *Low VSWR*
- *DC to 67 GHz (1.85mm)*
- *DC to 50 GHz (2.4mm)*
- *Mating Compatible to Each Other*

Description

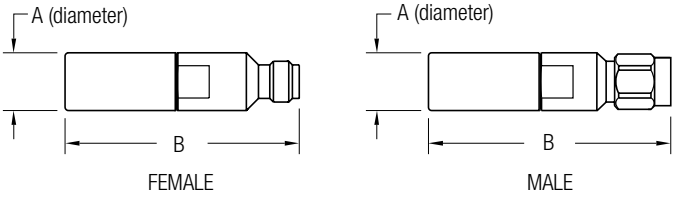
The 7831/32 and 7931 model series fixed terminations, which have 1.85mm and 2.4mm connectors respectively, are precision low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Depending on the frequency range and required calibration effectiveness of your network analyzer (VNA or PNA), specific models can be used for full or lowband one-port Z_0 calibration and full two-port isolation calibration. The 1.85mm and 2.4mm mini-connectors used on these terminations are mating compatible with each other.

Connector Descriptions

The precision 1.85mm connectors on the 7831A1/B1 and the 7832A/B are miniature, instrument grade, air-interface connectors that operate mode free up to 67 GHz, and comply with IEEE standard 287 general precision connector, instrument grade GPC1.85.

The precision 2.4mm connectors on the 7931A1/B1 are miniature, instrument grade, air-interface connectors that operate mode free up to 50 GHz, and comply with IEEE standard 287 general precision connector, instrument grade GPC2.4.

Dimensions – Inches (cm)



Unless otherwise noted, all dimensions are in inches and centimeters (cm).

TYPE	MODEL	A	B	MODEL	A	B
1.85mm	7831A1	0.36 (0.91)	1.46 (3.71)	7831B1	0.36 (0.91)	1.50 (3.81)
1.85mm	7832A	0.28 (0.71)	2.39 (6.07)	7832B	0.28 (0.71)	2.29 (5.82)
2.4mm	7931A1	0.36 (0.91)	1.46 (3.71)	7931B1	0.36 (0.91)	1.50 (3.81)

[1] Precision 1.85mm per Maury data sheet 5E-089.

[2] Precision 2.4mm per Maury data sheet 5E-064.

Available Models

MODEL FEMALE	MODEL MALE	FREQUENCY RANGE (GHz)	MAXIMUM VSWR	CONNECTOR TYPE
7831A1	7831B1	DC – 1.0 1.0 – 10.0 10.0 – 26.5 26.5 – 50.0	1.02 1.07 1.10 1.20	1.85mm
7832A	7832B	10.0 – 67.0	1.10	
7931A1	7931B1	DC – 4.0 4.0 – 50.0	1.016 1.15	2.4mm

Specifications

Frequency Range, VSWR . . . . . (See Available Models chart)
Power Rating . . . . . 0.5 watt CW, 0.25 kW peak
Nominal Impedance. . . . . 50 ohm
Connectors:
7831 series . . . . . 1.85mm [1]
7832 series . . . . . 1.85mm [1]
7931 series . . . . . 2.4mm [2]
Size . . . . . (See Dimensions)

Precision Fixed Terminations

2.92mm (K) (8775 series) and 3.5mm (8031 series)

Features

- *Low VSWR*
- *DC to 40 GHz (2.92mm)*
- *DC to 34 GHz (3.5mm)*
- *Mates with SMA & Each Other*

Description

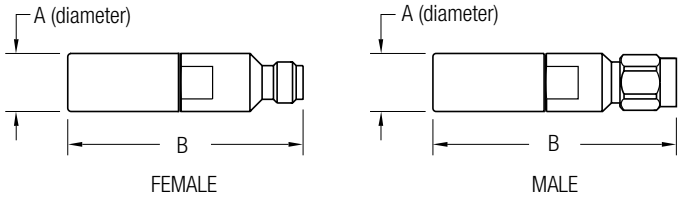
The 8775 and 8031 model series fixed terminations, which have 2.92mm and 3.5mm connectors respectively, are precision low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Depending on the frequency range and required calibration effectiveness of your network analyzer (VNA or PNA), specific models can be used for full or lowband one-port Z_0 calibration and full two-port isolation calibration. The 2.92mm (K) and 3.5mm connectors used on these terminations are mating compatible with each other, and with SMA connectors.

Connector Descriptions

The precision 2.92mm (or K) connectors on the 8775 model series are precision miniature 2.92mm air line interface connectors that operate mode free to 40 GHz. They have a mechanically compatible interface that mates with SMA and 3.5mm connectors. This interface was originally introduced by Maury in 1974 as the MPC3 connector and was reintroduced as the K connector by Wiltron in 1984.

The 3.5mm connectors on the 8031 model series are air interface connectors that are mating compatible with SMA and K (2.92mm) connectors. They have an air line size of 0.0598 (inner diameter) and 0.1378 (outer diameter).

Dimensions – Inches (cm)



Unless otherwise noted, all dimensions are in inches and centimeters (cm).

TYPE	MODEL	A	B	MODEL	A	B
2.92mm	8775A2	0.36 (0.91)	1.46 (3.71)	8775B2	0.36 (0.91)	1.50 (3.81)
3.5mm	8031A( )	0.36 (0.91)	1.46 (3.71)	8031B( )	0.36 (0.91)	1.50 (3.81)

[1] Precision 2.92mm (K) per Maury data sheet 5E-063.

[2] Precision 3.5mm per Maury data sheet 5E-062.

Available Models

MODEL FEMALE	MODEL MALE	FREQUENCY RANGE (GHz)	MAXIMUM VSWR	CONNECTOR TYPE
8775A2	8775B2	DC – 4.0	1.016	2.92mm [1]
		4.0 – 40.0	1.15	
8031A2	8031B2	DC – 4.0	1.05	3.5mm [2]
		4.0 – 12.0	1.10	
		12.0 – 18.0	1.15	
		18.0 – 26.5	1.20	
		26.5 – 34.0	1.25	
8031A4	8031B4	DC – 2.0	1.03	3.5mm [2]
		2.0 – 4.0	1.05	
		4.0 – 18.0	1.10	
		18.0 – 26.5	1.15	
8031A5	8031B5	DC – 3.0	1.02	3.5mm [2]
		3.0 – 6.0	1.032	
		6.0 – 20.0	1.052	
		20.0 – 26.5	1.083	

Specifications

Frequency Range, VSWR . . . . . (See Available Models chart)

Power Rating . . . . . 0.5 watt CW, 0.25 kW peak

Nominal Impedance. . . . . 50 ohm

Connectors:

8775 series . . . . . 2.92mm (K) [1]

8031 series . . . . . 3.5mm [2]

Size . . . . . (See Dimensions)

Precision Fixed Terminations

7mm (2610 series) and Type N (2510 series)

Features

- *Low VSWR*
- *DC to 18 GHz*

Description

The 2610 and 2510 series fixed terminations (utilizing 7mm and type N connectors respectively) are precision, broadband, low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Depending upon the frequency range and required calibration effectiveness of a vector network analyzer (VNA or PNA), specific models can be used for full or lowband one-port Z_0 calibration and full two-port isolation calibration.

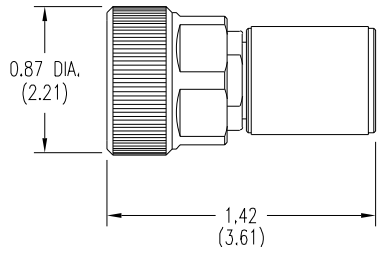
Connector Descriptions

The 7mm connectors on the 2610 series terminations are precision air interface hermaphroditic connectors that are rated from DC to 18 GHz. They have an air line size of 0.1197 inner diameter and a 0.2756 outer diameter.

The connectors on the 2510 series terminations are Maury precision stainless steel type N connectors that mate with most of the precision type N connectors commonly used today, including those complying with MIL-C-39012 and MIL-T-81490. They are low VSWR connectors rated from DC to 18 GHz.

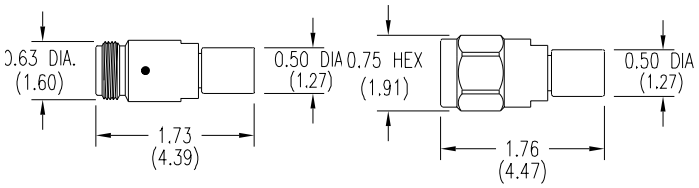
Dimensions – Inches (cm)

7mm



2610

Type N



2510 Female 2510 Male

Key Literature: Maury data sheet 2C-003, 2C-005, 5E-049, and 5E-060.

Available Models

MODEL FEMALE	MODEL MALE	FREQUENCY RANGE (GHz)	MAXIMUM VSWR	CONNECTOR TYPE
2610C		DC – 4.0 4.0 – 18.0	1.04 1.08	7mm [1]
2610D		DC – 18.0	1.04	7mm [1]
2610F		DC – 1.0 1.0 – 2.0 2.0 – 8.0 8.0 – 18.0	1.005 1.01 1.03 1.06	7mm [1]
2510A4	2510B4	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.04 1.10 1.15	Type N [2]
2510A5	2510B5	DC – 4.0 4.0 – 18.0	1.04 1.10	Type N [2]
2510A6	2510B6	DC – 2.0 2.0 – 4.0 4.0 – 18.0	1.02 1.04 1.06	Type N [2]
2510A7	2510B7	DC – 2.0 2.0 – 4.0 4.0 – 18.0	1.01 1.04 1.12	Type N [2]
2510A8	2510B8	DC – 3.0 3.0 – 6.0	1.01 1.02	Type N [2]

Specifications

Frequency Range, VSWR . . . . . (See Available Models chart)

Power Rating . . . . . 1 watt CW, 1 kW peak

Nominal Impedance. . . . . 50 ohm

Connectors:

2610 series . . . . . 7mm [1]

2510 series . . . . . Type N [2]

Size . . . . . (See Dimensions)

[1] Precision 7mm per Maury data sheet 5E-060.

[2] Precision stainless steel type N per Maury data sheet 5E-049.

Precision Fixed Terminations

Type N 75 ohm (8883 series)
BNC 75 ohm (8583 series)

Features

- *Low VSWR*
- *DC to 2 GHz*

Description

The 8883 series and 8583 series fixed terminations are precision, low VSWR, 75 ohm terminations equipped with type N and BNC connectors, respectively. These terminations are suited to a wide variety of general purpose and precision laboratory applications; however, their primary usage is for 75 ohm reference Z_0 calibration of network analyzers at frequencies up to 2 GHz. All Maury 75 ohm components are identifiable by a black ring encircling the body of the component. 75 ohm connectors should never be mated to their 50 ohm counterparts as doing so could result in damage to the 75 ohm female connector and/or poor, or erratic electrical performance.

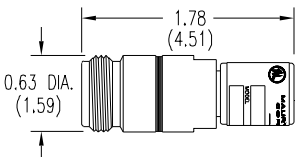
Connector Description

The type N 75 ohm connectors on the components in the 8883 series are a precision version of type N 75 ohm connectors, developed by Maury, which meets all applicable requirements of IEC169-16. They exhibit extremely low VSWR, and although specified to 2.0 GHz, they can be used at much higher frequencies. The male connectors are provided with a 3/4" hex coupling nut so the junctions can be properly torqued to 12 in. lbs.

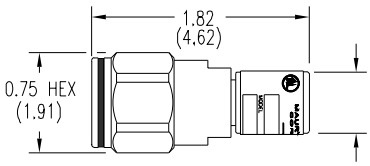
The BNC connectors on the 8583 series terminations are precision miniature coaxial connectors featuring a quick disconnect bayonet locking coupling mechanism. The connector body is fabricated from solid brass finished with nickle plating. The center conductor is beryllium-plated copper, supported by teflon beads. They are rugged, lightweight connectors that are negligibly affected by temperature and humidity.

Dimensions – Inches (cm)

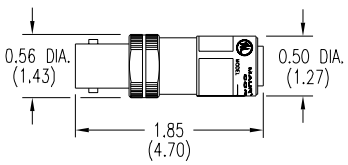
8883A Female



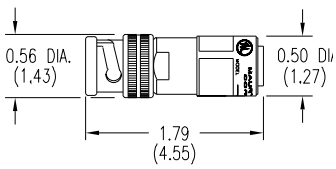
8883B Male



8583A Female



8583B Male



Specifications

Model 8883A – Female type N 75 ohm fixed termination
Model 8883B – Male type N 75 ohm fixed termination
Frequency Range . . . . . DC – 2.0 GHz
Maximum VSWR 1.01
Power Rating . . . . . 1 watt CW
Nominal Impedance. . . . . 75 ohm
Connectors:
8883A . . . . . Precision 75 ohm type N female [1]
8883B . . . . . Precision 75 ohm type N male [1]
Size . . . . . (see Dimensions)

Model 8583A – Female BNC 75 ohm fixed termination
Model 8583B – Male BNC 75 ohm fixed termination
Frequency Range . . . . . DC – 2.0 GHz
Maximum VSWR 1.02
Power Rating . . . . . 1 watt CW
Nominal Impedance. . . . . 75 ohm
Connectors:
8583A . . . . . Precision 75 ohm BNC female
8583B . . . . . Precision 75 ohm BNC male
Size . . . . . (see Dimensions)

Key Literature: Maury data sheet 2Z-036.

Precision Fixed Terminations

HN, SC, BNC and C (335, 336, 351, and 354 series)

Features

- *Low VSWR*
- *DC to 10 GHz*

Description

Maury produces these four series of low power, general purpose terminations which are designed to operate from DC to 8 or DC to 10 GHz. They are useful in a variety of airborne systems and laboratory applications where low VSWR broadband termination is required.

These compact, lightweight, rugged terminations are available with HN, SC, BNC, and C connectors. Most are sufficiently well matched for low frequency VNA Z_0 calibrations and all can be used for isolation calibrations within the appropriate frequency range.

Connector Descriptions

The HN connectors on the 335 series terminations are medium size high voltage connectors with a screw type coupling mechanism and overlapping dielectrics for longer breakdown paths.

The SC connectors on the 336 series terminations are threaded versions of the C connector and are designed for use in severe environments, where vibration and shock are present.

The C connectors on the 354 series terminations are medium size, 50 ohm impedance connectors with bayonet couplings. Maury MPC C connectors mate with most C versions in use today, specific-ally with MIL-C-39012/35/36 and test connectors with MIL-C-3989 interfaces. They are normally made with stainless steel bodies and have heat treated, gold-plated beryllium copper contacts.

The BNC connectors on the 351 series terminations are 50 ohm impedance connectors with two-stud bayonet coupling. They conform to MIL-C-39012 and are normally made with stainless steel bodies with heat treated, gold-plated beryllium copper contacts.

Dimensions – Inches (cm)

TYPE	MODEL	DIAMETER INCHES	(CM)	LENGTH INCHES	(CM)
HN Female	335A	0.750	(1.905)	1.770	(4.496)
HN Male	335B1	0.875	(2.223)	1.955	(4.966)
SC Female	336A	0.760	(1.930)	1.925	(4.889)
SC Male	336B1	0.790	(2.007)	1.835	(4.661)
BNC Female	351A2	0.570	(1.448)	1.520	(3.861)
BNC Male	351B2	0.570	(1.448)	1.435	(3.645)
C Female	354A	0.760	(1.930)	1.925	(4.889)
C Male	354B	0.790	(2.007)	1.835	(4.661)

Key Literature: Maury data sheet 2C-004, 2C-005.

Available Models

MODEL FEMALE	MODEL MALE	FREQUENCY RANGE (GHz)	MAXIMUM VSWR	CONNECTOR TYPE
335A	335B1	DC – 1.0	1.05	HN [1]
		1.0 – 4.0	1.10	
		4.0 – 8.0	1.20	
336A	336B1	DC – 1.0	1.03	SC [1]
		1.0 – 4.0	1.07	
		4.0 – 10.0	1.12	
351A2	351B2	DC – 2.0	1.04	BNC
		2.0 – 4.0	1.10	
		4.0 – 10.0	1.20	
354A	354B	DC – 1.0	1.05	C
		1.0 – 4.0	1.15	
		4.0 – 10.0	1.30	

Specifications

Frequency Range, VSWR . . . . . (See Available Models chart)

Power Rating:

HN and SC . . . . . 1 watt CW, 1 kW peak

BNC and C . . . . . 2 watt CW, 1 kW peak

Nominal Impedance. . . . . 50 ohm

Size . . . . . (See Dimensions)

[1] Precision stainless steel connector per Maury data sheet 5E-051.

[2] Precision stainless steel SC per Maury data sheet 5E-050.

Precision Fixed Terminations

TNC (332 series), AFTNC (8684 series) and TNCA (8674 series)

Features

- *Low VSWR*
- *DC to 20 GHz*

Description

These TNC, AFTNC, and TNCA units are precision, broadband, low VSWR fixed terminations suited to a variety of general purpose and precision laboratory applications. Depending upon the frequency range and required calibration effectiveness of a vector network analyzer (VNA) specific models can be used for full or low-band one-port Z_0 calibration and full two-port, isolation calibration.

Connector Description

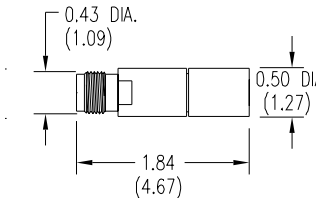
Maury TNC connectors (MPC/TNC) on the are precision stainless steel connectors that mate with MIL-C-39012 and MIL-T-81490 connectors. These low VSWR connectors rated from DC to 18.0 GHz.

Maury AFTNC connectors fully comply with the requirements of MIL-C-87104/2. The male connector utilizes a solid outer conductor configuration to provide consistent measurement results. Connector bodies are fabricated from stainless steel for strength and durability. These connectors were developed using optimized HFSS simulation to provide extremely low VSWR, and they are rated to 20 GHz.

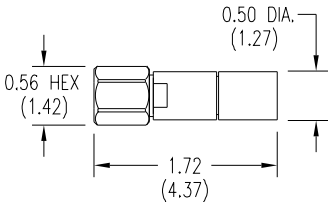
Maury TNCA connectors fully comply with the requirements of MIL-STD 348A. The male connector utilizes a solid outer conductor configuration to provide consistent measurement results. Connector bodies are fabricated from stainless steel for strength and durability.

Dimensions – Inches (cm)

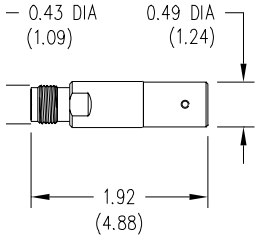
332A Female



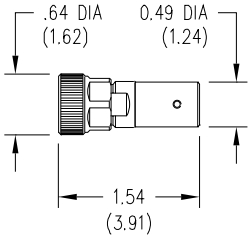
332B Male



8684A & 8674A Female



8684B & 8674B Male



1 Precision TNC per Maury data sheet 5E-053.

2 Precision TNC MIL-C-87104/2 per Maury data sheet 5E-056.

Available Models

MODEL FEMALE	MODEL MALE	FREQUENCY RANGE (GHz)	MAXIMUM VSWR	CONNECTOR TYPE
332A	332B	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.10 1.15 1.20	TNC [1]
332E	332F	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.06 1.10 1.15	TNC [1]
332G	332H	DC – 2.0 2.0 – 4.0	1.02 1.05	TNC [1]
332A3	332B3	DC – 3.0 3.0 – 6.0	1.02 1.04	TNC [1]
332A8	332B8	DC – 3.0 4.0 – 13.5	1.03 1.06	TNC [1]
332A5	332B5	DC – 12.0 12.0 – 18.0	1.25 1.10	TNC [1]
8684A	8684B	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.04 1.08 1.10	AFTNC [2]
8674A	8674B	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.04 1.08 1.10	TNCA [3]

Specifications

Frequency Range, VSWR . . . . . See chart
Power Rating . . . . . 1 watt CW, 1 kW peak
Impedance . . . . . 50 ohm (nominal)
Connectors:
332 series . . . . . TNC [1]
8684 series . . . . . AFTNC [2]
8674 series . . . . . TNCA [3]
Size . . . . . (see Dimensions)

3 Precision TNC MIL-STD 348A per Maury data sheet 5E-058.

Precision Fixed Terminations

LCP/OSP™ (8783 series)

Features

- *Low VSWR*
- *DC to 18 GHz*

Description

The 8783 series fixed terminations are equipped with Maury LCP/OSP™ connectors, which are precision, broadband, low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Their unique coupling mechanism is an improvement on the original OSP™ design that significantly enhances the performance of these connectors (see Connector Description below). Depending upon the frequency range and required calibration effectiveness of your VNA, PNA, or ENA, specific models can be used for full or lowband one-port Z_0 calibration and full two-port, isolation calibration.

Connector Description

The connectors on these components are Maury precision LCP/OSP™ connectors that are mating compatible with standard OSP™ and Dynawave/Dynamate™ series blind-mate connectors. They are low VSWR connectors rated from DC to 18 GHz. A unique feature of these connectors is their use of a positive (thread-on) coupling system which permits mating with the use of a calibrated torque wrench to enhance the repeatability and electrical performance of the connection. For interface specifications on these connectors, please refer to Maury data sheet 5E-065.

8783A 8783B

Specifications

Model 8783A female LCP/OSP™ fixed termination

Model 8783B male LCP/OSP™ fixed termination

Frequency Range . . . . . DC to 18.0 GHz

Maximum VSWR:

DC to 1.0 GHz 1.03

1.0 to 6.0 GHz 1.05

6.0 to 18.0 GHz 1.08

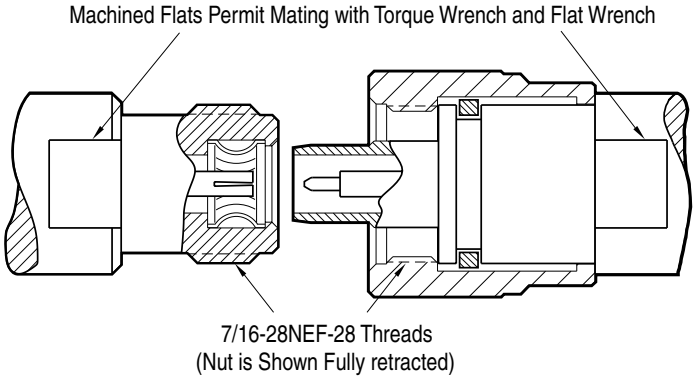
Power Rating . . . . . 1 watt CW, 0.5 kW peak

Reference Impedance. . . . . 50 ohm (nominal)

Connectors . . . . . .LCP/OSP™

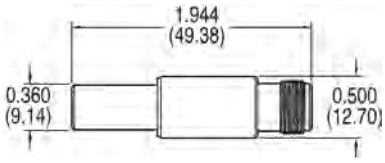
Size . . . . . (see Dimensions)

Maury OSP™ Improvements

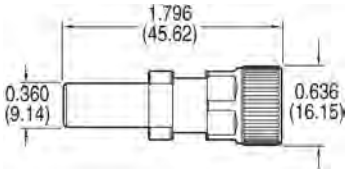


Dimensions – Inches (cm)

8783A Female



8783B Male



Precision Fixed Terminations

14mm – GR900 Equivalent (2410A)

2410A

Features

- *Low VSWR*
- *DC to 8.5 GHz*

Description

The 2410A fixed termination is equipped with the Maury MPC14 connector, a precision 14mm connector. The 2410A is a broadband, low VSWR termination suited to a wide variety of general purpose and precision laboratory applications. Within its frequency range this termination can be used for full or lowband one-port Z_0 calibration and full two-port, isolation calibration.

Connector Description

The MPC14 precision 14mm connector is essentially equivalent to, and mating compatible with, GR900 type connectors. It features an improved hex knurl coupling nut and an improved center conductor inner contact (model 2481A). The coupling nut has a 1.00 inch hex for accurate tightening with a torque wrench, and the knurled knob provides a positive grip for finger tightening.

Dimensions – Inches (cm)

See the diagram at right.

Specifications

Model 2410A Precision 14mm Fixed Termination

Frequency Range . . . . . DC to 8.5 GHz

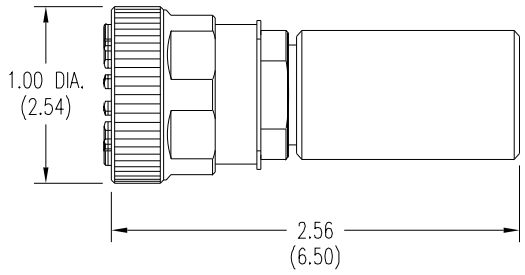
Maximum VSWR: . . . . . 1.005 + 0.004 GHz

Power Rating . . . . . 3 watts CW, 1 kW peak

Reference Impedance . . . . . 50 ohm (nominal)

Connector 14mm (MPC14)

Size . . . . . (see diagram below)



Precision Fixed Terminations

7-16 (2710 Series)

2710A 2710B

Features

- *Low VSWR*
- *DC to 7.5 GHz*

Description

The 2710 series fixed terminations are precision, broadband, low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Within their frequency range they can be used for full band one-port Z_0 calibration and full two-port isolation calibration.

Connector Description

The 7-16 connectors found on the components in these kits are rugged, calibration grade connectors that exceed the requirements for IEC169-4 reference grade and BSEN122190 grade 0 specifications. They feature a thicker dielectric bead to eliminate deflection, retracted threads on the female connector to eliminate the need to apply excessive torque during calibration and test, and tighter tolerance control than called for in the IEC and BSEN specifications to reduce uncertainties.

Specifications

Model 2710A Female Precision 7-16 Fixed Termination

Model 2710B Male Precision 7-16 Fixed Termination

Frequency Range . . . . . DC to 7.5 GHz

Maximum VSWR:

DC to 4.0 GHz 1.02

4.0 to 7.5 GHz 1.03

Power Rating . . . . . 3 watts CW, 1 kW peak

Reference Impedance . . . . . 50 ohm (nominal)

Connector . . . . . Precision 7-16

Size in inches (cm):

2710A . . . . . 1.142 (2.901) max dia., 2.758 (7.005) length

2710B . . . . . 1.311 (3.330) max. dia. 3.068 (7.793) length

Precision Fixed Terminations

Waveguide (301 series)

Features

- *Low VSWR*
- *1.12 to 110 GHz*
- *Moderate Power Handling*

Description

The 301 series low power waveguide fixed terminations are precision, low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. They can be used for full band one-port calibration and full two-port, isolation calibration.

Waveguide Flange Description

The waveguide flanges used on these terminations are Maury Precision Flanges (MPF) in rectangular, or round configurations. MPF flanges have precision indexing holes and removable indexing pins for excellent measurement repeatability. The millimeter waveguide flanges in the WR22 and smaller sizes are of a unique Maury-pioneered design featuring a raised outer rim to prevent the flanges from cocking during connection. These flanges will mate with corresponding UG ( )/U flanges. (See page 149 for flange details.)

Available Models

MODEL	FREQUENCY RANGE (GHz)	VSWR (Maximum)	EIA WR NUMBER	EQUIVALENT FLANGE	POWER RATING		LENGTH	
					AVE. (W)	PEAK (kW)	inches	(cm)
L301A	1.12 — 1.20 1.20 — 1.70	1.040 1.025	650	CPR-650F	25.0	10.0	19.5	(49.53)
R301A	1.70 — 1.90 1.90 — 2.60	1.025 1.020	430	UG435/U	12.0	5.0	14.8	(37.6)
D301A	2.20 — 3.30	1.025	340	CPR340F	5.0	2.0	9.8	(24.9)
S301A	2.60 — 3.95	1.025	284	UG584/U	5.0	2.0	10.4	(26.4)
E301F	3.30 — 4.90	1.020	229	CPR229F	5.0	2.0	7.4	(18.8)
G301	3.95 — 5.85	1.020	187	UG149A/U	5.0	2.0	6.4	(16.3)
F301C	4.90 — 7.05	1.020	159	CPR159F	3.0	1.0	5.8	(14.7)
C301	5.85 — 8.20	1.020	137	UG344/U	2.5	1.0	5.2	(13.2)
H301A	7.05 — 10.00	1.015	112	UG51/U	2.0	1.0	5.0	(12.7)
X301A	8.20 — 12.40	1.015	90	UG39/U	1.0	1.0	5.0	(12.7)
M301A	10.00 — 15.00	1.020	75	MPF75	1.0	1.0	5.0	(12.7)
P301A	12.40 — 18.00	1.020	62	UG419/U	1.0	1.0	4.0	(10.2)
N301	15.00 — 22.00	1.025	51	MPF51	0.5	0.2	3.1	(07.9)
K301	18.00 — 26.50	1.025	42	UG595/U	0.5	0.2	2.8	(07.1)
U301	26.50 — 40.00	1.025	28	UG599/U	0.5	0.2	2.2	(05.6)
J301A	33.00 — 50.00	1.040	22	UG383[1]	0.5	0.1	1.6	(04.1)
V301B	50.00 — 75.00	1.025	15	UG385[1]	0.3	0.05	1.5	(03.8)
Y301	60.00 — 90.00	1.030	12	UG387/U	0.2	0.03	1.5	(03.8)
Z301B	75.00 — 110.00	1.030	10	UG387[1]	0.2	0.03	1.5	(03.8)

[1] Units are supplied with Maury precision flanges (MPF) which mate with the UG flanges shown.

Sliding Terminations

General Information

A sliding termination (or sliding load) consists of a precision, movable, tapered termination in a highly accurate, air dielectric transmission line. These instruments are basic tools for making precision microwave measurements, and are particularly useful in the following applications:

Load Separation: A general application measurement in which the reflection from the terminating element can be separated from that of the test device. Load separation using sliding loads is a key element in the calibration of vector network analyzers (VNAs). The technique is also used in the measurement of the reflection from two-port devices, particularly "non-insertable", (e.g., waveguide-to-coax adapters, and the directivity of directional couplers). Maury sliding terminations make it possible to measure test device reflection in extremely small increments that would normally be masked by the reflections from the termination.

50 ohm Fixed Termination: The low VSWR inherent in Maury sliding terminations make them excellent for use as fixed terminations in 50 ohm systems.

Maury manufactures sliding terminations which offer a range of performance and convenience features. These include metrology grade, high precision units with integral, dedicated connectors; precision units which permit the sex of the connector to be changed within the same connector series; and true, modular instruments which permit changing the connector type or sex.

Metrology grade sliding terminations provide the highest level of accuracy, stability and repeatability when used as impedance standards for calibrating vector network analyzers. They feature integral connectors, flush set adjustment, and thermal isolation.

Dedicated connector sliding terminations are capable of handling higher power than is typical of metrology grade sliding terminations. Their defining characteristic is that they feature connectors of a single type, and (in sexed connectors) of a single, non-interchangable, sex.

Modular sliding terminations are provided with a range of interchangable connectors, permitting the user to change the connector type and sex of the sliding termination as needed.

Most Maury sliding termination VNA calibration kits include metrology grade sliding terminations. These sliding terminations are also available individually as replacement parts for the calibration kits. Dedicated connector and Modular models are likewise available as individual instruments, and in some cases as boxed sets. The following pages provide detailed descriptions and specifications for all of the coaxial and waveguide sliding terminations offered by Maury.

Sliding Terminations — Metrology Grade

2.4mm, 2.92mm and 3.5mm

Features

- *Integral Connectors*
- *"Flush Set" Adjustment*
- *"Pull Back" Mechanism & Lock*
- *Thermal Isolation*
- *Enhanced Air Line Accuracy*

Description

These metrology grade sliding terminations achieve a high level of accuracy, stability and repeatability when used as impedance standards for calibrating vector network analyzers (VNAs) and in other critical, precision measurement applications.

They feature seamless, integral, beadless (air dielectric) connectors that provide an extremely accurate impedance reference, and an external jacket that enhances thermal stability by insulating the transmission line.

When used with "thread-on" connector gages, a "flush set" mechanism allows users to adjust the center conductor to achieve a coplanar inner and outer conductor interface at the connector mating plane. A "pull back" mechanism automatically locks the center conductor to a previously set flush condition, making it easy to return to flush condition from any other position.

These terminations are available individually, with female or male connectors, or in boxed sets with one each of both sexes, per the ***Specifications*** chart (below).

Specifications

MODEL	CONNECTOR TYPE	FREQUENCY RANGE & MAXIMUM VSWR [1]	AIR LINE ACCURACY [2]	POWER HANDLING
7935A	2.4mm female	4.0 GHz — 10.0 GHz, 1.10	42 dB (4.0 — 50.0 GHz)	0.5 watts CW, 0.5 kW peak
7935B	2.4mm male	10.0 GHz — 50.0 GHz, 1.05		
7935C	2.4mm boxed set (1 ea. 7935A female and 7935B male) [3]			
8777A1	2.92mm (K) female	4.0 GHz — 10.0 GHz, 1.10	46 dB (4.0 — 40.0 GHz)	0.5 watts CW, 0.5 kW peak
8777B1	2.92mm (K) male	10.0 GHz — 40.0 GHz, 1.05		
8777C1	2.92mm (K) boxed set (1 ea. 8777A1 female and 8777B1 male) [3]			
8037A	3.5mm female	2.0 GHz — 4.0 GHz, 1.09	50 dB (4.0 — 34.0 GHz)	1.0 watts CW, 1.0 kW peak
8037B	3.5mm male	4.0 GHz — 34.0 GHz, 1.05		
8037C	3.5mm boxed set (1 ea. 8037A female and 8037B male) [3]			
2608C	7mm (LPC7)	1.8 GHz — 18.0 GHz, 1.035	62 dB	1.0 watt CW, 1.0 kW peak
8834A	Type N female	2.0 GHz — 18.0 GHz, 1.04	54 dB	
8834B	Type N male			
8834C	Type N boxed set (1 ea. 8834A female and 8834B male) [3]			

[1] Maximum VSWR (50 ohm reference) of the terminating element alone.

[2] Equivalent return loss of the air line impedance (50 ohm reference).

[3] Supplied in a foam-lined wood instrument case.

Sliding Terminations — Precision Dedicated Connectors

7mm (LPC7A), Type N, TNC, AFTNC, TNCA, SMA and 14mm (LPC14)

Features

- *Dedicated (Non-Interchangeable) Precision Connectors*
- *Low Reflection*
- *Greater than 1/2-λ Travel at Lowest Frequency*

Description

These sliding terminations feature dedicated connectors. Those with sexed connectors (e.g., type N), are available in two models; one each with female and male connectors. Except as noted, the terminating elements are capable of handling higher power than typical laboratory sliding loads.

TNC and SMA terminations are precision air lines with low-reflection transformers to the dielectrically loaded connectors. Their air dielectric connectors and movable center conductors permit precision setting of the connector interface condition, using an appropriate connector gage.

Specifications

Frequency Range . . . . . .See chart
VSWR (terminating element) . . . . . .See chart
Power Rating . . . . . .See chart
Nominal Impedance . . . . . .50 ohm
Air Line Accuracy . . . . . .See chart
Travel . . . . . >1/2 wavelength at lowest rated frequency
Connectors . . . . . .See chart

Note: Wood instrument cases are provided with many of these units or are available as optional accessories.

Available Models

MODEL	CONNECTOR TYPE	FREQUENCY RANGE & MAXIMUM VSWR [1]	AIR LINE ACCURACY [2]	POWER HANDLING
2517H	LPC7A [3]	2.0 GHz — 18.0 GHz, 1.04	52 dB	1.0 watt CW, 5.0 kW peak
453A1	Type N female [4]	1.8 GHz — 18.0 GHz, 1.05	56 dB	5.0 watt CW, 1.0 kW peak
453B1	Type N male [4]			
493A	Type N female [4]	0.9 GHz — 18.0 GHz, 1.10		
493B	Type N male [4]	1.8 GHz — 18.0 GHz, 1.05		
452A1	TNC female [5]	1.8 GHz — 18.0 GHz, 1.05		
452B1	TNC male [5]			
487A	SMA female [6]	0.9 GHz — 1.8 GHz, 1.10		
487B	SMA male [6]	1.8 GHz — 18.0 GHz, 1.05		
8683A	AFTNC female [7]	2.0 GHz — 4.0 GHz, 1.04		
8683B	AFTNC male [7]	4.0 GHz — 20.0 GHz, 1.05		
8673A	TNCA female [8]	2.0 GHz — 4.0 GHz, 1.04		
8673B	TNCA male [8]	4.0 GHz — 20.0 GHz, 1.05		
2408A1	LPC14 [9]	0.9 GHz — 1.5 GHz, 1.08	64 dB	2.0 watts CW, 2.0 kW peak
		1.5 GHz — 2.0 GHz, 1.04		
		2.0 GHz — 8.5 GHz, 1.03		

[1] Maximum VSWR (50 ohm reference) of the terminating element alone.

[2] Equivalent return loss of the air line impedance (50 ohm reference).

[3] Air interface connector per Maury data sheet 5E-061 with a spring-loaded, self-centering, center pin that mates with standard 7mm connectors.

[4] Precision stainless steel type N per Maury data sheet 5E-049.

[5] Precision stainless steel TNC per ES-2047.

[6] Precision stainless steel SMA per MIL-C-39012.

[7] Precision TNC MIL-C-87104/2 per Maury data sheet 5E-056.

[8] Precision TNCA MIL-STD 348A per Maury data sheet 5E-058.

[9] Movable center conductor permits setting of connector interface conditions.

Sliding Terminations — Modular Connectors

3.5mm, 7mm (LPC7) and Type N

Features

- *Interchangeable Precision Connectors*
- *Greater than 1/2-λ Travel at Lowest Frequency*
- *Broadband, Low-Reflection*

Description

These precision sliding terminations have interchangeable precision, beadless connectors, eliminating the need for separate loads for different connector sexes or types as noted in the chart below. The 8035A has a single center conductor and interchangeable female and male center contacts and connector bodies. The 2507 and 2517A are true modular instruments provided with interchangeable LPC7 and type N (female and male) connectors. Precision adapters for other connectors (including SC, HN, BNC and C) are also available as options.

The 8035A is characterized by highly accurate, 50 ohm air line impedance and low terminating element VSWR. The 2507 and 2517A are high precision, movable, low-reflection, broadband terminations .

In all of the models listed below, the travel of the movable loads is at least 1/2 wavelength (at the lowest rated frequency) so that frequencies within the rated phase range of the load reflection can be reversed and separated from other in-system reflections. The connectors are beadless (air dielectric), and the movable center conductors can be set to the correct connector interface conditions with the aid of an appropriate connector gage.

All three models are provided in foam-lined wooden instrument cases.

Specifications

Frequency Range . . . . . See chart

VSWR (terminating element) . . . . . See chart

Power Rating . . . . . See chart

Nominal Impedance . . . . . 50 ohm

Air Line Accuracy . . . . . See chart

Travel . . . . . >1/2 wavelength at lowest rated frequency

Connectors . . . . . See chart

Center Conductor . . . . . Silver plated stainless steel

Accessories (provided) . . . . . Wood Instrument case and operating instructions

Available Models

MODEL	CONNECTOR TYPE(S)	FREQUENCY RANGE & MAXIMUM VSWR [1]	AIR LINE ACCURACY [2]	POWER HANDLING
8035A	3.5mm [3]	2.0 GHz — 4.0 GHz, 1.09 (<1.06 typ) 4.0 GHz — 34.0 GHz, 1.05 (<1.03 typ)	44 dB	1.0 watt CW, 1.0 kW peak
8784E	LCP/OSP [4]	2.0 GHz — 4.0 GHz, 1.09 (<1.06 typ) 4.0 GHz — 18.0 GHz, 1.05 (<1.03 typ)	44 dB	1.0 watt CW, 1.0 kW peak
2507	Beadless LPC7 [5] Type N female [6] Type N male [6]	0.9 GHz — 1.5 GHz, 1.08 1.5 GHz — 2.0 GHz, 1.05 2.0 GHz — 18.0 GHz, 1.03	56 dB	1.0 watt CW, 5.0 kW peak
2517A	Beadless LPC7 [5] Type N female [6] Type N male [6]	1.8 GHz — 18.0 GHz, 1.05	54 dB	1.0 watt CW, 1.0 kW peak

1 Maximum VSWR (50 ohm reference) of the terminating element alone.

2 Equivalent return loss of the air line impedance (50 ohm reference).

3 See Maury data sheet 5E-062 for interface specifications.

4 Precision LCP/OPS™ per Maury data sheet 5E-065.

5 Air interface connector per Maury data sheet 5E-061 with a spring-loaded, self-centering, center pin that mates with standard 7mm connectors.

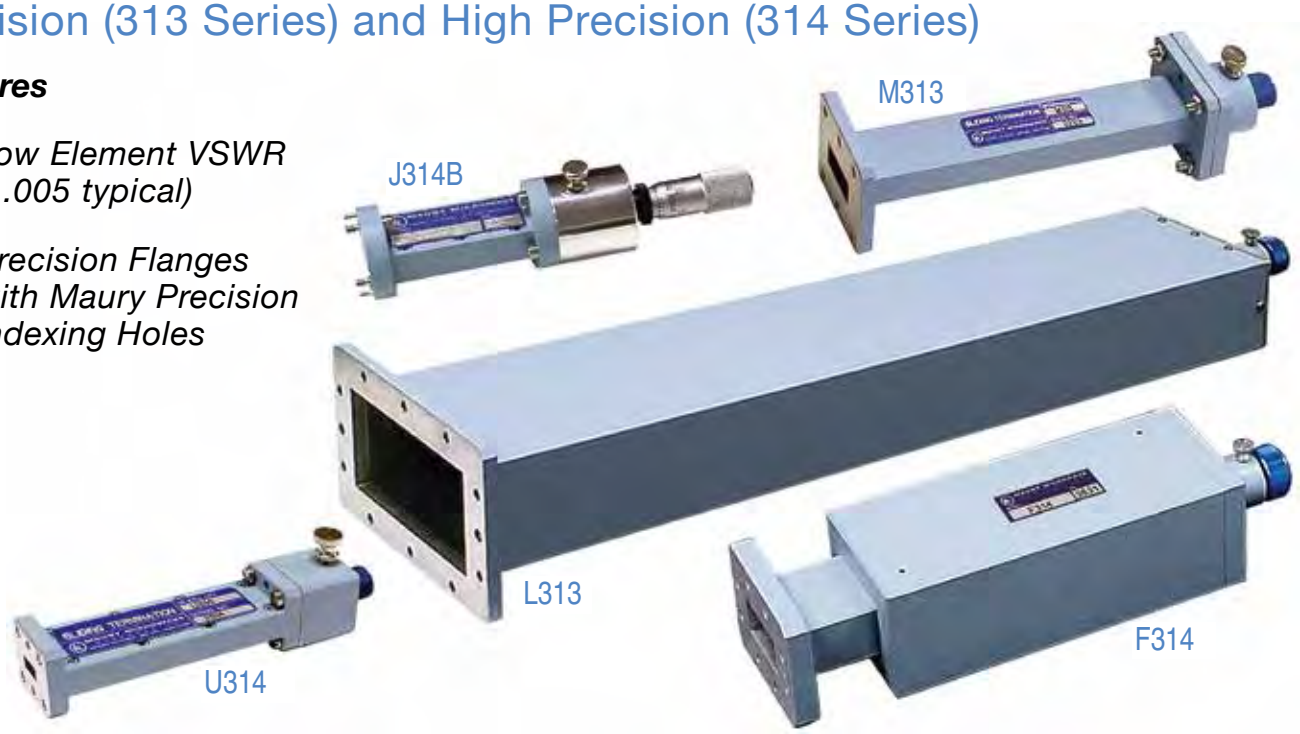
6 Precision stainless steel type N per Maury data sheet 5E-049.

Sliding Terminations — Waveguide

Precision (313 Series) and High Precision (314 Series)

Features

- *Low Element VSWR (1.005 typical)*
- *Precision Flanges with Maury Precision Indexing Holes*



Description

These precision sliding terminations are ideal for use as impedance standards for VNA calibration, and are included in many of the VNA calibration kits offered by Maury. They feature a typical effective return loss greater than 45 dB (313 series) or greater than 50 dB (314 series). Element travel in both series is greater than 1/2 waveguide wavelength (at the lowest rated frequency) so that effective frequencies within the rated phase range of the load reflection can be reversed and separated from other in-system reflections.

Available Models

FREQUENCY RANGE (GHz)	EIA WR NUMBER	EQUIVALENT FLANGE	MAXIMUM ELEMENT VSWR	POWER HANDLING WATTS (w)	PRECISION MODEL & MAX. HOUSING VSWR		HIGH PRECISION MODEL & MAX. HOUSING VSWR [1]	
1.7 — 2.6	430	UG435/U	1.01 [2]	8.0	R313A	1.01	R314	1.005
2.2 — 3.3	340	CPR340F	1.01	7.0	D313A	1.01	—	—
2.6 — 3.95	284	UG584/U	1.01	6.0	S313A	1.01	S314	1.005
3.3 — 4.9	229	CPR229F	1.01	5.0	E313F	1.01	E314	1.005
3.95 — 5.85	187	UG149A/U	1.01	5.0	G313	1.01	G314	1.005
4.90 — 7.05	159	CPR159F	1.01	4.0	F313C	1.01	F314	1.005
5.85 — 8.2	137	UG344/U	1.01	3.0	C313	1.01	C314	1.005
7.05 — 10.0	112	UG51/U	1.01	2.0	H313	1.01	H314	1.005
8.2 — 12.4	90	UG39/U	1.01	2.0	X313	1.012	X314	1.005
10.0 — 15.0	75	MPF75	1.01	1.5	M313	1.013	M314	1.006
12.4 — 18.0	62	UG419/U	1.01	1.0	P313A	1.015	P314	1.006
15.0 — 22.0	51	MPF51	1.01	0.5	N313	1.025	N314	1.008
18.0 — 26.5	42	UG595/U	1.01	0.5	K313	1.02	K314	1.01
22.0 — 33.0	34	UG1530/U [3]	1.015	0.5	—	—	Q314A	1.01
26.5 — 40.0	28	UG599/U	1.015	0.5	U313	1.025	U314	1.015
33.0 — 50.0	22	UG383 [3]	1.02	0.5	—	—	J314A	1.015
50.0 — 75.0	15	UG385/U [3]	1.02	0.5	—	—	V314B	1.015
60.0 — 90.0	12	UG387/U [3]	1.025	0.5	—	—	Y314B	1.015
75.0 — 110.0	10	UG387/U [3]	1.025	0.5	—	—	Z314B	1.015

[1] Housings are machined.

[2] 1.02 maximum at 1.7 to 2.1 GHz.

[3] Units are provided with Maury MPF series flanges with index holes which mate with the UG flanges shown.

Fixed Flush and Fixed Offset Shorts

General Information

Fixed flush and fixed offset short circuit terminations (shorts) are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNAs). Offset shorts can be used for banded calibrations of VNA. Those with the longest offset are often used to evaluate the calibration effectiveness of a VNA by measuring the effective source match after calibration.

In general, the shorting plane of fixed flush shorts is at the connector reference plane, and at some predetermined offset in offset shorts. The shorting plane of some fixed offset shorts can also be relative to a reference offset established by another short. (e.g.: the 8046 and 8047 series shown on page 88).

Many of the shorts listed in this section are components of the Maury VNA calibration kits described on pages 24 through 68 of this catalog. Others are available as supplements to the components in these kits. In all cases, the specification "Phase Accuracy" is defined in this section as phase deviation from a nominal unit.

1.85mm Precision Fixed Offset Shorts

Model Series 7846 (female) and 7847 (male)

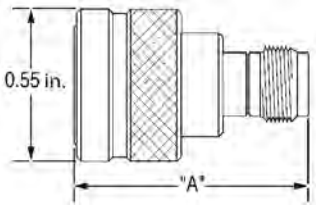
Description

These fixed offset shorts are designed to perform short, short, short (SSS) calibrations on VNAs equipped with 1.85mm test port connectors, including the Agilent PNA series. The 7846A and 7647A are sold as primary components of Maury's 7850 and 7860 series VNA calibration kits; the other models are also included in the 7850A calibration kits as offset shorts which are offset relative to the 7846A and 7847A. All series 7846 and 7847 models may also be purchased separately as replacement parts or spares.

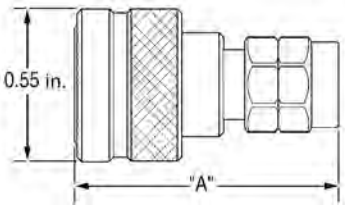
Specifications

Frequency Range . . . . . DC to 67.0 GHz [1]
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy [2] . . . . . ± 4.0°

Reference Dimensions



7846A/B/C/D



7847A/B/C/D

[1] Operates to 70 GHz.

[2] Phase accuracy is phase deviation from a nominal unit.

7846A 7847A

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
7846A [3]	female	0.980	(2.4384)	0.1968 [3]	(0.4999)
7846B	female	1.022	(2.5451)	0.2386	(0.6060)
7846C	female	1.052	(2.6213)	0.2690	(0.6833)
7846D	female	1.096	(2.7330)	0.3125	(0.7938)
7847A [3]	male	0.945	(2.4003)	0.1968 [3]	(0.4999)
7847B	male	0.987	(2.5070)	0.2386	(0.6060)
7847C	male	1.017	(2.5832)	0.2690	(0.6833)
7847D	male	1.061	(2.6949)	0.3125	(0.7938)

[3] Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (shown in this table) from the offset length of their appropriate reference short (i.e., 7846A or 7846B).

2.4mm Precision Fixed Offset Shorts

Models 7946A (female) and 7946B (male)

Description

These fixed offset shorts are used to establish the reference plane of calibration for vector network analyzers with 2.4mm test port connectors, including the Agilent PNA series. They are sold as part of Maury's 7950 and 7960 series VNA calibration kits, or may be purchased separately as replacement parts or spares.

7946A 7946B

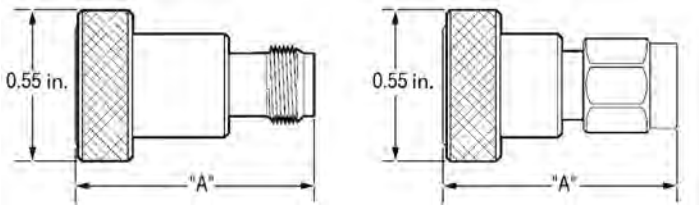
Specifications

Frequency Range . . . . . DC to 50.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
7946A	female	0.830	(2.1082)	0.2	(0.508)
7946B	male	0.797	(2.0244)	0.2	(0.508)

Reference Dimensions



7946A 7946B

2.92mm Precision Fixed Offset Shorts

Model Series 8771 (female) and 8772 (male)

Description

These fixed offset shorts mate with the 2.92mm (K) test port connectors on various vector network analyzers, including the Agilent PNA series. The 8771F1 and 8772F1 are reference shorts which are sold as part of Maury's 8770 and 8760 series VNA calibration kits, but may also be purchased separately as replacement parts or spares. The other models in these series are also sold separately as calibration kit accessories.

8771F1 8772F1

Specifications

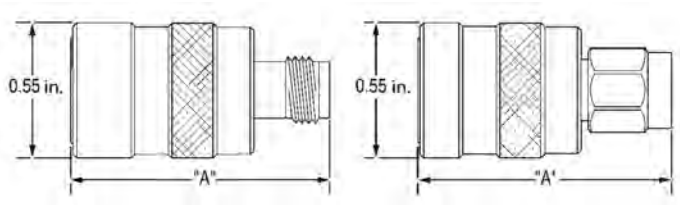
Frequency Range . . . . . DC to 40.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH		1/4- λ FREQ (GHz)
		INCHES	(CM)	INCHES	(CM)	
8771A1	female	1.856	(4.7142)	1.1803	(2.9980)	3.0
8771B1	female	1.364	(3.4646)	0.6885	(1.7488)	6.0
8771C1	female	1.162	(2.9515)	0.4862	(1.2349)	10.2
8771D1	female	1.080	(2.7432)	0.4040	(1.0262)	14.24
8771E1	female	1.005	(2.5527)	0.3295	(0.8369)	22.24
8771F1[1]	female	0.873	(2.2174)	0.1970 [1]	(0.5004)	REF
8772A1	male	1.897	(4.8184)	1.1803	(2.9980)	3.0
8772B1	male	1.405	(3.5687)	0.6885	(1.7488)	6.0
8772C1	male	1.203	(3.0556)	0.4862	(1.2349)	10.2
8772D1	male	1.121	(2.8473)	0.4040	(1.0262)	14.24
8772E1	male	1.046	(2.6568)	0.3295	(0.8369)	22.24
8772F1[1]	male	0.914	(2.3216)	0.1970 [1]	(0.5004)	REF

[1] Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (show in this table) from the offset length of their appropriate reference short (i.e., 8771F1 or 8772F1).

Reference Dimensions



8771F1 8772F1

3.5mm Precision Fixed Offset Shorts

Model Series 8046 (female) and 8047 (male)

Description

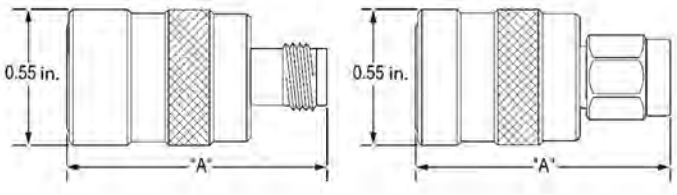
These shorts mate with the 3.5mm test port connectors on various VNAs, including the Agilent PNA series. The "F" models are reference shorts and are sold as part of Maury's 8050 and 8060 series VNA calibration kits; the other models are offset relative to the 8046F and 8047F, and are sold separately as supplemental parts for those VNA calibration kits.

8046A 8047A

Specifications

Frequency Range . . . . . DC to 34.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Reference Dimensions



8046 8047

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH		1/4- λ FREQ (GHz)
		INCHES	(CM)	INCHES	(CM)	
8046A	female	1.856	(4.7142)	1.1803	(2.9980)	3.0
8046B	female	1.364	(3.4646)	0.6885	(1.7488)	6.0
8046C	female	1.162	(2.9515)	0.4862	(1.2349)	10.2
8046D	female	1.080	(2.7432)	0.4040	(1.0262)	14.24
8046E	female	1.005	(2.5527)	0.3295	(0.8369)	22.24
8046F [1]	female	0.873	(2.2174)	0.1970 [1]	(0.5004)	REF
8047A	male	1.897	(4.8184)	1.1803	(2.9980)	3.0
8047B	male	1.405	(3.5687)	0.6885	(1.7488)	6.0
8047C	male	1.203	(3.0556)	0.4862	(1.2349)	10.2
8047D	male	1.121	(2.8473)	0.4040	(1.0262)	14.24
8047E	male	1.046	(2.6568)	0.3295	(0.8369)	22.24
8047F [1]	male	0.914	(2.3216)	0.1970 [1]	(0.5004)	REF

[1] Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (shown in this table) from the offset length of their appropriate reference short (i.e., 8046F or 8047F).

3.5mm/SMA Reference Fixed Flush Shorts

Models 360D (female) and 360B (male)

Description

These true coplanar, reference plane shorts mate with the 3.5mm, SMA and 2.92mm (K) test port connectors on various VNAs, including the Agilent PNA series. The 360D has a return loss of less than 0.2 dB with a phase offset of less than 2 degrees. The 360D and 360B are sold as supplemental parts for use with Maury's 8050 and 8060 series VNA calibration kits.

360D 360B

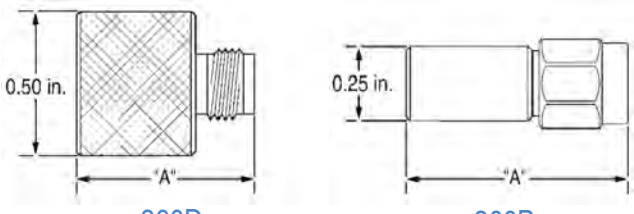
Specifications

Frequency Range . . . . . DC to 26.5 GHz (usable to 40 GHz)
Minimum Reflection Coefficient 0.99
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Available Models

MODEL	SEX	DIMENSION "A"		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
360D	female	0.700	(1.1780)	0	(0)
360B	male	0.610	(1.5494)	0	(0)

Reference Dimensions



360D 360B

7mm Precision Reference Fixed Flush Shorts

Model Series 2615

Description

These true coplannar, reference fixed shorts are designed to terminate an APC7 connector at its mating plane, and are used to establish a reference plane in systems as well as in loss measurements. 2615A3 is a flat face/flat plane short, 2615B3 includes a collet contact to support the inner conductor of series 2653 reference air lines, and 2615D3 has a precision hole (for the same purpose) in place of the collet contact. Two of these shorts are included in Maury 7mm VNA calibration kits; 2615D3 is a component of 2650 series kits , and 2515B3 is a component of 2660 series kits. All of the models shown here are also sold separately as replacement parts or spares.

Specifications

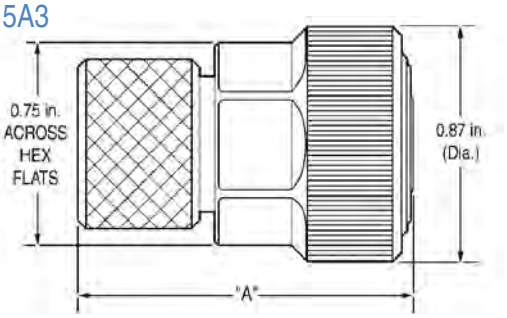
Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.995
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 0.3°

Available Models

MODEL	"A" DIMENSION		OFFSET LENGTH	
	INCHES	(CM)	INCHES	(CM)
2615A3	1.250	(3.1750)	0	(0)
2615B3	1.250	(3.1750)	0	(0)
2615D3	1.250	(3.1750)	0	(0)

Dimensions – Inches (CM)

2615A3



7mm Precision Fixed Offset Shorts

Model Series 2649

Description

These very low loss fixed offset shorts are offset electrically from the reference plane of the APC7 connector established by 2615 series flush shorts. The offset length is held to ±0.0025cm. A set of four (2649A/B/C/D) in a foam-lined wood instrument case can be ordered as model 2649R.

Specifications

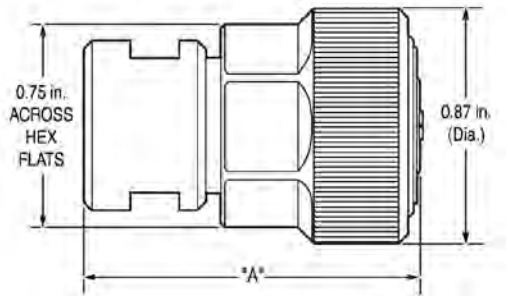
Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Available Models

MODEL FREQ	"A" DIMENSION		RELATIVE OFFSET LENGTH [1]		1/4-λ
	INCHES	(CM)	INCHES	(CM)	(GHz)
2649A	1.583	(4.0208)	0.9833	(2.4976)	3.00
2649B	1.091	(2.7711)	0.4915	(1.2484)	6.00
2649C	1.250	(3.1750)	0.2892	(0.7346)	10.20
2649D	1.250	(3.1750)	0.2070	(0.5258)	14.24

[1] Relative to the 0 (zero) offset of the 2615 series.

Reference Dimensions



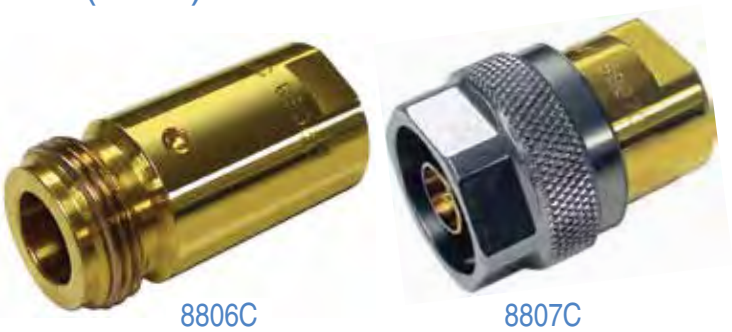
2649C

Type N Precision Fixed Offset Shorts

Model Series 8806 (female) and 8807 (male)

Description

These very low loss fixed offset shorts are offset electrically from the reference plane of the type N connector. The 8806C and 8807C are included as components of Maury's 8850 and 8860 VNA calibration kits. The 8806G is also included in the 8860 kit for use in TRL calibrations. The other models in these series may be purchased separately to complement those included in the kits.

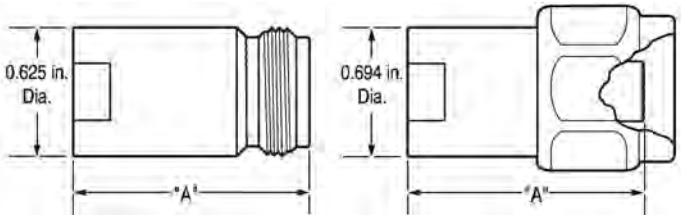


8806C 8807C

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Reference Dimensions



8806C 8807C

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8806A	female	1.942	(4.9327)	0.9833	(2.498)
8806B	female	1.451	(3.6855)	0.4915	(1.248)
8806C	female	1.248	(3.1699)	0.2892	(0.735)
8806D	female	1.166	(2.9616)	0.2070	(0.526)
8806G [1]	female	1.456	(3.6982)	0.4972	(1.263)
8807A	male	1.791	(4.5491)	1.1913	(3.026)
8807B	male	1.300	(3.3020)	0.6995	(1.777)
8807C [1]	male	1.097	(2.7864)	0.4972	(1.263)
8807D	male	1.015	(2.5781)	0.4150	(1.054)

[1] 8806G and 8807C are matched (have the same electrical length) for use in TRL calibrations.

TNC [1] Precision Fixed Offset Shorts

8606, 8607, and 8615 Series

Description

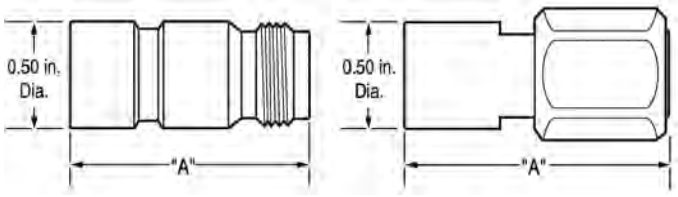
These very low loss fixed offset shorts are offset electrically from the reference plane of the TNC connector. The offset length is held to ±0.005cm.

8615A 8615B

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 5.0°

Reference Dimensions



8606A 8607A

[1] Precision TNC per Maury Data Sheet 5E-053.

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH		1/4- λ FREQ (GHz)
		INCHES	(CM)	INCHES	(CM)	
8615A [2]	female	1.431	(3.6347)	0.5000 [2]	(1.2700)	REF
8606A	female	2.123	(5.3824)	1.1920	(3.0277)	3.00
8606B	female	1.777	(4.5136)	0.8460	(2.1488)	6.00
8606C	female	1.635	(4.1529)	0.7035	(1.7869)	10.20
8606D	female	1.577	(4.0056)	0.6455	(1.6396)	14.25
8615B [2]	male	1.300	(3.3020)	0.7000 [2]	(1.7780)	REF
8607A	male	1.992	(5.0597)	1.1820	(3.0023)	3.00
8607B	male	1.646	(4.1808)	0.8360	(2.1234)	6.00
8607C	male	1.504	(3.8202)	0.6935	(1.7615)	10.20
8607D	male	1.446	(3.6728)	0.6355	(1.6142)	14.25

[2] Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (show in this table) from the offset length of their appropriate reference short (i.e., 8615A or 8615B).

AFTNC[1] Precision Fixed Offset Shorts

Models 8686A (female) and 8687A (male)

Description

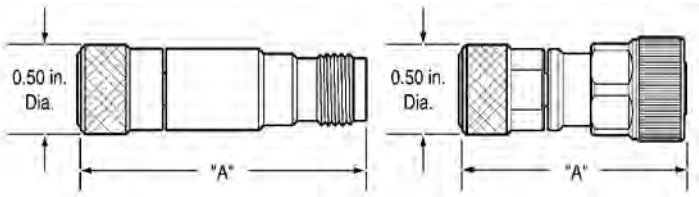
These fixed offset shorts are reference plane shorts that are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA), including the Agilent PNA series. They are sold as part of Maury's 8680A and 8680B series VNA calibration kits, or may be purchased separately as replacement parts or spares.

8686A 8687A

Specifications

Frequency Range . . . . . DC to 20.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Reference Dimensions



8686A 8687A

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8686A	female	1.744	(4.4298)	0.9833	(2.498)
8687A	male	1.366	(3.4964)	0.4915	(1.248)

1 Precision AFTNC per MIL-C-87104/2 per Maury data sheet 5E-056.

TNCA[2] Precision Fixed Offset Shorts

Models 8676A (female) and 8677A (male)

Description

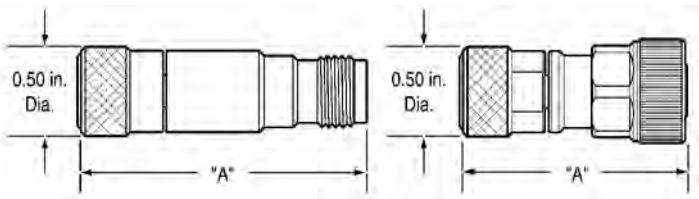
These fixed offset shorts are reference plane shorts that are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA), including the Agilent PNA series. They are sold as part of Maury's 8670A and 8670B series VNA calibration kits, or may be purchased separately as replacement parts or spares.

8676A 8677A

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Reference Dimensions



8676A 8677A

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8676A	female	1.744	(4.4298)	0.9833	(2.498)
8677A	male	1.366	(3.4964)	0.4915	(1.248)

2 Precision TNCA per MIL-STD 328A per Maury data sheet 5E-058.

14mm Precision Reference Fixed Flush Shorts

Model Series 2415

Description

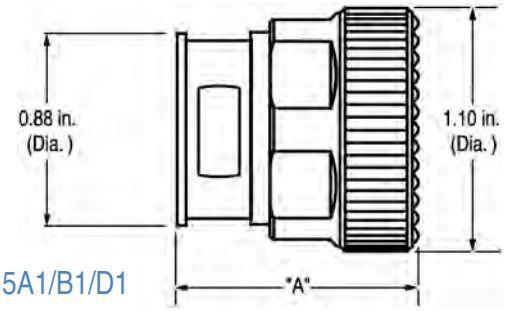
These true coplanar, reference fixed flush shorts are designed to terminate an 14mm connector at its mating plane, and are used to establish a reference plane in systems as well as in loss measurements. 2415A1 is a flat face/flat plane short, 2415B1 includes a collet contact to support the inner conductor of series 2453 reference air lines, and 2415D1 has a precision hole (for the same purpose) in place of the collet contact. The 2415D1 is included as a component of Maury's 2450 VNA calibration kits. The other models in these series may be purchased separately to complement those included in the kits.

2415A1 2415B1 2415D1

Specifications

Frequency Range . . . . . DC to 8.5 GHz
Minimum Reflection Coefficient 0.995
Nominal Impedance . . . . . 50 ohm
Connector . . . . . 14mm (mating compatible with GR900)
Phase Accuracy . . . . . ± 0.2°

Reference Dimensions



2415A1/B1/D1

Available Models

MODEL	"A" DIMENSION		OFFSET LENGTH	
	INCHES	(CM)	INCHES	(CM)
2415A1	1.00	(2.45)	0.00	(0.00)
2415B1	1.00	(2.45)	0.00	(0.00)
2415D1	1.00	(2.45)	0.00	(0.00)

LCP/OSP™ Fixed Offset Shorts

Model Series 8781

Description

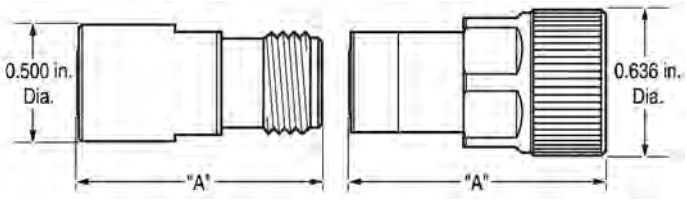
These fixed offset shorts are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA), including the Agilent PNA series. They are sold as part of Maury's 8780 series VNA calibration kits, or may be purchased separately as replacement parts or spares.

8781A 8781B

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Reference Dimensions



8781A 8781B

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8781A	female	1.050	(2.6670)	0.3270	(0.8306)
8781B	male	1.103	(2.8016)	0.3270	(0.8306)

7-16 Precision Fixed Offset Shorts

Model Series 2714

Description

The 2714A and 2714B are precision 7-16 fixed offset shorts designed to operate from DC to 7.5 GHz. These shorts establish a measurement plane of 2.00cm offset from the connector reference plane for compatibility with the companion 2716 series opens. See page 99.

2714A 2714B

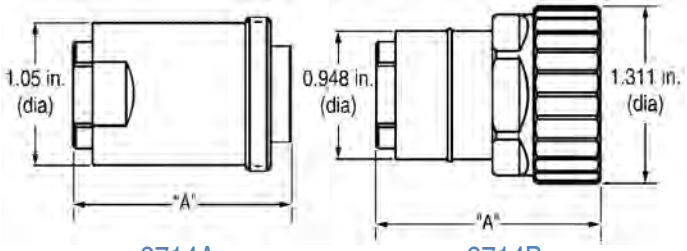
Specifications

Frequency Range . . . . . DC to 7.5 GHz
Minimum Reflection Coefficient 0.99
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . DC to 4.0 GHz = ± 0.60°
4.0 to 7.5 GHz = ± 0.85°

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
2714A	female	1.707	(4.3358)	0.7897	(2.006)
2714B	male	1.777	(4.5136)	0.7897	(2.006)
2714C	female	2.886	(7.3304)	1.9680	(4.999)
2714D	male	2.955	(7.5057)	1.9680	(4.999)

Reference Dimensions



2714A 2714B

General Purpose Fixed Offset Shorts

Description

The defining characteristic of this class of fixed offset shorts is their suitability for general purpose vector network analyzer (VNA) calibration, where the reference plane (or an offset established by another component) has a wider range of tolerance than would be desirable for high precision, metrology grade calibrations.

361N2

361P2

Specifications

MODEL	CONNECTOR TYPE	FREQUENCY RANGE (GHz)		
8884A	Type N 75 ohm female	DC	—	2.0
8884B	Type N 75 ohm male			
364C	C female	DC	—	10.0
364D	C male			
8445A	HN female	DC	—	8.0
8445B1	HN male			
8455A	SC female	DC	—	10.0
8455B1	SC male			
361N2	BNC female	DC	—	12.4
361P2	BNC male			
8584A	BNC 75 ohm female	DC	—	2.0
8584B	BNC 75 ohm male			

Waveguide Fixed Flush Shorts

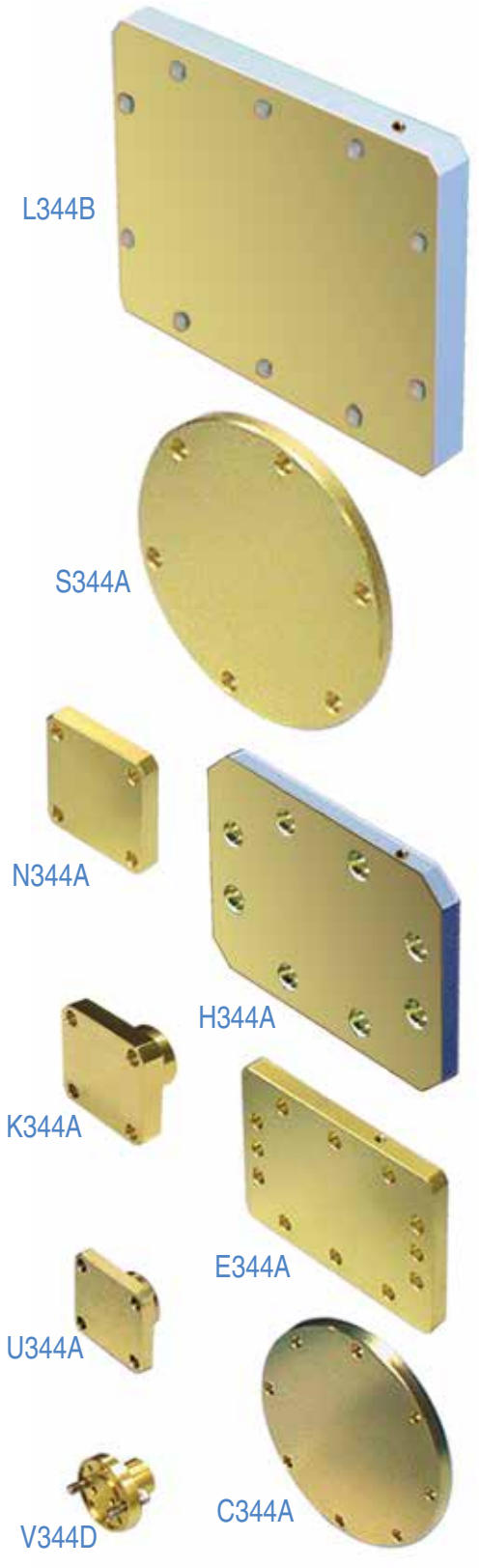
Model Series 344

Description

These machined fixed shorts are designed to terminate round or rectangular waveguide connectors at the mating plane. They are used to establish a reference plane in systems and in making loss measurements. They are flat face/flat plane shorts that cover frequencies from 1.12 to 110.0 GHz. They may be ordered with user-specified flanges; with or without Maury precision indexing holes. These shorts are included as components of Maury's 7005/6/7 series VNA calibration kits as listed on pages 64–68. They may also be purchased separately as spare or replacement parts for these kits.

Available Models

MODEL	MATES WITH EQUIVALENT FLANGE	EIA WR NUMBER	FREQUENCY RANGE (GHz)
L344B	CPR650F	650	1.12 — 1.7
R344B	CPR430F / UG435A/U	430	1.7 — 2.6
D344B	CPR340F	340	2.2 — 3.3
S344A	UG53/U	284	2.6 — 3.95
S344B	CPR284F		
S344C	CMR284		
E344B	CPR229F	229	3.3 — 4.9
E344C	CMR229		
G344A	UG149A/U	187	3.95 — 5.85
G344B	CPR187F		
G344C	CMR187		
F344B	CPR159F	159	4.9 — 7.05
F344C	CMR159		
C344A	UG344/U	137	5.85 — 8.2
C344B	CPR137F		
C344C	CMR137		
H344A	UG51/U	112	7.05 — 10.0
H344B	CPR112F		
H344C	CMR112		
X344A	UG39/U	90	8.2 — 12.4
X344B	CPR90F		
X344C	CMR90		
M344A	MPF75	75	10.0 — 15.0
P344A	UG419U	62	12.4 — 18.0
N344A	MPF51	51	15.0 — 22.0
K344A	UG595/U	42	18.0 — 26.5
K344D	UG425/U		
K344E	UG595/U [1]	42	18.0 — 26.5
[3]	—	34	22.0 — 33.0
U344A	UG599/U	28	26.5 — 40.0
[3]	UG381/U		
[3]	UG383/U	22	33.0 — 50.0
[3]	—	19	40.0 — 60.0
V344D	UG385/U	15	50.0 — 75.0
V344E	UG385/U [2]	15	50.0 — 75.0
[4]	UG387U	12	60.0 — 90.0
[4]	—	10	75.0 — 110.0



[1] Same as K344D with index holes.
[2] Same as V344D with index holes.
[3] Use K344D.
[4] Use V344D.

Waveguide Fixed Offset Shorts

Model Series 340

Description

Offset shorts with 1/8 and 3/8 wavelength offsets are considered one of the more accurate means of obtaining a 180° phase difference in waveguide. Using these single-piece devices will reduce the number of flange interfaces during calibration. This helps to maintain an essentially constant magnitude of current flow across the calibration plane.

The chart below lists the offset shorts available from Maury. Those in rectangular guide are nominally 1/8 and 3/8 wavelength offset at a frequency near the waveguide band center. These will not be the exact band center as the frequency is chosen to equalize the phase differences at the band edges.

Available Models

BAND	EIA WR NUMBER	FREQUENCY RANGE (GHz)	MODEL	OFFSET (cm)	DELAY (ps) [1]
L	WR650	1.12 — 1.7	L340A1	3.581	119.488
			L340A3	10.744	358.497
R	WR430	1.7 — 2.6	R340F1	2.336	77.946
			R340F3	7.010	233.904
S	WR284	2.6 — 3.95	S340B1	1.524	50.852
			S340B2	4.572	152.555
E	WR229	3.3 — 4.9	E340B3	1.359	45.346
			E340B4	4.077	136.038
G	WR187	3.95 — 5.85	G340B1	1.026	34.235
			G340B3	3.078	102.704
F	WR159	4.9 — 7.05	F340C1	0.815	27.194
			F340C3	2.446	81.616
C	WR137	5.85 — 8.2	C340F1	0.686	22.890
			C340F3	2.058	68.670
H	WR112	7.05 — 10.0	H340B1	0.571	19.067
			H340B3	1.714	57.191
HS	WR102	7.0 — 11.0	HS340A	0.558	16.684
			HS340B	1.676	55.923
X	WR90	8.2 — 12.4	X340B1	0.483	16.116
			X340B3	1.448	48.316
M	WR75	10.0 — 15.0	M340C1	0.396	13.213
			M340C3	1.189	39.674
P	WR62	12.4 — 18.0	P340A1	0.352	11.745
			P340A2	1.055	35.202
N	WR51	15.0 — 22.0	N340A	0.267	8.909
			N340B	0.800	26.694
K	WR42	18.0 — 26.5	K340A1	0.251	8.365
			K340A2	0.752	25.095
U	WR28	26.5 — 40.0	U340B	0.150	5.005
			U340C	0.450	15.015
J	WR22	33.0 — 50.0	J340A1	0.120	4.007
			J340B1	0.360	12.022
V	WR15	50.0 — 75.0	V340A1	0.080	2.669
			V340A3	0.240	8.008
Y	WR12	60.0 — 90.0	Y340A1	0.067	2.245
			Y340A3	0.202	6.729
Z	WR10	75.0 — 110.0	Z340A1	0.054	1.802
			Z340A3	0.162	5.405

[1] Offset delay is calculated without consideration for the dispersive effect of waveguide, that is, assuming the short is in air dielectric coaxial line. This conforms to the convention established for Agilent network analyzers. Anritsu analyzers use the actual mechanical offset in centimeters.

Sliding Shorts

General Information

A sliding short is a movable short circuited termination in a precision air line which is used in a variety of laboratory measurement applications. These devices are used to establish a reference plane in a transmission system, as tuning elements in the development of microwave components (mixers, amplifiers, etc.), and tuning high precision CW reflectometer systems. An important application is the calibration of vector network analyzers (VNA). The use of a sliding short for such a calibration is particularly effective when the VNA is to be used for the measurement of highly reflective devices.

The primary criteria for a quality coaxial sliding short are a) a precision transmission structure (air line), b) consistent low noise contacts on the inner and outer conductors and c) a precision connector. Maury manufactures coaxial sliding shorts with a range of performance and operational convenience features. Among the classes available are modular units with interchangeable connectors, high precision devices with dedicated connectors, and rugged general purpose units.

Modular Sliding Shorts

Models 2508A, 2518A, 8036A, 8779A, and 8779B

Features

- *Broad Frequency Range*
- *Precision Air Lines*
- *Interchangeable Connectors*

Description

The 2508A, 2518A, and 8036A sliding shorts are true modular instruments. These units are provided with interchangeable connector bodies and center conductors so that measurements may be made in type N (female or male), or 7mm with the 2508A and 2518A, or 3.5mm (female or male) with the 8036A.

The connectors used on these units are air-dielectric (beadless) and the center conductor is movable; therefore, with the aid of an appropriate connector gage, the center pin of the connector can be set to the desired interface condition.

Specifications

Frequency Range . . . . . See Available Models Chart

VSWR (excluding transmission line loss):

2.92mm . . . . . 4.0 to 18.0 GHz, 100:1
18 to 26.5 GHz, 75:1
26.5 to 40.0 GHz, 50:1

3.5mm . . . . . 2.0 to 18.0 GHz, 100:1
18 to 26.5 GHz, 75:1
26.5 to 34.0 GHz, 50:1

7mm . . . . . 2.0 to 18 GHz, 100:1

Type N . . . . . 2.0 to 18 GHz, 100:1

Impedance . . . . . 50 ohm ±0.3%

Travel . . . . . > 1/2-λ at the lowest rated frequency

Available Models

MODEL	FREQUENCY RANGE (GHz)	CONNECTOR	AIR LINE ACCURACY [1]
2508A	0.9 – 18.0	LPC7 [2], Type N female and male	56 dB
2518A	1.8 – 18.0		
8036A	2.0 – 34.0	3.5mm female and male	44 dB
8779A1	4.0 – 20.0	2.92mm female	42 dB
	20.0 – 40.0		40 dB
8779B1	4.0 – 20.0	2.92mm male	42 dB
	20.0 – 40.0		40 dB

[1] Equivalent return loss of the air line impedance (50 ohm ref.)

[2] Air interface connector with a spring loaded, self-centering center pin that mates with standard 7mm connectors.

Sliding Shorts
High Precision

Features

- *0.9 to 18.0 GHz*
- *Precision Air Lines*
- *Dedicated Connectors*

Description

These models are movable shorts with dedicated connectors in precision air lines. The inherent low reflection and accurate transmission line of these instruments, coupled with efficient beryllium copper inner and outer conductor contacting fingers, provide an excellent short circuit. The travel of the shorting plane of these instruments is at least 1/2 wavelength at the lowest rated frequency to permit reversal of the reflection phase.

Specifications

Frequency Range . . . . . See Available Models Chart
VSWR (excluding transmission line loss) . . . . . 100:1 minimum
Impedance . . . . . 50 ohm ±0.3%
Travel . . . . . > 1/2 wavelength at the lowest rated frequency

Available Models

MODEL	FREQ. RANGE (GHz)	CONNECTOR	AIR LINE ACCURACY [1]
1959A	1.8 – 18.0	SMA (f)	56 dB
1959B		SMA (m)	
2604A	0.9 – 18.0	7mm	

1 Equivalent return loss of the air line impedance (50 ohm ref.)

General Purpose Sliding Shorts
Model Series 1909 and 1978

Specifications

Frequency Range . . . . . See Available Models Chart
Impedance . . . . . 50 ohm
Travel . . . . . 1/2 wavelength at the lowest rated frequency
Connectors . . . . . See Available Models Chart

Available Models

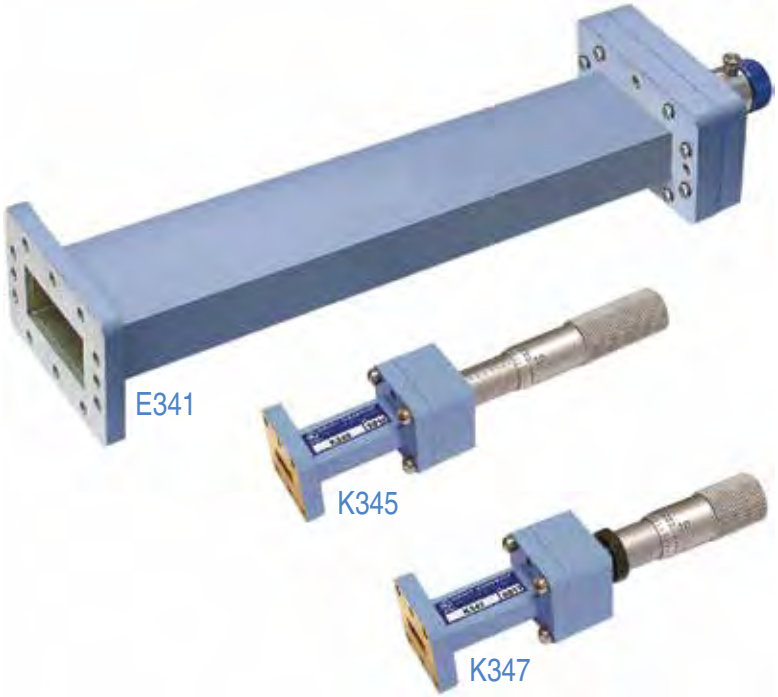
MODEL	FREQ. RANGE (GHZ)	CONNECTOR	SHORT TRAVEL (IN.)	LENGTH CLOSED (IN.)
1909A1 1909A2	0.2 – 0.5	SMA (f) SMA (m)	30.0	32.6
1909B1 1909B2	0.4 – 1.0	SMA (f) SMA (m)	15.0	17.6
1909C1 1909C2	0.8 – 4.0	SMA (f) SMA (m)	7.5	10.1
1909D1 1909D2	2.0 – 12.0	SMA (f) SMA (m)	3.0	5.6
1978A1 1978A2	0.2 – 0.5	Precision N (f) Precision N (m)	30.0	32.6
1978B1 1978B2	0.4 – 1.0	Precision N (f) Precision N (m)	15.0	17.6
1978C1 1978C2	0.8 – 4.0	Precision N (f) Precision N (m)	7.5	10.1
1978D1 1978D2	2.0 – 12.0	Precision N (f) Precision N (m)	3.0	5.6

Waveguide Sliding Shorts

Series 341, 345 and 347

Description

Maury waveguide sliding shorts are convenient, low loss, movable shorts for use in a variety of microwave techniques. They can be used with waveguide tees as a variable shunt for tuning or impedance matching applications and they are a necessary device for tuning high performance tuned reflectometer systems. They are valuable for establishing a reference impedance for the calibration and error analysis of waveguide measurement systems. Maury offers three grades of waveguide sliding shorts; series 341, featuring an uncalibrated sliding shaft with a position lock (called an "uncalibrated drive"; series 345, featuring a 0.001-inch resolution micrometer drive (or "calibrated drive"); and series 347 high precision drive, featuring a sliding shaft with a position lock for rapid adjustment, plus a 0.001-inch resolution micrometer for fine adjustment.



Available Models

MODEL	DRIVE TYPE	EIA WR NUMBER	FREQUENCY RANGE (GHz)			EQUIVALENT FLANGE
R341B	Uncalibrated	430	1.7	—	2.6	CPR430F
S341	Uncalibrated	284	2.6	—	3.95	UG53/U
E341B	Uncalibrated	229	3.3	—	4.9	CPR229F
G341	Uncalibrated	187	3.95	—	5.85	UG149A/U
F341B	Uncalibrated	159	4.90	—	7.05	CPR159F
C345	Calibrated	137	5.85	—	8.2	UG344/U
H345	Calibrated	112	7.05	—	10.0	UG51/U
X345	Calibrated	90	8.2	—	12.4	UG39/U
M345	Calibrated	75	10.0	—	15.0	MPF75
P345	Calibrated	62	12.4	—	18.0	UG419/U
K345	Calibrated	42	18.0	—	26.5	UG595/U
U345	Calibrated	28	26.5	—	40.0	UG599/U
S347	High Precision	284	2.6	—	3.95	UG53/U
C347	High Precision	137	5.85	—	8.2	UG344/U
H345	High Precision	112	7.05	—	10.0	UG51/U
X347A	High Precision	90	8.2	—	12.4	UG39/U
M347	High Precision	75	10.0	—	15.0	MPF75
P347	High Precision	62	12.4	—	18.0	UG419/U
K347	High Precision	42	18.0	—	26.5	UG595/U
U347	High Precision	28	26.5	—	40.0	UG599/U
J347A	High Precision	22	33.0	—	50.0	UG383/U

Opens

General Information

Shielded, coaxial open circuit terminations (opens) are used in the calibration of vector network analyzers (VNAs) to provide a nominal 180 degree phase offset from a compatible reference short circuit over a broad range of microwave frequencies.

At these frequencies, open circuit terminations are inherently imperfect. Shielding the open essentially eliminates radiation loss, but creates a residual frequency-sensitive capacitance. An accurate knowledge of the open's effective capacitance is essential to an accurate calibration of the analyzer.

Maury opens are characterized for effective capacitance versus frequency by means of a fourth order polynomial curve fit, and the nominal capacitance coefficients are provided with each unit. We offer several innovative designs that improve the consistency and repeatability of the open's capacitance coefficients resulting in improved effective source match of the calibrated VNA [1].

One design (seen in the 14mm and 7mm models shown below) uses a beadless captivated dielectric rod in place of the center conductor contact. This rod depresses the spring-loaded contact of the test port connector so that it is flush with the outer conductor mating plane. This creates highly accurate, precisely repeatable open circuit conditions which improve the calibration effectiveness and measurement accuracy of the open.

Another design (seen in most of the sexed models listed below) uses a center contact that is captivated and set at the factory to be essentially flush with the outer conductor mating plane, thereby eliminating dependence on test port connector tolerances and adding a high degree of performance consistency to the open.

The 371N1/P1, 8585A/B, and 8885A/B models are designed for limited frequency ranges as determined by their connector types. Models 8885A and 8885B have shielded shells without center conductors or supporting dielectric rods.

In all cases, the specification "Phase Accuracy" is defined as phase deviation from a nominal unit.

Specifications and Available Models

MODEL	SEX	CONNECTOR TYPE	FREQUENCY RANGE (GHz)	NOMINAL IMPEDANCE	PHASE ACCURACY	MINIMUM REFLECTION COEFFICIENT
7948A1	female	2.4mm	DC – 50.0	50 ohm	± 2.0 degrees	0.98
7948B1	male	2.4mm	DC – 50.0	50 ohm	± 2.0 degrees	0.98
8773A1	female	2.92mm (K)	DC – 40.0	50 ohm	± 1.5 degrees	0.98
8773B1	male	2.92mm (K)	DC – 40.0	50 ohm	± 1.5 degrees	0.98
8048A1	female	3.5mm	DC – 26.5	50 ohm	± 1.4 degrees	0.98
8048B1	male	3.5mm	DC – 26.5	50 ohm	± 1.4 degrees	0.98
2616D3	—	7mm	DC – 18.0	50 ohm	± 0.3 degrees	0.995
8809B1	female	Type N	DC – 18.0	50 ohm	± 2.0 degrees	0.99
8810B1	male	Type N	DC – 18.0	50 ohm	± 2.0 degrees	0.99
8609B	female	TNC	DC – 18.0	50 ohm	± 5.0 degrees	0.98
8610B	male	TNC	DC – 18.0	50 ohm	± 5.0 degrees	0.98
8685A	female	AFTNC	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8685B	male	AFTNC	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8675A	female	TNCA	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8675B	male	TNCA	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8782A	female	OSP™	DC – 18.0	50 ohm	± 2.0 degrees	0.99
8782B	male	OSP™	DC – 18.0	50 ohm	± 2.0 degrees	0.99
371N2	female	BNC	DC – 12.4	50 ohm	± 5.0 degrees	0.98
371P2	male	BNC	DC – 12.4	50 ohm	± 5.0 degrees	0.98
2416D1	—	14mm (GR900)	DC – 8.5	50 ohm	± 0.2 degrees	0.997
2716A	female	7-16	DC – 7.5	50 ohm	± 1.00 degrees	0.99
2716B	male	7-16	DC – 7.5	50 ohm	± 1.25 degrees	0.99
8585A	female	BNC	DC – 2.0	75 ohm [2]	± 1.0 degrees	0.98
8585B	male	BNC	DC – 2.0	75 ohm [2]	± 1.0 degrees	0.98
8885A	female	Type N	DC – 4.0	75 ohm [2]	± 1.0 degrees	0.98
8885B	male	Type N	DC – 4.0	75 ohm [2]	± 1.0 degrees	0.98

1 See Maury data sheet 5C-027.

2 The 8585 and 8885 series opens are for use in 75 ohm calibrations only. These units should never be mated to 50 ohm connectors, as this could result in damage to the 75 ohm female center conductor contact, and would produce an unreliable, unstable electrical connection.

Precision Air Lines

General Information

Coaxial air lines are air-dielectric transmission lines with highly accurate dimensions that can be used as fundamental impedance standards in measurement and calibration applications, and may also be used to establish reference positions for measurements.

Maury offers air lines with bead supported and/or beadless connectors in a variety of popular types including, 1.85mm, 2.4mm, 2.92mm (K), 3.5mm, 7mm, type N, 14mm, and 7-16.

Bead supported air lines offer greater convenience and easier connections (the center conductor is automatically aligned by the dielectric bead for easy connection); beadless air lines offer better impedance and electrical length accuracies, as well as lower VSWR (the center conductor floats free in the air line body, and the male connector nut is retractable to facilitate insertion of the center conductor contact before the thread- on connection tightened.

The photos at the right (above) show end views of two type N air lines. On the left is a model 2503F (representing Maury's bead supported design) and on the right is a model 2553T5 (representing Maury's beadless design). The low-loss dielectric bead in the 2503F keeps the center conductor precisely centered in the body of the air line. The photo on the right shows how the unsupported center conductor of the 2553T5 has shifted to the left, and floats freely in the air line body until it is connected at both ends. The beadless design is a true "air" line in that it does not include any discontinuities caused by having the center conductor supported by dielectric beads.

Bead-Supported Unsupported (air dielectric)

Beadless air lines are often used as "sample holders" where samples of various materials can be inserted in the air line and measured to determine the material's dielectric properties.

Specifications given for the air line models in this section include the odd 1/4-λ frequency rating. This rating indicates the frequencies at which the electrical length is an odd multiple of a 1/4 wavelength where n = zero or an integer.

1.85mm Beadless Air Lines

Model Series 7843

Features

- *DC to 67.0 GHz (Operates to 70.0 GHz)*
- *Virtually Reflectionless*
- *1.85mm Connectors*

7843S3.00

7843S1.15

7843S0.96

Description

These reference air lines are beadless 1.85mm coaxial transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard. They are rated for a frequency range from DC to 67 GHz and are virtually reflectionless. Fabricated from beryllium copper, they are gold-plated to prevent tarnishing.

Specifications

Frequency Range . . . . . DC to 67.0 GHz
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy 0.0025cm
Minimum Return Loss (excluding connector interface) . . . 48 dB
Nominal Impedance . . . . . 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)	
7843S0.96	1.85mm female to male	0.96	(2n + 1)	7.8
7843S1.15	1.85mm female to male	1.15	(2n + 1)	6.5
7843S3.00	1.85mm female to male	3.00	(2n + 1)	2.5

2.4mm Beadless Air Lines

Model Series 7943

Features

- *DC to 50.0 GHz*
- *Virtually Reflectionless*
- *2.4mm Connectors*

Description

The Maury 7943 series reference air lines are beadless 2.4mm coaxial transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard utilizing precision 2.4mm connectors These air lines are fabricated from beryllium copper and are gold plated for low loss and to prevent tarnishing.

Specifications

Frequency Range. . . . . DC to 50 GHz (usable to 54 GHz)
Minimum Return Loss (excluding connector interfaces) . . 48 dB
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.0025cm
Nominal Impedance . . . . . 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
7943G	2.4mm female to male	4.997	(2n + 1) 1.5
7943H	2.4mm female to male	2.997	(2n + 1) 2.5
7943S1.25	2.4mm female to male	1.25	(2n + 1) 6.0
7943S1.50	2.4mm female to male	1.50	(2n + 1) 5.0
7943S6.25	2.4mm female to male	6.25	(2n + 1) 1.2

2.92mm Beadless Air Lines

Model Series 8774

Features

- *DC to 40.0 GHz*
- *Virtually Reflectionless*
- *2.92mm Connectors*

Description

The 8774C series female to male and 8774B series male to male reference air lines are beadless precision 2.92mm coaxial transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard, utilizing precision 2.92mm connectors. Fabricated from beryllium copper, these air lines are gold plated for low loss and to prevent tarnishing.

Specifications

Frequency Range. . . . . DC to 40 GHz
Minimum Return Loss (excluding connector interfaces) . . 48 dB
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.0025cm
Nominal Impedance . . . . . 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
8774C15	2.92mm female to male	14.990	(2n + 1) 0.50
8774C7.5	2.92mm female to male	7.495	(2n + 1) 1.00
8774C6	2.92mm female to male	6.000	(2n + 1) 1.25
8774C5.25	2.92mm female to male	5.250	(2n + 1) 1.43
8774C5	2.92mm female to male	4.997	(2n + 1) 1.50
8774C3	2.92mm female to male	2.998	(2n + 1) 2.50
8774B15	2.92mm male to male	14.990	(2n + 1) 0.50
8774B7.5	2.92mm male to male	7.495	(2n + 1) 1.00
8774B6.8	2.92mm male to male	6.795	(2n + 1) 1.10

3.5mm Beadless Air Lines

Model Series 8043

Features

- *DC to 26.5 GHz*
- *Virtually Reflectionless*
- *Precision 3.5mm Connectors*

8043S15

Description

The 8043S series female to male and 8043M series male to male reference air lines are beadless, precision, coaxial 3.5mm transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard. Fabricated from beryllium copper, they are gold-plated to prevent tarnishing, with a special stainless steel coupling nut on the male connectors that can be retracted for ease of assembly. All units are equipped with machined flats to permit the use of torque wrenches for proper mating.

Specifications

Frequency Range. . . . . DC to 26.5 GHz
Minimum Return Loss (excluding connector interfaces) . . 48 dB
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.0025cm
Nominal Impedance . . . . . 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
8043S15	3.5mm female to male	14.990	(2n+1) 0.50
8043S10	3.5mm female to male	9.993	(2n+1) 0.75
8043S7.5	3.5mm female to male	7.495	(2n+1) 1.00
8043S6	3.5mm female to male	6.000	(2n+1) 1.25
8043S5.3	3.5mm female to male	5.298	(2n+1) 1.41
8043S5	3.5mm female to male	4.997	(2n+1) 1.50
8043M10	3.5mm male to male	9.993	(2n+1) 0.75
8043M7.2	3.5mm male to male	7.195	(2n+1) 1.04
8043M6.8	3.5mm male to male	6.795	(2n+1) 1.10

3.5mm Bead Supported Air Lines

Model Series 8042

Features

- *DC to 18.0 GHz*
- *Virtually Reflectionless*
- *Precision 3.5mm Connectors*

8042E

Description

The 8042 series precision air lines utilize 3.5mm connectors in which the center conductor is supported by a low-loss dielectric bead. The air lines are fabricated from gold-plated, copper alloys to prevent tarnishing.

Specifications

Frequency Range. . . . . DC to 18.0 GHz
VSWR (typical) . . . . . <1.004 + 0.0035f(GHz)
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.02cm
Nominal Impedance . . . . . 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
8042C	3.5mm female to male	14.990	(2n+1) 0.50
8042D	3.5mm female to male	9.993	(2n+1) 0.75
8042E	3.5mm female to male	7.495	(2n+1) 1.00
8042G	3.5mm female to male	4.997	(2n+1) 1.50

7mm Beadless Air Lines

Model Series 2653

Features

- *DC to 18.0 GHz*
- *Virtually Reflectionless*
- *LPC7 Connectors*

Description

The 2653 series reference air lines are beadless, virtually reflectionless, coaxial 7mm air lines. Spring-loaded tips on the ends of the center conductors mate with standard 7mm connectors.

Specifications

Frequency Range . . . . . DC to 18.0 GHz
VSWR:
DC to 3.0 GHz . . . . . <1.002 + 0.001f (GHz)
3.0 to 18.0 GHz . . . . . <1.005 maximum
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.005cm
Characteristic Impedance
(where skin depth is negligible) . . . . . 50 + 0.1 ohm [1]

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
2653L	7mm (LPC7) [2]	0.693	(2n + 1) 10.81
2653S3	7mm (LPC7) [2]	2.9969	(2n + 1) 2.50
2653S4	7mm (LPC7) [2]	3.994	(2n + 1) 1.875
2653S5	7mm (LPC7) [2]	4.994	(2n + 1) 1.50
2653S6	7mm (LPC7) [2]	5.993	(2n + 1) 1.25
2653S7.5	7mm (LPC7) [2]	7.493	(2n + 1) 1.00
2653S9.2	7mm (LPC7) [2]	9.239	(2n + 1) 0.81
2653S10	7mm (LPC7) [2]	9.988	(2n + 1) 0.75
2653S15	7mm (LPC7) [2]	14.983	(2n + 1) 0.50
2653S20	7mm (LPC7) [2]	19.980	(2n + 1) 0.375
2653S30	7mm (LPC7) [2]	29.969	(2n + 1) 0.25

7mm Beadless Air Line Kits

Sets of 2653S air lines are also supplied as kits; 2653K2 is a set of 6 air lines with 1 each 2653S3, 2653S5, 2653S6, 2653S7.5, 2653S10, and 2653S15. 2653K3 adds 1 each 2653S20, and 2653S30 to those in 2653K2 for a total of 8. Both kits are supplied in attractive, foam-lined wood cases.

7mm Bead Supported Air Lines

Model Series 2603

Features

- *DC to 18.0 GHz*
- *Virtually Reflectionless*
- *Precision 7mm Connectors*

Description

The 2603 precision air lines are 7mm coaxial line sections with 7mm connectors[3] in which the center conductor is supported by a low-loss dielectric bead. The air lines are held to extremely close tolerances to provide an accurate 50 ohm impedance standard, and are fabricated from copper alloys with a gold-flash protective coating (except those over 15cm which have a silver-layered stainless steel center conductor to eliminate sag).

Specifications

Frequency Range . . . . . DC to 18.0 GHz
VSWR . . . . . <1.004 + 0.003f (GHz)
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.015cm
Characteristic Impedance
(where skin depth is negligible) . . . . . 50 + 0.12 ohm

[1] Impedance = 49.987 ohms based on nominal dimensions and tolerances of the conductors, and the equation: $Z = 59.939 \log_e D/d$, D = I.D. inner conductor, d = O.D. outer conductor.

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
2603A	Precision 7mm [4]	29.979	(2n + 1) 0.25
2603B	Precision 7mm [4]	19.986	(2n + 1) 0.375
2603C	Precision 7mm [4]	14.990	(2n + 1) 0.50
2603D	Precision 7mm [4]	9.993	(2n + 1) 0.75
2603E	Precision 7mm [4]	7.495	(2n + 1) 1.00
2603F	Precision 7mm [4]	5.996	(2n + 1) 1.25
2603G	Precision 7mm [4]	4.997	(2n + 1) 1.50

7mm Bead Supported Air Line Kits

Sets of 2603 air lines are also supplied as kits; 2603K is a set of 6 airlines consisting of 1 each 2653A, 2603B, 2603C, 2603D, 2603E, and 2603G. 2603L is a set of 7 air lines consisting of all those included in 2603K plus 1 each 2603F. Both kits are supplied in attractive, foam-lined wood cases.

[2] Beadless 7mm connector that mates with standard precision 7mm.

[3] Precision 7mm connector per Maury data sheet 5E-060.

Type N Beadless Air Lines

Model Series 2553

Features

- DC to 18.0 GHz
- Virtually Reflectionless
- Beadless Type N Connectors

Description

The 2553T series reference air lines utilize beadless type N connectors which are integral to the air lines, thereby producing extremely low reflection transmission lines. The complete air lines (inner and outer conductor) are fabricated from gold-plated, low-loss copper alloys.

Specifications

Frequency Range . . . . . DC to 18.0 GHz
VSWR (conservatively rated) . . . . . <1.004 + 0.001f (GHz)
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.01cm
Characteristic Impedance
(where skin depth is negligible) . . . . . 50 + 0.2 ohm [1]

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)	
2553T30	Type N female to male [2]	29.969	(2n + 1)	0.25
2553T20	Type N female to male [2]	19.986	(2n + 1)	0.375
2553T15	Type N female to male [2]	14.983	(2n + 1)	0.50
2553T10	Type N female to male [2]	9.988	(2n + 1)	0.75
2553T7.5	Type N female to male [2]	7.493	(2n + 1)	1.00
2553T6	Type N female to male [2]	5.993	(2n + 1)	1.25
2553T5	Type N female to male [2]	4.994	(2n + 1)	1.50
2553T3.82	Type N female to male [2]	3.816	(2n + 1)	1.96
2553T3.12	Type N female to male [2]	3.123	(2n + 1)	2.40
2553T3	Type N female to male [2]	2.9969	(2n + 1)	2.50

Type N Beadless Air Line Kits

The 2553K is a kit consisting of six reference air lines from the chart above supplied in an attractive foam-lined wood instrument case.

Type N Bead Supported Air Lines

Model Series 2503

Features

- DC to 18.0 GHz
- Virtually Reflectionless
- Precision Type N Connectors

Description

The 2503 series precision air lines utilize stainless steel type N connectors in which the center conductor is supported by a low-loss dielectric bead. The air lines (inner and outer conductor) are fabricated from gold-plated, low-loss copper alloys.

Specifications

Frequency Range . . . . . DC to 18.0 GHz
VSWR . . . . . <1.03 + 0.003f (GHz)
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.02cm
Characteristic Impedance
(where skin depth is negligible) . . . . . 50 + 0.2 ohm

[1] Impedance = 49.987 ohms based on nominal dimensions and tolerances of the conductors, and the equation: $Z = 59.939 \log_e D/d$, D = I.D. inner conductor, d = O.D. outer conductor.

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)	
2503A	Type N female to male [3]	29.979	(2n + 1)	0.25
2503B	Type N female to male [3]	19.986	(2n + 1)	0.375
2503C	Type N female to male [3]	14.990	(2n + 1)	0.50
2503D	Type N female to male [3]	9.993	(2n + 1)	0.75
2503E	Type N female to male [3]	7.495	(2n + 1)	1.00
2503F	Type N female to male [3]	5.996	(2n + 1)	1.25
2503G	Type N female to male [3]	4.997	(2n + 1)	1.50

Type N Bead Supported Air Line Kits

Air lines kits, model 2503K (consisting of one each 2503A, C, D, E, G) and model 2503L (consisting of one each 2503A, B, C, D, E, F, G) are available and are supplied in an attractive foam-lined wood instrument case.

[2] Beadless precision type N connectors, one female and one male.

[3] Precision stainless steal type N per Maury data sheet 5E-049.

14mm Beadless Air Lines

Model Series 2453

Features

- *DC to 8.5 GHz*
- *Virtually Reflectionless*
- *LPC14 Connectors* [1]

Description

The 2453 series are beadless, virtually reflectionless, coaxial 14mm reference air lines with spring-loaded tips on the ends of the inner conductor to mate with 14mm connectors [2]. VSWR is <1.006 at 8.5 GHz. The lines are fabricated from beryllium copper and are gold-plated to prevent tarnishing.

Specifications

Frequency Range. . . . . DC to 8.5 GHz
VSWR . . . . . <1.001 + 0.0005f (GHz)
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.005cm
Characteristic Impedance
(where skin depth is negligible). . . . . 50 + 0.05 ohm [2]

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)	
2453A	Precision 14mm [2]	29.979	(2n + 1)	0.25
2453B	Precision 14mm [2]	19.986	(2n + 1)	0.375
2453C	Precision 14mm [2]	14.990	(2n + 1)	0.50
2453D	Precision 14mm [2]	9.993	(2n + 1)	0.75
2453E	Precision 14mm [2]	7.495	(2n + 1)	1.00
2453F	Precision 14mm [2]	5.996	(2n + 1)	1.25
2453G	Precision 14mm [2]	4.997	(2n + 1)	1.50
2453H	Precision 14mm [2]	2.998	(2n + 1)	2.50

14mm Beadless Air Line Kits

The 2453K is a kit consisting of one (each) of 2453C, D, E, F, G and H, from the chart above, supplied in an attractive foam-lined wood instrument case.

7-16 Beadless Air Lines

Model Series 2735A

Features

- *DC to 7.5 GHz*
- *Virtually Reflectionless*
- *Precision 7-16 Connectors*

Description

The 2735A series are beadless, virtually reflectionless, coaxial 7-16 reference air lines. The lines are fabricated from beryllium copper and are gold-plated to prevent tarnishing.

Specifications

Frequency Range. . . . . DC to 7.5 GHz
VSWR . . . . . <1.004 + 0.0035f (GHz)
Electrical Length . . . . . See Available Models Chart
Electrical Length Accuracy . . . . . ±0.005cm
Characteristic Impedance . . . . . 50 + 0.05 ohm

[1] A precision beadless 14mm connector that mates with GR900 connectors.
[2] Impedance = 49.987 ohms based on nominal dimensions and tolerances of the conductors, and the equation: $Z = 59.939 \log_e D/d$, D = I.D. inner conductor, d = O.D. outer conductor.

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)	
2735A30	7-16 female to male	29.979	(2n + 1)	0.25
2735A7.5	7-16 female to male	7.495	(2n + 1)	1.00
2735A6.0	7-16 female to male	5.996	(2n + 1)	1.25

7-16 Precision Air Line Kits

The 2735K kits consist of the reference air lines listed in the chart above provided in an attractive foam-lined wood instrument case. (See Maury data sheet 2Z-041A for test port adapter options.)

2735K

Precision Mismatches

General Information

Precision standard mismatches are fixed coaxial terminations, which are used to introduce a known VSWR into a 50 ohm transmission system. These mismatches are extremely useful in a wide variety of applications and are quick and easy to use. They can be used to calibrate swept reflectometers, verify network analyzer calibration, establish impedance references in TDR measurements, etc.

Maury standard mismatches are quality constructed using thin film resistors and a unique grounding method that ensures stable operation. For ease of identification, the VSWR value of the mismatch is engraved on the end cap. Calibration data is provided for all units.

The standard units in this section are fitted with 2.4mm, 2.92mm, 3.5mm, 7mm, type N, TNC, and 14mm connectors. Please consult with our sales staff for application assistance. The units are also available as sets or kits packaged in foam-lined wood instrument cases. (See page 108.)

Precision Mismatches

2.4mm, 2.92mm & 3.5mm Connectors

2.4mm Standard Mismatches

Models 7933A1/A2 and 7933B1/B2

Specifications

Frequency Range . . . . . DC to 50.0 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . VNA data 2.0 to 50.0 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 0.5 W average, 0.5 kW peak

2.92mm Standard Mismatches

Models 8778A1/A2 and 8778B1/B2

Specifications

Frequency Range . . . . . DC to 40.0 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . VNA data 2.0 to 40.0 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 0.5 W average, 0.5 kW peak

3.5mm Standard Mismatches

Models 8033A1/A2/A3 and 8033B1/B2/B3

Specifications

Frequency Range . . . . . DC to 26.5 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . VNA data 2.0 to 26.5 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 0.5 W average, 0.5 kW peak

2.4mm Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)	
FEMALE	MALE		DC – 12.0	12.0 – 50.0
7933A1.10	7933B1.10	1.10	±0.08	+0.13 –0.10
7933A1.20	7933B1.20	1.20	±0.09	±0.13
7933A1.30	7933B1.30	1.30	±0.09	±0.17
7933A1.50	7933B1.50	1.50	±0.10	±0.20
7933A1.75	7933B1.75	1.75	±0.12	±0.22
7933A2.00	7933B2.00	2.00	±0.14	±0.25

2.92mm Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)	
FEMALE	MALE		DC – 12.0	12.0 – 40.0
8778A1.10	8778B1.10	1.10	±0.08	+0.13 –0.10
8778A1.15	8778B1.15	1.15	±0.08	±0.13
8778A1.20	8778B1.20	1.20	±0.08	±0.13
8778A1.25	8778B1.25	1.25	±0.08	±0.13
8778A1.30	8778B1.30	1.30	±0.09	±0.17
8778A1.50	8778B1.50	1.50	±0.10	±0.20
8778A1.75	8778B1.75	1.75	±0.12	±0.22
8778A2.00	8778B2.00	2.00	±0.14	±0.25

3.5mm Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)	
FEMALE	MALE		DC – 12.0	12.0 – 26.5
8033A1.10	8033B1.10	1.10	±0.06	±0.08
8033A1.20	8033B1.20	1.20	±0.07	±0.10
8033A1.30	8033B1.30	1.30	±0.08	±0.12
8033A1.50	8033B1.50	1.50	±0.09	±0.17
8033A1.75	8033B1.75	1.75	±0.11	±0.19
8033A2.00	8033B2.00	2.00	±0.12	±0.22
8033A2.50	8033B2.50	2.50	±0.13	±0.23
8033A3.00	8033B3.00	3.00	±0.15	±0.25

Precision Mismatches

7mm, Type N, TNC and 14mm Connectors

7mm Standard Mismatches

Models 2611A/B/C/D/E/F/G

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . 2.0 to 18.0 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 1 W average, 1 kW peak

Type N Standard Mismatches

Models 2561A/B/C/D/E/F/G and 2562A/B/C/D/E/F

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . 2.0 to 18.0 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 1 W average, 1 kW peak

TNC [1] Standard Mismatches

Models 8611C/D/E/G and 8612G

Specifications

Frequency Range . . . . . DC to 18.0 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . 2.0 to 18.0 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 1 W average, 1 kW peak

14mm Standard Mismatches

Model 2411E

Specifications

Frequency Range . . . . . DC to 8.5 GHz
Nominal VSWR . . . . . See Available Models Chart
VSWR Accuracy . . . . . See Available Models Chart
Calibration Data Provided . . . . . 2.0 to 8.5 GHz
Nominal Calibration Impedance Reference . . . . . 50 ohm
Power Handling . . . . . 1 W average, 1 kW peak

7mm Available Models

MODEL	NOMINAL VSWR	ACCURACY (GHz)			RESISTANCE (OHMS)
		DC – 8.0	8.0 – 12.4	12.4 – 18.0	
2611A	1.05	±0.05	±0.05	+0.07 −0.05	47.6
2611B	1.10	±0.05	±0.05	±0.07	45.5
2611C	1.20	±0.05	±0.06	±0.09	41.7
2611D	1.30	±0.05	±0.07	±0.10	38.5
2611E	1.50	±0.06	±0.08	±0.15	33.3
2611F	1.75	±0.08	±0.10	±0.17	28.6
2611G	2.00	±0.10	±0.12	±0.20	25.0

Type N Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)			RESISTANCE (OHMS)
FEMALE	MALE		DC – 8.0	8.0 – 12.4	12.4 – 18.0	
2561A	2562A	1.05	±0.05	±0.05	+0.08 −0.05	47.6
2561B	2562B	1.10	±0.06	±0.06	±0.08	45.5
2561C	2562C	1.20	±0.06	±0.07	±0.10	41.7
2561D	2562D	1.30	±0.06	±0.08	±0.12	38.5
2561E	2562E	1.50	±0.08	±0.09	±0.17	33.3
2561F	2562F	1.75	±0.10	±0.11	±0.19	28.6
2561G	2562G	2.00	±0.12	±0.12	±0.22	25.0

TNC [1] Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)		RESISTANCE (OHMS)
FEMALE	MALE		DC – 10.0	10.0 – 18.0	
8611C	8612C	1.20	±0.08	±0.15	41.7
8611D	8612D	1.30	±0.09	±0.15	38.5
8611E	8612E	1.50	±0.10	±0.18	33.3
8611F	8612F	1.75	±0.13	±0.20	28.6
8611G	8612G	2.00	±0.15	±0.25	25.0

14mm Available Model

MODEL	NOMINAL VSWR	ACCURACY (GHz)			RESISTANCE (OHMS)
		DC – 1.0	1.0 – 4.0	4.0 – 8.5	
2411B	1.10	±0.02	±0.03	±0.04	55
2411C	1.20	±0.03	±0.04	±0.05	60
2411D	1.30	±0.04	±0.05	±0.06	65
2411E	1.50	±0.05	±0.06	±0.07	75

1 Precision TNC per Maury Data Sheet 5E-053.

Precision Mismatches

Mismatch Sets

Maury offers standard mismatches in sets containing a selection of mismatch values including the nominal matched load (typically, 1.05 VSWR). These sets, available with 7mm, type N female or male, 3.5mm, 2.92mm, 2.4mm, and TNC connectors, are packaged in foam-lined wooden instrument cases. Each mismatch is provided with an individual calibration report.

2562L

2.4mm, 2.92m, and TNC Mismatch Sets

Please consult our Sales Department for availability of mismatch sets with TNC, 2.92mm and 2.4mm connectors.

3.5mm Mismatch Sets

The 8033K mismatch set is made up of all six each female and male of the 3.5mm mismatches from 1.10 through 2.00 VSWR. The set is packaged in a foam-lined wooden instrument case, and each mismatch value is provided with an individual calibration report.

7mm and Type N Mismatch Sets

Two types of sets are offered in these connector styles: sets with model suffix "L" contain one each of four mismatch values – a nominally matched load, 1.20, 1.50 and 2.00 VSWR. Sets with the model suffix "M" contain one each of all mismatch values indicated on page 71. The basic model designations are: 2611L/M, 7mm; 2561L/M, type N female; 2562L/M, type N male. For example: 2562L describes a mismatch set with type N male connectors containing the four mismatches noted above.

2611M

Special Kits

Custom mismatch kits, combining different connector types and values, can be configured. Please consult our Sales Department and reference model 9476(x).

Instrument Cases

Standard mismatches in the various connector styles and mismatch values are available as individual units. Should you wish to purchase individual units and configure a custom set, Maury can offer the following foam-lined wood instrument cases to provide suitable laboratory storage.

2611S1	houses 4 units
2611S2	houses 8 units
2611S3	houses 12 units
8650Z1	houses 24 units

Waveguide Two-Port Mismatch Standard Sets

322A Series


G322A

Features

- *Two-Port Calculable Standards*
- *Reduced Height 1.00, 1.10, 1.25, 1.50, 2.00 VSWR Spacers*
- *1/4 λ at Midband*

Description

These 322 series models are two-port calculable waveguide standard sets. The sets consist of five reduced height spacers which provide an accurately known VSWR which is directly calculable from the mechanical dimensions. The spacers are fabricated from aluminum and are provided with precision indexing holes for excellent flange alignment. Indexing pins and mounting hardware are also provided. The sets are packaged in foam-lined wood instrument cases.

The standards in these sets are extremely stable and easy to use for a variety of calibration applications. Their simple geometry allows direct calculation of reflection, loss, transfer and group delay characteristics and makes them ideally suited for quickly checking the performance and accuracy of automated network analyzers.

To order the 1.00 VSWR shim by itself, please add "1.00" to the model number. (Example: X322A1.00)

Available Models

MODEL	FREQUENCY RANGE (GHz)	EIA WR NUMBER	EQUIVALENT FLANGE	1/4-λ FREQUENCY (GHZ)	LENGTH INCHES	(CM)	WAVEGUIDE TOLERANCE	PS DELAY WITH AIR DIELECTRIC
R322A	1.7 — 2.6	430	CPR430F	2.112	1.840	(4.6736)	±0.005	155.9444
S322A	2.6 — 3.95	284	UG584/U	3.221	1.198	(3.0429)	±0.004	101.5334
E322A	3.3 — 4.9	229	CPR229F	4.042	0.948	(2.4079)	±0.003	80.34527
G322A	3.95 — 5.85	187	UG149A/U	4.826	0.807	(2.0498)	±0.002	68.39518
F322A	4.90 — 7.05	159	CPR159F	5.906	0.642	(1.6307)	±0.002	54.41104
C322A	5.85 — 8.2	137	UG344/U	6.960	0.539	(1.3691)	±0.0015	45.68154
H322A	7.05 — 10.0	112	UG51/U	8.438	0.447	(1.1354)	±0.0010	37.88432
X322A	8.2 — 12.4	90	UG39/U	10.129	0.382	(0.9703)	±0.0010	32.37541
M322A	10.0 — 15.0	75	MPF75 [1]	12.322	0.311	(0.7899)	±0.0010	26.35799
P322A	12.4 — 18.0	62	UG419/U	15.030	0.253	(0.6426)	±0.0008	21.44236
N322A	15.0 — 22.0	51	MPD51	18.249	0.209	(0.5309)	±0.0008	17.71325
K322A	18.0 — 26.5	42	UG595/U	21.941	0.175	(0.4445)	±0.0005	14.83167
U322A	26.5 — 40.0	28	UG599/U	32.693	0.118	(0.2997)	±0.0005	10.00078
J322A	33.0 — 50.0	22	MPF22 [1]	40.824	0.0946	(0.2403)	±0.0005	8.017576
V322A	50.0 — 75.0	15	MPF15 [1]	61.518	0.0630	(0.1600)	±0.00025	5.339401
Y322A	60.0 — 90.0	12	MPF12 [1]	73.772	0.0529	(0.1344)	±0.00025	4.483402
Z322A	75.0 — 110.0	10	MPF10 [1]	91.221	0.0424	(0.1077)	±0.00025	3.593501

[1] Provided with Maury "MPF" precision type flanges with indexing holes.

Two-Port Mismatch Air Line Standards (Individual Units and Sets)

General Information

Mismatch air line sets are two-port, 1/4-λ VSWR standards consisting of coaxial air lines employing a design that features a precision outer conductor with beadless connectors and a set of inner conductors with increasing diameters. The inner conductors produce accurately known reflection coefficients which are directly calculable from and traceable to the air line dimensions [1].

Air line standard sets are extremely stable and easy to use for a variety of applications. Their simple geometry allows direct calculation of reflection, loss, transfer and group delay characteristics, making them ideally suited for checking the performance and accuracy of network analyzers. The sets described here utilize beadless connectors and rely on the mating connectors for center conductor support.

3.5mm Two-Port Mismatch Air Line Standards

Model 8044S15 & 8044S60

Features

- *DC to 26.5 GHz*
- *Separated Step Discontinuity*
- *Beadless 3.5mm Connectors*

8044S60

Description

Maury offers the 8044S15 and the 8044S60 as individual two-port mismatch standards in 3.5mm line size and connector type. A key design feature of these units is that the step discontinuity is separated from the connector interface for better accuracy [2].

Both models also feature a precision outer conductor with beadless 3.5mm connectors, and a stepped center conductor. The center conductors are designed to produce an accurately known VSWR which is directly calculable from the mechanical dimension.

Specifications

Frequency Range. . . . . DC to 26.5 GHz

VSWR:

Γ = 0.15 . . . . . 1.350 ± 0.025

Γ = 0.60 . . . . . 4.00 ± 0.25

Reference Impedance . . . . . 50 ohm

Nominal Overall Electrical Length 10cm

Nominal Mismatch Section Electrical Length 7.5cm

Odd 1/4-λ Frequencies . . . . . 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25 GHz

[1] Beatty, R.W., "Calculated and Measured S11, S21, and Group Delay for Simple Types of Coaxial and Rectangular Waveguide 2-port Standards", NBS Technical Note No. 657, Dec. 1974.

[2] Maury, M.A. Jr., and Simpson, G.R., "Two-Port Verification Standards iin 3.5mm and 7mm for Vector Automatic Network Analyzers", Microwave Journal, June 1984; pp. 101-110.

7mm Two-Port Mismatch Air Line Standard Set

Model 2654A

Features

- *DC to 18.0 GHz*
- *Beadless LPC7 Connectors*

Description

The 2654A Beadless Mismatch Air Line Set was designed for use in coaxial systems employing 7mm connectors. The air line connectors are beadless LPC7 connectors that mate with standard 7mm connectors, and rely on the mating connector for center conductor support.

Each set consists of:

A) One (1) outer conductor.

B) Five (5) inner conductors (see specification for corresponding VSWR values).

C) A foam-lined, wood instrument case for protection and storage.

Specifications

Frequency Range. . . . . DC to 18.0 GHz

Nominal Impedance . . . . . 49.987 for 1.00 VSWR

Mismatch Values (VSWR) . . . . . 1.00, 1.10, 1.25, 1.50, 2.00 (based on nominal impedance)

Electrical Length 7.495cm

Odd 1/4-λ Frequencies . . . . . .1, 3, 5, 7, 9, 11, 13, 15, 17 GHz

7mm Two-Port Mismatch Air Line Standard Sets

Model 2654B

Features

- *DC to 18.0 GHz*
- *Beadless LPC7(F) Connectors*

Description

The Maury 2654B precision air line standard set contains calculable two-port 7mm coaxial air lines [1]. These standards are provided with the step discontinuity separated from the connector interface for better accuracy [2].

The set consists of a precision outer conductor with beadless 7mm connectors and three center conductors. Each center conductor has a different diameter to produce an accurately known VSWR which is directly calculable from the mechanical dimension. They employ self-centering, spring-loaded pins to allow connection easily without tools.

Also available are the Maury 2654S15 and 2654S60 which are individual two-port standards with Γ = 0.15 and 0.60, respectively.

[1] Beatty, R.W., "Calculated and Measured S11, S21, and Group Delay for Simple Types of Coaxial and Rectangular Waveguide 2-port Standards", NBS Technical Note No. 657, Dec. 1974.

Specifications

Frequency Range. . . . . DC to 18.0 GHz

VSWR:

Γ = 0 . . . . . 1.005 maximum

Γ = 0.15 . . . . . 1.350 ± 0.025

Γ = 0.60 . . . . . 4.00 ± 0.25

Reference Impedance . . . . . 50 ohm

Nominal Overall Electrical Length 10cm

Nominal Mismatch Section Electrical Length 7.5cm

Odd 1/4-λ Frequencies . . . . . .1, 3, 5, 7, 9, 11, 13, 15, 17 GHz

[2] Maury, M.A. Jr., and Simpson, G.R., "Two-Port Verification Standards iin 3.5mm and 7mm for Vector Automatic Network Analyzers", Microwave Journal, June 1984; pp. 101-110.

Connector Gages and Connector Gage Kits

General Information

Features

- *Direct Reading, Self-Checking*
- *Accurate, Easy to Use*
- *Digital and/or Dial Indicator Styles*

A050A 2.92mm/3.5mm Digital Connector Gage Kit

A050A Digital Gage with Master Block (enlarged)

Description

Maury connector gage kits provide an easy and accurate way to measure critical linear interface dimensions of most coaxial connectors. Each kit consist of gages with specially adapted indicators, and the bushings and pins needed to mate with specified connectors. Master setting gages are used to adjust the dial indicators (or digital indicators) to zero, before push-on or thread-on gages are mated with connectors to measure the distance from a given interface (male shoulder, etc.) to the outer conductor mating plane. The table below lists available models. Additional information is found in the referenced data sheets.

Why You Need Connector Gages

The Importance of checking the critical mechanical dimensions of your coaxial connectors before mating cannot be overstated. Superior electrical performance depends on making sure all the coaxial connectors in you test setup are operating within their specified tolerances. Pin depth and position of the center conductors are especially critical in that regard.

If the male and female contacts are recessed beyond tolerance they will exhibit a "gap-fit" connection when mated. This causes significant reduction of electrical performance.

If the male and female contacts protrude beyond their specified tolerances they will exhibit an "interference-fit" when mated. This will also degrade electrical performance, with adverse effects on measurement accuracy, and may result in catastrophic damage to the center connectors and contacts.

Since 1962 Maury Microwave has been designing connector gage kits that provide the best method of checking pin depth and position in all the most popular coaxial connector types. Today these include digital gage kits in 1.85mm/2.4mm and 2.92mm/3.5mm connector types, and dial-indicator gage kits in 1.85mm/2.4mm, 2.92mm/3.5mm, 7mm, type N (in 50 ohm and 75 ohm models), BNC, TNC, AFTNC, TNCA, SMA, OSP™, 14mm, 7-16, SMP/GPO™, Multiport, and ZMA/BZ connector types.

All Maury connector gage kits are designed for superior durability, stability and repeatability. Each kit includes at least one connector gage with the master gage block or blocks necessary to ensure the accuracy of the gages. Kits are available as metrology-grade thread-on designs or hand-held push-on designs.

Available Models - Digital Indicator Style

CONNECTOR TYPE	DIAL RESOLUTION (INCHES)	MODEL	DESCRIPTION	DATA SHEET
1.85mm/2.4mm	0.001mm/ 0.00004 in.	A048A	Two “thread-on” metrology grade digital gages measure female and male contact pin locations.	2Y-048
2.92mm (K) or 3.5mm	0.001mm/ 0.00004 in.	A050A	Two “thread-on” metrology grade digital gages measure female and male contact pin locations.	2Y-049
Type N	0.0001mm/ 0.00004 in.	A020K	Two “thread-on” metrology grade digital gages measure type N female and male connectors, sliding loads, airlines, two-port standards, VNA test port adapters, etc.	2Y-032

[1] OSP™ (the Omni-Spectra designation) is a trademark of M/A-Com.

[2] GPO™ is a trademark of the Gilbert Engineering Co., Inc.

A007A Type N Push-On Connector Gage Kit

A020D Type N Thread-On Connector Gage Kit

Available Models - Dial Indicator Style

CONNECTOR TYPE	DIAL RESOLUTION (INCHES)	MODEL	DESCRIPTION	DATA SHEET
2.92mm (K) or 3.5mm	0.00025	A034B	Two “push-on” gages measure female and male contact pin interface locations.	2Y-020
2.92mm (K) or 3.5mm	0.0001	A034E	Two metrology grade “thread-on” gages measure female and male contact pin interface locations.	2Y-020A
2.4mm/1.85mm	0.0001	A035E	Two metrology grade “thread-on” gages measure female and male contact pin interface locations.	2Y-022A
7mm	0.0001	A028	One “push-on” gage measures planar contact location.	2Y-005
7mm	0.0001	A028D	One “thread-on” metrology grade gage measures planar contact location.	2Y-005A
N	0.001	A007A	One “push-on” gage measures female and male contact pin location.	2Y-002
N	0.00025	A020A	One “push-on” gage measures female and male contact pin location.	2Y-003
N	0.0001	A020D	Two metrology grade “thread-on” gages measure female and male contact pin interface locations.	2Y-003A
N (75 ohms)	0.0001	A020G	One “push-on” gage measures female and male contact pin location of 75 ohm type N connectors.	2Y-003G
N, BNC, TNC, C or SC	0.00025	A025A	One “push-on” gage measures female and male contact pin location.	2Y-016
BNC or TNC	0.0005	A012A	One “push-on” gage measures female and male contact pin and dielectric interface locations.	2Y-009
AFTNC, TNC or TNCA	0.0001	A012E	Six “push-on” “universal” gages measure all contact pin and dielectric interface locations of all MIL-STD, IEC and commercial TNC connectors.	2Y-028
SMA	0.0005	A027	Two “push-on” gages measure female and male contact pin interface locations.	2Y-004
SMA	0.0005	A027A	Four “push-on” gages measure female and male contact pin and dielectric interface locations.	2Y-004
SMA	0.0005	A027G	Two “push-on” gages measure female contact pin and dielectric interface locations.	2Y-004
SMA	0.0005	A027M	Three “push-on” gages measure standard male contact pin and dielectric interface locations, and the stepless 0.085-inch male pin dimension.	2Y-004
OSP™ [1]	0.00025	A039C	One “push-on” gage measures female and male contact pin location.	2Y-026
14mm (GR900)	0.0001	A024	One “push-on” gage measures planar contact location of 14mm and 7mm connectors.	2Y-006
7-16	0.0001	A041A	One “push-on” gage measures female and male contact pin location.	2Y-027
SMP/GPO™ [2]	0.0005	A042A	Three “push-on” gages measures SMP connectors’ contact pin and dielectric interface locations.	2Y-031
Multiport	0.0001	A045A	Six “push-on” gages measures multiport connectors’ contact pin and dielectric locations.	2Y-029
ZMA/BZ	0.0001	A046A	Six “push-on” gages measures ZMA and BZ connectors’ contact pin and dielectric locations.	2Y-030

[1] OSP™ (the Omni-Spectra designation) is a trademark of M/A-Com.

[2] GPO™ is a trademark of the Gilbert Engineering Co., Inc.

Torque Wrenches

All Models

Description

Maury's torque wrenches are recommended for tightening coaxial connectors in order to obtain optimum repeatability and prolong connector life. They employ a "break" design so it is impossible to over-torque a coupled junction, and torque can be applied in either direction. Each Maury torque wrench is factory preset to the proper in. lbs for tightening its coaxial connector type, and the color coded handles make it easy to select the correct wrench from your toolbox at a glance.

Maury torque wrenches are included in many of our VNA calibration kits, and can be ordered separately by the model numbers listed in the chart below. If the wrench you need isn't shown in this chart, please contact our Sales Department or your local Maury representative for assistance.

Note: The models shown are delivered in a non-calibrated state unless calibration is requested at the time they are ordered. Maury highly recommends annual re-calibration of these torque wrenches to ensure their continued ability to properly tighten connections. Torque wrenches that are subject to heavy use should have their calibration checked more frequent.

Available Models

Model	For Use With Connector	Wrench Size (Inches)	Preset Torque (in.lbs.)	Handle Color[6]
2498T1	MPC14, LPC14[1]	1.0 HEX	12 ±0.8	BLUE
2698C2	7mm, LPC7, N[2], NMD3.5, NMD2.92, NMD2.4	0.75 HEX	12 ±0.8	BLUE
2698G1	TNC[3], MPC6	0.562 HEX	12 ±0.8	BLUE
2698H1	LPC/OSP™[4]	0.562 HEX	8±0.5	RED
2698J1	SC	0.812 HEX	12 ±0.8	BLUE
2698K1	7-16	1.062 HEX	20 ±1.2	GREEN
8799A1[5]	3.5mm, 2.92mm, 2.4mm, 1.85mm	0.312 HEX	8 ±0.5	RED
8799D1	SMA, OSM	0.312 HEX	5 ±0.3	BLACK
8799E1	OSSM, MPC8	0.250 HEX	5 ±0.3	BLACK

1 MPC14 and LPC14 connectors are precision 14mm connectors that are essentially the same a s GR900 connectors and are supplied with 1.0 hex nuts.

2 Precision N connectors supplied with 3/4 hex nuts.

3 Precision TNC connectors supplied with 9/16 hex nuts.

4 Precision LPC/OSP™ per Maury data sheet 5E-065. OSP is a M/A Com Omni-Spectra designation.

5 WARNING: Do Not Use on SMA connectors. Damage can result.

6 Unless otherwise marked on nameplate, handle color represents torque value: blue = 12 in. lbs., red = 8 in. lbs., black = 5 in. lbs., gold = 20 in. lbs.

Coaxial-to-Coaxial Adapter Finder

The chart below shows the page(s) in this catalog which describe Maury's Coaxial-to-Coaxial Adapters

Coaxial-to-Coaxial Connectors Side A \ Side B	• NMD1.85mm	• 1.85mm	• NMD2.4mm	• 2.4mm	• NMD2.92mm (K)	• 2.92mm (K)	• NMD3.5mm	• 3.5mm	• QT3.5mm™	• 3.5mm Panel Mount	• SMA	• 7mm	• Type N (50 ohm)	• Type N (75 ohm)	• LCP/OSP™	• TNC	• TNCA	• AFTNC	• BNC (50 ohm)	• HN, SC	• 14mm (GR 900)	• 7-16	• EIA 7/8
• NMD1.85mm	119	119	119		119	119		119				119	119										
• 1.85mm	119	120		120		120		120															
• NMD2.4mm	119		122	122	122	122		122	130			122	122										
• 2.4mm		120	122	123		123		123				123	123										
• NMD2.92mm (K)	119		122		125	125																	
• 2.92mm (K)	119	120	122	123	125	126						127	127										
• NMD3.5mm							128	128	130	132		128	128	137		128		128					
• 3.5mm	119	120	122	123			128	129				131	131	137	138	131	131	131	131			141	
• QT3.5mm™			130				130					130	130										
• 3.5mm Panel Mount							132					132	132										
• SMA												133	136										
• 7mm	119		122	123		127	128	131	130	132	133	133	133	137	138	133	133		133	133	133	141	133
• Type N (50 ohm)	119		122	123		127	128	131	130	132	136	133	135	137	138	136		136	136	136		141	
• Type N (75 ohm)							137	137				137	137	137									
• LCP/OSP™								138				138	138										
• TNC							128	131				133	136			139							
• TNCA								131				133					139						
• AFTNC							128	131				133						139					
• BNC (50 ohm)								131				133	136										
• HN, SC												133	136										
• 14mm (GR 900)								140				133	140									140	140
• 7-16								141				141	141								140	141	
• EIA 7/8												133									140		

Also in this Section

- Waveguide-to-Coaxial Adapters are listed on pages 142-143 (Right Angle Launch models) and pages 144-145 (End Launch models).
- Space Qualified Waveguide-to-Coaxial Adapters (see page 146).
- Waveguide Flange Adapters (see page 148).
- Waveguide Transmission Lines & Test Port Adapters (see page 147).
- Waveguide Flange Information, Specifications and Hole Patterns (see pages 150-152).
- Test Port Cable Assemblies and Test Port Adapters (see page 154).
- Recommended Test Port Adapters (see page 155).
- Stability™ Microwave/RF Cable Assemblies (see page 158-159).
- Stub Tuners (see page 160).
- Noise Calibration Systems and Components (see pages 161-174).

Precision Adapters, Cables, Connectors, Waveguide Components and Noise Calibration Systems

General Information

Coaxial Adapters

Maury Microwave produces three lines of in-series and between-series coax-to-coax adapters including industry-standard ***Calibration-Grade (Metrology) Adapters***, available in all precision laboratory measurement connector types (1.85mm, 2.4mm, 2.92mm (K), 3.5mm, 7mm, 14mm, etc.) and all common systems connectors (type N, TNC, etc.); with two new ***Test Essentials™*** lines of ***Laboratory Adapters*** and ***ColorConnect™ Adapters***. Maury also manufactures coaxial adapters in other less common connector series not shown in this catalog. For specific configurations not covered in these pages, please contact our Sales Department for assistance.

Waveguide-to-Waveguide Adapters

Maury produces waveguide-to-waveguide adapters, transitions, and straight transmission line sections in all popular EIA waveguide sizes. Units from R through P bands are normally aluminum construction with irridite finish; K band and above are copper alloy with a plated finish. All units are painted with highly durable paint.

Maury also produces waveguide devices in millimeter sizes from 26.5 through 110 GHz (WR28 to WR10), large waveguides (WR430), and in many less common configurations such as: flat guide, reduced height, round, etc. Maury can provide waveguide to waveguide adapters with any flange type, material or finish you require. Consult us on your specific requirement.

Waveguide-to-Coaxial Adapters

Maury's comprehensive line of precision end launch and right-angle launch waveguide-to-coaxial adapters provide a convenient and reliable transition between most popular EIA waveguide sizes and a wide range of precision coaxial connector types. In most cases the waveguide flanges used are Maury Precision Flanges (MPF) that incorporate a pattern of precision index holes and matching pins to ensure proper mating alignment and connection repeatability. Space qualified adapters with specialized coatings or for Aerospace applications are also available.

Test Port Adapters

Maury Test port adapters are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets, such as those used on Agilent PNA series VNAs and Anritsu 37000 series VNAs. Maury's test port adapters can convert those connectors to other coaxial connector or waveguide types. Using Maury test port adapters as connector savers can yield significant cost savings in terms of reduced VNA down time and lower repair costs.

Precision Connectors

All of the connectors used on Maury adapters are mating compatible with connectors conforming to the applicable MIL-C or MIL-T and industry-standard specifications. However, most Maury connectors are manufactured to even more exacting requirements.

Maury also offers a limited selection of precision connectors with integral or removable panel mount flanges, a series of micro-strip connectors designed for mounting on miniature micro-strip packages, and tool kits for use in performing precision assembly or disassembly of Maury precision connectors.

Stability™ and Utility™ Microwave/RF Cable Assemblies

Maury Microwave's Stability™ series sets the standard for high-performance ruggedized microwave/RF cable assemblies. For phase-stable and amplitude-stable applications, these cables offer excellent measurement repeatability even after cable flexure. With a ruggedized, durable construction, Stability™ will outlast and outperform other assemblies resulting in a reduced total cost-of-test. Stability's™ light weight, superior flexibility and small form factor make it ideal for daily use with VNA's, test instruments, bench-top testing and ATE systems. Stability™, the phase stable cable of choice.

Maury Microwave's Utility™ series sets the standard for high-end all-purpose test and measurement cable assemblies. Designed for general testing applications, Utility™ offers excellent value with its low cost, low insertion loss, excellent return loss, flexibility, and amplitude and phase stability. Utility™ is the ideal interconnection for reliable and repeatable measurements when mated with test instruments including bench-top testing, on-wafer characterization and ATE systems.

Both Maury's Stability™ and Utility™ cable assemblies are now part of the ColorConnect™ family! Complete product details available in Maury data sheet 2Z-004 and 2Z-005.

Noise Calibration Systems

Maury Noise Calibration Systems (NCS) are self-contained, highly accurate sources of RF and microwave noise power that are used wherever noise source accuracy is critical. Examples are: receiver noise measurements, such as noise figure and effective input noise temperature; calibration of solid state noise sources; evaluation and verification of earth station receivers; and as radiometer reference sources.

Cryogenic Terminations (Cold Loads)

Maury cryogenic terminations are liquid nitrogen cooled loads which provide accurately known noise power at a well matched output port. Used with ambient and/or thermal terminations and a noise figure meter, these terminations provide cold reference temperatures needed for highly accurate noise figure or effective input noise temperature measurements. Because of the accuracy of their noise output, cryogenic terminations are often used as a noise standard for calibration of solid state noise generators.

Thermal Terminations (Hot Loads)

Maury thermal terminations are low-mismatch, heated loads in a precisely controlled thermal environment, which provide and accurately known noise power. Used with ambient and/or cryogenic terminations and a noise figure meter, these terminations provide the hot termination temperature needed for highly accurate noise figure or effective input noise temperature measurements. Because of the accuracy of the noise output, thermal terminations are often used as a noise standard for calibration of solid state noise generators.

Coaxial and Waveguide Ambient Terminations

Maury ambient terminations are room temperature noise sources consisting of stable terminations in massive copper housings that provide thermal stability and reduce the effects of thermal transients.

Noise Components & Accessories

Maury offers a wide range of calibrated adapters and adapter sets that are used with the MT7118J cryogenic termination and the MT7108B thermal termination to adapt the precision 7mm output port to other coaxial series or to waveguide at specific frequencies. They are calibrated for VSWR and insertion loss to allow their input noise temperature to be calculated.

Calibration-Grade (Metrology) Adapters

General Information

Connecting With Confidence

Test and measurement data is only as good as the system used to generate it. Good test and measurement systems rely on high-performance precision adapters to ensure proper connection between system components – connections that ensure the accuracy, repeatability, and reliability of component performance. Over the last four-and-a-half decades, Maury has earned a reputation as a leading producer of high quality, precision adapters. Today, Maury offers adapters with a wider variety of connector types and combinations than any other manufacturer.

Maury adapters feature low reflection at the interface and dielectric support, negligible electromagnetic interference, excellent connection repeatability,rugged durability, and are guaranteed to perform reliably within their specifications even after multiple connection/disconnection cycles.

When you consider the relative ease of incorporation into system designs and applications, and the value versus life-cycle cost inherent in every Maury adapter, it is easy to understand their popularity. Engineers, designers and technicians alike know that with Maury adapters they can have the highest confidence in their component connections.

The following paragraphs describe the major categories of Maury's precision adapter line.

In-Series and Between-Series Adapters

Maury Microwave's comprehensive line of in-series and between-series coaxial adapters are available for all precision laboratory measurement connectors – 1.85mm, 2.4mm, 2.92mm (K), 3.5mm, 7mm, 14mm, 7-16, etc.; all common systems connectors – type N, TNC, etc.; and several special purpose connector series such as EIA 7/8 rigid line connectors. Most of these are available as components of Maury's VNA calibration kits or as kit options, and are also sold separately, as auxiliary components, spares, or replacement parts.

Maury also manufactures adapters in other less common connector series not shown in this catalog. If you have a specific need and don't find a solution in these pages, please contact our Sales Department for assistance.

Phase Matched Adapters

Phase matched adapters are used in two-port VNA calibrations when the devices have same sex input and output connectors that must be tested. Through connection for calibration is made using adapters with female and male connectors. One adapter is then replaced to permit mating to the test device. With phase matched adapters, this can be done without significantly degrading the VNA error correction capability. Phase matched in-series and between-series adapters are noted as such in the following pages.

Ruggedized Test Port Adapters

Maury Test port adapters are specifically designed to mate with the special ruggedized connectors used on commercial VNA test sets, such as those used on Agilent PNA series VNAs and Anritsu 37000 series VNAs. Maury's test port adapters can convert those connectors to other coaxial or waveguide connector types. Using Maury test port adapters as connector savers can yield significant cost savings in terms of less VNA down time and repair costs.

NMD1.85mm Test Port Adapters

7809 Series

Features

- *Low VSWR*
- *DC to 67 GHz (Usable to 70 GHz)*
- *Protects VNA Test Ports*
- *Ruggedized for Long Life*

Description

Maury's 7809 series NMD1.85mm adapters are precision, low VSWR adapters designed to connect directly to the male 1.85mm NMD-style test ports on certain Agilent test sets and VNA models (including those in the PNA series). They are fully compatible with the VNA test ports, and adapt to precision 1.85mm, 2.4mm, 2.92mm, 3.5mm, 7mm, and type N connectors. Maury test port adapters provide the best possible connection between the VNA and other precision cables and devices. Their rugged construction provides for long life and highly stable, highly repeatable connections. The 7809A1/A2 and 7809K models also act as test port savers, by absorbing the wear and tear that would otherwise affect the test port; preventing costly repairs and eliminating downtime.

Connector Description

The NMD1.85mm female connectors on Maury 7809 series adapters are miniature, instrument grade, air-interface connectors. Rated for operate up to 67 GHz, they are usable up to 70 GHz. They comply with IEEE standard 287 general precision connector, instrument grade GPC1.85. For interface specifications please refer to Maury data sheet 5E-089.

Available Models

MODEL	CONNECTORS SIDE A	CONNECTORS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
7809A1	NMD1.85mm female [1]	1.85mm female [3]	DC — 26.5 ≤ 1.10 26.5 — 40.0 ≤ 1.15 40.0 — 67.0 ≤ 1.20	50 ohm	0.993	(2.52)
7809A2	NMD1.85mm female [1]	1.85mm male [3]		50 ohm	0.993	(2.52)
7809K	NMD1.85mm female [1]	NMD1.85mm male [1]		50 ohm	1.133	(2.88)
7809G	NMD1.85mm female [1]	NMD2.4mm male [2]	DC — 26.5 ≤ 1.10 26.5 — 40.0 ≤ 1.15 40.0 — 50.0 ≤ 1.20	50 ohm	1.142	(2.90)
7809H	NMD2.4mm female [2]	NMD1.85mm male [1]		50 ohm	1.317	(3.35)
7809F1	NMD1.85mm female [1]	2.92mm female [5]	DC — 20.0 ≤ 1.10 20.0 — 40.0 ≤ 1.16	50 ohm	1.072	(2.72)
7809F2	NMD1.85mm female [1]	2.92mm male [5]		50 ohm	1.072	(2.72)
7809B1	NMD1.85mm female [1]	3.5mm female [6]	DC — 10.0 ≤ 1.06 10.0 — 20.0 ≤ 1.10 20.0 — 34.0 ≤ 1.12	50 ohm	1.085	(2.76)
7809B2	NMD1.85mm female [1]	3.5mm male [6]		50 ohm	1.085	(2.76)
7809C	NMD1.85mm female [1]	7mm [7]	DC — 4.0 ≤ 1.05 4.0 — 12.0 ≤ 1.07 12.0 — 18.0 ≤ 1.10	50 ohm	1.206	(0.47)
7809D1	NMD1.85mm female [1]	Type N female [8]	DC — 4.0 ≤ 1.08 4.0 — 12.0 ≤ 1.12 12.0 — 18.0 ≤ 1.14	50 ohm	1.145	(2.91)
7809D2	NMD1.85mm female [1]	Type N male [8]		50 ohm	1.504	(3.82)

[1] NMD1.85mm per Maury data sheet 5E-085.
[2] NMD2.4mm per Maury data sheet 5E-083.
[3] Precision 1.85mm per Maury data sheet 5E-089.
[4] Precision 2.4mm per Maury data sheet 5E-064.
[5] Precision 2.92mm (K) per Maury data sheet 5E-063.
[6] Precision 3.5mm per Maury data sheet 5E-062.
[7] Precision 7mm per Maury data sheet 5E-060.
[8] Precision type N per Maury data sheet 5E-049.

Key Literature: Maury data sheet 2B-074.

1.85mm Between-Series Adapters

Models 7824A/B/C/D, 7826A/B/C/D and 7827A/B/C/D

Description

The precision adapters in these model series are designed to allow devices with 1.85mm connectors to mate with devices and cables bearing 2.4mm, 2.92mm, or 3.5mm connectors. When properly mated, they provide a low VSWR connection with low insertion loss and high repeatability. Made of highly durable materials, these adapters are ideal for use in laboratory and production environments where frequent connect/ disconnect cycles occur.

These adapters are **phase matched within each model series**, so that they may be easily interchanged for VNA measurement of non-insertable devices. Outline dimensions are shown on page 121.

2.4mm

7824A 7824B 7824C 7824D

2.92mm

7826A 7826B 7826C 7826D

3.5mm

7827A 7827B 7827C 7827D

1.85mm Connector Description

The precision 1.85mm connectors on these adapters are miniature, instrument grade, air-interface connectors that are rated for operation from DC to 67 GHz, but may be used up to 70 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC1.85).

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
7824A	1.85mm female [1]	2.4mm female [2]	DC — 26.5 ≤ 1.06	50 ohm	0.75	(1.905)
7824B	1.85mm female [1]	2.4mm male [2]	26.5 — 40.0 ≤ 1.10	50 ohm	0.75	(1.905)
7824C	1.85mm male [1]	2.4mm female [2]	40.0 — 67.0 ≤ 1.15	50 ohm	0.75	(1.905)
7824D	1.85mm male [1]	2.4mm male [2]		50 ohm	0.75	(1.905)
7826A	1.85mm female [1]	2.92mm female [3]	DC — 4.0 ≤ 1.05	50 ohm	0.657	(1.669)
7826B	1.85mm female [1]	2.92mm male [3]	4.0 — 20.0 ≤ 1.08	50 ohm	0.657	(1.669)
7826C	1.85mm male [1]	2.92mm female [3]	20.0 — 40.0 ≤ 1.12	50 ohm	0.657	(1.669)
7826D	1.85mm male [1]	2.92mm male [3]		50 ohm	0.657	(1.669)
7827A	1.85mm female [1]	3.5mm female [4]	DC — 4.0 ≤ 1.05	50 ohm	0.657	(1.669))
7827B	1.85mm female [1]	3.5mm male [4]	4.0 — 26.5 ≤ 1.08	50 ohm	0.657	(1.669)
7827C	1.85mm male [1]	3.5mm female [4]	26.5 — 34.0 ≤ 1.12	50 ohm	0.657	(1.669)
7827D	1.85mm male [1]	3.5mm male [4]		50 ohm	0.657	(1.669)

1.85mm In-Series Adapters

Models 7821A/B/C

7821A 7821B 7821C

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
7821A	1.85mm female [1]	1.85mm female [1]	DC — 26.5 ≤ 1.06	50 ohm	0.75	(1.905)
7821B	1.85mm male [1]	1.85mm male [1]	26.5 — 40.0 ≤ 1.10	50 ohm	0.75	(1.905)
7821C	1.85mm female [1]	1.85mm male [1]	40.0 — 67.0 ≤ 1.15	50 ohm	0.75	(1.905)

[1] Precision 1.85mm per Maury data sheet 5E-089.
[2] Precision 2.4mm per Maury data sheet 5E-064.
[3] Precision 2.92mm per Maury data sheet 5E-063.
[4] Precision 3.5mm per Maury data sheet 5E-062.

Key Literature: Maury data sheet 2B-070, 2B-071, 2B-072, 2B-073.

1.85mm Adapter Dimensions (Inches)

Models 7824A/B/C/D, 7826A/B/C/D and 7827A/B/C/D

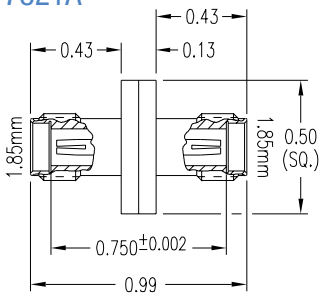
7821A/B/C series

7824A/B/C/D series

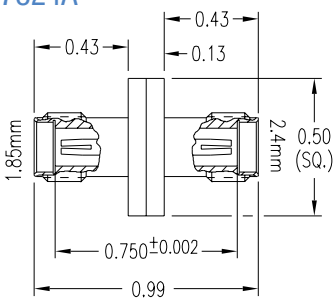
7826A/B/C/D series

7827A/B/C/D series

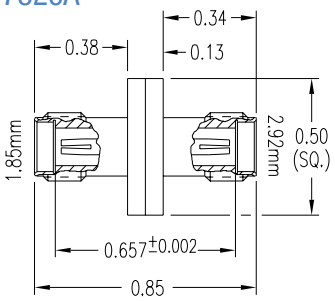
7821A



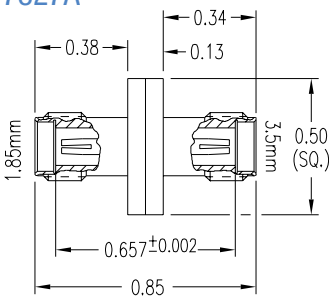
7824A



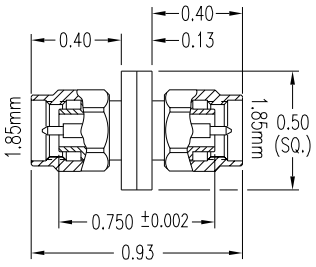
7826A



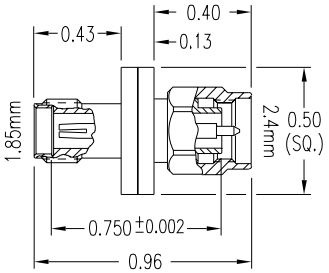
7827A



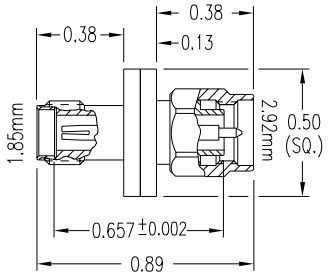
7821B



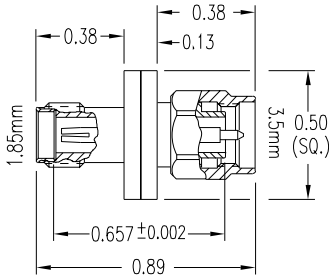
7824B



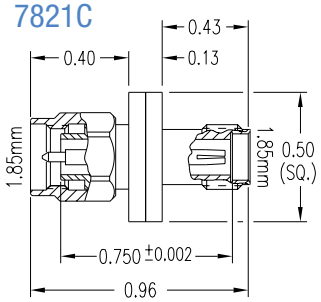
7826B



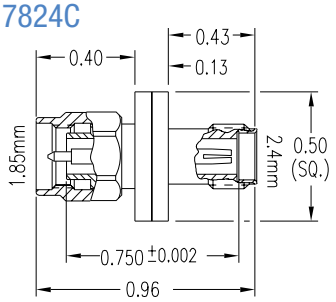
7827B



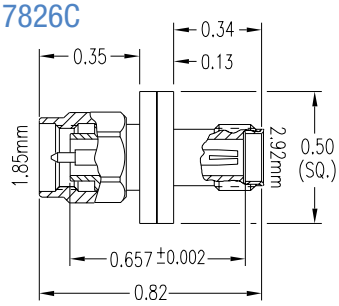
7821C



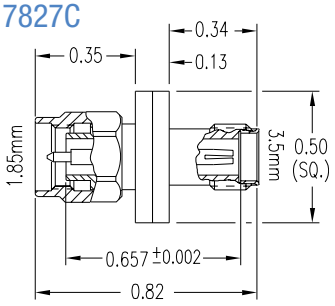
7824C



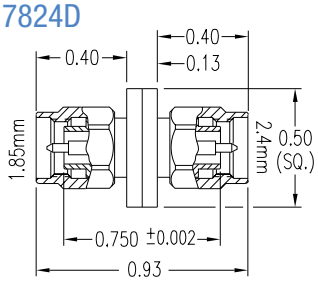
7826C



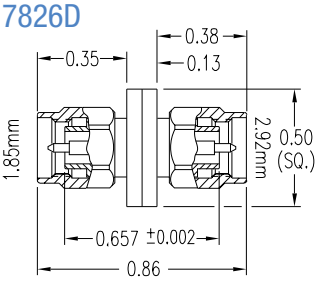
7827C



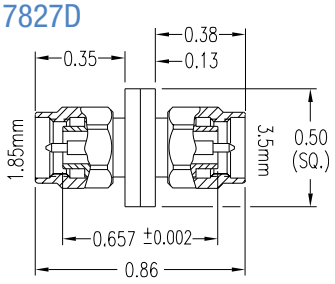
7824D



7826D



7827D



NMD2.4mm Test Port Adapters

7809H and 7909 Series

Features

- *Low VSWR*
- *DC to 50 GHz*
- *Protects VNA Test Ports*
- *Ruggedized for Long Life*

Description

Maury's 7909 series NMD2.4mm adapters are precision, low VSWR adapters designed to connect directly to the NMD-style 2.4mm male test ports on certain Agilent test sets and VNA models (including those in the PNA series). They are fully compatible with the VNA test ports, and adapt to precision 2.4mm 2.92mm, 3.5mm, 7mm or type N connectors. Maury test port adapters provide the best possible connection between the VNA and other precision cables and devices. Their rugged construction provides for long life and highly stable, highly repeatable connections. The 7909A1/A2 and 7909K models also act as test port savers, by absorbing the wear and tear that would otherwise affect the test port; preventing costly repairs and eliminating downtime.

Connector Description

The NMD2.4mm female connectors on Maury 7909 series adapters are miniature, instrument grade, air-interface connectors., rated for operate up to 50 GHz. They comply with IEEE standard 287 general precision connector, instrument grade GPC2.4.) For interface specifications please refer to Maury data sheet 5E-082. The NMD male connectors are mateable to NMD female connectors via external threads, and can also mate to non-NMD connectors via internal threads.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
7809H	NMD2.4mm female [1]	NMD1.85mm male [2]	DC — 26.5 ≤ 1.10 26.5 — 40.0 ≤ 1.15 40.0 — 50.0 ≤ 1.20	50 ohm	1.317	(3.35)
7909A1	NMD2.4mm female [1]	2.4mm female [3]		50 ohm	1.24	(3.15)
7909A2	NMD2.4mm female [1]	2.4mm male [3]		50 ohm	1.27	(3.23)
7909K	NMD2.4mm female [1]	NMD2.4mm male [1]		50 ohm	1.317	(3.35)
7909F1	NMD2.4mm female [1]	2.92mm female [5]	DC — 20.0 ≤ 1.10 20.0 — 40.0 ≤ 1.16	50 ohm	1.291	(3.279)
7909F2	NMD2.4mm female [1]	2.92mm male [5]		50 ohm	1.291	(3.279)
7909J	NMD2.4mm female [1]	NMD2.92mm male [4]		50 ohm	1.247	(3.17)
7909B1	NMD2.4mm female [1]	3.5mm female [6]	DC — 10.0 ≤ 1.06 10.0 — 20.0 ≤ 1.10 20.0 — 34.0 ≤ 1.14	50 ohm	1.06	(2.70)
7909B2	NMD2.4mm female [1]	3.5mm male [6]		50 ohm	1.02	(2.60)
7909H	NMD2.4mm female [1]	NMD3.5mm male [4]		50 ohm	1.317	(3.35)
7909C	NMD2.4mm female [1]	7mm [7]	DC — 4.0 ≤ 1.05 4.0 — 12.0 ≤ 1.07 12.0 — 18.0 ≤ 1.10	50 ohm	2.04	(5.18)
7909D1	NMD2.4mm female [1]	Type N female [8]	DC — 4.0 ≤ 1.08 4.0 — 12.0 ≤ 1.12 12.0 — 18.0 ≤ 1.14	50 ohm	1.28	(3.25)
7909D2	NMD2.4mm female [1]	Type N male [8]		50 ohm	1.64	(4.17)

[1] NMD2.4mm per Maury data sheet 5E-082.
[2] NMD1.85mm per Maury data sheet 5E-085.
[3] Precision 2.4mm per Maury data sheet 5E-064.
[4] NMD3.5mm per Maury data sheet 5E-083.
[5] Precision 2.92mm (K) per Maury data sheet 5E-063.
[6] Precision 3.5mm per Maury data sheet 5E-062.
[7] Precision 7mm per Maury data sheet 5E-060.
[8] Precision type N per Maury data sheet 5E-049.

Key Literature: Maury data sheet 2B-049, 2B-049A, 2B-050, 2B-051, 2B-052, 2B-053.

2.4mm In-Series Adapters

Models 7921A/B/C/D/E

Description

Maury precision 2.4mm in-series adapters are low VSWR and low loss devices that operate from DC to 50 GHz. The models 7921A, B and C offer combinations for in-series adapting and are phase matched, making them ideal for use in precision measurement applications. These adapters are minimum length and feature a square-flanged body for ease of connecting that also prevents them from rolling off flat surfaces. They are useful as "test port savers" when used with automated network analyzers such as the Agilent 8510, etc. The models 7921D and E are bulk-head and panel mount feedthru adapters respectively, and are designed for instrumentation applications.

Specifications

Frequency Range . . . . . DC – 50 GHz

Maximum VSWR . . . . . DC – 26.5 GHz, 1.06

26.5 – 40.0 GHz, 1.10

40.0 – 50.0 GHz, 1.15

Impedance . . . . . 50 ohm

Connectors . . . . . 2.4mm per Maury data sheet 5E-064

Available Models

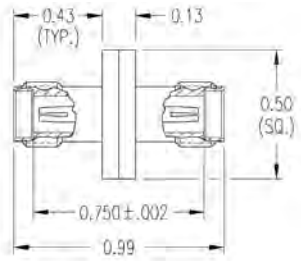
MODEL	ADAPTS SIDE A	ADAPTS SIDE B	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
7921A	2.4mm female [1]	2.4mm female [1]	0.75	(1.905)
7921B	2.4mm male [1]	2.4mm male [1]	0.75	(1.905)
7921C	2.4mm female [1]	2.4mm male [1]	0.75	(1.905)
7921D	2.4mm female [1]	2.4mm female [1]	0.86	(2.18)
7921E	2.4mm female [1]	2.4mm female [1]	0.86	(2.18)

[1] Precision 2.4mm per Maury data sheet 5E-064.

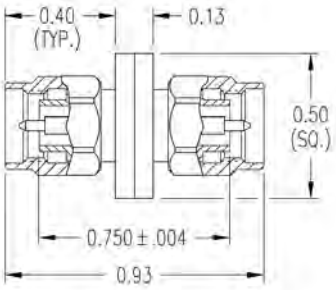
Key Literature: Maury data sheet 2B-001.

Dimensions – Inches

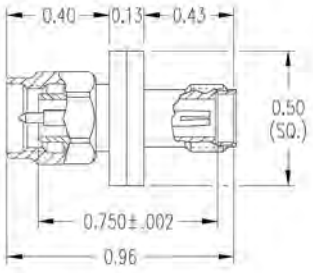
7921A



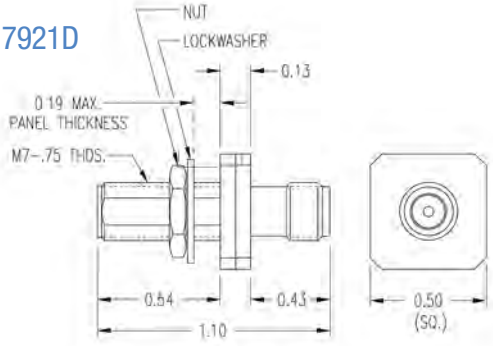
7921B

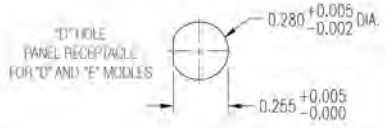


7921C

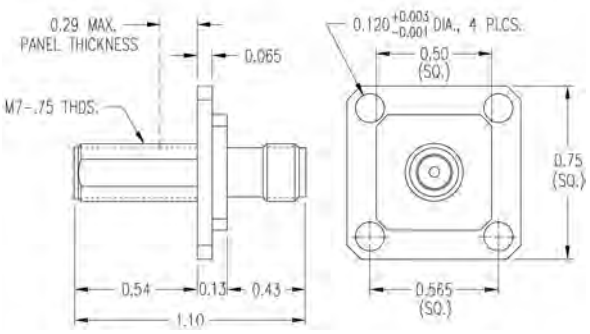


7921D





7921E



2.4mm Between-Series Adapters

Models 7926A/B/C/D, 7927A/B/C/D, 7922A/B and 7923A/B/C/D

Description

The precision adapters in these model series are designed to allow devices with 2.4mm connectors to mate with devices and cables bearing 2.92mm, 3.5mm, 7mm or Type N connectors. When properly mated, they provide a low VSWR connection with low insertion loss and high repeatability. Made of highly durable materials, these adapters are ideal for use in laboratory and production environments where frequent connect/ disconnect cycles occur.

Except for the 7923 series, these adapters are phase matched within each model series, so that they may be easily interchanged for VNA measurement of non-insertable devices.

2.92mm 7926A 7926B 7926C 7926D

3.5mm 7927A 7927B 7927C 7927D

2.4mm Connector Description

The precision 2.4mm connectors on these adapters are miniature, instrument grade, air-interface connectors that are rated for operation from DC to 50 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC2.4).

7mm 7922A 7922B

Type N 7923A 7923B 7923C 7923D

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
7926A	2.4mm female [1]	2.92mm female [2]	DC — 4.0 ≤ 1.05	50 ohm	0.65	(1.65)
7926B	2.4mm female [1]	2.92mm male [2]	4.0 — 20.0 ≤ 1.08	50 ohm	0.65	(1.65)
7926C	2.4mm male [1]	2.92mm female [2]	20.0 — 40.0 ≤ 1.12	50 ohm	0.65	(1.65)
7926D	2.4mm male [1]	2.92mm male [2]		50 ohm	0.65	(1.65)
7927A	2.4mm female [1]	3.5mm female [3]		50 ohm	0.657	(1.669)
7927B	2.4mm female [1]	3.5mm male [3]	DC — 18.0 ≤ 1.06	50 ohm	0.657	(1.669)
7927C	2.4mm male [1]	3.5mm female [3]	18.0 — 26.5 ≤ 1.08	50 ohm	0.657	(1.669)
7927D	2.4mm male [1]	3.5mm male [3]	26.5 – 34.0 ≤ 1.12	50 ohm	0.657	(1.669)
7922A	2.4mm female [1]	7mm [4]	DC — 4.0 ≤ 1.03	50 ohm	1.28	(3.25)
7922B	2.4mm male [1]	7mm [4]	4.0 — 12.0 ≤ 1.07 12.0 — 18.0 ≤ 1.08	50 ohm	1.28	(3.25)
7923A	2.4mm female [1]	Type N female [5]		50 ohm	1.22	(3.10)
7923B	2.4mm female [1]	Type N male [5]	DC — 4.0 ≤ 1.07	50 ohm	1.58	(4.02)
7923C	2.4mm male [1]	Type N female [5]	4.0 — 18.0 ≤ 1.12	50 ohm	1.20	(3.05)
7923D	2.4mm male [1]	Type N male [5]		50 ohm	1.56	(3.96)

[1] Precision 2.4mm per Maury data sheet 5E-064.
[2] Precision 2.92mm per Maury data sheet 5E-063.
[3] Precision 3.5mm per Maury data sheet 5E-062.
[4] Precision 7mm per Maury data sheet 5E-060.
[5] Precision type N per Maury data sheet 5E-049.

Key Literature: Maury data sheet 2B-008.

NMD2.92mm Test Port Adapters

8719 Series

Features

- *Low VSWR*
- *DC to 40 GHz*
- *Protects VNA Test Ports*
- *Ruggedized for Long Life*

8719A

8719B

8719E

8719F

Description

Maury's 8719 series NMD2.92mm adapters are precision, low VSWR adapters designed to connect directly to the NMD-style 2.92mm male test ports on certain Agilent test sets and VNA models (including those in the PNA series). They are fully compatible with the VNA test ports, and adapt to precision 2.4mm or 2.92mm (K) connectors. Maury test port adapters provide the best possible connection between the VNA and other precision cables and devices. Their rugged construction provides for long life and highly stable, highly repeatable connections. The 8719A/B and 8719F models also act as test port savers, by absorbing the wear and tear that would otherwise affect the test port; preventing costly repairs and eliminating downtime.

Connector Description – NMD2.92mm

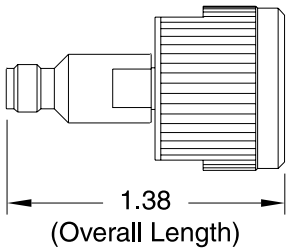
The NMD2.92mm connectors on Maury 8719 series adapters are ruggedized test-port connectors used for stable connection to a network analyzer. The female connector is only mateable to NMD male connectors via external threads on the male nut. The NMD male connectors are mateable to NMD female connectors via external threads, and can also mate to non-NMD connectors (2.92mm, SMA, or 3.5mm) via internal threads.

Connector Description – 2.92mm (K)

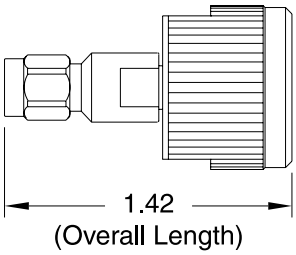
The K connectors on 8719A/B adapters are precision miniature 2.92mm air-interface connectors that are rated for operation from DC to 40 GHz. They have a mechanically compatible interface that mates with SMA and 3.5mm connectors. The K connector was originally introduced by Maury in 1974 as the MPC3 connector and re-introduced by Wiltron in 1984 as the K connector. They comply with IEEE standard 287 general precision connector, instrument grade (GPC2.92).

Dimensions – Inches (cm)

8719A



8719B



Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8719A	NMD2.92mm female [1]	2.92mm (K) female [2]	DC — 4.0 ≤ 1.05	50 ohm	1.23	(3.12)
8719B	NMD2.92mm female [1]	2.92mm (K) male [2]	4.0 — 20.0 ≤ 1.08	50 ohm	1.23	(3.12)
8719F	NMD2.92mm female [1]	NMD2.92mm male [1]	20.0 — 40.0 ≤ 1.12	50 ohm	1.28	(3.25)
8719E	NMD2.92mm female [1]	NMD2.4mm male [3]	DC — 20.0 ≤ 1.08 20.0 — 40.0 ≤ 1.12	50 ohm	1.44	(3.66)

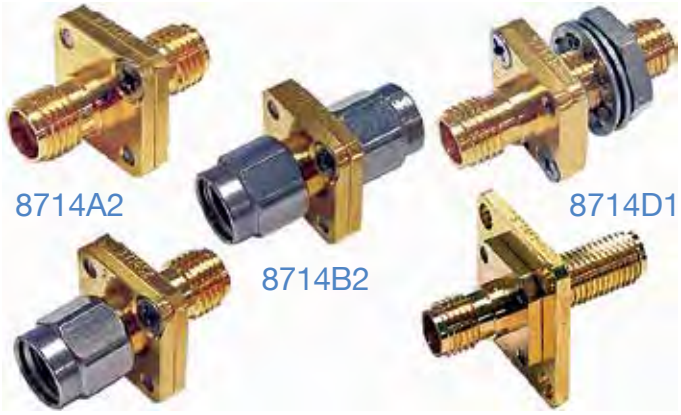
Note: See 7809F on page 98 for NMD1.85mm female to 2.92mm (K) test port adapters or 7909F on page 102 for NMD2.4mm to 2.92mm (K) test port adapters.

[1] NMD2.92mm per Maury data sheet 5E-083. [2] Precision 2.92mm (K) per Maury data sheet 5E-063. [3] NMD2.4mm per Maury data sheet 5E-082.

Key Literature: Maury data sheet 2B-004.

2.92mm (K) In-Series Adapters

Models 8714A2/B2/C2/D1/E1



Description

Maury precision 2.92mm (K) in-series adapters are low VSWR and low loss devices that operate from DC to 40 GHz. The models 8714A2, B2 and C2 offer all combinations for adapting and are ideal for using with precision measurement applications. These adapters are minimum length, phase matched and feature a square-flange body for ease of connecting and prevents rolling off tables. They are useful as "test port savers" when used with vector network analyzers such as the Agilent 8510, etc. The 8714D1 and 8714E1 are bulkhead and panel mount feedthru adapters respectively, designed for instrumentation applications.

Specifications

Frequency Range . . . . . DC – 40 GHz

Maximum VSWR . . . . . DC - 4.0 GHz, 1.05

4.0 - 20.0 GHz, 1.08

20.0 - 40.0 GHz, 1.12

Impedance . . . . . 50 ohm

Connectors . . . . . 2.92mm (K) per Maury data sheet 5E-063

Available Models

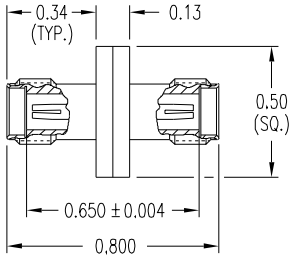
MODEL	ADAPTS SIDE A	ADAPTS SIDE B	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8714A2	2.92mm female[1]	2.92mm female[1]	0.65	(1.65)
8714B2	2.92mm male[1]	2.92mm male[1]	0.65	(1.65)
8714C2	2.92mm female[1]	2.92mm male[1]	0.65	(1.65)
8714D1	2.92mm female[1]	2.92mm female[1]	0.85	(2.15)
8714E1	2.92mm female[1]	2.92mm female[1]	0.85	(2.15)

[1] Precision 2.92mm per Maury data sheet 5E-063.

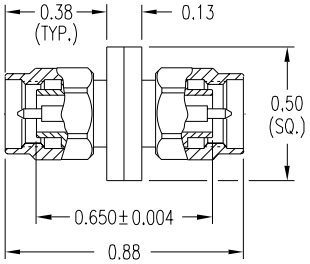
Key Literature: Maury data sheet 2B-003.

Dimensions – Inches (cm)

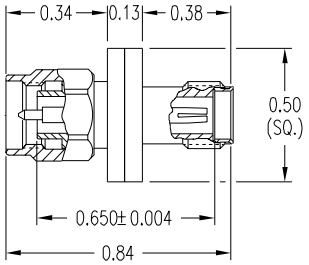
8714A2



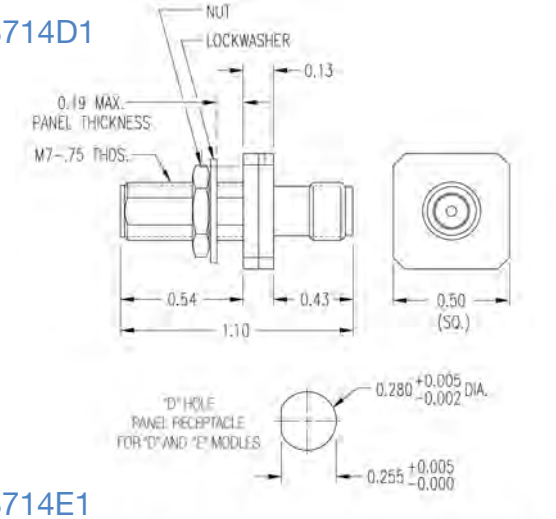
8714B2



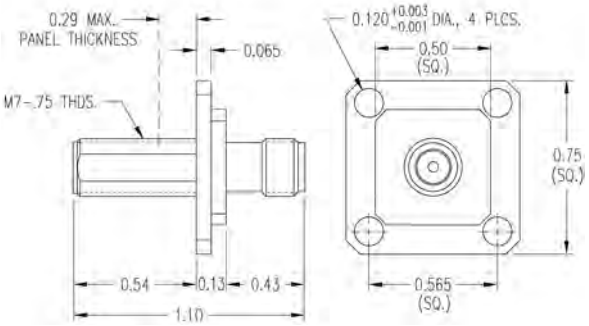
8714C2



8714D1



8714E1



2.92mm Between-Series Adapters

Models 8723A/B/C/D and 8725A/B

Description

The precision adapters in these model series are designed to allow devices with 2.92mm connectors to mate with devices and cables bearing 7mm or Type N connectors. When properly mated, they provide a low VSWR connection with low insertion loss and high repeatability. Made of highly durable materials, these adapters are ideal for use in laboratory and production environments where frequent connect/ disconnect cycles occur.

The 8725A and 8725B adapters are phase matched to each other so that they may be easily interchanged for network analyzer measurement of non-insertable devices.

Connector Description – 2.92mm (K)

The K connectors on 8719A/B adapters are precision miniature 2.92mm air-interface connectors that are rated for operation from DC to 40 GHz. They have a mechanically compatible interface that mates with SMA and 3.5mm connectors. The K connector was originally introduced by Maury in 1974 as the MPC3 connector and re-introduced by Wiltron in 1984 as the K connector. They comply with IEEE standard 287 general precision connector, instrument grade (GPC2.92).

Type N Connector Description

The precision type N connectors on these adapters are instrument grade, air-interface connectors that are rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N). The connectors are normally made with stainless steel bodies with heat treated gold-plated beryllium copper contacts.

7mm Connector Description

Maury precision 7mm connectors are miniature, instrument grade, air-interface connectors rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). They are normally made with gold-plated beryllim copper bodies and have a six-slot heat treated gold-plated beryllium copper center conductor contact for improved repeatability and durability. See Maury data sheet 5E-060 for interface dimensions.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8723A	2.92mm female [1]	Type N female [2]	DC — 4.0 ≤ 1.07 4.0 — 12.0 ≤ 1.10 12.0 – 18.0 ≤ 1.15	50 ohm	1.614	(4.099)
8723B	2.92mm female [1]	Type N male [2]		50 ohm	1.914	(5.014)
8723C	2.92mm male [1]	Type N female [2]		50 ohm	1.614	(4.099)
8723D	2.92mm male [1]	Type N male [2]		50 ohm	1.914	(5.014)
8725A	2.92mm female [1]	7mm [3]	DC — 4.0 ≤ 1.05 4.0 — 12.0 ≤ 1.07 12.0 — 18.0 ≤ 1.10	50 ohm	1.67	(4.24)
8725B	2.92mm male [1]	7mm [3]		50 ohm	1.67	(4.24)

[1] Precision 2.92mm per Maury data sheet 5E-063.

[2] Precision type N per Maury data sheet 5E-049.

[3] Precision 7mm per Maury data sheet 5E-060.

Key Literature: Maury data sheet 2B-042, 2B-043.

NMD3.5mm Test Port Adapters

2433A1, 2633C, 8009, 8619, 8679, 8691 and 8829 Series

Features

- *Low VSWR*
- *DC to 18, 20 or 26.5 GHz*
- *Protects VNA Test Ports*
- *Ruggedized for Long Life*

Description

Maury's NMD3.5mm adapters are precision, low VSWR adapters designed to connect directly to the NMD-style 3.5mm male test ports on certain Agilent test sets and VNA models (including those in the PNA series). They are fully compatible with the VNA test ports, and adapt to precision 3.5mm 7mm TYPE N, TNC, AFTNC, or 14mm connectors. Maury test port adapters provide the best possible connection between the VNA and other precision cables and devices. Their rugged construction provides for long life and highly stable, highly repeatable connections. The 8009A/B and 8009F models also act as test port savers, by absorbing the wear and tear that would otherwise affect the test port; preventing costly repairs and eliminating downtime.

Connector Description

The NMD3.5mm female connectors on Maury test port adapters are miniature, instrument grade, air-interface connectors., rated for operate up to 18, 20 or 26.5 GHz, according to the range of the adapted connector type. For interface specifications please refer to Maury data sheet 5E-084. The NMD male connectors on 8009F units are mateable to NMD female connectors via external threads, and can also mate to non-NMD connectors via internal threads.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8009A	NMD3.5mm female [1]	3.5mm female [2]	DC — 18.0 ≤ 1.08 18.0 — 26.5 ≤ 1.12	50 ohm	1.45	(3.68)
8009B	NMD3.5mm female [1]	3.5mm male [2]		50 ohm	1.49	(3.79)
8009F	NMD3.5mm female [1]	NMD3.5mm male [1]		50 ohm	1.49	(3.79)
2633C	NMD3.5mm female [1]	7mm [3]	DC — 18.0 ≤ $1.018 + 0.003f$	50 ohm	1.78	(4.53)
8829A	NMD3.5mm female [1]	Type N female [4]	DC — 6.0 ≤ 1.04 6.0 — 18.0 ≤ 1.08	50 ohm	2.04	(5.18)
8829B	NMD3.5mm female [1]	Type N male [4]		50 ohm	2.20	(5.59)
8619A	NMD3.5mm female [1]	TNC female [5]	DC — 3.5 ≤ 1.06 3.5 — 7.0 ≤ 1.10 7.0 — 18.0 ≤ 1.16	50 ohm	2.05	(5.21)
8619B	NMD3.5mm female [1]	TNC male [5]		50 ohm	2.00	(5.08)
8691A	NMD3.5mm female [1]	AFTNC female [6]	DC — 4.0 ≤ 1.04 4.0 — 20.0 ≤ 1.10	50 ohm	1.92	(4.88)
8691B	NMD3.5mm female [1]	AFTNC male [6]		50 ohm	1.54	(3.91)
8679A	NMD3.5mm female [1]	TNCA female [7]	DC — 4.0 ≤ 1.04 4.0 — 20.0 ≤ 1.10	50 ohm	1.92	(4.88)
8679B	NMD3.5mm female [1]	TNCA male [7]		50 ohm	1.54	(3.91)
2433A1	NMD3.5mm female [1]	14mm [8]	DC — 8.5 ≤ $1.01 + 0.008f$	50 ohm	2.32	(5.89)

[1] NMD3.5mm per Maury data sheet 5E-084.
[2] Precision 3.5mm per Maury data sheet 5E-062.
[3] Precision 7mm per Maury data sheet 5E-060.
[4] Precision type N per Maury data sheet 5E-049.
[5] Precision TNC per Maury data sheet 5E-053.
[6] Precision AFTNC per Maury data sheet 5E-056.
[7] Precision TNC MIL-STD 348A per Maury data sheet 5E-068.
[8] Precision 14mm per Maury data sheet 5E-068.

Key Literature: Maury data sheet 2B-049, 2B-049A, 2B-050, 2B-051, 2B-052, 2B-053.

3.5mm In-Series Adapters

Models 8021A/B/C/D/E/P/K/L

8021A2 8021B2 8021C2

8021D1 8021P 8021E1

Description

These precision 3.5mm adapters are low VSWR, low loss devices that operate from DC to 34 GHz. Models 8021A2, B2 and C2 offer combinations for in-series adapting and are phase matched, making them ideal for use in precision measurement applications. These adapters are minimum length and feature a square-flanged body for ease of connecting that also prevents them from rolling off flat surfaces. They are useful as "test port savers" when used with network analyzers such as the Agilent 8510, etc. Several designs are available for instrumentation applications: 8021D1 is a bulkhead feedthru models, 8021E1 is a panel mount model, and 8021K1/L1 are bull-nose panel mount adapters. 8021P is a slim-line 3.5mm female to male adapter that is designed for use in tight spaces where minimal clearance exists around the test port.

Specifications

Frequency Range . . . . . DC – 34 GHz

Maximum VSWR:	8021A2/B2/C2/P	8021D1/E1/K1/L1
DC – 18 GHz	1.05	1.07
18 – 26.5 GHz	1.08	1.10
26.5 – 34.0 GHz	1.12	1.15

Impedance . . . . . 50 ohm

Connectors . . . . . 3.5mm per Maury data sheet 5E-062

Available Models

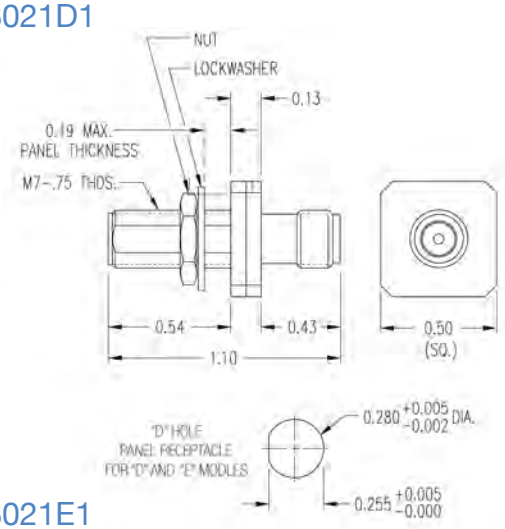
MODEL	ADAPTS SIDE A	ADAPTS SIDE B	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8021A2	3.5mm female[1]	3.5mm female[1]	0.65	(1.65)
8021B2	3.5mm male[1]	3.5mm male[1]	0.65	(1.65)
8021C2	3.5mm female[1]	3.5mm male[1]	0.65	(1.65)
8021D1	3.5mm female[1]	3.5mm female[1]	0.85	(2.15)
8021E1	3.5mm female[1]	3.5mm female[1]	0.85	(2.15)
8021P	3.5mm female[1]	3.5mm male[1]	0.95	(2.41)
8021K1	3.5mm male[1]	3.5mm female[1]	1.455	(3.69)
8021L1	3.5mm female[1]	3.5mm female[1]	1.304	(3.31)

[1] Precision 3.5mm per Maury data sheet 5E-062.

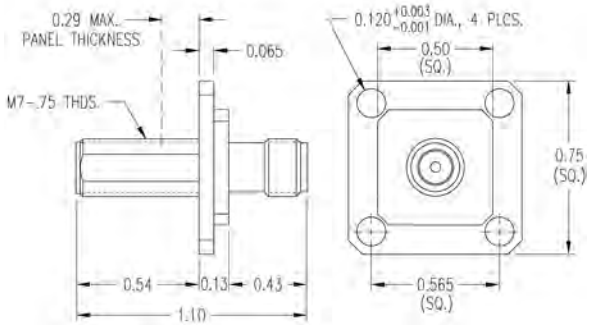
Key Literature: Maury data sheet 2B-021.

Dimensions – Inches (CM)

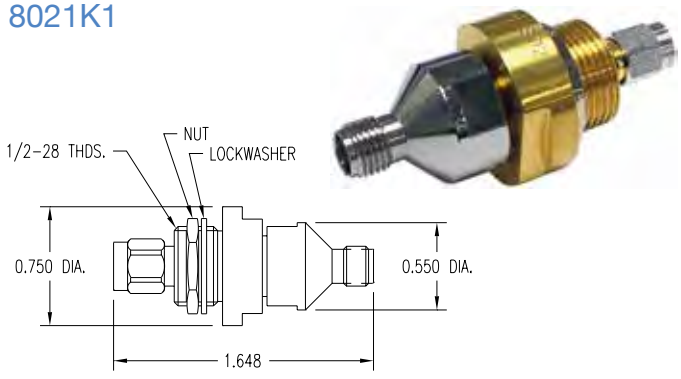
8021D1



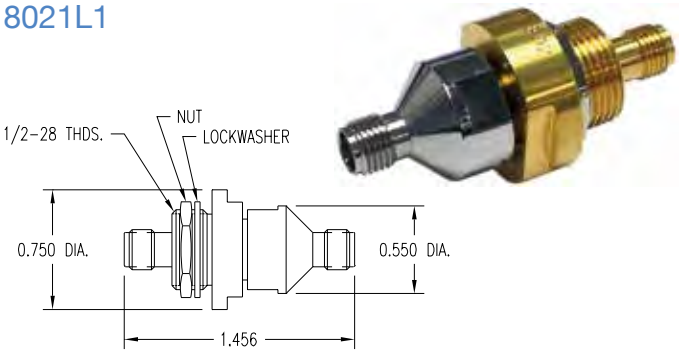
8021E1



8021K1



8021L1



3.5mm (QT3.5mm™) Quick Test Adapters

8006 Series (U.S. Patent No. 6,210,221)

Features

- *Quick, Easy Push-On/Pull-Off Design*
- *Designed for Durability and Long Life (3,000 Connect/Disconnect Cycles)*
- *Excellent Repeatability/Low VSWR*
- *Guide Sleeve Design for Automated applications*

8006E1 No Nut | 8006E11 3/8" Nut | 8006E21 9/16" Nut | 8006Q1 Guide Sleeve

Description

The QT3.5mm™ male connector incorporates a quick connect design that provides for a push-on/pull-off capability that mates with any commercially available SMA, 3.5mm, and 2.92mm female connectors. The optional quick 1-1/2 turn twist nut combines the best of both worlds allowing quick connect or disconnect with the increased accuracy of a thread-on connector. In addition to the no nut and quick turn nut designs, a guide sleeve configuration is available to provide a self-aligning capability required in automated test stations.

The push-on connector offers excellent repeatability and long life making these adapters ideal for use in a production environment. The nut can also be torqued to 8 in. lbs making them suitable for test port applications where a calibration is required. The connectors come in four configurations: no nut, a 3/8" diameter nut, a 9/16" diameter nut, and a guide sleeve configuration.

*Repeatability**

MODE	DC — 18 GHz	18 — 26.5 GHz
Push-On	> 40 dB	> 40 dB
Torqued to 8 in. lbs	> 50 dB	> 50 dB
Hand Torqued	> 50 dB	> 50 dB

*Repeatability is based on a minimum of 3,000 connect/disconnect cycles.

Available Models

MODEL	ADAPTS SIDE A	SIDE B	FREQUENCY RANGE (GHz)	MAXIMUM VSWR (GHz)
8006B1 8006B11 8006B21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	7mm	DC — 18.0	DC — 4.0 ≤ 1.04 4.0 — 18.0 ≤ 1.08
8006C1 8006C11 8006C21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	NMD3.5mm (f)	DC — 26.5 [1]	DC — 16.0 ≤ 1.08 16.0 — 26.5 ≤ 1.12
8006E1 8006E11 8006E21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	3.5mm (f)	DC — 26.5[1]	DC — 16.0 ≤ 1.05 16.0 — 26.5 ≤ 1.08
8006F1 8006F11 8006F21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	3.5mm (m)	DC — 26.5[1]	DC — 16.0 ≤ 1.05 16.0 — 26.5 ≤ 1.08
8006G1 8006G11 8006G21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	Type N (f)	DC — 18.0	DC — 4.0 ≤ 1.05 4.0 — 18.0 ≤ 1.08
8006H1 8006H11 8006H21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	Type N (m)	DC — 18.0	DC — 14.0 ≤ 1.05 4.0 — 18.0 ≤ 1.08
8006K1 8006K11 8006K21	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut	NMD2.4mm (f)	DC — 26.5[1]	DC — 16.0 ≤ 1.08 16.0 — 26.5 ≤ 1.12
8006Q1	QT3.5mm™ (m) guide sleeve	3.5mm (f)	DC — 26.5[1]	DC — 16.0 ≤ 1.05 16.0 — 26.5 ≤ 1.08

[1] Slightly reduced VSWR specifications to 34 GHz.

3.5mm Between-Series Adapters

8022, 8023, 8025, 8682, 8672 & 8028 Series

Description

These precision adapters are used to connect 3.5mm devices to cables or devices with the connector types listed below. Low VSWR, low insertion loss and high repeatability, make these rugged, highly durable adapters ideal for use wherever frequent connect/disconnect cycles occur. Most are phase matched within their model series.

3.5mm Connector Description

Rated from DC to 34 GHz, the precision 3.5mm miniature, air-interface connectors on these adapters comply with IEEE standard 287 for instrument grade general precision connectors (GPC3.5). See Maury data sheet 5E-062 for interface dimensions.

7mm Connector Description *(see page 131)*

Rated from DC to 18 GHz, these precision miniature, air-interface connectors comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). See Maury data sheet 5E-060 for interface dimensions.

Type N Connector Description *(see page 133)*

Rated from DC to 18 GHz, these precision miniature, air-interface connectors comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N). Maury data sheet 5E-049 for interface dimensions.

BNC Connector Description

Rated from DC to 10 GHz, Maury BNC series connectors conform to MIL-C-39012. The two-stud bayonet coupling connectors are normally made with stainless steel bodies with heat treated gold plated beryllium copper contacts.

TNC Connector Descriptions *(see page 137)*

Maury offers three precision TNC connector designs. See Maury data sheet 5E-058 for interface dimensions.

Available Models

MODEL	ADAPTS		FREQUENCY RANGE (GHZ) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH	
	SIDE A	SIDE B			INCHES	(CM)
8022A1	3.5mm female [1]	7mm	DC – 4.0 ≤ 1.04 4.0 – 18.0 ≤ 1.08	50 ohm	1.67	(4.24)
8022B1	3.5mm male [1]	7mm				
8022A2	3.5mm female [1]	7mm [2]				
8022B2	3.5mm male [1]	7mm [2]				
8022S	3.5mm female [1]	7mm [3]			1.22	(3.10)
8022T	3.5mm male [1]	7mm [3]				
8023A	3.5mm female [1]	Type N female	DC – 4.0 ≤ 1.065 4.0 – 18.0 ≤ 1.13	50 ohm	1.62	(4.11)
8023B1	3.5mm female [1]	Type N male				
8023C	3.5mm male [1]	Type N female				
8023D1	3.5mm male [1]	Type N male				
8025A1	3.5mm female [1]	TNC female	DC – 4.0 ≤ 1.04 (< 1.03 typ) 4.0 – 8.0 ≤ 1.14 (< 1.07 typ) 8.0 – 18.0 ≤ 1.20 (< 1.15 typ)	50 ohm	1.61	(4.10)
8025B1	3.5mm female [1]	TNC male				
8025C1	3.5mm male [1]	TNC female				
8025D1	3.5mm male [1]	TNC male				
8682A	3.5mm female [1]	AFTNC female	DC – 4.0 ≤ 1.04 4.0 – 12.0 ≤ 1.06 12.0 – 20.0 ≤ 1.08	50 ohm	1.34	(3.40)
8682B	3.5mm female [1]	AFTNC male			1.29	(3.28)
8682C	3.5mm male [1]	AFTNC female			1.34	(3.40)
8682D	3.5mm male [1]	AFTNC male			1.29	(3.28)
8672A	3.5mm female [1]	TNCA female	DC – 4.0 ≤ 1.04 4.0 – 12.0 ≤ 1.06 12.0 – 20.0 ≤ 1.08	50 ohm	1.34	(3.40)
8672B	3.5mm female [1]	TNCA male			1.29	(3.28)
8672C	3.5mm male [1]	TNCA female			1.34	(3.40)
8672D	3.5mm male [1]	TNCA male			1.29	(3.28)
8028A	3.5mm female [1]	BNC female	DC – 4.0 ≤ 1.10 4.0 – 10.0 ≤ 1.20	50 ohm	2.00	(5.08)
8028B	3.5mm female [1]	BNC male			1.91	(4.85)
8028C	3.5mm male [1]	BNC female			2.00	(5.08)
8028D	3.5mm male [1]	BNC male			1.91	(4.85)

[1] Precision 3.5mm per Maury data sheet 5E-062. These 3.5mm connectors are mating compatible with SMA or 2.92mm (K) connectors.

[2] High Precision 7mm test port interface with enhanced performance in VNA applications.

[3] 8022S and 8022T feature low VSWR and ultra-low insertion loss from DC to 18.0 GHz. Designed for optimal match and loss performance. See data sheet 2B-022E.

Key Literature: Maury data sheets 2B-022, 2B-022D, 2B-022E, 2B-017, 2B-017A, 2B-025, and 2B-028.

3.5mm Between-Series Panel Mount Adapters

Models 8022N/P, 8023P1/P2, 8023T1/T2, 8009D/E/E1

Description

The 8022N/P and 8023P/T models are precision panel mount adapters designed for use in OEM applications, special test fixtures, and custom instrumentation designs. These models adapt 3.5mm female or male connectors to 7mm or type N female or male connectors. When properly mated, they provide a low VSWR connection with low insertion loss and high repeatability. Made of highly durable materials, these adapters are ideal for use in laboratory and production environments where frequent connect/disconnect cycles occur.

The 8009D/E/E1 are NMD3.5mm panel mount adapters designed for use in applications where the highest repeatability is critical. They adapt precision 3.5mm connectors to NMD3.5mm male connectors, and are mateable to non-NMD SMA, 2.92mm (K) and 3.5mm connectors via internal threads. The center conductors are supported by two dielectric beads for exceptional stability and long life. These models are rated for operation from DC to 26.5 GHz.

3.5mm Connector Description

Maury precision 3.5mm connectors on these adapters are miniature, instrument grade, air-interface connectors that are rated for operation from DC to 34 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC3.5).

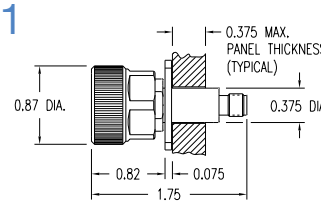
7mm Connector Description

Maury precision 7mm connectors are miniature, instrument grade, air-interface connectors rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). They are normally made with gold-plated beryllium copper bodies and have a six-slot heat treated gold-plated beryllium copper center conductor contact for improved repeatability and durability. See Maury data sheet 5E-060 for interface dimensions.

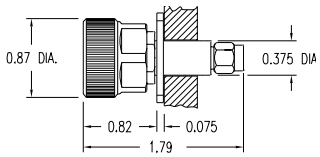
Type N Connector Description

The precision type N connectors on these adapters are instrument grade, air-interface connectors that are rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N). The connectors have stainless steel bodies with heat treated gold-plated beryllium copper contacts.

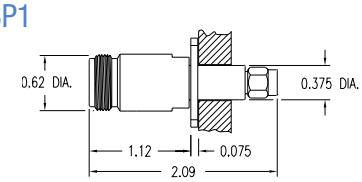
8022N



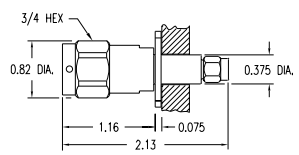
8022P



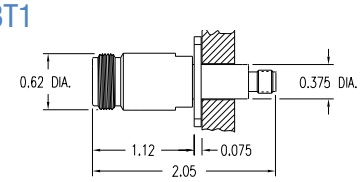
8023P1

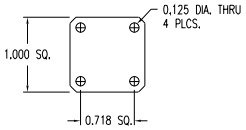


8023P2



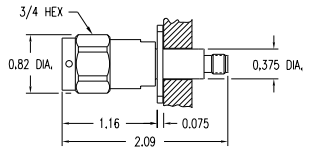
8023T1



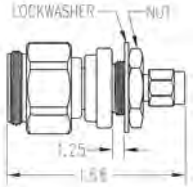


Flange Layout (8022/23)

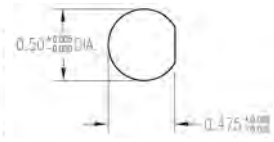
8023T2



8009D



Recommended Mounting Hole (8009D)



Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8022N	3.5mm female	7mm	DC — 4.0 ≤ 1.04	50 ohm	1.670	(4.24)
8022P	3.5mm male	7mm	4.0 — 18.0 ≤ 1.08	50 ohm	1.670	(4.24)
8023P1	3.5mm male	Type N female	DC — 4.0 ≤ 1.065	50 ohm	1.611	(4.09)
8023P2	3.5mm male	Type N male	4.0 — 18.0 ≤ 1.13	50 ohm	1.972	(5.01)
8023T1	3.5mm female	Type N female	DC — 4.0 ≤ 1.065	50 ohm	1.615	(4.10)
8023T2	3.5mm female	Type N male	4.0 — 18.0 ≤ 1.13	50 ohm	1.976	(5.02)
8009D	3.5mm male	NMD3.5mm male	DC — 18.0 ≤ 1.06	50 ohm	1.455	(3.69)
8009E	3.5mm male	NMD3.5mm male	18.0 — 26.5 ≤ 1.10	50 ohm	1.455	(3.69)
8009E1	3.5mm male	NMD3.5mm male		50 ohm	1.455	(3.69)

Key Literature: Maury data sheets 2B-022C, 2B-017A and 2B-034B.

7mm Between-Series Adapters

Series 2633, 2606, 2607, 2617, 2621, 2622, 2624, 2625, 2657, 8692 & 8696

Description

Maury offers an extensive line of precision 7mm adapters in all common laboratory and systems connector types. 7mm adapters are also available for special purpose connections such as EIA rigid line connectors. Female and male adapters in the same connector series are phase matched for VNA applications. See pages 119 –131 for 7mm to 2.4mm, 2.92mm, and 3.5mm adapters.

7mm Connector Description

Maury precision 7mm connectors are miniature, instrument grade, air-interface connectors rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). They are normally made with gold-plated beryllium copper bodies and have a six-slot heat treated gold-plated beryllium copper center conductor contact for improved repeatability and durability. See Maury data sheet 5E-060 for interface dimensions.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
2633A	7mm "female" [1]	7mm [1]	DC — 18.0 ≤ 1.004 + 1.003f	50Ω	1.62	(4.24)
2606C	7mm [1]	Type N female [2]	DC — 4.0 ≤ 1.03 4.0 — 9.0 ≤ 1.04	50Ω	1.51	(3.84)
2606D	7mm [1]	Type N male [2]	9.0 — 18.0 ≤ 1.07	50Ω	1.51	(3.84)
2622A1	7mm [1]	TNC female [3]	DC — 4.0 ≤ 1.05 4.0 — 18.0 ≤ 1.15	50Ω	1.68	(4.26)
2622B	7mm [1]	TNC male [3]		50Ω	1.55	(3.94)
8692A	7mm [1]	AFTNC female [4]	DC — 4.0 ≤ 1.04 4.0 — 18.0 ≤ 1.06	50Ω	1.88	(4.78)
8692B	7mm [1]	AFTNC male [4]		50Ω	1.82	(4.62)
8696A	7mm [1]	TNCA female [5]	DC — 4.0 ≤ 1.04 4.0 — 18.0 ≤ 1.06	50Ω	1.88	(4.78)
8696B	7mm [1]	TNCA male [5]		50Ω	1.82	(4.62)
2625A	7mm [1]	SMA female [6]	DC — 4.0 ≤ 1.05 4.0 — 10.0 ≤ 1.08 10.0 — 18.0 ≤ 1.15	50Ω	1.67	(4.24)
2625B	7mm [1]	SMA male [6]		50Ω	1.67	(4.24)
2621A1	7mm [1]	BNC female	DC — 4.0 ≤ 1.06 4.0 — 10.0 ≤ 1.15	50Ω	2.16	(5.48)
2621B1	7mm [1]	BNC male		50Ω	2.07	(5.25)
8582D1	7mm [1]	BNC 75Ω female	DC — 2.0 ≤ 1.50P (Typ.)	50Ω /75Ω	2.06	(5.23)
8582D2	7mm [1]	BNC 75Ω male		50Ω /75Ω	2.06	(5.23)
2657A	7mm [1]	HN female [7]	DC — 4.0 ≤ 1.05 4.0 — 8.5 ≤ 1.12	50Ω	3.00	(7.62)
2657B	7mm [1]	HN male [7]		50Ω	2.70	(6.86)
2624A	7mm [1]	SC female [8]	DC — 4.0 ≤ 1.06 4.0 — 8.0 ≤ 1.09 8.0 — 10.0 ≤ 1.12	50Ω	2.36	(5.99)
2624B1	7mm [1]	SC male [8]		50Ω	2.22	(5.64)
2607A1	7mm [1]	14mm (GR900)	DC — 8.5 ≤ 1.004 + 1.004f	50Ω	2.01	(5.10)
2617	7mm [1]	7/8 EIA	DC — 1.0 ≤ 1.02 1.0 — 2.0 ≤ 1.05 2.0 — 3.0 ≤ 1.10 3.0 — 4.0 ≤ 1.15	50Ω	2.68	(6.81)

1 7mm per Maury data sheet 5E-060.
2 Precision type N per Maury data sheet 5E-049.
3 Precision TNC per Maury data sheet 5E-053
4 Precision TNC MIL-C-87104/2 per Maury data sheet 5E-056.
5 Precision TNC MIL-STD 348A per Maury data sheet 5E-058.
6 Precision stainless steel per MIL-C-39012.
7 Precision stainless steel HN per Maury data sheet 5E-051.
8 Precision stainless steel SC per Maury data sheet 5E-050.

Key Literature: Maury data sheets 2B-022, 2B-022D, 2B-017, 2B-017A, 2B-025, 2B-028, and 2B-030.

Type N In-Series Adapters (50 ohm) – Phase Matched

8828 Series

Description

The 8828 precision type N in-series adapters feature extremely low VSWR with low insertion loss, and are phase matched (having the same electrical insertion length) so they may be readily interchanged in network analyzer measurement applications. They are constructed with aluminum bodies. Connector bodies are made from stainless steel, and the center conductors are made from gold plated, heat treated beryllium.

Connector Description

The Maury type N connectors on these adapters are precision, miniature, instrument grade, air-interface connectors, rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N), and meet most applicable interface requirements of MIL-C-39012/1 (see footnote 2, in Figure 1 below) and they meet all applicable interface requirements of MIL-C-39012/2. The connectors will mate properly with MIL-C-71, MIL-C-39012, MIL-T-81490 and most other semi-precision type N connectors. The male connectors are provided with a 0.75-inch hex coupling nut so they can be properly torqued to 12 in. lbs. The connectors have stainless steel bodies with heat treated gold-plated beryllium copper contacts.

Specifications

Frequency Range . . . . . DC – 18 GHz

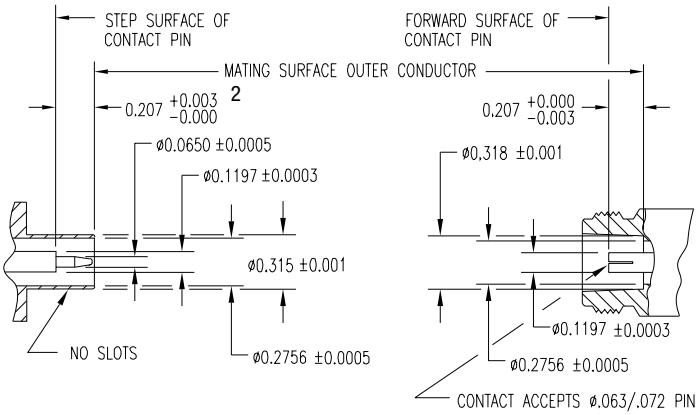
Maximum VSWR . . . . . DC – 4.0 GHz, 1.03 (<1.02 typical)
4.0 – 10.0 GHz, 1.05 (<1.03 typical)
10.0 – 18.0 GHz, 1.09 (<1.06 typical)

Impedance . . . . . 50 ohm

Insertion Loss . . . . . 0.08 dB + 0.01 dBf (GHz)

Interface Dimensions – Inches

Figure 1 – Contact Pin Location



2 This dimension is .210 minimum on MIL-C-39012/1.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8828A	Type N female [1]	Type N female [1]	2.50	(6.35)
8828B	Type N male [1]	Type N male [1]	2.50	(6.35)
8828C	Type N female [1]	Type N male [1]	2.50	(6.35)

1 Precision type N per Maury data sheet 5E-049.

Dimensions – Inches

Figure 2 – 8828A

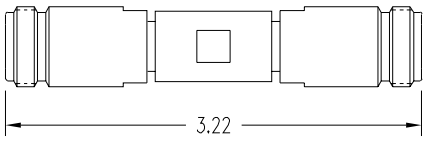


Figure 3 – 8828B

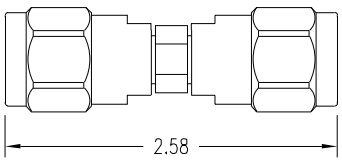
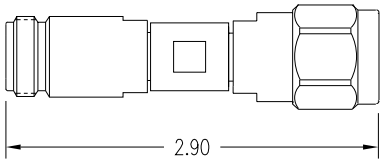


Figure 4 – 8828C



Key Literature: Maury data sheet 2B-029.

Type N In-Series Adapters (50 ohm)

8801 and 8803 Series

Description

The 8801 beadless (air dielectric) adapters, and the 8803 bead-supported adapters both have precision type N connectors that exhibit low VSWR and low insertion loss from DC to 18 GHz. They are useful in a variety of VNA measurement applications or in general laboratory use. Two kits are available; the 8801K and 8801L; each including a selection of these adapters in a wood instrument case. (See "Available Models" below for kit contents.)

8801K
Type N
Adapter Kit

Connector Description

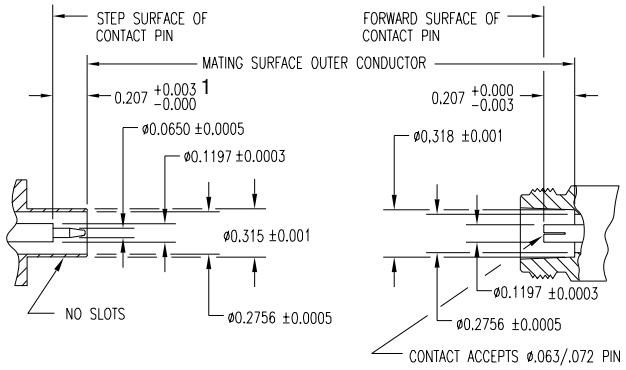
The Maury type N connectors on these adapters are precision, miniature, instrument grade, air-interface connectors, rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N), and most applicable interface requirements of MIL-C-39012/1 (see footnote 1, in Figure 1 below). They also meet all applicable interface requirements of MIL-C-39012/2, and will mate properly with MIL-C-71, MIL-C-39012, MIL-T-81490 and most other semi-precision type N connectors. The male connectors are provided with a 0.75-inch hex coupling nut so they can be properly torqued to 12 in. lbs. The connectors have stainless steel bodies with heat treated gold-plated beryllium copper contacts.

Specifications

Frequency Range . . . . . DC – 18 GHz
Maximum Insertion Loss:
DC – 4.0 GHz . . . . . 8801 ≤ 0.07 dB; 8803 ≤ 0.1 dB
4.0 – 10.0 GHz . . . . . 8801 ≤ 0.10 dB; 8803 ≤ 0.15 dB
10.0 – 18.0 GHz . . . . . 8801 ≤ 0.15 dB; 8803 ≤ 0.25 dB
Dielectric . . . . . .8801 – Beadless; 8803 – Teflon Bead

Dimensions – Inches

Figure 1 – Contact Pin Location



1 This dimension is .210 minimum on MIL-C-39012/1.

Dimensions – Inches

Figure 2 – 8801A/8803A

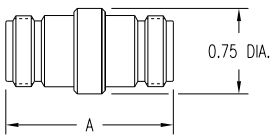


Figure 3 – 8801B/8803B

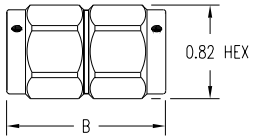
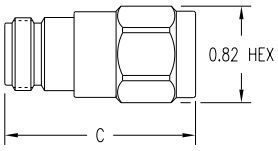


Figure 4 – 8801C/8803C



Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8801A	Type N female 2	Type N female 2	DC — 4.0 ≤ 1.03	50 ohm	0.657	(1.67)
8801B	Type N male 2	Type N male 2	4.0 — 10.0 ≤ 1.08	50 ohm	1.302	(3.31)
8801C	Type N female 2	Type N male 2	10.0 — 18.0 ≤ 1.10	50 ohm	1.237	(3.14)
8803A	Type N female 2	Type N female 2	DC — 4.0 ≤ 1.05 (<1.03 typ)	50 ohm	0.836	(2.12)
8803B	Type N male 2	Type N male 2	4.0 — 10.0 ≤ 1.08 (<1.05 typ)	50 ohm	1.729	(4.39)
8803C	Type N female 2	Type N male 2	10.0 — 18.0 ≤ 1.12 (<1.08 typ)	50 ohm	1.282	(3.25)
8803D 3	Type N female 2	Type N female 2		50 ohm	0.836	(2.12)
8801K	Kit consisting of one each 8801A, 8801B, 8803A and 8803B.					
8801L	Kit consisting of one each of all models listed above, except the 8803D.					

2 Precision type N per Maury data sheet 5E-049.
3 This is a precision pressurized bulkhead feedthru adapter similar to UG30/U. Outline drawing available on request.

Key Literature: Maury data sheet 2B-010.

Type N Between-Series Adapters (50 ohm)

Model Series 8694, 8697, 8816, 8817, 8820, and 8821

Description

Maury precision type N between-series adapters are designed for general purpose laboratory use and high precision measurement applications. They exhibit low VSWR and low insertion loss across the frequency range of the adapted connector, and are built to the same rigorous quality standards as the type N in-series adapters listed on the preceding pages.

8816A 8816C 8817B 8820C

Type N Connector Description

See pages 134-135 for a description of Maury type N connectors.
See also Maury data sheet 5E-049 for interface dimensions.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8816A	Type N female [2]	SMA female [3]	DC — 4.0 ≤ 1.05 4.0 — 10.0 ≤ 1.10 10.0 — 18.0 ≤ 1.16	50 ohm	1.59	(4.04)
8816B	Type N female [2]	SMA male [3]			1.59	(4.04)
8816C	Type N male [2]	SMA female [3]			1.95	(4.95)
8816D	Type N male [2]	SMA male [3]			1.95	(4.95)
8817A	Type N female [2]	TNC female [4]	DC — 4.0 ≤ 1.065 4.0 — 8.0 ≤ 1.10 8.0 — 12.0 ≤ 1.12 12.0 — 18.0 ≤ 1.14		1.17	(2.97)
8817B	Type N female [2]	TNC male [4]			1.50	(3.81)
8817C	Type N male [2]	TNC female [4]			1.53	(3.89)
8817D	Type N male [2]	TNC male [4]			1.86	(4.72)
8694A	Type N female [2]	AFTNC female [5]	DC — 4.0 ≤ 1.04 4.0 — 8.0 ≤ 1.06 8.0 — 18.0 ≤ 1.08		1.82	(4.63)
8694B	Type N female [2]	AFTNC male [5]			1.77	(4.48)
8694C	Type N male [2]	AFTNC female [5]			2.18	(5.54)
8694D	Type N male [2]	AFTNC male [5]			2.13	(5.90)
8697A	Type N female [2]	TNCA female [6]	DC — 4.0 ≤ 1.04 4.0 — 8.0 ≤ 1.06 8.0 — 18.0 ≤ 1.08		1.82	(4.63)
8697B	Type N female [2]	TNCA male [6]			1.77	(4.48)
8697C	Type N male [2]	TNCA female [6]			2.18	(5.54)
8697D	Type N male [2]	TNCA male [6]			2.13	(5.90)
8821A1 [1]	Type N female [2]	BNC female	DC — 4.0 ≤ 1.08 4.0 — 10.0 ≤ 1.20		2.10	(5.33)
8821B1 [1]	Type N female [2]	BNC male			2.01	(5.11)
8821C1 [1]	Type N male [2]	BNC female			2.46	(6.25)
8821D1 [1]	Type N male [2]	BNC male			2.37	(6.02)
8820A	Type N female [2]	HN female [7]	DC — 4.0 ≤ 1.08 4.0 — 8.5 ≤ 1.12		1.93	(4.90)
8820B1	Type N female [2]	HN male [7]			2.64	(6.71)
8820C	Type N male [2]	HN female [7]			2.39	(6.07)
8820D1	Type N male [2]	HN male [7]			2.00	(5.08)

[1] 8821A1/B1 and 8821C1/D1 are phase matched pairs.
[2] Precision type N per Maury data sheet 5E-049.
[3] Precision stainless steel SMA per MIL-C-39012.
[4] Precision stainless steel TNC per Maury data sheet 5E-053.
[5] Precision TNC per MIL-C-87104/2 per Maury data sheet 5E-056.
[6] Precision TNC per MIL-STD 348A per Maury data sheet 5E-058.
[7] Precision stainless steel HN per Maury data sheet 5E-051.

Key Literature: Maury data sheets 2B-006B, 2B-016, 2B-011, 2B-045, 2B-056, 2B-057 and 2B-058.

Type N Adapters (75 ohm) – Phase Matched

8882 Series

Description

The 8882 type N 75 ohm adapters are manufactured with a precision version of the Maury type N interface. To help prevent the inadvertent mating of these 75 ohm adapters to 50 ohm type N connectors, a black band is incised into these adapters on the male coupling nut, or just behind the female coupling threads. 75 ohm N center conductors are smaller than 50 ohm versions, so mating a 50 ohm male to a 75 ohm female will destroy the female contact. Mating a 75 ohm male to a 50 ohm female will result in a poor electrical connection.

These adapters are phase matched (having the same electrical insertion length) within their series so they may be readily interchanged in network analyzer measurement applications, and for accurate measurement of non-insertable devices.

Connector Description

Maury type N, 75 ohm connectors are a precision version of the Maury type N interface which meets all applicable requirements of IEC169-16. They exhibit extremely low VSWR and although rated to 2.0 GHz, they can be used at much higher frequencies. The male connectors are provided with a 0.75-inch hex coupling nut so they can be properly torqued to 12 in. lbs. See Maury data sheet 5E-054 for interface dimensions.

Specifications

Frequency Range . . . . . DC – 2.0 GHz

Maximum VSWR:

8882A/B/C 1.03

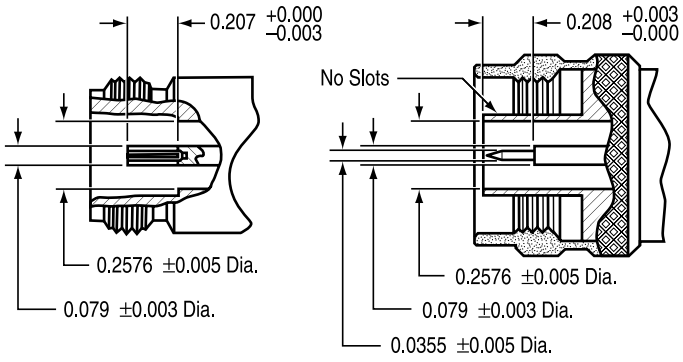
All 75 ohm to 50 ohm models . . . . . 1.5 (75/50 ohm) typical
(calibrated out during the measurement calibration process)

Nominal Impedance . . . . . 75 ohm

8882E1 8882E2 8882G11 8882F22

Interface Dimensions

Contact Pin Location



Available Models (In-Series)

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8882A	Type N (F) 75 Ω [1]	Type N (F) 75 Ω [1]	2.768	(7.0307)
8882B	Type N (M) 75 Ω [1]	Type N (M) 75 Ω [1]	2.768	(7.0307)
8882C	Type N (F) 75 Ω [1]	Type N (M) 75 Ω [1]	2.768	(7.0307)

[1] Precision Type N - 75 ohm per Maury data sheet 5E-054.
[2] NMD3.5mm per Maury data sheet 5E-084.
[3] Precision 3.5mm per Maury data sheet 5E-062.

Available Models (Between-Series)

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8882E1	NMD3.5mm (F) 50 Ω [2]	Type N (F) 75 Ω [1]	1.003	(2.5476)
8882E2	NMD3.5mm (F) 50 Ω [2]	Type N (M) 75 Ω [1]	1.603	(4.0716)
8882G11	Type N (F) 75 Ω [1]	3.5mm (F) 50 Ω [3]	1.748	(4.4399)
8882G12	Type N (F) 75 Ω [1]	3.5mm (M) 50 Ω [3]	1.748	(4.4399)
8882G21	Type N (M) 75 Ω [1]	3.5mm (F) 50 Ω [3]	1.748	(4.4399)
8882G22	Type N (M) 75 Ω [1]	3.5mm (M) 50 Ω [3]	1.748	(4.4399)
8882D1	Type N (F) 75 Ω [1]	7mm 50 Ω [4]	2.277	(5.7836)
8882D2	Type N (M) 75 Ω [1]	7mm 50 Ω [4]	2.277	(5.7836)
8882F11	Type N (F) 75 Ω [1]	Type N (F) 50 Ω [5]	2.634	(6.6904)
8882F12	Type N (F) 75 Ω [1]	Type N (M) 50 Ω [5]	2.634	(6.6904)
8882F21	Type N (M) 75 Ω [1]	Type N (F) 50 Ω [5]	2.634	(6.6904)
8882F22	Type N (M) 75 Ω [1]	Type N (M) 50 Ω [5]	2.634	(6.6904)

[4] Precision 7mm per Maury data sheet 5E-060.
[5] Precision type N per Maury data sheet 5E-049.

Key Literature: Maury data sheet 2B-031.

LPC/OSP™ Between-Series Adapters

8787 Series

Description

The LPC/OSP™[1] adapters are designed to provide a precisely repeatable mated interface for calibration purposes and for test of production components which use the standard OSP™[2] series blind-mate connectors.

Interface dimensions of the connectors are tightly controlled. A hexagonal coupling nut on the male connector, allows torquing to 8 in/lb with a calibrated torque wrench to further improve the repeatability of a mated pair. Both the female and male connectors are fully mating compatible with the standard OSP™ series and with Dynawave's Dynamate™ series 3 blind-mate connectors.

Most adapters in the same series are phase matched and may be interchanged for VNA measurement of non-insertable devices.

3.5mm Connector Description

The Maury precision 3.5mm connectors on these adapters are miniature, instrument grade, air-interface connectors that are rated for operation from DC to 34 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC3.5).

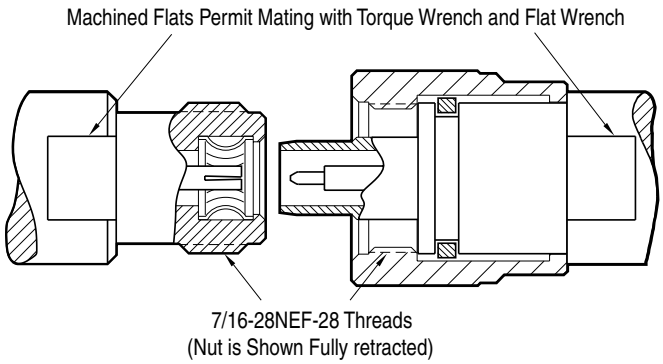
7mm Connector Description

Maury precision 7mm connectors are miniature, instrument grade, air-interface connectors rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC7). They are normally made with gold-plated beryllium copper bodies and have a six- slot heat treated gold-plated beryllium copper center conductor contact for improved repeatability and durability. See Maury data sheet 5E-060 for interface dimensions.

Type N Connector Description

The Maury type N connectors on these adapters are precision, miniature, instrument grade, air-interface connectors, rated for operation from DC to 18 GHz. They comply with IEEE standard 287 for instrument grade general precision connectors (GPC Type N), and meet most applicable interface requirements of MIL-C-39012/1 (see Note 7, below) and they meet all applicable interface requirements of MIL-C-39012/2. The connectors will mate properly with MIL-C-71, MIL-C-39012, MIL-T-81490 and most other semi-precision type N connectors. The male connectors are provided with a 0.75-inch hex coupling nut so they can be properly torqued to 12 in. lbs. The connectors have stainless steel bodies with heat treated gold-plated beryllium copper contacts.

Maury Improved LCP/OSP™ Interface



Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
8787Q	LPC/OSP™ female [1]	3.5mm female [4]		50 ohm	1.50	(3.81)
8787R	LPC/OSP™ female [1]	3.5mm male [4]	DC — 4.0 ≤ 1.04	50 ohm	1.50	(3.81)
8787S	LPC/OSP™ male [1]	3.5mm female [4]	4.0 — 18.0 ≤ 1.08	50 ohm	1.50	(3.81)
8787T	LPC/OSP™ male [1]	3.5mm male [4]		50 ohm	1.50	(3.81)
8787G	LPC/OSP™ female [1]	7mm [5]	DC — 4.0 ≤ 1.04	50 ohm	2.10	(5.32)
8787H	LPC/OSP™ male [1]	7mm [5]	4.0 — 18.0 ≤ 1.08	50 ohm	2.10	(5.32)
8787J	LPC/OSP™ female [1]	Type N male [6]	DC — 4.0 ≤ 1.065	50 ohm	2.40	(6.08)
8787K	LPC/OSP™ male [1]	Type N male [6]	4.0 — 18.0 ≤ 1.13	50 ohm	2.40	(6.08)

[1] Precision LCP/OSP™ per Maury data sheet 5E-065.
[2] OSP™ is a tradmark of M/A-Com, Inc.
[3] Dynamate™ is a trademark of Dynawave, Inc.
[4] Precision 3.5mm per Maury data sheet 5E-062.
[5] Precision 7mm per Maury data sheet 5E-060.
[6] Precision type N per Maury data sheet 5E-049.
[7] This dimension is .210 minimum on MIL-C-39012/1.

Key Literature: Maury data sheets 2B-022C, 2B-017A and 2B-034B.

TNC In-Series Adapters

232, 8688 & 8678 Series

Description

Because TNC interfaces vary from maker to maker, compatibility must be verified before connectors of different specification types are mated. Mating different specification types degrades electrical performance and risks damage to connector interfaces. Maury application note 5A-031 discusses the most common TNC connectors and compatibility issues that arise if specification types are mixed. See also Maury data sheet 5E-057A to check the compatibility of your TNC connectors.

TNC Connector Descriptions

Maury offers three precision TNC connector designs:

MPC/TNC – Precision TNC connectors that mate with most commercially available TNC connectors and specifically with MIL-C-39012/26/27 test connectors or MIL-T-81490 connectors. This design is used in the 232A11/B11/C11 models and – with some modifications – in the 232A2/B2/C2 models.

Models 232A11/B11/C11 are designed per the Maury 5E-053 interface standard and are intended for general purpose precision test applications. These adapters are recommended for use with dielectrically loaded TNC interfaces. Because they are ideal for use in VNA application these adapters are provided in Maury 8650E series VNA calibration kits (see page 46).

Models 232A2/B2/C2 are designed per the Maury 5E-053A interface standard; an improved MPC/TNC version that is mating compatible with all common military and IEC specification TNC connectors. This includes MIL-STD-348A standard and test connectors (which replace MIL-C-39012 connectors), MIL-T-81490, and IEC 169-17 G0 and G2 connectors.

All 232 series adapters exhibit low VSWR when properly mated and are usable to 18 GHz.

AFTNC – Fully compliant with MIL-C-87104/2 "AFTNC" design standards. Mating dimensions are tightly controlled to ensure low VSWR from DC to 20 GHz. In this design, the male connector utilizes a solid outer conductor configuration to provide consistent measurement results.

For long life and reliability, connector bodies are fabricated from solid stainless steel, with gold-plated, heat treated beryllium copper contacts. See Maury data sheet 5E-056 for interface dimensions.

This design is used in the 8688A/B/C in-series adapters (listed below). For optimum performance, models 8688A/B/C should only be used with other MIL-C-87104/2 connectors.

TNCA – Fully compliant with MIL-STD 348A with tightly controlled interface dimensions to ensure low VSWR from DC to 20 GHz. This design is used in the 8678A/B/C in-series adapters listed below. In the 8678A/B/C models, the male connector utilizes a solid outer conductor configuration to provide consistent measurement results. When properly mated, these adapters exhibit low VSWR from DC to 20 GHz. When mated to TNC connectors governed by other specifications, reduced performance can be expected. Connector bodies are made from stainless steel, and contacts are made from gold-plated, heat treated beryllium copper to ensure long life and reliability. See Maury data sheet 5E-058 for interface dimensions.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
232A11	TNC female [1]	TNC female [1]	DC — 4.0 ≤ 1.06	50 ohm	1.35	(3.43)
232B11	TNC male [1]	TNC male [1]	4.0 — 7.0 ≤ 1.10	50 ohm	1.35	(3.43)
232C11	TNC female [1]	TNC male [1]	7.0 — 18.0 ≤ 1.14	50 ohm	1.35	(3.43)
232A2	TNC female [2]	TNC female [2]	DC — 4.0 ≤ 1.06	50 ohm	1.35	(3.43)
232B2	TNC male [2]	TNC male [2]	4.0 — 7.0 ≤ 1.10	50 ohm	1.35	(3.43)
232C2	TNC female [2]	TNC male [2]	7.0 — 18.0 ≤ 1.14	50 ohm	1.35	(3.43)
8688A	AFTNC female [3]	AFTNC female [3]	DC — 4.0 ≤ 1.04	50 ohm	2.10	(5.33)
8688B	AFTNC male [3]	AFTNC male [3]	4.0 — 8.0 ≤ 1.08	50 ohm	1.95	(4.95)
8688C	AFTNC female [3]	AFTNC male [3]	8.0 — 20.0 ≤ 1.12	50 ohm	2.00	(5.08)
8678A	TNCA female [4]	TNCA female [4]	DC — 4.0 ≤ 1.04	50 ohm	2.10	(5.33)
8678B	TNCA male [4]	TNCA male [4]	4.0 — 8.0 ≤ 1.08	50 ohm	1.95	(4.95)
8678C	TNCA female [4]	TNCA male [4]	8.0 — 20.0 ≤ 1.12	50 ohm	2.00	(5.08)

[1] Precision TNC per Maury data sheet 5E-053.
[2] Precision TNC per Maury data sheet 5E-053A.
[3] Precision TNC per Maury data sheet 5E-056.
[4] Precision TNCA per Maury data sheet 5E-058.

Key Literature: Maury data sheets 2B-007, 2B-046.

14mm Between-Series Adapters

2406, 2407 & 2709 Series; EIA Model 2417B

Description

Maury 14mm coaxial adapters utilize precision air dielectric connectors that are fully mating compatible with, and equivalent to, the GR900BT connector. These connectors are often used in highly critical laboratory applications at frequencies up to 8.5 GHz. They feature improved center conductor inner contacts (model 2481A) and outer connector bodies with a one-inch Hex/Knurl coupling nut for accurate tightening with a calibrated torque wrench. Coupled junctions that are properly tightened with a calibrated torque wrench offer greatly enhanced measurement repeatability and accuracy.

14mm Adapters are offered for precision 3.5mm, type N, 7-16, and 7/8 EIA rigid line connectors. The 3.5mm adapters can also be used for connection to SMA and 2.92mm (the frequency range is limited to 8.5 GHz by the 14mm connector). To adapt from 14mm to 7mm, please see model 2607A1 (see page 133).

In addition to coaxial adapters, Maury also offers a full line of components utilizing the 14mm precision interface. Many of these are direct replacements for the original GR models. Please contact our Sales Department for a cross reference to the original GR model numbers. Maury 14mm products also include VNA calibration kits, directional couplers and noise terminations.

14mm Connector Description

Maury precision 14mm connectors are instrument grade, air-interface connectors that are rated for operation from DC to 8.5 GHz. The connectors are normally made with stainless steel bodies with heat treated gold plated beryllium copper contacts. They are also known as GR900 (General Radio) connectors.

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
2407A1 [1]	14mm (GR900) [3]	3.5mm female [4]	DC — 8.5 ≤ 1.020 + 0.008f	50 ohm	2.01	(5.11)
2407B1 [1]	14mm (GR900) [3]	3.5mm male [4]	DC — 8.5 ≤ 1.020 + 0.008f	50 ohm	2.01	(5.11)
2406C1	14mm (GR900) [3]	Type N female [5]	DC — 8.5 ≤ 1.006 + 0.006f	50 ohm	1.95	(4.95)
2406D1	14mm (GR900) [3]	Type N male [5]	DC — 8.5 ≤ 1.006 + 0.006f	50 ohm	2.03	(5.16)
2709A [2]	14mm (GR900) [3]	7-16 female [6]	DC — 7.5 ≤ 1.006 + 0.006f	50 ohm	1.81	(4.60)
2709B [2]	14mm (GR900) [3]	7-16 male [6]	DC — 7.5 ≤ 1.006 + 0.006f	50 ohm	1.81	(4.60)
2417B	14mm (GR900) [3]	7/8 EIA	DC — 5.0 ≤ 1.012 + 0.008f	50 ohm	3.04	(7.72)

[1] 2407A1 and 2407B1 are phase matched for VNA applications.
[2] 2709A and 2709B are phase matched for VNA applications.
[3] Precision 14mm (GR900) per Maury data sheet 5E-068.
[4] Precision 3.5mm per Maury data sheet 5E-062.
[5] Precision type N per Maury data sheet 5E-049.
[6] Precision 7-16 per Maury data sheet 5E-066.

Key Literature: Maury data sheet 2B-020.

7-16 In-Series and Between-Series Adapters

2705, 2706, 2707 and 2712 Series

Description

These adapters are precision 7-16 to 3.5mm, 7mm, type N or 7mm connectors which cover the frequency ranges from DC to 7.5 GHz. They are fabricated from stainless steel and beryllium copper alloy to provide a rugged, long-wearing and highly repeatable interface with very low VSWR. These characteristics make them ideal for use in laboratory measurement environments and in wireless applications.

Adapters in the same model series are phase matched so that they can be readily interchanged for VNA measurement of non-insertable devices. Maury also supplies these adapters in sets, and together with a full complement of calibration standards in the 2750 series VNA calibration kits (see page 59–62).

7-16 Connector Description

The Maury 7-16 interface is designed to provide a standard test interface that is tighter controlled than the grade "0" standard test connectors specified by European Standard EN 122190 and British Standard BSEN 122190. This interface also complies with the requirements of the "Reference Connector" specified in IEC standard publication 169-4 and is designed to be used as a test connector for all devices which use the general purpose 7-16 connector described in all three standards. Recommended torque value when mating these connectors to themselves or to general purpose 7-16 connectors is 20.0 in/lb. (See Maury data sheet 5E-066 for interface dimensions.)

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	NOMINAL IMPEDANCE	INSERTION LENGTH INCHES	INSERTION LENGTH (CM)
2705A	7-16 female [1]	3.5mm female [2]	DC — 7.5 ≤ 1.04	50 ohm	2.45	(6.21)
2705B	7-16 female [1]	3.5mm male [2]				
2705C	7-16 male [1]	3.5mm female [2]				
2705D	7-16 male [1]	3.5mm male [2]				
2707A	7-16 female [1]	7mm [3]	DC — 7.5 ≤ 1.03	50 ohm	2.56	(6.50)
2707B	7-16 male [1]	7mm [3]				
2707C *	7-16 male [1, 5]	7mm [3]				
2706A	7-16 female [1]	Type N female [4]	DC — 7.5 ≤ 1.03	50 ohm	2.86	(7.26)
2706B	7-16 female [1]	Type N male [4]				
2706C	7-16 male [1]	Type N female [4]				
2706D	7-16 male [1]	Type N male [4]				
2706E *	7-16 male [1, 5]	Type N female [4]				
2706F *	7-16 male [1, 5]	Type N male [4]				
2712A	7-16 female [1]	7-16 female [1]	DC — 7.5 ≤ 1.025	50 ohm	1.83	(4.65)
2712B	7-16 male [1]	7-16 male [1]				
2712C	7-16 female [1]	7-16 male [1]				

* Special short-face design made to facilitate a proper connect with air lines.

[1] Precision 7-16 per Maury data sheet 5E-066.
[2] Precision 3.5mm per Maury data sheet 5E-062.
[3] Precision 7mm per Maury data sheet 5E-060.
[4] Precision type N per Maury data sheet 5E-049.
[5] Test port adapter for use with precision 7-16 beadless air lines.

Key Literature: Maury data sheet 2B-080, 2B-081, 2B-082 and 2B-083.

Waveguide-To-Coaxial Adapters — Right Angle Launch

WR650–WR22 to 2.4mm, 2.92mm, 3.5mm, SMA, 7mm, Type N, and TNC

General Information

Maury produces a comprehensive lines of waveguide to coaxial adapters. Our adapters set the standards for high precision laboratory test and measurement applications, and for systems applications where accuracy and durability are important. These adapters feature precision index holes and lapped flanges to facilitate proper mating; ensuring that your system will deliver the critical performance demanded by the most exacting measurement tasks.

Maury waveguide to coaxial adapters include right angle and end launch configurations. They are available in all common waveguide sizes, covering frequencies from DC to 50 GHz. They adapt to 2.4mm, 2.92mm, 3.5mm, 7mm, type N, TNC and SMA coaxial connector types.

If you require an adapter not listed in this catalog, please contact our Sales Department or your local Maury representative. Special adapters in large waveguide sizes such as WR975 (0.76 to 1.15 GHz), in uncommon sizes (e.g.: WR102), and in half-height waveguide can also be provided. We can also provide units with less common connectors such as SC, 14mm (GR900) and EIA rigid line (7/8, 1-5/8, etc.). Other special adapters have been built for space flight environments.

Description

Maury right angle launch adapters feature low VSWR and low insertion loss. Except where noted, flanges are in accordance with the listing on page 149. Most of the adapters shown incorporate precision index holes in the flange for precise mating alignment and connection repeatability. Please consult the factory for detailed flange interface information.

Specifications

Frequency Range . . . . . 1.12 – 40.0 GHz (in waveguide bands)

Maximum VSWR . . . . . 1.25 (<1.15 typical)

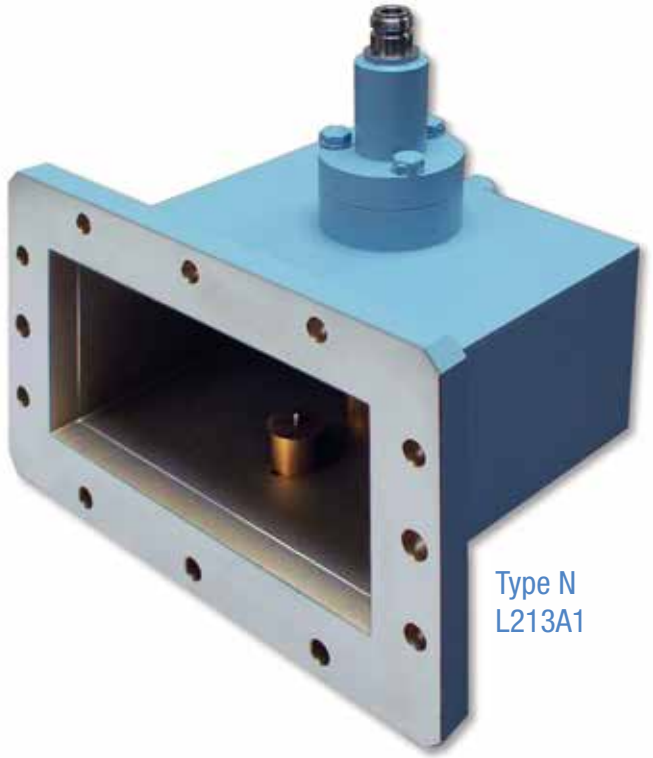
Flanges . . . . . Cover Type, see page 149

VSWR Options

Improved VSWR is provided on adapters with a numeric suffix to the model number (e.g., X200A2).

Model Suffix	Maximum VSWR
2	1.05
8	1.07
1	1.10
6	1.15
3	1.20
7	1.25

Many adapters can be provided with improved VSWR over their full or partial waveguide bands. Our Sales Department will gladly assist you with this and other application specific requirements. Information on specific models such as loss, power handling and dimensions will be provided on request.



Type N
L213A1

7mm
C209D2

7mm
P209D2

3.5mm
N200A2

2.92mm
K211C1

Waveguide To Coaxial Adapters — Right Angle Launch

Available Models

Right Angle Launch EIA WR to 2.4mm, 2.92mm and 3.5mm Connectors

FREQUENCY RANGE (GHz)	EIA WR NUMBER	MODEL (BY COAXIAL CONNECTOR TYPE)					
		2.4mm female	2.4mm male	2.92mm female	2.92mm male	3.5mm female	3.5mm male
1.70 – 2.60	430	—	—	—	—	R200A1	R200B1
2.20 – 3.30	340	—	—	—	—	—	—
2.60 – 3.95	284	—	—	—	—	S200A1	S200B1
3.30 – 4.90	229	—	—	—	—	E200A1	E200B1
3.95 – 5.85	187	—	—	—	—	G200A1	G200B1
4.90 – 7.05	159	—	—	—	—	F200A1	F200B1
5.85 – 8.20	137	—	—	—	—	C200A1	C200B1
7.05 – 10.00	112	—	—	—	—	H200A1	H200B1
8.20 – 12.40	90	X236A1	X236B1	—	—	X200A2	X200B2
10.00 – 15.00	75	—	—	—	—	M200A2	M200B2
12.40 – 18.00	62	P236A1	P236B1	—	—	P200A2	P200B2
15.00 – 22.00	51	N236A1	N236B1	—	—	N200A2	N200B2
18.00 – 26.50	42	K236A1	K236B1	—	—	K200A2	K200B2
22.00 – 33.00	34	Q236A1	Q236B1	—	—	Q200A3	Q200B3
26.50 – 40.00	28	U236A6	U236B6	U210C6	U211C6	U200A1 [1]	U200B1 [1]
33.00 – 50.00	22	J236A3	J236B3	—	—	—	—

Right Angle Launch EIA WR to SMA, 7mm, Type N and TNC Connectors

FREQUENCY RANGE (GHz)	EIA WR NUMBER	MODEL (BY COAXIAL CONNECTOR TYPE)						
		SMA female [2]	SMA male [2]	7mm	Type N female	Type N male	TNC female	TNC male
1.12 – 1.70	650	—	—	L209A1	L213A1	L214A1	—	—
1.70 – 2.60	430	—	—	R209A2	R213A2	R214A2	—	—
2.20 – 3.30	340	—	—	D209A2	D213A1	D214A1	—	—
2.60 – 3.95	284	—	—	S209D2	S213D2	S214D2	—	—
3.30 – 4.90	229	—	—	E209A2	E213A2	E214A2	—	—
3.95 – 5.85	187	—	—	G209D2	G213D2	G214D2	—	—
4.90 – 7.05	159	—	—	F209A2	F213A2	F214A2	—	—
5.85 – 8.20	137	C210D	C211D	C209D2	C213D2	C214D2	—	—
7.05 – 10.00	112	—	—	H209D2	H213D2	H214D2	—	—
8.20 – 12.40	90	X210D	X211D	X209D2	X213D2	X214D2	—	—
10.00 – 15.00	75	M210D1	M211D1	M209D2	M213D2	M214D2	M215D1	M216D1
12.40 – 18.00	62	P210D	P211D	P209D2	P213D2	P214D2	—	—
15.00 – 22.00	51	N210D	—	—	—	—	—	—
18.00 – 26.50	42	—	—	—	—	—	—	—
26.50 – 40.00	28	—	—	—	—	—	—	—

[1] 3.5mm WR28 models are rated to 34 GHz. Use 2.92mm adapters, which are mating compatible, for full band coverage.

[2] Use 3.5mm adapters in bands not covered.

Waveguide To Coaxial Adapters — End Launch

WR430–WR22 to 2.4mm, 2.92mm, 3.5mm, SMA, 7mm, and Type N

General Information

Maury produces a comprehensive lines of waveguide to coaxial adapters. Our adapters set the standards for high precision laboratory test and measurement applications, and for systems applications where accuracy and durability are important. These adapters feature precision index holes and lapped flanges to facilitate proper mating; ensuring that your system will deliver the critical performance demanded by the most exacting measurement tasks.

Maury waveguide to coaxial adapters include right angle and end launch configurations. They are available in all common rectangular waveguide sizes, covering frequencies from DC to 50 GHz. They adapt to 2.4mm, 2.92mm, 3.5mm, 7mm, type N and SMA coaxial connector types.

If you require an adapter not listed in this catalog, please contact our Sales Department or your local Maury representative. Special adapters in large waveguide sizes such as WR975 (0.76 to 1.15 GHz), in uncommon sizes (e.g.: WR102), and in half-height waveguide can also be provided. We can also provide units with less common connectors such as SC, 14mm (GR900) and EIA rigid line (7/8, 1-5/8, etc.). Other special adapters have been built for space flight environments.

Description

Maury end launch adapters feature low VSWR and low insertion loss. Except where noted, flanges are in accordance with the listing on page 149. Most of the adapters shown incorporate precision index holes in the flange for precise mating alignment and connection repeatability. Please contact us for detailed flange interface information.

Specifications

Frequency Range . . . . . 1.7 – 40.0 GHz
(in waveguide bands)

Maximum VSWR . . . . . 1.25 (<1.15 typical) to 18.0 GHz
1.30 (< 1.20 typical) to 50.0 GHz

Flanges . . . . . Cover Type, see page 149

VSWR Options

Improved VSWR is provided on adapters with a numeric suffix to the model number (e.g.,X230A1).

Model Suffix	Maximum VSWR
2	1.05
8	1.07
1	1.10
6	1.15
3	1.20
7	1.25

Many adapters can be provided with improved VSWR over their full or partial waveguide bands. Our Sales Department will gladly assist you with this and other application specific requirements. Information on specific models such as loss, power handling and dimensions will be provided on request.

E229A1
WR229-to-7mm

H229A2
WR112-to-7mm

K233B8
WR42 -to-2.92mm
Male

U237A1
WR28 -to-2.4mm
Female

Waveguide To Coaxial Adapters — End Launch

Available Models

End Launch EIA WR to 2.4mm, 2.92mm, and 3.5mm Connectors

FREQUENCY RANGE (GHz)	EIA WR NUMBER	MODEL (BY COAXIAL CONNECTOR TYPE)					
		2.4mm female	2.4mm male	2.92mm female	2.92mm male	3.5mm female	3.5mm male
1.70 – 2.60	430	—	—	—	—	—	—
2.60 – 3.95	284	—	—	—	—	—	—
3.30 – 4.90	229	—	—	—	—	E230A1	E230B1
3.95 – 5.85	187	—	—	—	—	G230A1	G230B1
4.90 – 7.05	159	—	—	—	—	—	—
5.85 – 8.20	137	—	—	—	—	C230A1	C230B1
7.05 –10.00	112	—	—	—	—	H230A1	H230B1
8.20 –12.40	90	—	—	—	—	X230A1	X230B1
10.00 –15.00	75	—	—	—	—	M230A1	M230B1
12.40 –18.00	62	—	—	—	—	P230A2	P230B2
15.00 –22.00	51	—	—	—	—	N230A3	N230B3
18.00 – 26.50	42	K237A2	K237B2	K233A8	K233B8	K230A6	K230B6
22.00 – 33.00	34	Q237A2	Q237B2	—	—	—	—
26.50 –40.00	28	U237A1	U237B1	U233A1	U233B1	U230A7 [1]	U230B7 [1]
33.00 –50.00	22	J237A6	J237B6	—	—	—	—

End Launch EIA WR to SMA, 7mm, and Type N Connectors

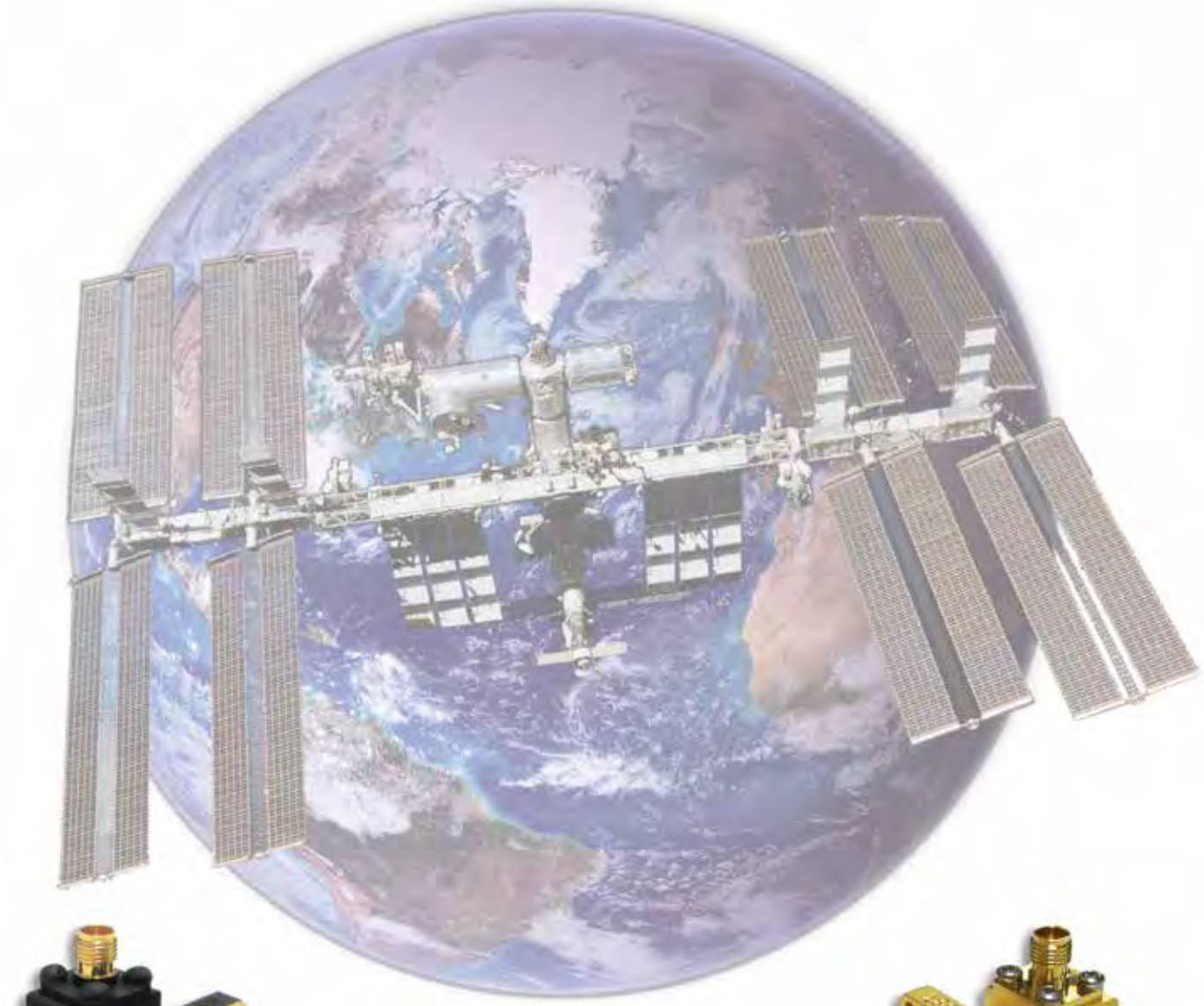
FREQUENCY RANGE (GHz)	EIA WR NUMBER	MODEL (BY COAXIAL CONNECTOR TYPE)				
		SMA female [2]	SMA male [2]	7mm	Type N female	Type N male
1.70 – 2.60	430	—	—	R229A1	R221A	R221B
2.60 – 3.95	284	—	—	S229A1	S221A1	S221B1
3.30 – 4.90	229	—	—	E229A1	E221A1	E221B1
3.95 – 5.85	187	—	—	G229C1	G221A1	G221B1
4.90 – 7.05	159	—	—	F229C1	F221A1	F221B1
5.85 – 8.20	137	—	—	C229A1	C221A1	C221B1
7.05 – 10.00	112	—	—	H229A2	H221A	H221B
8.20 – 12.40	90	—	—	X229A2	X221A2	X221B2
10.00 – 15.00	75	—	—	M229A2	M221A2	M221B2
12.40 – 18.00	62	P223A	P223B	P229A2	P221A2	P221B2
15.00 – 22.00	51	—	—	—	—	—
22.00 – 33.00	34	—	—	—	—	—
18.00 – 26.50	42	—	—	—	—	—
26.50 –40.00	28	—	—	—	—	—

[1] 3.5mm WR28 models are rated to 34 GHz. Use 2.92mm adapters, which are mating compatible, for full band coverage.

[2] Use 3.5mm adapters in bands not covered.

Space Qualified Adapters

Maury Microwave offers an extensive line of precision Space Qualified waveguide-to-coaxial adapters for use in satellite communications and other space applications. Our unique designs, special materials, plating and coating processes, enable us to produce adapters that operate with optimum performance and reliability under the extreme conditions encountered in space. Maury Space Qualified adapters are available in right angle and end launch versions and can be provided in many waveguide size and connector configurations. Weight-saving designs, custom flanges and beadless versions for harsh radiation exposure are also available, with full band or optimized narrow band performance ranges. These adapters can be qualified under Group A/B/C environmental testing, including Thermal Shock, Vibration, Operating Temperature Extremes, and EMI — all tailored to your exact specifications. Please call our Sales Department for more information.



N232P01

N233P01

N233P02

N234P02

Waveguide Transmission Lines and Test Port Adapters

Straight Sections and Transitions

Description

Maury produces waveguide components in many EIA WR sizes. A comprehensive line of standard rectangular products is available in the sizes shown below. They are generally supplied with cover flanges. Units from R through P bands are normally aluminum construction with irridite finish; K band and above are copper alloy with a plated finish. All units are painted with highly durable paint, or other special order finishes. Maury can provide waveguide devices with any flange type, material or finish you require. Special waveguide devices in millimeter sizes from 18 to 110 GHz (WR62 to WR10), large waveguides (WR430), and many special configurations such as: flatguide, reduced height, round, etc. can also be provided.

U103A1.375

V106B

Rectangular Transmission Lines

MODEL	FREQUENCY RANGE (GHz)			LENGTH [1] INCHES	(CM)
S102A12 [2]	2.60	—	3.95	12.00	(30.5)
G102A8 [2]	3.95	—	5.85	8.00	(20.3)
C101A8 [3]	5.85	—	8.20	8.00	(20.3)
H101A6 [3]	7.05	—	10.00	6.00	(15.2)
X101A6 [3]	8.20	—	12.40	6.00	(15.2)
M102A6 [2]	10.00	—	15.00	6.00	(15.2)
P101A6 [3]	12.40	—	18.00	6.00	(15.2)
N102A4 [2]	15.00	—	22.00	4.00	(10.2)
K101A4 [3]	18.00	—	26.50	4.00	(10.2)
U101A4 [3]	26.50	—	40.00	4.00	(10.2)
Q102A4 [2]	22.00	—	33.00	4.00	(10.2)

Millimeter Wave Test Port Adapters (Straight Sections)

MODEL	FREQUENCY RANGE (GHz)			LENGTH [1] INCHES	(CM)
U103A1.375	26.5	—	40.0	1.375	(3.51)
J115B1	33.0	—	50.0	1.97	(5.00)
T115B	40.0	—	60.0	1.97	(5.00)
V115C	50.0	—	75.0	1.50	(3.81)
Y115B	60.0	—	90.0	1.97	(5.00)
Z115A	75.0	—	110.0	1.375	(3.51)

Millimeter Waveguide Transmission Lines

MODEL	FREQUENCY RANGE (GHz)			LENGTH [1] INCHES	(CM)
J106B [4]	33.0	—	50.0	1.96	(5.0)
V106B [4]	50.0	—	75.0	1.96	(5.0)
T106B [5]	40.0	—	60.0	1.96	(5.0)
Y106B [5]	60.0	—	90.0	1.96	(5.0)
Z106B [5]	75.0	—	110.0	1.96	(5.0)

Rectangular to Rectangular Waveguide Stepped Transitions – Overlapping Bands

MODEL	FREQUENCY RANGE (GHz) AND MAXIMUM VSWR				EIA WAVEGUIDE SIZES SIDE A	SIDE B	EQUIVALENT FLANGES SIDE A	SIDE B	LENGTH [1] INCHES	(CM)
H161C	8.20	—	10.00	≤ 1.05	112	90	CPR112F	UG39/U	1.5	(3.8)
X161	10.00	—	12.40	≤ 1.05	90	75	UG39/U	MPF75	2.4	(6.1)
M161	12.40	—	15.00	≤ 1.05	75	62	MPF75	UG419/U	2.4	(6.1)

[1] Other lengths can be provided. Please specify when ordering.
[2] Aluminum construction.
[3] Brass plated construction.
[4] Precision aluminum straight sections.
[5] To request straight sections made out of solid aluminum, specify band, length, and 104 series.

Waveguide Flange Adapters

In-Band – Minimum Length

Description

Maury series 166 are unique precision waveguide flange adapters for converting flanges from one type to another type in the same waveguide band and introducing a minimum of insertion length. A summary of the basic model types of adapters available in this series may be found in Maury data sheet 3A-166. This data sheet also lists the contents of the specific hardware kit that is supplied with each model type (except K and U bands).

These flange adapters are designed for both laboratory and system applications. They provide a convenient and precise method for converting equipment from one type flange to another for either temporary or permanent installations. Due to the precision manufacturing techniques utilized, the reflection introduced by these adapters is 1.01. Each adapter is provided with special mounting hardware and installation instructions, (except models in K and U bands).

Available Models

MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE (GHz)	TYPICAL VSWR	EIA WR NUMBER	OVERALL LENGTH INCHES	OVERALL LENGTH (CM)
S166B	CPR284F	UG53/U	2.60 — 3.95	1.01	284	0.50	(1.3)
E166C	CPR229F	CMR229	3.30 — 4.90	1.01	229	0.50	(1.3)
E166D	CMR229	CPR229	3.30 — 4.90	1.01	229	0.50	(1.3)
G166A	UG149A/U	CPR187F	3.95 — 5.85	1.01	187	0.50	(1.3)
F166C	CPR159	CPR159	4.90 — 7.05	1.01	159	0.75	(1.9)
F166D	CMR159	CPR159F	4.90 — 7.05	1.01	159	0.75	(1.9)
C166A	UG344/U	CPR137F	5.85 — 8.20	1.01	137	0.50	(1.3)
C166B	CPR137F	UG344/U	5.85 — 8.20	1.01	137	0.50	(1.3)
C166D	CMR137	CPR137F	5.85 — 8.20	1.01	137	0.75	(1.9)
C166E	UG344/U	CMR137	5.85 — 8.20	1.01	137	0.50	(1.3)
H166A	UG51/U	CPR112F	7.05 — 10.00	1.01	112	0.50	(1.3)
H166B	CPR112F	UG51/U	7.05 — 10.00	1.01	112	0.50	(1.3)
H166C	CPR112F	CMR112	7.05 — 10.00	1.01	112	0.75	(1.9)
H166D	CMR112	CPR112F	7.05 — 10.00	1.01	112	0.75	(1.9)
H166E	UG51/U	CMR112	7.05 — 10.00	1.01	112	0.50	(1.3)
H166F	CMR112	UG51/U	7.05 — 10.00	1.01	112	0.50	(1.3)
X166A	UG39/U	CPR90F	8.20 — 12.40	1.01	90	0.50	(1.3)
X166B	CPR90F	UG39/U	8.20 — 12.40	1.01	90	0.50	(1.3)
X166D	CMR90	CPR90F	8.20 — 12.40	1.01	90	0.75	(1.9)
X166E	UG39/U	CMR90	8.20 — 12.40	1.01	90	0.50	(1.3)
X166F	CMR90	UG39/U	8.20 — 12.40	1.01	90	0.50	(1.3)
K166G	UG595U	UG425U	18.00 — 26.50	1.01	42	0.50	(1.3)
U166G	UG599/U	UG381/U	26.50 — 40.00	1.01	28	0.50	(1.3)

Key Literature: Maury data sheet 3A-166.

Waveguide Flange Information

Maury Precision Flanges (MPF)

Description

Maury MPF flanges are designed to provide precise mating of flanges when repeated connections are required or in systems where optimum waveguide alignment is critical. Some MPF series flanges also allow mating to more than one type of flange interface, which amplifies their versatility and economy when mating different flange types within a band. Please refer to the "mates with" column in the chart below to see the possible combinations.

MPF flanges are provided on components used in Maury calibration kits or on low VSWR components such as waveguide to coax adapters with VSWR of 1.10 or better.

MPF flanges in WR22 and smaller waveguide (millimeter wave sizes) provide dramatic improvements in connection consistency, repeatability and serviceability versus standard UG flanges, while still maintaining mating compatibility with these older designs (see Maury data sheet 5E-030). As in larger waveguide sizes, these flanges have two precision index holes and slip-fit alignment pins. (Threaded pins may also be installed in the standard four-pin pattern when mating to standard UG flanges.

Both types of pins are removable, making the flange face available for servicing.)

MPF flanges also have a raised outer ring which prevents the mating surfaces from cocking due to uneven torque applied to the flange bolts. To obtain complete technical descriptions, please request the data sheets shown in the Maury Data Sheet column.

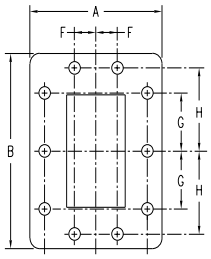
NOTE: All Maury MPF flanges have precision index holes. Corresponding slip-fit alignment pins are also available. Together, these ensure precise alignment and repeatable mating in waveguide connections. All Maury waveguide VNA calibration kit components come with MPF flanges. Alignment pins are available separately. See Maury data sheet 3A-996 for details.

Maury Precision Flange Reference Chart

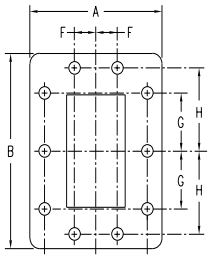
BAND	EIA WR NUMBER	MPF DESIGNATION	MATES WITH	MAURY DATA SHEET
L	650	MPF650	UG417A/U (without groove)	—
R	430	MPF430	UG435/U (without groove)	5E-016
D	340	MPF340	CPR340F	—
S	284	MPF284	UG53/U, UG54A/U, CPR284	5E-002
S	284	MPF284B	UG53/U, UG54A/U, CPR284, CMR284	5E-002A
S	284	MPF284C	UG53/U, UG54A/U	5E-002B
E	229	MPF229	CPR229, CMR229	5E-003
E	229	MPF229B	CPR229	5E-003A
G	187	MPF187	UG149A/U, UG148B/U, CPR187	5E-004
G	187	MPF187C	UG149A/U, UG148B/U	5E-004A
F	159	MPF159	CPR159, CMR159	5E-011
F	159	MPF159B	CPR159	5E-011A
C	137	MPF137	UG344/U, UG343A/U, CPR137	5E-005
C	137	MPF137C	UG344/U, UG343A/U	5E-005A
H	112	MPF112	UG51/U, UG138/U, CPR112F & G	5E-001
H	112	MPF112B	UG51/U, UG52/U	5E-001A
H	112	MPF112C	UG51/U, UG52/U, CMR112	5E-001C
HS	102	MPF102	UG1493	5E-014
X	90	MPF90	UG39/U, UG40A/U, CPR90	5E-006
X	90	MPF90A	UG39/U, UG40A/U, CMR90	5E-006
X	90	MPF90B	UG39/U, UG40A/U	5E-006A
M	75	MPF75A & B	M3922/70-004 & -005	5E-007
P	62	MPF62	UG419/U, UG541A/U	5E-008
N	51	MPF51A & B	M3922/70-010, -011, -012, -022, -023, -024	5E-012
N	51	MPF51C	Agilent Type, UBR180	5E-013
K	42	MPF42	UG595/U, UG596/U	5E-009
Q	34	MPF34	UG595U, UG596/U, UG1530/U	5E-019
U	28	MPF28	UG599/U, UG600/U	5E-010
J	22	MPF22	UG383/U	5E-030
T	19	MPF19	UG383/U-M	5E-030
V	15	MPF15	UG385/U	5E-031
Y	12	MPF12	UG387/U	5E-031
Z	10	MPF10	UG38&/U-M	5E-031

Standard Waveguide Flange Specifications

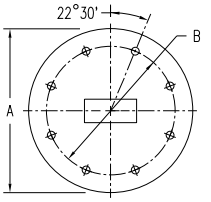
WR650	WG6	R14
UG417A/U (without groove)		
Dimensions	inches	mm
A	5.44	138.18
B	8.69	220.73
E	2.31	58.69
F	1.25	31.73
G	2.37	60.30
H	3.94	100.00
Hole Dia.	0.330 [1]	8.20



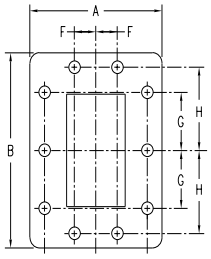
WR430	WG8	R22
UG435B/U (without groove)		
Dimensions	inches	mm
A	4.19	106.38
B	6.34	161.04
E	1.72	43.69
F	0.94	23.83
G	1.79	45.39
H	2.79	70.99
Hole Dia.	0.257 [1]	6.71



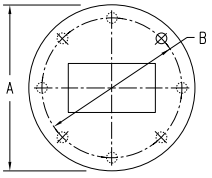
WR284	WG10	R32
UG53/U		
Dimensions	inches	mm
A	5.31	134.87
B	4.75	120.65
Hole Dia.	0.257 [1]	6.50



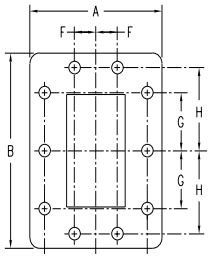
WR229	WG11A	R40
CPR229F	UDR40	
Dimensions	inches	mm
A	2.76	70.20
B	3.89	98.73
E	1.05	26.67
F	0.50	12.70
G	1.07	27.18
H	1.62	41.15
Hole Dia.	0.257 [1]	6.50



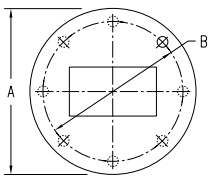
WR187	WG12	R48
UG149/U	UAR48	
Dimensions	inches	mm
A	3.64	92.33
B	3.25	82.55
Hole Dia.	0.330 [1]	5.13



WR159	WG13	R58
CPR159	UDR58	
Dimensions	inches	mm
A	2.44	61.98
B	3.18	80.77
E	0.88	22.35
F	0.38	9.53
G	0.50	12.70
H	1.27	32.26
Hole Dia.	0.257 [1]	6.50



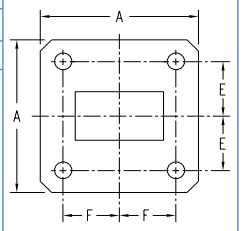
WR137	WG14	R70
UG344/U	UAR70	
Dimensions	inches	mm
A	3.13	79.50
B	2.75	69.85
Hole Dia.	0.199 [1]	5.16



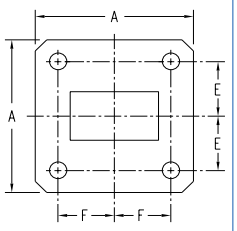
[1] English and metric hole sizes may differ slightly.

Standard Waveguide Flange Specifications

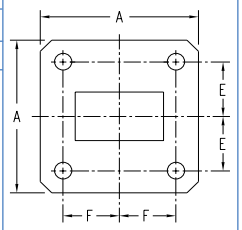
WR112	WG15	R84
UG51/U	UBR84	
Dimensions	inches	mm
A	1.875 [1]	47.90
E	0.737	18.72
F	0.676	17.17
Hole Dia.	0.169 [2]	4.255



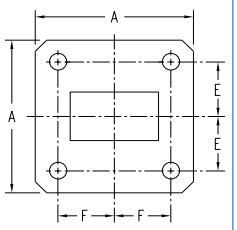
WR90	WG16	R100
UG39/U	UBR100	
Dimensions	inches	mm
A	1.625 [1]	41.40
E	0.640	16.26
F	0.610	15.49
Hole Dia.	0.169 [2]	4.255



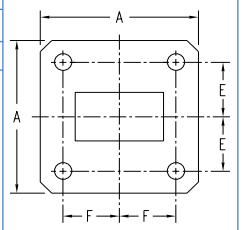
WR75	WG17	R120
COM'L	UBR120	
Dimensions	inches	mm
A	1.50 [1]	38.83
E	0.561	14.25
F	0.520	13.21
Hole Dia.	0.144 [2]	4.085



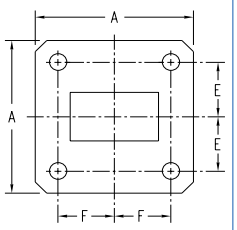
WR62	WG18	R140
UG419/U	UBR140	
Dimensions	inches	mm
A	1.31 [1]	33.30
E	0.478	12.14
F	0.497	12.63
Hole Dia.	0.144 [2]	4.085



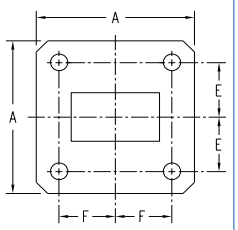
WR51	WG19	R180
COM'L		
Dimensions	inches	mm
A	1.31 [1]	33.27
E	0.497 [1]	12.62
F	0.478 [1]	12.14
Hole Dia.	0.144 [2]	3.658



WR42	WG20	R220
UG595/U	UBR220	
Dimensions	inches	mm
A	0.875 [1]	22.23
E	0.335	8.51
F	0.320	8.13
Hole Dia.	0.116 [2]	3.07



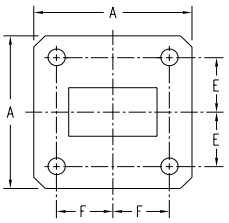
WR34	WG21	R260
UG1530		
Dimensions	inches	mm
A	0.875 [1]	22.41
E	0.335 [1]	8.51
F	0.320 [1]	8.13
Hole Dia.	0.116 [2]	3.07



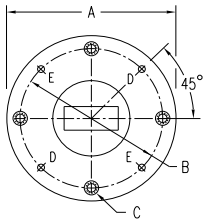
[1] CAUTION: U.S. MIL and commercial flange dimensions differ from IEC flanges.
[2] English and metric hole sizes may differ slightly.

Standard Waveguide Flange Specifications

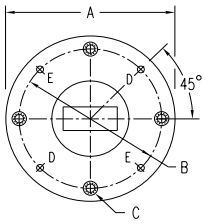
WR28	WG22	R320
UG599/U		
Dimensions	inches	mm
A	0.75	19.05
E	0.265	6.73
F	0.250	6.35
Hole Dia.	0.116	2.98



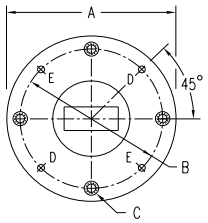
WR22	WG23	R400
UG383/U		
Dimensions	inches	mm
A	1.13	28.85
B	0.94	23.81
C Holes	4-40 UNC-2B	
D Holes	0.063	1.613
E Dowels	0.061	1.555



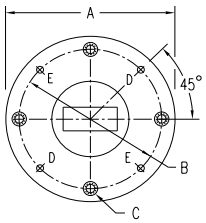
WR19	WG24	R500
UG383/U-M		
Dimensions	inches	mm
A	1.13	28.85
C Holes	4-40 UNC-2B	
D Holes	0.063	1.613
E Dowels	0.061	1.555
All Holes	0.938	23.81



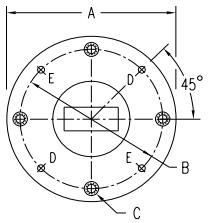
WR15	WG25	R620
UG385/U		
Dimensions	inches	mm
A	0.750	19.05
B	0.563	14.29
C Holes	4-40 UNC-2B	
D Holes	0.063	1.613
E Dowels	0.061	1.555



WR12	WG26	R740
UG387/U		
Dimensions	inches	mm
A	0.750	19.05
B	0.563	14.29
C Holes	4-40 UNC-2B	
D Holes	0.063	1.613
E Dowels	0.061	1.555
All Holes	0.563	14.29



WR10	WG27	R900
UG387/U-M		
Dimensions	inches	mm
A	0.750	19.05
B	0.563	14.29
C Holes	4-40 UNC-2B	
D Holes	0.063	1.613
E Dowels	0.061	1.555
All Holes	0.563	14.29



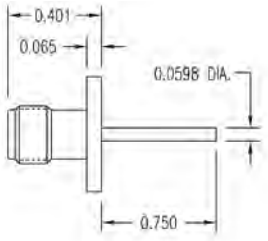
3.5mm Panel Mount, Suspended Stripline, and Micro-Strip Launch Connectors

8002 and 8004 Series

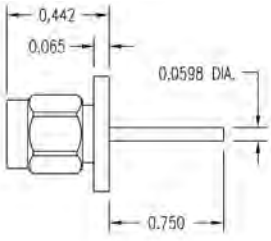
Panel Mount Connectors

The 8002A and 8002B are 3.5mm panel mount connectors in a four-hole mounting configuration. Ordering Option 1 converts these to two-hole mounting. The rear part of the center conductor can be removed for machining and a set of five spare center conductors, 8002C, is available.

8002A Female



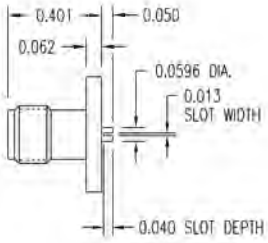
8002B Male



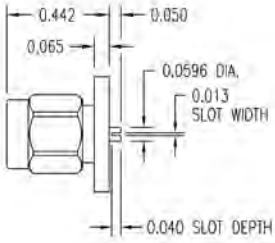
Suspended Stripline Connectors

The 8002D and 8002E are designed for use with suspended stripline circuits utilizing 0.010 thick dielectric with 1/2 ounce copper on both sides (0.012 inch nominal thickness). 8002D and 8002E are provided with the 4-Hole flange configuration only.

8002D Female



8002E Male

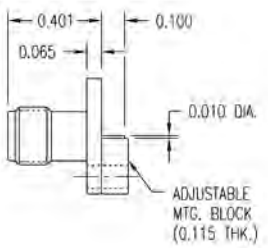


Micro-Strip Connectors

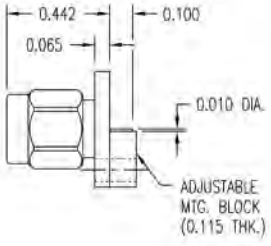
The 8004 series connectors are designed for use with micro-strip circuits and include a transformer from 3.5mm to a 0.01-inch pin diameter launch. Three basic panel mount configurations are available: Mounting Block, Dielectric Feed Thru, and Bushing Feed Thru. Mounting Block and Dielectric Feed Thru versions (8004A, 8004B, 8004C and 8004D) are available in both 4-Hole flange and 2-Hole flange configurations. 8004E and 8004F Bushing Feed Thru versions are only available with the 4-Hole flange.

Mounting Block Configuration

8004A Female

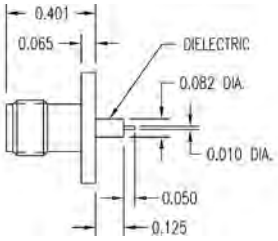


8004B Male

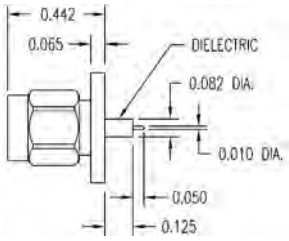


Dielectric Feed Thru Configuration

8004C Female

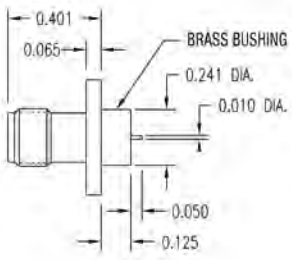


8004D Male

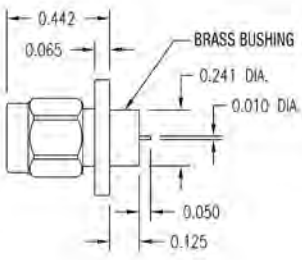


Bushing Feed Thru Configuration

8004E Female



8004F Male

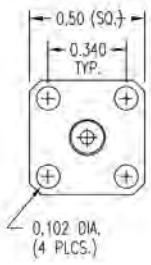


Ordering Flange Configurations

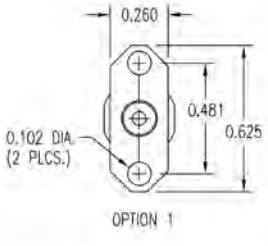
When placing your order be sure to indicate which flange configuration you need. The default configuration is the 4-hole flange, which is standard for all 8002 and 8004 models.

A 2-Hole flange option is available for 8002 and 8004 models except 8002D, 8002E, 8004A, 8004B, 8004E and 8004F. To order connectors with the 2-Hole flange, indicate that you are ordering Option 1 by adding a numeral 1 after the model number.

4-Hole Flange



2-Hole Flange (Option 1)



Test Essentials™ Maury Microwave

ColorConnect™ Maury Microwave

Shop Online for Test Essentials™ Lab Adapters & ColorConnect™ Precision Adapters Online at the Maury Store:

(http://www.maurymw.com/store)

At-A-Glance Performance Comparison

Test Essentials™ Lab Adapters

Test Essentials™ Lab Adapters have been designed for daily use in microwave/RF labs and production facilities and offer one of the industry's best price/performance ratios. Test Essentials™ Lab Adapters feature excellent electrical performance, rugged construction for durability, repeatable mating and high reliability. Test Essentials™ Lab Adapters are available in SMA, N, 3.5mm, 2.92mm, 2.4mm and 1.85mm in-series and between-series configurations.

ColorConnect™ Precision Adapters

ColorConnect™ Precision Adapters have been designed for lab and field use where quality, performance, ease-of-identification and ease-of-use are critical. New manufacturing techniques have given ColorConnect™ Precision Adapters improved VSWR specifications bridging the gap between calibration-grade metrology adapters and daily-use lab adapters. Following the proposed IEEE high-frequency connector/adapter color convention, ColorConnect™ Precision Adapters are the first commercially available products to offer clear indications of compatibility and intermatability. ColorConnect™ makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible adapters. ColorConnect™ Precision Adapters are available in N Type, 3.5mm, 2.92mm, 2.4mm and 1.85mm in-series and between-series.

Calibration-Grade (Metrology) Adapters

Maury Microwave's comprehensive line of calibration-grade (metrology) adapters (see page 118) have been designed as an integral part of its renowned Vector Network Analyzer (VNA) Calibration Kits and are also available separately where calibration-grade precision is demanded. In-series and between series coaxial adapters are available for all precision laboratory measurement connectors – 1.85mm, 2.4mm, 2.92mm (K), 3.5mm, 7mm, 14mm, 7-16, etc.; all common systems connectors – type N, TNC, etc.; and several special purpose connector series such as EIA 7/8 rigid line connectors. See pages 118-141 for detailed product descriptions.

Maury Coaxial Adapter Solutions

Connector 1	Connector 2	VSWR		
		Test Essentials™		Metrology
		Lab Adapters	ColorConnect™ Precision Adapters	Calibration-Grade Adapters
SMA (F)	SMA (F)	1.15	1.15	—
SMA (M)	SMA (M)	1.15	1.15	—
SMA (M)	SMA (F)	1.15	1.15	—
SMA (F)	N (F)	1.15	1.15	—
SMA (M)	N (M)	1.15	1.15	—
SMA (F)	N (M)	1.15	1.15	—
SMA (M)	N (F)	1.15	1.15	—
N (F)	N (F)	1.20	1.15	1.09
N (M)	N (M)	1.20	1.15	1.09
N (M)	N (F)	1.20	1.15	1.09
3.5mm (F)	N (F)	1.15	1.14	1.13
3.5mm (M)	N (M)	1.15	1.14	1.13
3.5mm (F)	N (M)	1.15	1.14	1.13
3.5mm (M)	N (F)	1.15	1.14	1.13
3.5mm (F)	3.5mm (F)	1.20	1.12	1.08
3.5mm (M)	3.5mm (M)	1.20	1.12	1.08
3.5mm (M)	3.5mm (F)	1.20	1.12	1.08
2,4mm (F)	3.5mm (F)	1.15	1.10	1.08
2.4mm (M)	3.5mm (M)	1.15	1.10	1.08
2.4mm (F)	3.5mm (M)	1.15	1.10	1.08
2.4mm (M)	3.5mm (F)	1.15	1.10	1.08
2.92mm (F)	2.92mm (F)	1.17	1.14	1.12
2.92mm (M)	2.92mm (M)	1.17	1.14	1.12
2.92mm (M)	2.92mm (F)	1.17	1.14	1.12
2.4mm (F)	2.92mm (F)	1.17	1.14	1.12
2.4mm (M)	2.92mm (M)	1.17	1.14	1.12
2.4mm (F)	2.92mm (M)	1.17	1.14	1.12
2.4mm (M)	2.92mm (F)	1.17	1.14	1.12
2,4mm (F)	2,4mm (F)	1.22	1.17	1.15
2.4mm (M)	2.4mm (M)	1.22	1.17	1.15
2.4mm (M)	2.4mm (F)	1.22	1.17	1.15
1.85mm (F)	1.85mm (F)	1.30	1.20	1.15
1.85mm (M)	1.85mm (M)	1.30	1.20	1.15
1.85mm (M)	1.85mm (F)	1.30	1.20	1.15

Two New Maury Coaxial Adapter Solutions

Test Essentials™ Lab Adapters — In-Series

Test Essentials™ ColorConnect™ Adapters — In-Series

Available Models

Test Essentials™ Lab Adapters				
Model	**Connector 1**	**Connector 2**	**Frequency**	**VSWR**
TE-A-SMA-FF	SMA Female	SMA Female	DC – 18.0	1.15
TE-A-SMA-MM	SMA Male	SMA Male	DC – 18.0	1.15
TE-A-SMA-MF	SMA Male	SMA Female	DC – 18.0	1.15
TE-A-SMAN-FF	SMA Female	N Female	DC – 18.0	1.15
TE-A-SMAN-MM	SMA Male	N Male	DC – 18.0	1.15
TE-A-SMAN-FM	SMA Female	N Male	DC – 18.0	1.15
TE-A-SMAN-MF	SMA Male	N Female	DC – 18.0	1.15
TE-A-N-FF	N Female	N Female	DC – 18.0	1.20
TE-A-N-MM	N Male	N Male	DC – 18.0	1.20
TE-A-N-MF	N Male	N Female	DC – 18.0	1.20
TE-A-35N-FF	3.5mm Female	N Female	DC – 18.0	1.15
TE-A-35N-MM	3.5mm Male	N Male	DC – 18.0	1.15
TE-A-35N-FM	3.5mm Female	N Male	DC – 18.0	1.15
TE-A-35N-MF	3.5mm Male	N Female	DC – 18.0	1.15
TE-A-35-FF	3.5mm Female	3.5mm Female	DC – 26.5	1.20
TE-A-35-MM	3.5mm Male	3.5mm Male	DC – 26.5	1.20
TE-A-35-MF	3.5mm Male	3.5mm Female	DC – 26.5	1.20
TE-A-2435-FF	2.4mm Female	3.5mm Female	DC – 26.5	1.15
TE-A-2435-MM	2.4mm Male	3.5mm Male	DC – 26.5	1.15
TE-A-2435-FM	2.4mm Female	3.5mm Male	DC – 26.5	1.15
TE-A-2435-MF	2.4mm Male	3.5mm Female	DC – 26.5	1.15
TE-A-292-FF	2.92mm Female	2.92mm Female	DC – 40.0	1.17
TE-A-292-MM	2.92mm Male	2.92mm Male	DC – 40.0	1.17
TE-A-292-MF	2.92mm Male	2.92mm Female	DC – 40.0	1.17
TE-A-24292-FF	2.4mm Female	2.92mm Female	DC – 40.0	1.17
TE-A-24292-MM	2.4mm Male	2.92mm Male	DC – 40.0	1.17
TE-A-24292-FM	2.4mm Female	2.92mm Male	DC – 40.0	1.17
TE-A-24292-MF	2.4mm Male	2.92mm Female	DC – 40.0	1.17
TE-A-24-FF	2,4mm Female	2.4mm Female	DC – 50.0	1.22
TE-A-24-MM	2.4mm Male	2.4mm Male	DC – 50.0	1.22
TE-A-24-MF	2.4mm Male	2.4mm Female	DC – 50.0	1.22
TE-A-185-FF	1.85mm Female	1.85mm Female	DC – 65.0	1.30
TE-A-185-MM	1.85mm Male	1.85mm Male	DC – 65.0	1.30
TE-A-185-MF	1.85mm Male	1.85mm Female	DC – 65.0	1.30

Available Models

ColorConnect™ Precision Adapters				
Model	**Connector 1**	**Connector 2**	**Frequency**	**VSWR**
CC-A-SMA-FF	SMA Female	SMA Female	DC – 18.0	1.15
CC-A-SMA-MF	SMA Male	SMA Female	DC – 18.0	1.15
CC-A-SMA-MM	SMA Male	SMA Male	DC – 18.0	1.15
CC-A-N-FF	N Female	N Female	DC – 18.0	1.15
CC-A-N-MM	N Male	N Male	DC – 18.0	1.15
CC-A-N-MF	N Male	N Female	DC – 18.0	1.15
CC-A-35N-FF	3.5mm Female	N Female	DC – 18.0	1.14
CC-A-35N-MM	3.5mm Male	N Male	DC – 18.0	1.14
CC-A-35N-FM	3.5mm Female	N Male	DC – 18.0	1.14
CC-A-35N-MF	3.5mm Male	N Female	DC – 18.0	1.14
CC-A-35-FF	3.5mm Female	3.5mm Female	DC – 26.5	1.12
CC-A-35-MM	3.5mm Male	3.5mm Male	DC – 26.5	1.12
CC-A-35-MF	3.5mm Male	3.5mm Female	DC – 26.5	1.12
CC-A-2435-FF	2.4mm Female	3.5mm Female	DC – 26.5	1.10
CC-A-2435-MM	2.4mm Male	3.5mm Male	DC – 26.5	1.10
CC-A-2435-FM	2.4mm Female	3.5mm Male	DC – 26.5	1.10
CC-A-2435-MF	2.4mm Male	3.5mm Fem	DC – 26.5	1.10
CC-A-292-FF	2.92mm Female	2.92mm Female	DC – 40.0	1.14
CC-A-292-MM	2.92mm Male	2.92mm Male	DC – 40.0	1.14
CC-A-292-MF	2.92mm Male	2.92mm Female	DC – 40.0	1.14
CC-A-24292-FF	2.4mm Female	2.92mm Female	DC – 40.0	1.14
CC-A-24292-MM	2.4mm Male	2.92mm Male	DC – 40.0	1.14
CC-A-24292-FM	2.4mm Female	2.92mm Male	DC – 40.0	1.14
CC-A-24292-MF	2.4mm Male	2.92mm Female	DC – 40.0	1.14
CC-A-24-FF	2,4mm Female	2,4mm Female	DC – 50.0	1.17
CC-A-24-MM	2.4mm Male	2.4mm Male	DC – 50.0	1.17
CC-A-24-MF	2.4mm Male	2.4mm Female	DC – 50.0	1.17
CC-A-185-FF	1.85mm Female	1.85mm Female	DC – 65.0	1.20
CC-A-185-MM	1.85mm Male	1.85mm Male	DC – 65.0	1.20
CC-A-185-MF	1.85mm Male	1.85mm Female	DC – 65.0	1.20

Proposed IEEE High-Frequency Connector/Adapter Color Convention
(Available with Maury ColorConnect™ Precision Adapters)

Test Port Cable Assemblies

Series 8944C, 8946C and 8948C

8946C25

Features

- *For VNA Applications*
- *Ruggedized Test Port Connectors*
- *For Use with 2.4mm, 2.92mm, 3.5mm, and 7mm Test Ports*
- *Coaxial Test Port to Waveguide Adapters Available*

Description

Maury 8944, 8946 and 8948 series test port cable assemblies and test port adapters replace multiple cables in various connector types with versatile and cost-effective alternatives. These cable assemblies extend the test ports of network analyzers, and have a rugged female and male test port connector at each end. They come in standard lengths of 25 or 38 inches and are extremely flexible while maintaining excellent phase and amplitude stability. The adapters also have a rugged test port connector on one side with a precision 2.4mm, 2.92mm, 3.5mm, 7mm, N, TNC or waveguide connector (EIA WR229 to WR28) on the other side. NMD to NMD adapters are also available. The adapters are sold separately. (See page 157.)

Available Models – Cable Assemblies

KIT MODEL	TYPE	CABLE LENGTH INCHES	(CM)	FREQUENCY RANGE (GHz)	CABLE O.D. (NOMINAL) INCHES	(CM)	BEND RADIUS (MINIMUM) INCHES	(CM)	NOMINAL IMPEDANCE
8946C25	NMD2.4mm	25.0	(63.5)	DC — 50.0	0.6	(1.524)	2.5	(6.35)	50 ohm
8946C38	NMD2.4mm	38.0	(96.5)						
8944C25	NMD3.5mm	25.0	(63.5)	DC — 26.5	0.6	(1.524)	2.5	(6.35)	50 ohm
8944C38	NMD3.5mm	38.0	(96.5)						
8948C25	7mm	25.0	(63.5)	DC — 18.0	0.6	(1.524)	2.5	(6.35)	50 ohm
8948C38	7mm	38.0	(96.5)						

Specifications (25-in. Length Cables)

Maury 8944, 8946 and 8948 series 25-inch test port cables have the following specifications:

Frequency Range:
- 8946 series . . . . . DC – 50.0 GHz
- 8944 series . . . . . DC – 26.5 GHz
- 8948 series . . . . . DC – 18.0 GHz

Insertion Loss (dB)*
- 8946 series . . . . . Typical: $0.02 + 0.34\sqrt{f} + 0.004f$
  Guaranteed: $0.65 + 0.38\sqrt{f} + 0.006f$
- 8944 & 8948 series . . . . . Typical: $0.02 + 0.19\sqrt{f} + 0.005f$
  Guaranteed: $0.39 + 0.19\sqrt{f} + 0.007f$

Return Loss (dB):
- 8946 series 15
- 8944 & 8948 series 18

Overall Phase Stability (degrees):* . . . . . Typical: $0.05(f)$
Guaranteed: $0.5 + 0.08(f)$

Overall Amplitude Stability (dB): . . . . . Typical: ≤0.03
Guaranteed: ≤0.08

Return Loss Stability (dB): . . . . . ≥40

Specifications (38-in. Length Cables)

Maury 8944, 8946 and 8948 series 38-inch test port cables have the following specifications:

Frequency Range:
- 8946 series . . . . . DC – 50.0 GHz
- 8944 series . . . . . DC – 26.5 GHz
- 8948 series . . . . . DC – 18.0 GHz

Insertion Loss (dB):*
- 8946 series . . . . . Typical: $0.02 + 0.52\sqrt{f} + 0.006f$
  Guaranteed: $0.65 + 0.57\sqrt{f} + 0.009f$
- 8944 & 8948 series . . . . . Typical: $0.02 + 0.29\sqrt{f} + 0.007f$
  Guaranteed: $0.39 + 0.29\sqrt{f} + 0.011f$

Return Loss (dB):
- 8946 series 15
- 8944 & 8948 series 18

Overall Phase Stability (degrees):* . . . . . Typical: $0.10(f)$
Guaranteed: $0.5 + 0.17(f)$

Overall Amplitude Stability (dB): . . . . . Typical: ≤0.05
Guaranteed: ≤0.15

Return Loss Stability (dB): . . . . . ≥40

* f = frequency in GHz.

Recommended Test Port Adapters

Adapter Specifications

Coaxial to Coaxial Test Port Adapter Specifications

ADAPTER MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE AND MAXIMUM VSWR (GHz)	NOMINAL IMPEDANCE	OVERALL LENGTH INCHES	(CM)
7909A1 [1]	NMD2.4mm female	2.4mm female	DC — 26.5 ≤ 1.10 26.5 — 40.0 ≤ 1.15 40.0 — 50.0 ≤ 1.20	50 ohm	1.51	(3.84)
7909A2 [1]	NMD2.4mm female	2.4mm male		50 ohm	1.48	(3.76)
7909B1	NMD2.4mm female	3.5mm female	DC — 10.0 ≤ 1.06 10.0 — 20.0 ≤ 1.10 20.0 — 34.0 ≤ 1.14	50 ohm	1.46	(3.71)
7909B2	NMD2.4mm female	3.5mm male		50 ohm	1.50	(3.81)
7909C	NMD2.4mm female	7mm	DC — 4.0 ≤ 1.05 4.0 — 12.0 ≤ 1.07 12.0 — 18.0 ≤ 1.10	50 ohm	2.16	(5.49)
7909D1	NMD2.4mm female	Type N female	DC — 4.0 ≤ 1.08 4.0 — 12.0 ≤ 1.12 12.0 — 18.0 ≤ 1.14	50 ohm	1.80	(4.57)
7909D2	NMD2.4mm female	Type N male		50 ohm	1.84	(4.67)
7909F1	NMD 2.4mm female	2.92mm (K) female	DC — 20.0 ≤ 1.10 20.0 — 40.0 ≤ 1.16	50 ohm	1.44	(3.66)
7909F2	NMD 2.4mm female	2.92mm (K) male		50 ohm	1.48	(3.76)
7909H	NMD 2.4mm female	NMD 3.5mm male	DC — 10.0 ≤ 1.06 10.0 — 20.0 ≤ 1.10 20.0 — 34.0 ≤ 1.14	50 ohm	1.49	(3.79)
8009A	NMD 3.5mm female	3.5mm female	DC — 18.0 ≤ 1.08 18.0 — 26.5 ≤ 1.12	50 ohm	1.45	(3.68)
8009B	NMD 3.5mm female	3.5mm male		50 ohm	1.49	(3.79)
2633C	NMD 3.5mm female	7mm	DC — 18.0 ≤ $1.018 + 0.003f$	50 ohm	1.86	(4.72)
8829A	NMD 3.5mm female	Type N female	DC — 6.0 ≤ 1.04 6.0 — 18.0 ≤ 1.08	50 ohm	2.04	(5.18)
8829B	NMD 3.5mm female	Type N male		50 ohm	2.20	(5.59)
2433A1	NMD 3.5mm female	14mm (GR900 equiv)	DC — 8.5 ≤ $1.01+0.008f$	50 ohm	2.32	(5.89)
8022A1	3.5mm female	7mm	DC — 4.0 ≤ 1.04 4.0 — 18.0 ≤ 1.08	50 ohm	1.67	(4.24)
8022B1	3.5mm male	7mm		50 ohm	1.67	(4.24)
2633A	7mm	7mm “female”	DC — 18.0 ≤ $1.004 + 0.003f$	50 ohm	1.62	(4.12)
2606C	7mm	Type N female	DC — 4.0 ≤ 1.03 4.0 — 9.0 ≤ 1.04 9.0 — 18.0 ≤ 1.07	50 ohm	1.51	(3.84)
2606D	7mm	Type N male		50 ohm	1.51	(3.84)
2622A1	7mm	TNC female	DC — 4.0 ≤ 1.05 4.0 — 18.0 ≤ 1.15	50 ohm	1.68	(4.26)
2622B	7mm	TNC male		50 ohm	1.55	(3.94)
2607A1	7mm	14mm (GR900 equiv)	DC — 8.5 ≤ $1.004 + 0.004f$	50 ohm	2.01	(5.10)

Waveguide to Coaxial Test Port Adapter Specifications

ADAPTER MODEL	ADAPTS SIDE A	ADAPTS SIDE B	FREQUENCY RANGE AND MAXIMUM VSWR (GHz)	EQUIVALENT FLANGE	OVERALL LENGTH INCHES	(CM)
E230K1 [2]	NMD3.5mm female	EIA WR229	3.3 — 4.9 ≤ 1.10	CPR229F	3.88	(9.86)
G230K1 [2]	NMD3.5mm female	EIA WR187	3.95 — 5.85 ≤ 1.10	UG149/U	3.88	(9.86)
F230K1	NMD3.5mm female	EIA WR159	4.9 — 7.05 ≤ 1.10	CPR159F	3.40	(8.64)
C230K1	NMD3.5mm female	EIA WR137	8.85 — 8.20 ≤ 1.10	UG344/U	3.13	(7.95)
H230K1	NMD3.5mm female	EIA WR112	7.05 — 10.0 ≤ 1.10	UG51/U	2.98	(7.57)
X230K1	NMD3.5mm female	EIA WR90	8.2 — 12.4 ≤ 1.10	UG39/U	2.73	(6.93)
M230K1	NMD3.5mm female	EIA WR75	10.0 — 15.0 ≤ 1.10	MPF75	2.63	(6.68)
P230K1	NMD3.5mm female	EIA WR62	12.4 — 18.0 ≤ 1.10	UG419/U	2.38	(6.05)
N230K3	NMD3.5mm female	EIA WR51	15.0 — 22.0 ≤ 1.20	MPF51	2.00	(5.08)
K230K6	NMD3.5mm female	EIA WR42	18.0 — 26.5 ≤ 1.15	UG595/U	1.80	(4.57)
U233E [3]	NMD2.92mm female	EIA WR28	26.5 — 40.0 ≤ 1.30	UG599/U	1.80	(4.57)

[1] 7909A1 and 7909A2 are phase matched for VNA applications.

[2] These Larger waveguide adapters should not be directly connected to test sets without support.

[3] Mates with the special (K) connector provided on Anritsu 360 VNA.

Stability™ Microwave/RF Cable Assemblies

Series SC-24, SC-292, SC-35 and SC-N

Features and Benefits

- *Amplitude and phase stable with flexure*
- *Reliable and repeatable measurements*
- *Durable, ruggedized, crush-resistant*
- *Longer flex life*
- *Also available in 2.92mm or 3.5mm Low-Profile and Thermal Vacuum configurations.*
- *Available in 90° Swept Angle configurations.*

Typical Applications

- *Vector network analyzers (VNAs)*
- *RF and microwave instruments*
- *Bench-top testing*
- *Probe station integrations*
- *RF production testing*
- *ATE systems*

Description

Maury Microwave's Stability™ series sets the standard for high-performance ruggedized cable assemblies. Designed specifically for phase-stable and amplitude-stable applications, Stability™ offers excellent measurement repeatability even after cable flexure. With a ruggedized, durable construction, Stability™ will outlast and outperform other assemblies resulting in a reduced total cost-of-test. Stability's™ light weight, superior flexibility and small form factor make it ideal for daily use with VNA's, test instruments, bench-top testing and ATE systems.

Stability™ cable assemblies are now part of the ColorConnect™ family! Following the proposed IEEE high-frequency connector/adapter color convention, Stability™ cable assemblies are the first commercially available assemblies to offer clear indications of compatibility and intermatability. ColorConnect™ makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible interconnects.

Stability™ Specifications

STABILITY™ Cable Type	Frequency	Typical Phase Stability with Flexure	Typical Amplitude Stability with Flexure
SC-24	50 GHz	±6.0°	±0.05 dB
SC-292	40 GHz	±5.0°	±0.05 dB
SC-35	26.5 GHz	±3.5°	±0.02 dB
SC-N	18.0 GHz	±2.0°	±0.015 dB

STABILITY™ SC-292-MM-36
Microwave/RF Cable Assembly

Cable Assembly Specifications

Electrical Properties [1]

STABILITY™ Cable Type	SC-24	SC-292	SC-35	SC-N
Maximum Frequency	50 GHz	40 GHz	26.5 GHz	18.0 GHz
VSWR	1.30 typ 1.43 max	1.25 typ 1.40 max	1.25 typ 1.35 max	1.25 typ 1.30 max
Typical Insertion Loss (cable only)	1.54 dB/ft	0.84 dB/ft	0.67 dB/ft	0.54 dB/ft
Impedance (nominal)	50 ohm	50 ohm	50 ohm	50 ohm
Phase Stability vs Bending [2]	±6° typ ±11.8° max	±5° typ ±9.5° max	±3.5° typ ±7.0° max	±2.0° typ ±4.5° max
Amplitude Stability vs Bending [3]	±0.05 dB typ ±0.08 dB max	±0.05 dB typ ±0.1 dB max	±0.02 dB typ ±0.04 dB max	±0.015 dB typ ±0.02 dB max
Phase Stability vs Temp	<4°/m/GHz (–55 ~+125°C)			
Velocity of Propagation	76% (nominal)			
Shielding Effectiveness	>90 dB (DC –18.0 GHz)			
Time Delay (nominal)	1.3ns/ft (4.4ns/m)			

[1] These specifications also apply to Stability™ Low-Profile (-LP) and Thermal Vacuum (-TVAC) cable assemblies (see page160).

[2] Per IEC 60966-1, section 8.6, method 1.

[3] Per IEC 60966-1, section 8.4.

Ordering Information

Part Number	Length [7]	Connector 1	Connector 2	Frequency
SC-24-MM-24	24 in.	2.4mm male	2.4mm male	50 GHz
SC-24-MM-36	36 in.			
SC-24-MM-48	48 in.			
SC-24-MM-60	60 in.			
SC-24-MM-78	78 in.			
SC-292-MM-24	24 in.	2.92mm male	2.92mm male	40 GHz
SC-292-MM-36	36 in.			
SC-292-MM-48	48 in.			
SC-292-MM-60	60 in.			
SC-292-MM-78	78 in.			
SC-35-MM-24	24 in.	3.5mm male	3.5mm male	26.5 GHz
SC-35-MM-36	36 in.			
SC-35-MM-48	48 in.			
SC-35-MM-60	60 in.			
SC-35-MM-78	78 in.			
SC-N-MM-24	24 in.	N male	N male	18 GHz
SC-N-MM-36	36 in.			
SC-N-MM-48	48 in.			
SC-N-MM-60	60 in.			
SC-N-MM-78	78 in.			

[7] Custom lengths are available by special order.

Mechanical/Environmental Properties

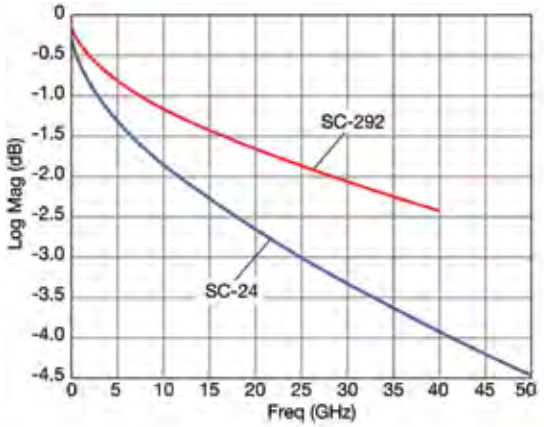
STABILITY™ Cable Type	SC-24, SC-292, SC-35 and SC-N	
Center Conductor Material	Silver-Plated Copper-Clad Steel	
Maximum Outer Diameter	SC-292/SC-35/SC-N 0.277 in (7.04mm)	SC-24 0.244 (6.20mm)
Nominal Weight	1.61 oz/ft (150g/m)	1.02 oz/ft (95g/m)
Min. Static Bend Radius / Min. Dynamic Bend Radius	1.0 in. (25.4mm) / 2.0 in. (50.8mm)	
Flex Life Cycles [4]	>20,000	
Crush Resistance	>254 lb/inch (44 kN/m)	
Operating Temperature Range	–67 ~ +257°F (–55 ~ +125°C)	
Fire Resistance [5]	Yes	
Abrasion Resistance [6]	Yes	
RoHS/REACH	Yes	

[4] Per IEC 60966-1, section 9.3.

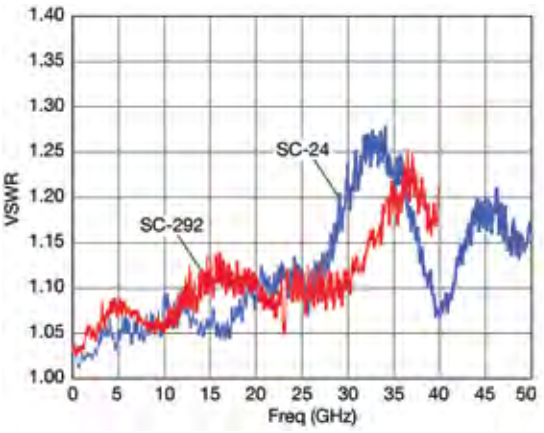
[5] Per MIL-C-87104.

[6] Per SAE AS5756.

Maury Stability™ 36" Cable Assembly Typical Insertion Loss

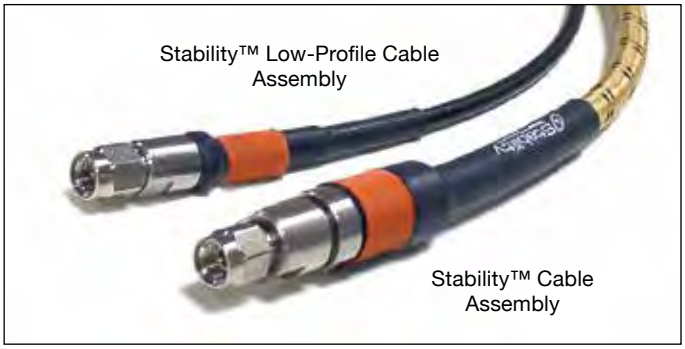


Maury Stability™ 36" Cable Assembly Typical VSWR



Stability™ Low-Profile Cable Assemblies (-LP)

Stability™ Low-Profile Cable Assemblies are designed for high-density applications such as switch matrices and PXI/PXIe/AXIe cards, as well as wafer-probe applications where traditional cable assemblies might cause interference due to cable and connector size. Stability™ Low-Profile Cable Assemblies offer the same electrical performance as Stability™ Microwave/RF Cable Assemblies in an configuration that is 44% smaller and 66% lighter, and are available with 3.5mm and 2.92mm connectors.



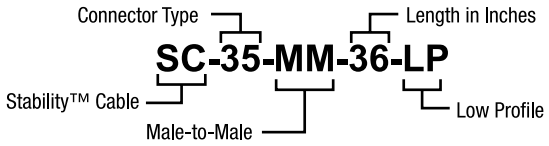
Mechanical/Environmental Properties (-LP)

STABILITY™ Cable Type	SC-292 and SC-35
Center Conductor Material	Silver-Plated Copper-Clad Steel
Maximum Outer Diameter	0.156 in (3.95mm)
Nominal Weight	0.54 oz/ft (50g/m)
Minimum Bend Radius	1.0 in. (25.4mm)
Flex Life Cycles[8]	>20,000
Crush Resistance	>23 lb/inch (4kN/m)
Operating Temperature Range	–67 ~ +257°F (–55 ~ +125°C)
Fire Resistance[9]	Yes
RoHS/REACH	Yes

[8] Per IEC 60966-1, section 9.3. [9] Per MIL-C-87104.

Ordering Instructions for Stability™ Low Profile (-LP) Cable Assemblies

To specify a Stability™ Low Profile Cable Assembly, add "-LP" at the end of the SC model number, as shown in the example at the right.

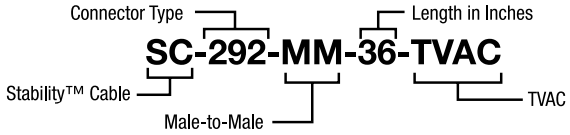


Stability™ Thermal Vacuum Cable Assemblies (-TVAC)

Stability™ TVAC Cable Assemblies have been designed for measurements in a thermal vacuum environment for space product testing. TVAC cable assemblies connect components or satellites located in thermal test chambers to systems and instruments outside. Stability™ TVAC Cable Assemblies offer the same electrical and mechanical performance as Stability™ Microwave/RF Cable Assemblies with specialized vented 2.92mm connectors that meet low outgassing requirements of ESA-PSS-01-702 with a TML < 1% and CVCM < 0.1%.

Ordering Instructions for Stability™ Thermal Vacuum (-TVAC) Cable Assemblies

To specify a Stability™ Thermal Vacuum Cable Assembly, add "-TVAC" at the end of the SC model number, as shown in the example at the right.



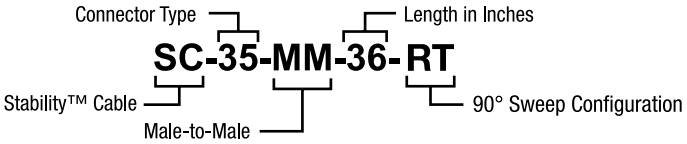
Stability™ Swept 90° Cable Assemblies (-RT)

Stability™ Swept 90° Cable Assemblies are designed for applications requiring a fixed and stable bend where traditional cable assemblies may be inconvenient. With a bend radius of 1.43 inches and a cable-to-connector length of 3.3 inches, Stability™ Swept 90° Cable Assemblies retain the electrical and mechanical specifications of the traditional assembly while removing stresses related to hand-formed bends. Stability™ Swept 90° Cable Assemblies are built on demand and are available with 2.92mm, 3.5mm and Type-N connectors.

Stability™ Swept 90° Cable Assemblies are available in all the lengths offered for the standard Stability™ Microwave/RF Cable Assemblies.

Ordering Instructions for Stability™ Swept 90° Cable Assemblies (-RT)

To specify a Stability™ Swept 90° Cable Assembly, add "-RT" at the end of the SC model number, as shown in the example at the right.

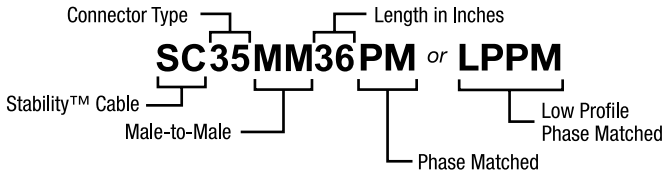


Stability™ Phase-Matched (PM) Cable Assembly Sets

Stability™ Phase-Matched Cable Assemblies have been designed for applications where strict phase equality between multiple paths are required. Stability™ PM Cable Assemblies are matched within ±0.63 °/GHz and available as sets of two or more assemblies. Stability™ PM Cable Assemblies are offered in both standard and low-profile formats and maintain the mechanical and electrical characteristics of the original assembly. Phase matched assemblies are available with 2.4mm, 2.92mm, 3.5mm and Type-N connectors and in all lengths.

Ordering Instructions for Stability™ Phase-Matched (PM) Cable Assembly Sets

To specify a Stability™ Phase-Matched Cable Assembly set, add "PM" or "LPPM" at the end of the SC model number, as shown in the example at the right. "PM" indicates standard configuration Phase-Matched sets; "LPPM" indicates Low Profile configuration, Phase-Matched sets.



Utility™ Microwave/RF Cable Assemblies

Series UC-N and UC-SMA

Typical Applications

- *RF and microwave instruments*
- *Bench-top testing*
- *Probe station integrations*
- *RF production testing*
- *Component/module testing*
- *ATE systems*

Features and Benefits

- *Excellent Value*
- *Low insertion loss*
- *Reliable and repeatable measurements*
- *Amplitude and phase stable with flexure*
- *High mating-cycle durability*

Description

Maury Microwave's Utility™ series sets the standard for high-end all-purpose test and measurement cable assemblies. Designed for general testing applications, Utility™ offers excellent value with its low cost, low insertion loss, excellent return loss, flexibility, and amplitude and phase stability. Utility™ is the ideal interconnection for reliable and repeatable measurements when mated with test instruments including bench-top testing, on-wafer characterization and ATE systems.

Utility™ cable assemblies are now part of the ColorConnect™ family! Following the proposed IEEE high-frequency connector/adapter color convention, Utility™ cable assemblies are the first commercially available assemblies to offer clear indications of compatibility and intermatability. ColorConnect™ makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible interconnects.

Utility™ UC-N-MM-24 (Left) and UC-SMA-MM-24 (Right) Microwave/RF Cable Assemblies

Cable Assembly Specifications

Electrical Properties

Utility™ Cable Type	Type N	SMA
Maximum Frequency	18.0 GHz	20.0 GHz
VSWR	1.30 max	1.25 max
Typical Insertion Loss (cable only)	0.64 dB/ft	
Impedance (nominal)	50 ohm	
Phase Stability vs Bending[1]	±3.0° typ	
Amplitude Stability vs Bending[2]	±0.015 dB typ	
Velocity of Propagation	71% (nominal)	
Shielding Effectiveness	>100 dB (DC –18.0 GHz)	
Time Delay (nominal)	1.45ns/ft (4.75ns/m)	

[1] Per IEC 60966-1, section 8.6, method 1.

[2] Per IEC 60966-1, section 8.4.

Mechanical/Environmental Properties

Utility™ Cable Type	Type N and SMA
Center Conductor Material	Silver-Plated Copper-Clad Steel
Maximum Outer Diameter	0.190 in (4.81mm)
Nominal Weight	0.65 oz/ft (60g/m)
Min. Static Bend Radius/ Min. Dynamic Bend Radius	1.0 in. (25.4mm)/ 2.0 in. (50.8mm)
Flex Life Cycles[3]	>10,000
Crush Resistance	>131 lb/inch (23 kN/m)
Operating Temperature Range	–67 ~ +221°F (–55 ~ +105°C)
Fire Resistance[4]	Yes
RoHS/REACH	Yes

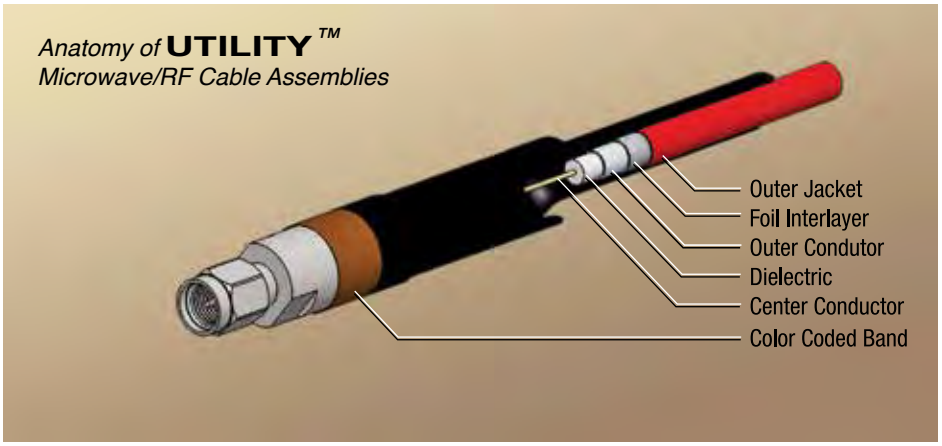
[3] Per IEC 60966-1, section 9.3.

[4] Per MIL-C-87104.

Available Models

Part Number	Length[5]	Connector 1	Connector 2	Frequency
UC-N-MM-24	24 in.	N male	N male	18 GHz
UC-N-MM-36	36 in.			
UC-N-MM-48	48 in.			
UC-N-MM-60	60 in.			
UC-N-MM-78	78 in.			
UC-SMA-MM-24	24 in.	SMA male	SMA male	20 GHz
UC-SMA-MM-36	36 in.			
UC-SMA-MM-48	48 in.			
UC-SMA-MM-60	60 in.			
UC-SMA-MM-78	78 in.			

[5] Custom lengths are available by special order.



Coaxial Stub Tuners

Description

Maury stub tuners are basic laboratory tools used for matching load impedances to provide for maximum power transfer between a generator and a load, and for introducing a mismatch into an otherwise matched system. Typical applications include power and attenuation measurements, tuned reflectometer systems and providing a DC return for single-ended mixers and detectors. Maury stub tuners are available in double- and triple-stub configurations with frequency ranges extending from 0.2 to 18.0 GHz.

Stub tuners work as impedance transformers to introduce a variable shunt susceptance into a coaxial transmission line. They consist of one or more short-circuited, variable length lines (stubs) connected at right angles to the primary transmission line. To provide all possible shunt susceptances, each stub must be movable over 1/2 wavelength at the lowest frequency of operation; therefore, the lower frequency limit of a tuner is determined by the frequency at which the maximum stub travel equals 1/2 wavelength. The upper frequency limit for a stub tuner is established by its connectors.

The inter-stub spacing of multiple-stub tuners determines the range of impedances that can be matched and the ease of tuning. Triple-stub tuners are more convenient to use since tuning sensitivity is relatively independent of stub spacing.

Available Models

STUB CONFIGURATION	FREQUENCY RANGE (GHz)	MODEL (BY CONNECTOR TYPE) TYPE N	7mm	SMA	STUB TRAVEL INCHES	(cm)	STUB SPACING INCHES	(cm)
DOUBLE-STUB	0.2 — 0.5	1778G	2612B7	—	30.0	(76.2)	4.6	(11.7)
	0.4 — 1.0	1778A	2612B1	1719A	15.0	(38.1)	4.6	(11.7)
	0.8 — 4.0	1778B	2612B2	1719B	7.5	(19.1)	2.0	(5.1)
	2.0 — 12.0	1778C	2612B3	1719C	3.0	(7.6)	0.75	(1.9)
	2.0 — 18.0	1778E	—	—	3.0	(7.6)	0.5	(1.3)
	4.0 — 18.0	1778D	2612B4	1719D	1.75	(4.4)	0.5	(1.3)
TRIPLE-STUB	0.2 — 0.5	1878G	2612C7	—	30.0	(76.2)	4.6 (11.7) / 2.0	(5.1)
	0.4 — 1.0	1878A	2612C1	1819A	15.0	(38.1)	4.6 (11.7) / 2.0	(5.1)
	0.8 — 4.0	1878B	2612C2	1819B	7.5	(19.1)	1.0 (2.5) / 0.75	(1.9)
	2.0 — 18.0	1878C	2612C3	1819C	3.0	(7.6)	0.75 (1.9) / 0.5	(1.3)
	4.0 — 18.0	1878D	2612C4	1819D	1.75	(4.4)	0.75 (1.9) / 0.5	(1.3)

Maury Noise Calibration Systems and Components

True Thermal Noise Sources That Provide High Accuracy in a Conceptually Simple Package.

In This Section:

Maury MT7000 Series Noise Calibration Systems

These Maury Noise Calibration Systems (NCS) are self-contained, highly accurate sources of RF and microwave noise power that are used wherever noise source accuracy is critical. Examples are: receiver noise measurements, such as noise figure and effective input noise temperature; calibration of solid state noise sources; evaluation and verification of earth station receivers; and as radiometer reference sources. (See pages 164-165).

Maury MT7000 Series Waveguide Cryogenic Terminations (Cold Loads) and Maury MT7100 Series Coaxial Cryogenic Terminations (Cold Loads)

Maury cryogenic terminations are liquid nitrogen cooled loads which provide accurately known noise power at a well matched output port. Used with ambient and/or thermal terminations and a noise figure meter, these terminations provide cold reference temperatures needed for highly accurate noise figure or effective input noise temperature measurements. Because of the accuracy of their noise output, cryogenic terminations are often used as a noise standard for calibration of solid state noise generators. (See pages 166-168.)

Maury MT7000 Series Waveguide Thermal Terminations (Hot Loads) and Maury MT7100 Series Coaxial Thermal Terminations (Hot Loads)

Maury thermal terminations are low-mismatch, heated loads in a precisely controlled thermal environment, which provide and accurately known noise power. Used with ambient and /or cryogenic terminations and a noise figure meter, these terminations provide the hot termination temperature needed for highly accurate noise figure or effective input noise temperature measurements. Because of the accuracy of the noise output, thermal terminations are often used as a noise standard for calibration of solid state noise generators. (See pages 173-175.)

Maury Coaxial and Waveguide Ambient Terminations

Maury ambient terminations are room temperature noise sources consisting of a stable termination in a massive copper housing to provide thermal stability and to reduce the effects of thermal transients. (See page 172.)

Noise Components & Accessories

Maury offers a number of accessories to support your Maury Noise Calibration System including a wide range of calibrated adapters and adapter sets that are used with the MT7118J cryogenic termination and the MT7108B thermal termination to adapt the precision 7mm output port to other coaxial series or to waveguide at specific frequencies. They are calibrated for VSWR and insertion loss to allow their input noise temperature to be calculated. (See pages 169 and 176.)

Noise Calibration Systems and Components

MT7149D12
WR10 75–110 GHz
Noise Calibration System

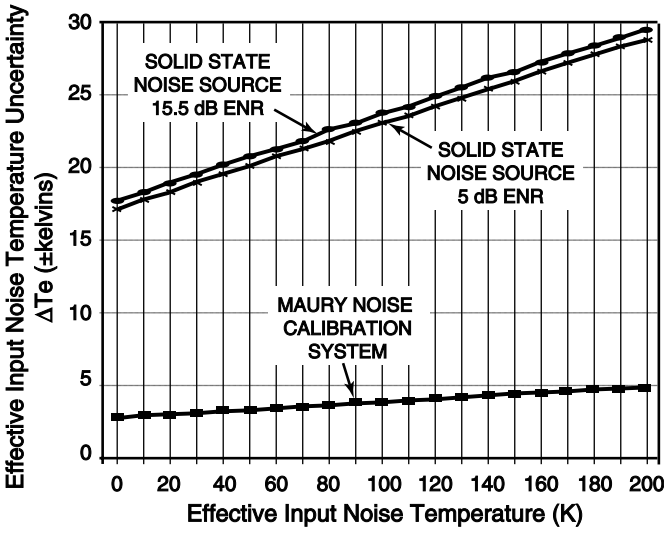
Introduction

The Maury Noise Calibration Systems (NCS) are self-contained, highly accurate sources of RF and microwave noise power. These systems are used wherever noise source accuracy is critical. Examples are: receiver noise measurements such as noise figure and effective input noise temperature; calibration of solid state noise sources; evaluation and verification of earth station receivers; and as radiometer reference sources.

Each NCS consists of two (hot/cold) or three (hot/ambient/cold) thermal noise sources whose outputs can be conveniently switched into a single calibrated output port. This capability makes for a unique combination of accuracy and convenience. The incorporation of the output switch makes the operation of the NCS in a noise performance measurement as convenient as a solid state noise generator – without the accuracy penalty associated with the latter. The plot shown at right illustrates the improvement in accuracy that can be gained by the use of an NCS in a typical measurement application (effective input noise temperature).

The cold noise source is a liquid nitrogen (LN_2) cooled termination. A liquid nitrogen level sensor and an automatic fill system maintains the proper nitrogen level. The user must provide a suitable liquid nitrogen reservoir. The cold termination is also pressurized with helium at 2 psi. Pressure is maintained by a regulator that requires 20 psi maximum from an external user-supplied source. Since most helium bottles are pressurized to about 1,000 psi or more, the MT152C pressurizing system is included.

The hot noise source is a heated termination whose temperature is maintained by proportional control to better than ±0.2K by the MT155J controller. Actual temperature is indicated by a digital readout on the controller front panel.



Cryogenic Noise Terminations (Cold Loads)

MT7025J with Power Supply and Foam-lined Wood Carrying Case.

Introduction

Maury cryogenic terminations are liquid nitrogen cooled loads which provide accurately known noise power at a well matched output port. Used with ambient and/or thermal terminations and a noise figure meter, these terminations provide cold reference temperatures needed for highly accurate noise figure or effective input noise temperature measurements. Because of the accuracy of their noise output, cryogenic terminations are often used as a noise standard for calibration of solid state noise generators.

The accuracy achieved by these terminations is possible because they utilize the known temperature of boiling liquid nitrogen as a constant for calculating noise temperature. Because of this, measurements made with these terminations are traceable to the fundamental quantity, temperature and NIST via temperature and network calibration standards.

Each unit is provided with a calibration report which includes VSWR and available output noise temperature data at standard frequencies. Options for additional user-selected frequencies are available (see Maury data sheet 4E-020, which provides specifics for the MT7250 series Noise Calibration Swept Data Module, a software too that allows users to work with non-standard data points in addition to, or in place of the factory standards).

The cryogenic terminations require user-provided liquid nitrogen and dry helium gas at 2 psi. Maury's MT152A pressurization system is available as an optional accessory to regulate the helium pressure (see page 169). The terminations include a heater circuit to prevent frosting on the output connector and to prevent the heat load of the device under test from affecting the output noise temperature.

Noise Calibration Systems and Components

(Continued)

MT155J

The MT155J controller can be located up to 25 feet (7.6 meters) away from the mounting plate.

The NCS consists of three assemblies:

A. A component mounting plate which holds the cryogenic and heated termination assemblies, the hot/cold or hot/ambient/cold remotely controlled relay(s) and output assembly, and the helium pressure regulator. The LN_2 level sensor and fill solenoid are mounted on the cover of the dewar flask.

B. The MT155J controller (shown at right) which contains the temperature control circuitry and a digital temperature readout for the thermal termination, the automatic or manual LN_2 fill control circuitry and the remote noise temperature output switch.

C. The MT155L control cable, 25 feet in length, which connects the controller to the mounting plate.

Calibration of the hot/cold noise temperatures at the output connector of the NCS is provided at a number of frequencies. Each NCS model is calibrated at specific standard frequencies. Typically, waveguide units will be calibrated at the band edges and the arithmetic center frequency of the waveguide. Coaxial units are generally calibrated at four data points within the frequency range of the connector type. For example, the MT7098J is a dual-load model equipped with a 7mm connectors and transmission lines. Calibration for this unit is provided at 3.95 GHz, 7.5 GHz, 12.4 GHz and 18.0 GHz. (Maury also offers the MT7250 series Noise Calibration Swept Data Module as a tool that allows users to work with other non-standard data points in addition to, or in place of the factory standards.[1]) Note that these noise temperatures are not critical as long as they are accurately known.

Typical NCS Models

The table below shows a some of the more popular NCS available from Maury. Each model is a complete system made up of the appropriate terminations assembled on a mounting plate, the MT155J controller and the interconnecting cable. All dual-load systems shown consist of cold (LN_2) and heated terminations. The tri-load system (MT7208J) includes an ambient termination as well. Please consult our Sales Department if you do not see a noise calibration system in this table suitable for your application or if you would like more detailed information on any of these systems.

Model	Frequency Range (GHz)	Transmission Line	Output Connector Or Flange	Type
MT7091B	10.0 — 12.4	WR90	MPF90 [2]	Dual-load
MT7093B	10.0 — 15.0	WR75	MPF75B [3]	Dual-load
MT7094B	15.0 — 22.0	WR51	MPF51B [3]	Dual-load
MT7095J	18.0 — 26.5	WR42	UG595/U	Dual-load
MT7096J	26.5 — 40.0	WR28	UG599/U	Dual-load
MT7097	33.0 — 50.0	WR22	UG383/U	Dual-load
MT7100J	50.0 — 75.0	WR15	UG385/U	Dual-load
MT7149D	75.0 — 110.0	WR10	UG385/U	Dual-load
MT7098J	DC — 18.0	Coaxial	7mm	Dual-load
MT7208J [4]	DC — 18.0	Coaxial	7mm	Tri-load

[1] Maury data sheet 4E-020 provides specifics on the MT7250 series.

[2] Mates with the appropriate military (UG) and CPR flanges.

[3] Mates with most standard military and industrial flanges in this band.

[4] CE certified.

MT7118J 7mm Coaxial Cryogenic Terminations

DC to 18.0 GHz

Features

- *Accurate Noise Temperature At Specified Calibration Frequencies*
- *Low VSWR Across The Full Frequency Range*
- *Liquid Nitrogen Cooled*
- *Metrology Grade Calibration For Solid State Noise Generators*
- *Low Noise Figure/Temperature Measurements*

MT7118J

Description

The MT7118J cryogenic termination is a liquid nitrogen cooled noise source that provides accurately known noise temperatures at specified calibration frequencies and low VSWR over the full frequency range. It is used for performing accurate noise temperature measurements in 7mm applications such as certification of the noise performance of low noise earth stations. It is also used for general purpose, low noise figure/temperature measurements and calibration of solid state noise generators.

The MT7118J comes with a linear power supply that operates on line voltages of 120 VAC/60 Hz or 240 VAC/50 Hz, while supplying 48 VDC to the device power input.

The MT7118J can be packaged with an extensive complement of options and accessories, including calibrated adapters to other coaxial connector series and waveguide, and user specified calibration frequencies. Our sales staff will be happy to assist in tailoring the best package for your application.

The MT7118J can be optimized for VSWR and input noise temperature over other bandwidths, or with additional calibration points. For calibration at additional or other frequencies see Maury data sheet 4E-020, which covers the maury MT7250 series Noise Calibration Swept Data Module; a software tool that works with Microsoft® Excel® 2003 (or later) to provide an Effective Noise Temperature Interpolator. Please contact our Sales Department for additional information.

Maury also produces an extensive line of precision hot, cold and ambient terminations in both coaxial and waveguide configurations. Our sales staff is ready to assist you in ordering the right noise calibration solution for your applications.

Pressurizing System

Maury cryogenic terminations require helium gas pressurization at 2 psi. The optional MT152A pressurizing system (see page 169) provides the valves, gages, and hardware necessary to connect an external helium gas supply to Maury cryogenic terminations (helium gas supply is not provided).

Specifications

Frequency Range. ..... DC to 18.0 GHz

Maximum VSWR: ..... 1.06, DC to 4.0 GHz
1.10, 4.0 to 12.0 GHz
1.15, 12.0 to 18.0 GHz

Operating Temperature (Load) ..... 77.36°K (liquid N cooled)

Calibration Frequencies & Noise Temperature Uncertainty ..... ±1.5 K

Connector 7mm

Operating Orientation ..... Horizontal

Operating Life ..... 2 hours minimum (one fill)

Dewar Capacity ..... 1 liter

Weight ..... 7 lbs approximate (empty)

Pressurization ..... 2 psi helium gas (external supply)

AC Power ..... 100 to 240 VAC, 47 to 63 Hz
6.0 amps maximum

Accessories (provided) ..... One (1) two meter power cord and a wooden instrument case

Note: For calibration at additional or other frequencies, see the information on Maury's MT7250 series Noise Calibration Swept Data Module software (pages 170 – 171), or consult our Sales Department.

Features

- *Accurate Noise Temperature At Specified Calibration Frequencies*
- *Low VSWR Across The Full Frequency Range*
- *Liquid Nitrogen Cooled*
- *Metrology Grade Calibration For Solid State Noise Generators*
- *Low Noise Figure/Temperature Measurements*


MT7025J

Description

Maury offers waveguide cryogenic terminations in several styles and a wide range of waveguide sizes from WR430 through WR15. The chart below represents a typical sample of the available terminations.

Waveguide terminations are generally calibrated at three frequencies – high, low and arithmetic center – within the applicable frequency range; however, they can be calibrated at any user-specified frequency within the waveguide band (using Maury MT7250 Noise Calibration Swept Data Module (see pages 170-171). Additional user-specified calibration frequencies are also available as an option.

In addition to liquid nitrogen, these terminations require pressurization with helium gas (not provided) at 2 psi. The MT152A pressurizing system (see page 169) is available to provide proper regulation of the helium supply.

The MT70xx series units come with a universal input power supply that operates on line voltages of 100–240 VAC and 47–63 Hz, while supplying 48 VDC to the device power input.

Available Model Series (Typical)

Model	Frequency Range (GHz)	EIA Waveguide Size	VSWR (maximum)
MT7040( )	7.05 — 10.0	WR112 [1, 2]	1.08
MT7041( )	10.0 — 12.4	WR90 [2]	1.10
MT7042( )	10.0 — 15.5	WR75 [3]	1.08
MT7043( )	13.0 — 15.0	WR62 [2]	1.10
MT7044( )	15.0 — 22.0	WR51 [3]	1.10
MT7021( )	18.0 — 26.5	WR42 [2]	1.08
MT7022( )	26.5 — 40.0	WR28 [2]	1.10
MT7023( )	33.0 — 50.0	WR22 [2]	1.10
MT7025( )	50.0 — 75.0	WR15 [2]	1.15
MT7027( )	75.0 — 110.0	WR10 [2]	1.20

Calibration Uncertainty

Frequency Range (GHz)	Calibration Uncertainty
< 18.0	±1.5 K
18.0 — 40.0	±1.5 K
40.0 — 50.0	±1.8 K
50.0 — 110.0	±2.6 K

1 Flange mates with the applicable CPR flange.
2 Flange mates with the applicable CMR flange.
3 Flange mates with the applicable military (UG) flange.

Cryogenic Termination Accessories

MT152A/C Helium Pressurizing Systems

Maury cryogenic terminations must be supplied with helium gas at about 2 psi to purge contaminants (air, carbon dioxide, etc.) from the coaxial or waveguide transmission line (connecting the cooled termination to the output connector) before the dewar is filled with liquid nitrogen. For stand-alone cryogenic terminations, the MT152A regulates the helium supply by use of a two-stage pressure regulator preset to provide 2 to 3 psi output pressure and a safety pressure relief valve set to 4 psi. These are included with an 8 foot hose and CGA-580 fittings for connecting your helium supply to the termination.

Maury dual-load and tri-load noise calibration systems are provided with the MT152C helium pressurizing system, a modified version of the MT152A, which serves the same purpose.


MT152A

Calibrated Adapters Sets

Maury offers a wide range of calibrated adapters and adapter sets that are used with the MT7118J cryogenic termination and the MT7108B thermal termination to adapt the precision 7mm output port to other coaxial series or to waveguide at specific frequencies. They are calibrated for VSWR and insertion loss to allow their input noise temperature to be calculated.

The table below lists the available models and calibrated adapter sets. These are also available separately; however, since the use of adapters affects measurement accuracy and limits stability or repeatability in waveguide applications, better accuracy is achieved (and operation of the termination is simpler) when they are purchased and calibrated with your instrument. Maury recommends purchase of your instrument with the connector type or waveguide flange needed. (See also page 176.)

Maury also offers cryogenic and thermal terminations calibrated at user-specified or standard frequencies. Please consult our Sales Department for more information.

Available Models

Model	Connector Type	Description [1]	Maximum VSWR
8022M	3.5mm	One (1) each female and male adapter calibrated at 3.95, 7.5, 12.4, and 18.0 GHz.	DC – 4.0 GHz, 1.04 4.0 – 18.0 GHz, 1.08
2606M	Type N	One (1) each female and male adapter calibrated at 3.95, 7.5, 12.4, and 18.0 GHz.	DC – 4.0 GHz, 1.03 4.0 – 9.0 GHz, 1.04 9.0 – 18.0 GHz, 1.07
2607M	GR900	One (1) adapter calibrated at 3.95, 7.5, 12.4, and 18.0 GHz.	DC – 8.5 GHz, 1.04
R229E	WR430	One (1) w/g to 7mm end launch adapter calibrated at 2.25, 2.295 and 2.388 GHz.	1.7 – 2.6 GHz, 1.10
E229D	WR229	One (1) w/g to 7mm end launch adapter calibrated at 3.7, 3.95 and 4.2 GHz.	3.7 – 4.2 GHz, 1.05
F229D	WR159	One (1) w/g to 7mm end launch adapter calibrated at 4.9, 6.0 and 7.05 GHz.	4.9 – 7.05 GHz 1.10
H229D	WR112	One (1) w/g to 7mm end launch adapter calibrated at 7.5, 8.0, 8.212 and 8.4 GHz.	7.05 – 10.0 GHz, 1.05
X229D	WR90	One (1) w/g to 7mm end launch adapter calibrated at 11.7, 11.95 and 12.2 GHz.	8.2 – 12.4 GHz, 1.05
M229D	WR75	One (1) w/g to 7mm end launch adapter calibrated at 14.0, 14.25 and 14.5 GHz.	10.0 – 15.0 GHz, 1.05
P229D	WR62	One (1) w/g to 7mm end launch adapter calibrated at 12.4, 15.0 and 18.0 GHz.	12.4 – 18.0 GHz, 1.05

1 Calibration and VSWR at other frequencies is available upon request. Contact our sales department for assistance.

Key literature – Maury data sheet 4A-008A and 4A-008B.

Noise Calibration Swept Data Module

MT7250 SERIES

Features

- *Multiple Data Points*
- *Effective Noise Temperature Calculator*
- *Effective Noise Temperature Interpolator*
- *Certified Calibration Report Generator*
- *Standard and User-Defined Frequencies*

Description

Maury cryogenic and thermal terminations, whether stand-alone models or components of Maury noise calibration systems, are calibrated for hot/cold noise temperatures at their output connectors for a number of frequencies. Waveguide units are typically calibrated at specific standard frequencies or data points at the band edges and the arithmetic center frequency of the waveguide. Coaxial units are generally calibrated at four data points within the frequency range the connector type is rated for. Maury offers the MT7250 series Noise Calibration Swept Data Module as a tool that allows users to work with other, non-standard, data points in addition to, or in place of, the factory standards.

The MT7250 series Swept Data Module Software works with Microsoft® Excel® 2003[1] (or later) to give users the ability to generate standardized, or customized, Maury-certified calibration reports for any Maury cryogenic termination, thermal termination or noise calibration system. The data module can be supplied with a new unit at time of purchase, or with a re-certified unit.

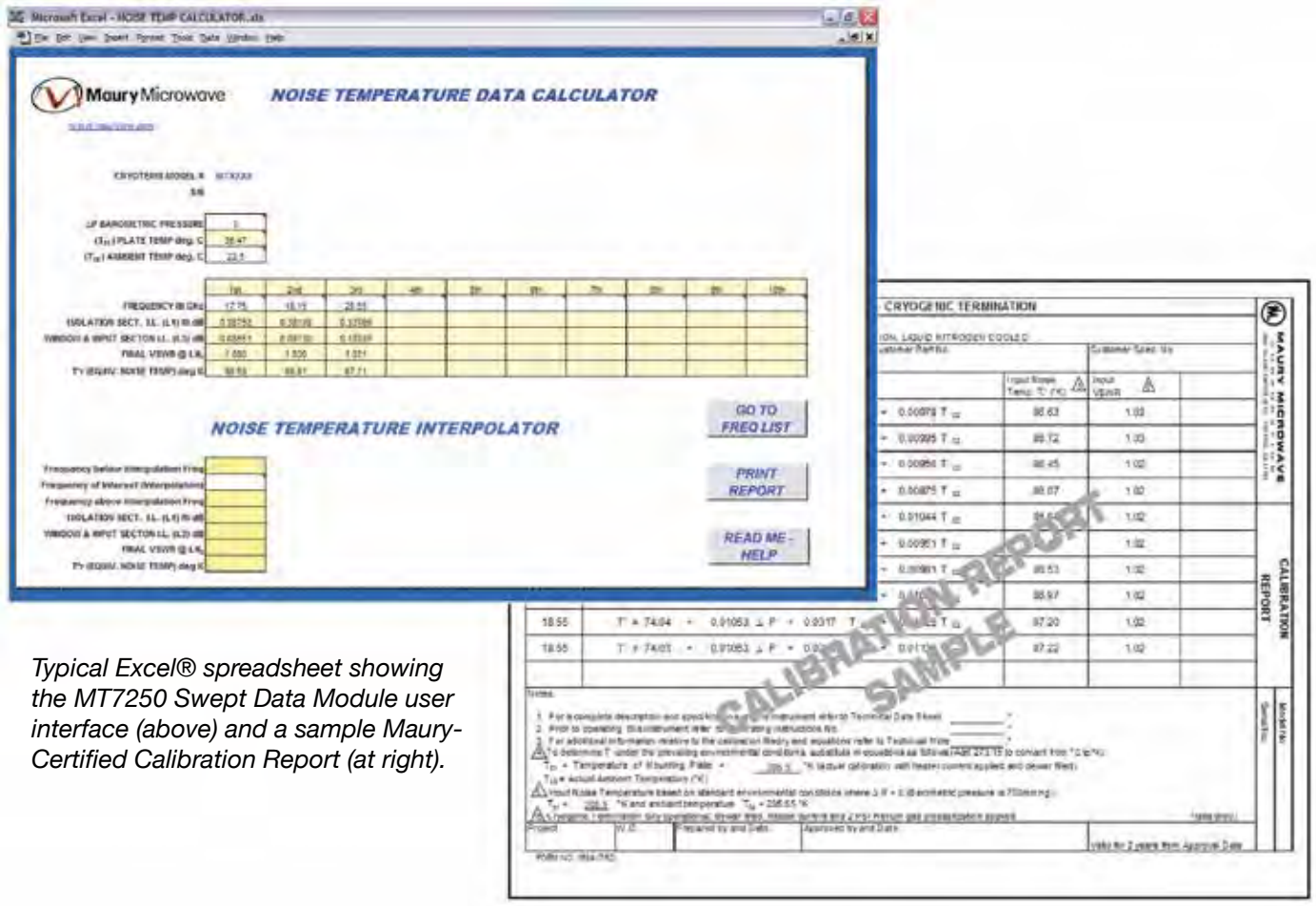
The Effective Noise Temperature Calculator

The Effective Noise Temperature Calculator uses measured loss and actual temperature data to produce Maury-certified calibration reports. These reports are based on a) pre-measured data points (as shown in the table on the page 15), or b) a user-defined or customized set of measured data points, or c) a combination of both.

The Effective Noise Temperature Interpolator

For use as a reference tool, the built-in Effective Noise Temperature Interpolator can be used to generate noise temperatures for non-measured data points within the data band of interest.

1 Not provided.



Typical Excel® spreadsheet showing the MT7250 Swept Data Module user interface (above) and a sample Maury-Certified Calibration Report (at right).

Standard Pre-Measured Data Points

Waveguide or Line	Frequency Band (GHz)	Step Size
WR51	15.0—22.0	0.10
WR42	18.0—26.5	0.10
WR28	26.5—40.0	0.25
WR22	33.0—50.0	0.25
WR15	50.0—75.0	0.50
WR10	75.0—110.0	0.50
7mm	0.2—18.0	0.20

Ambient Terminations

2659A

J309A

Description

Maury ambient terminations are room temperature noise sources consisting of a stable termination in a massive copper housing to provide thermal stability and to reduce the effects of thermal transients.

These terminations are used as a reference temperature noise source for highly accurate noise figure or effective input noise temperature measurements, as an "on-line" standard for calibrating the operating noise temperature of low noise receiving systems, and in the calibration of solid state noise generators.

Each unit is provided with a direct reading dial thermometer calibrated from -5° to 45°C with better than 0.5° resolution and accuracy. The thermometer receptacle in the housing will also accept a quartz thermometer probe which, when connected to an appropriate unit, will provide for a remote temperature readout.

The units listed below are typical of those available. Please consult the factory for terminations in waveguide sizes, connector types or frequency ranges not shown here.

Available Models

Model	Frequency Range (GHz)	VSWR (maximum)	Connector or EIA Waveguide Size
2459A	DC — 8.5	1.02, DC — 1.0 1.04, 1.0 — 4.0 1.06, 4.0 — 8.5	14mm (GR900)
2659A	DC — 18.0	1.04, DC — 4.0 1.08, 4.0 — 12.0 1.10, 12.0 — 18.0	7mm
R309B	2.2 — 2.3	1.05	WR430 [1]
E309A	3.7 — 4.2	1.05	WR229 [1]
X309A	8.2 — 12.4	1.05	WR90 [2]
M309A	10.0 — 15.0	1.05	WR75 [3]
P309A	12.4 — 18.0	1.05	WR62 [2]
K309B	21.0 — 23.0	1.05	WR42 [2]
J309A	33.0 — 50.0	1.05	WR22 [2]
U309B	36.0 — 38.0	1.05	WR28 [2]

1 Flange mates with the applicable CPR flange.
2 Flange mates with the applicable military (UG) flange.
3 Flange mates with most applicable standard military and industrial flanges.

Thermal Noise Terminations (Hot Loads)

General

Maury thermal terminations are low-mismatch, heated loads in a precisely controlled thermal environment which provide an accurately known noise power. Used with ambient and/or cryogenic terminations and a noise figure meter, these terminations provide the hot termination temperature needed for highly accurate noise figure or effective input noise temperature measurements. Because of the accuracy of the noise output, thermal terminations are often used as a noise standard for calibration of solid state noise generators.

The accuracy achieved by these terminations is possible because they utilize the proven concept of thermal (Johnson) noise operating in a precision thermal environment provided by the MT151C temperature controller. (The MT151C is a highly stable, proportional temperature controller that is accurately calibrated against NIST-traceable temperature measuring equipment.) This is the same concept used in several national standards laboratories and NIST at the higher microwave frequencies.

The termination and the controller are matched during calibration; therefore, the two instruments must be purchased as a unit. In addition, a line voltage option must be specified. Each unit is provided with a calibration report which includes VSWR and available output noise temperature at specific frequencies.

Options for additional or alternative user-selected frequencies are available. Maury also offers the MT7250 series Noise Calibration Swept Data Module as a tool that allows users to work with non-standard data points in addition to, or in place of the factory standards[1].) Other accessories such as special instrument cases and calibrated adapters to other coaxial series or waveguide are also available.

[1] See Maury Data Sheet 4E-020. See also pages 170-171.

Coaxial Thermal Termination

MT7108B

MT151C MT7108B

Description

Maury offers a single thermal noise termination model (the MT7108B), which is equipped with a precision 7mm coaxial output connector, and operates from DC to 18 GHz. This compact, reliable instrument is equally suited for both field measurements and laboratory use. It is generally used to make accurate low noise figure/temperature measurements and for calibration of solid state noise generators. The flexibility and versatility of the MT7108B are enhanced by an extensive selection of options and accessories. These include calibrated adapters to other coaxial connector series and waveguide flanges, and factory calibration at user-specified frequencies. (Maury's MT7250 series Noise Calibration Swept Data Module is offered as a tool that allows users to work with non-standard data points in addition to, or in place of the factory standards[1].)

The MT7108B comes with a MT151C controller, with which it is precisely matched during the initial factory calibration. For accurate performance, these units must be used together. The MT151C's internal proportional controller responds to sensors in physical proximity to the termination and directs the MT7108B's heater circuit to maintain the physical temperature of the termination at 373.1 kelvins (100°C). Heavy insulation of the entire termination assembly minimizes the effects of the external environment. The MT151C's line voltage must be specified at the time of order. This ensures that the MT151C will be properly fuzed and shipped with the appropriate power cable (AC power option 22 for 100/120 VAC, 50/60 Hz, or option 32 for 220/240 VAC, 50/60 Hz).

VSWR and noise temperature data are provided at four frequencies (3.95 GHz, 7.5 GHz, 12.4 GHz and 18.0 GHz). A certified calibration report with traceability to NIST is provided with each unit.

1 See Maury data sheet 4E-020 for details, and pages 170-171 in this volume.
2 Precision 7mm per Maury data sheet 5E-060.

Specifications

Frequency Range ..... DC to 18 GHz

Nominal Physical Load Temperature.....373.1 K

Load Temperature Stability..... ±0.2 K

VSWR (maximum):

DC to 4 GHz 1.06
4 to 12 GHz 1.10
12 to 18 GHz 1.15

AC Power (User specifies one of two options):

Option 22.....100/120 VAC, 50/60 Hz
Option 32.....220/240 VAC, 50/60 Hz

Noise Temperature Uncertainty ..... ±0.7 K

Connector ..... Precision 7mm [2]

Accessories Provided

- One (1) MT151C controller
- One (1) MT151P controller cable
- One (1) Instrument case

Waveguide Thermal Terminations

MT70xx Series

Description

Maury offers waveguide thermal terminations in several styles and a wide range of waveguide sizes, from WR430 through WR10. The chart below represents a typical sample of the available terminations.

Waveguide terminations are generally calibrated at three frequencies – high, low, and arithmetic center – within the applicable frequency range; however, they can be calibrated at any user-specified frequency within the waveguide band. Additional user-specified calibration frequencies are also available as an option. (Maury's MT7250 series Noise Calibration Swept Data Module is offered as a tool that allows users to work with non-standard data points in addition to, or in place of the factory standards[1].) Please contact our Sales Department for more information.

The physical temperature of the waveguide terminations is 350 kelvins with a stability of ±0.2 kelvins. These terminations are calibrated with a specific temperature controller, and the two instruments are provided as a unit. A line voltage option must be specified at the time of order.

Available Models

Model	Frequency Range (GHz)	EIA Waveguide Size	Maximum VSWR
MT7005A	3.7 – 4.2	WR229 [2]	1.07
MT7081A	10.0 – 12.4	WR90 [3]	1.10
MT7082A	10.0 – 15.0	WR75 [3]	1.08
MT7009B	15.0 – 22.0	WR51	1.10
MT7084A	18.0 – 26.5	WR42 [3]	1.08
MT7085A	26.5 – 40.0	WR28 [3]	1.10
MT7086A	33.0 – 50.0	WR22 [3]	1.10
MT7088B	50.0 – 75.0	WR15 [3]	1.20
MT7090J	75.0 – 110.0	WR10 [3]	1.15

Calibration Uncertainty

Frequency Band (GHz)	Uncertainty (Kelvins)
< 18.0	±0.70 K
18.0 – 40.0	±0.60 K
40.0 – 50.0	±0.65 K
50.0 – 110.0	±1.00 K

Accessories Provided

- One (1) MT151C controller
- One (1) MT151P controller cable
- One (1) Instrument case

1 See Maury data sheet 4E-020 and pages 170-171 in this volume.

2 Flange mates with applicable CPR and CMR flanges.

3 Flange mates with the applicable military (UG) flange.

Thermal Terminations – Options and Accessories

Temperature Controller, MT151C

A temperature controller is provided with each thermal termination. The controller and the termination are calibrated together and are sold as a unit. A line voltage must be specified at the time of order:

- Option 22 ..... 100/120 VAC
- Option 32 ..... 220.240 VAC

MT151C

Instrument Case

Most Maury heated terminations are supplied in a foam-lined instrument case (like the one shown at below) for convenient handling and storage. Please contact our Sales Department for details.

MT7090J and calibrated MT151C Controller and Operating Manual in a typical foam-lined Instrument case.

Calibrated Adapters For Your 7mm Hot and Cold Loads

You can increase the utility of your Maury Cryogenic and Thermal Terminations by using precision adapters to connect the 7mm output port on the termination to other coaxial and waveguide connectors. However, as in any microwave measurement system, adding adapters degrades the accuracy of the data that can be obtained. In the case of waveguide measurement, stability and repeatability will also be degraded by the use of adapters. Therefore, for optimum performance, it is always recommended that a thermal termination with the appropriate output port be used for specific measurement applications.

In situations where adapters must be used, it is critical that the adapters are calibrated so that the critical performance parameters are known and can be calculated into the measurements. Adapters can be calibrated separately, but better accuracy is achieved and operation of the termination is simpler when they are purchased and calibrated with the thermal termination they will be used with.

The table at right shows the adapters and adapter sets that are available from Maury. If you don't see the adapter you need in this table, please contact our Sales Department for assistance.

All of these adapters are calibrated for VSWR and insertion loss so that their input noise temperature can be calculated using Maury technical note TN-011. The adapters are shipped with a test report and operating note. When purchased with a thermal termination, Maury can provide VSWR calibration of these adapters for an additional cost (quoted on request). Please contact our Sales Department for further details.

See page 171 for descriptions of the calibrated adapter sets.

Typical 7mm between-series adapters.

Model	Maximum VSWR (GHz)	Adapts 7mm to
2606M	1.03, DC–4.0 1.04, 4.0–9.0 1.07, 9.0–18.0	Type N (F & M)
8022M	1.04, DC–4.0 1.08, 4.0–18.0	3.5mm (F & M)
2607M	$1.004 + 0.004f$	14mm
R229E	1.10, 1.7–2.6	WR430
E229D	1.05, 3.7–4.2	WR229
F229D	1.10, 4.9–7.05	WR159
H229D	1.05, 7.05–10.0	WR112
X229D	1.05, 8.2–12.4	WR90
M229D	1.05, 10.0–15.0	WR75
P229D	1.05, 12.4–18.0	WR62

Thank You!

We want to take the opportunity to thank you for your interest in Maury Microwave products and services. We realize that we must earn your business on each and every requirement by providing the highest quality products at a fair price with delivery per commitment.

This is what you expect and this is what Maury Microwave strives to provide.

Maury Microwave

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CATALOG 1G-003a (09/2013)