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WINTER 2017 EDITION

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RF Device Characterization System Integration
250 MHz to 110 GHz

Measurement and Modeling Device Characterization Services

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 ISO 9001:2008/AS9100C CERTIFIED 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 55 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.

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 DC to 67 GHz in most popular line sizes and we also manufacture waveguide components from WR284 (2.60 GHz) to WR10 (110 GHz).

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

Keysight Technologies, Inc.

KEYSIGHT TECHNOLOGIES
Global Solutions Partner

Keysight'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.

Keysight 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 Keysight's solutions partner Maury works closely with Keysight 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
a MauryMicrowave company™

Anteverta-mw is pioneer of large signal device characterization methodologies and systems, and high efficiency/linearity PA design. Anteverta's patented IP allows non-50Ω characterization at speeds up to 100x faster than traditional systems, and is unique in its capability of wideband impedance control for realistic modulated signals.

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. Maury Microwave acquired Anteverta in full in March 2015.

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 — AS9100C Documentation

Maury Microwave Corporation is registered as conforming to ISO 9001:2008 with AS9100C for Design, Manufacturing and Servicing of Microwave Based Measuring and Testing Equipment for the Aerospace, Defense and Wireless Telecom Industries.

EAGLE Registrations Inc.
SERVICE • INTEGRITY • VALUE

ANAB

Certificate No. 3867 (Recertified – January 9, 2015 - 2 Copies)
January 10, 2015 through January 9, 2018

Certificate of Registration

This is to certify that the Quality Management System of

Maury Microwave
Your Calibration, Measurement & Modeling Solutions Partner

2900 Inland Empire Blvd., Ontario, CA 91764 USA
Site definition: Single

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

ISO 9001:2008 with AS9100C

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 recommended that the following items be placed on a 12-month re-calibration cycle:

- Calibration 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

We recommend annual re-calibration and refurbishment of your Maury products to ensure continuous measurement accuracy. Because we are the original equipment manufacturer and users of Maury products, we understand the critical performance criteria of your measurement equipment. Therefore, we will always give you an honest evaluation of each and every Maury part when repairs are required. We will also provide you with options and our best recommendation for 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, We Build It, We Calibrate It, We 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

Maury Precision Calibration Standards

Your Calibration, Measurement & Modeling Solutions Partner!

In This Volume:

Calibration Kits for Vector Network Analyzers

For precise, accurate calibration of Keysight, Anritsu, Rohde & Schwarz, and other network analyzers from DC to 67 GHz, Maury offers calibration-grade (metrology) cal kits in all popular connector types, in fixed load, sliding load and TRL/LRL configurations.

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 10 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 Type N, and from WR280 to WR22. 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.

Maury Precision VNA Calibration Kits

For Fixed Load, Sliding Load and TRL Calibration of Keysight, Rhode & Schwarz and Anritsu VNAs

Network Analyzer Calibration Methodologies

Why do we need to calibrate?

Systematic errors that are present in any measurement equipment and setup must be removed in order to measure a DUT accurately. 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 known standards, you can connect for systematic errors that are a result of the VNA itself along with errors due to measurement setup (cables, adapters, fixtures, etc). 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. As the name suggest, systematic errors are non random in nature and hence can be characterized through calibration and removed during device measurements. Random and drift errors cannot be systematically be characterized and can affect measurement accuracy if the measurement setup and equipment are not validated prior to device measurement.

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.

1.85mm VNA Calibration Kits from Maury Microwave

7850CK30/31 series

Features

> 1.85mm Connectors
> DC to 67 GHz (Operates to 70 GHz)
> Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Calibration Methods Supported

> TRM – Thru-Reflect-Match (DC to 800 MHz)
> TRL – Thru-Reflect-Line (800 MHz to 13.0 GHz)
> LRL – Line-Reflect-Line (13.0 to 67.0 GHz)

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Method

TRL calibration, using Thru, Reflect and Line standards, relies on the characteristic impedance of the air lines (Line). TRL calibration is the most accurate method of measuring devices at low (typically better than 40 dB return loss) and high reflection coefficients.

TRL, LRL & TRM Calibration

TRL is typically used as a general term to represent any of these three specific types of calibration (TRM/TRL/LRL). Specifically, these three types of calibration are:

- TRM – Thru, Reflect, Match
- TRL – Thru, Reflect, Line
- LRL – Line, Reflect, Line

TRM is used for low frequencies where a very long air line would be required for the line standard. TRL is used for mid-frequencies where the appropriate line lengths are achievable to reach the 30°–150° phase delay over the frequency band. LRL is used for high frequencies where air line standards become too short to be practical, so the desired delay is achieved as the delta between a reference air line and a longer air line.

7850CK30/31 kits provide all of the calibration standards needed to perform TRL, TRM and LRL calibrations and are specifically configured for use under these three calibration methods. Source match can also be measured using the 3.00cm air line with the short circuit provided.

Recommended Accessories

A048A Digital Connector Gage Kit:

Contains two "thread-on" type, digital gages for measuring female and male contact pin location. They provide an easy and accurate way to measure critical linear interface dimensions of 1.85mm and 2.4mm coaxial connectors.

8799A1 5/16-inch Precision Torque Wrench (8.0 inch lbs):

For proper torquing of 1.85mm, 2.4mm, 2.92mm and 3.5mm connections. Factory preset to 8.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

7821A/B/C 1.85mm in-series adapters (specifications on page 18)

Recommended for the 7850CK30 kits; included in the 7850CK31 kits.

7809A1 & 7809A2 1.85mm NMD test port adapters:

Precision 1.85mm to NMD1.85mm; DC–67.0 GHz. Saves unnecessary wear and tear on your VNA test port connectors.

See page 60-61 to see all Maury 1.85mm in-series and between series adapters.

Kit Description

These precision 1.85mm TRL/LRL calibration kits are designed for use with a broad range of vector network analyzers (VNAs) and are used to make error-corrected measurements, from DC to 67 GHz, for devices supplied with 1.85mm connectors. Each kit includes a full complement of calibration standards (shorts, fixed loads and air lines). Three 1.85mm in-series, calibration-grade (metrology), adapters are included in the 7850CK31 kits but are not included in the 7850CK30 kits. All kit components are provided in an attractive foam-lined, wood instrument case.

7850CK30

Components Included in 7850CK30 Kits

QUANTITY	DESCRIPTION	MODEL
1	1.85mm female fixed short circuit (0.5cm)	7846A
1	1.85mm male fixed short circuit (0.5cm)	7847A
1	1.85mm female fixed termination	7831A1
1	1.85mm male fixed termination	7831B1
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	Torque wrench (8 in. lbs)	8799A1
1	5/16-inch double end wrench	8770Z6
1	3/16-inch double end wrench	7960Z1
1	Foam-lined wood instrument case	—

7850CK31

Components Included in 7850CK31 Kits

QUANTITY	DESCRIPTION	MODEL
1	1.85mm female fixed short circuit (0.5cm)	7846A
1	1.85mm male fixed short circuit (0.5cm)	7847A
1	1.85mm female fixed termination	7831A1
1	1.85mm male fixed termination	7831B1
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 to 1.85mm female	7821A
1	1.85mm male to 1.85mm male	7821B
1	1.85mm female to 1.85mm male	7821C
1	Torque wrench (8 in. lbs)	8799A1
1	5/16-inch double end wrench	8770Z6
1	3/16-inch double end wrench	7960Z1
1	Foam-lined wood instrument case	—

COMPONENT SPECIFICATIONS

Air Lines – Models 7843S0.96, 7843S1.15 & 7843S3.00

Frequency Range ..... DC to 67.0 GHz
Electrical Length:
- 7843S0.96 ..... 0.96cm
- 7843S1.15 ..... 1.15cm
- 7843S3.00 ..... 3.00cm

Electrical Length Accuracy 0.0005cm
Minimum Return Loss
(excluding connector interface) ..... 48 dB
Nominal Impedance ..... 50 ohm

Fixed Shorts - Models 7846A & 7847A

Frequency Range ..... DC to 67.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance ..... 50 ohm
Phase Accuracy ..... ±2.0 degrees

Fixed Terminations - Models 7831A1 & 7831B1

Frequency Range ..... DC to 50.0 GHz
Maximum VSWR:
- DC to 1 GHz 1.02
- 1 to 10 GHz 1.07
- 10 to 26.5 GHz 1.10
- 26.5 to 50 GHz 1.20

Power Handling ..... 0.5 watt CW, 0.25 kW peak
Nominal Impedance ..... 50 ohm

Precision 1.85mm In-series Adapters

Models 7821A/B/C (1.85mm to 1.85mm)

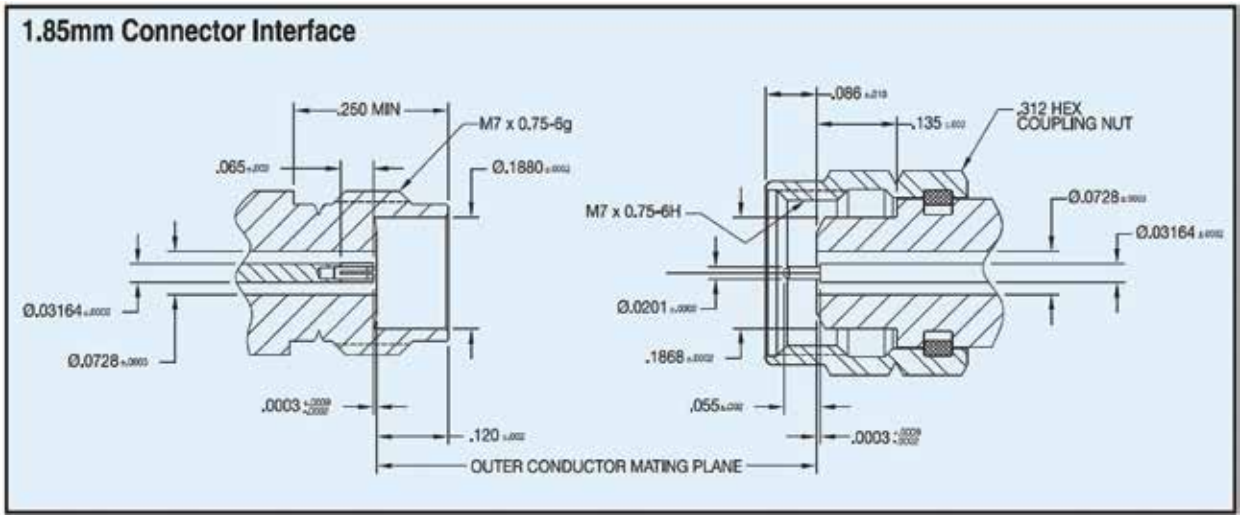
Frequency Range ..... DC to 67.0 GHz
Maximum VSWR:
- DC to 26.5 GHz 1.06
- 26.5 to 40.0 GHz 1.10
- 40.0 to 67.0 GHz 1.15

Nominal Impedance ..... 50 ohm

(Note: These adapters are included in the 7850CK31 kits, but are not included in the 7850CK30 kits)

Connector Description

The precision 1.85mm connectors on the components in this kit 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. For detailed interface specifications please refer to Maury data sheet 5E-089.



2.4mm VNA Calibration Kits from Maury Microwave

7950CK10/11 series, 7950CK20/21 series and 7950CK30/31 series

Features

- 2.4mm Connectors
- DC to 50 GHz
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Calibration Methods Supported

- 7950CK10/11 – Fixed Load SOLT (DC–50 GHz)
- 7950CK20/21 – Sliding Load SOLT (DC–50 GHz)
- 7950CK30/31 – TRM/TRL/LRL (DC–50 GHz)

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Methods

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

The sliding load SOLT kit can accurately measure lower reflection coefficients due to the improved termination performance provided by the sliding load (typically better than 30 dB return loss).

TRL calibration, using Thru, Reflect and Line standards, relies on the characteristic impedance of the air lines (Line). TRL calibration is the most accurate method of measuring devices at low (typically better than 40 dB return loss) and high reflection coefficients.

*Refer to specifications on page 21.

7950CK10/11/20/21 kits are configured for use in performing one-port SOL (Short-Open-Load) response calibrations (a method used for measuring VSWR/ Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

7950CK30/31 TRL/LRL calibration kits contain the components needed to perform TRM, TRL and LRL calibrations. Source match can also be measured using the 6.25cm air line with the short circuit provided.

7950CK11/21/31 kits include three 2.4mm in-series adapters for applications that require female/female, male/male, or male/female connections. A wide range of between-series adapters in 2.4mm to other types and special VNA test port adapters (NMD type) are also available by separate order.

Recommended Accessories

A048A Digital Connector Gage Kit:

Contains two "thread-on" type, digital gages for measuring female and male contact pin location. They provide an easy and accurate way to measure critical linear interface dimensions of 1.85mm and 2.4mm coaxial connectors.

8799A1 5/16-inch Precision Torque Wrench (8.0 inch lbs):

For proper torquing of 1.85mm, 2.4mm, 2.92mm and 3.5mm connections. Factory preset to 8.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

7909A1 & 7909A2 2.4mm NMD test port adapters:

Precision 2.4mm to NMD2.4mm; DC–50.0 GHz. Saves unnecessary wear and tear on your VNA test ports.

See page 62-63 to see all Maury 2.4mm in-series and between series adapters.

Maury 2.4mm VNA Calibration Kits

Maury precision 2.4mm VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. The 7950CK10/20/30 kits do not include adapters; the 7950CK11/21/31 kits include one each of the in-series adapters shown. Other in-series and between series adapters are sold separately.

7950CK10

7950CK11

7950CK20

7950CK21

7950CK30

7950CK31

Components Included in 7950CK10/11 Kits

QUANTITY	DESCRIPTION	MODEL
1	2.4mm female fixed short circuit	7946A
1	2.4mm male fixed short circuit	7946B
1	2.4mm female open circuit termination	7948A1
1	2.4mm male open circuit termination	7948B1
1	2.4mm female fixed termination	7931A1
1	2.4mm male fixed termination	7931B1
1*	2.4mm female to 2.4mm female adapter	7921A
1*	2.4mm male to 2.4mm male adapter	7921B
1*	2.4mm female to 2.4mm male adapter	7921C
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 7950CK11 kits, but are not included in the 7950CK10 kits.

Components Included in 7950CK20/21 Kits

QUANTITY	DESCRIPTION	MODEL
1	2.4mm female fixed short circuit	7946A
1	2.4mm male fixed short circuit	7946B
1	2.4mm female open circuit termination	7948A1
1	2.4mm male open circuit termination	7948B1
1	2.4mm female fixed termination	7931A1
1	2.4mm male fixed termination	7931B1
1*	2.4mm female to 2.4mm female adapter	7921A
1*	2.4mm male to 2.4mm male adapter	7921B
1*	2.4mm female to 2.4mm male adapter	7921C
1	2.4mm female sliding termination	7935A
1	2.4mm male sliding termination	7935B
1	Pin depth adjusting tool	8777S02
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	5/16-inch double end wrench	8770Z6
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 7950CK21 kits, but are not included in the 7950CK20 kits.

Components Included in 7950CK30/31 Kits

QUANTITY	DESCRIPTION	MODEL
1	2.4mm female fixed short circuit	7946A
1	2.4mm male fixed short circuit	7946B
1	2.4mm female fixed termination	7931A1
1	2.4mm male fixed termination	7931B1
1*	2.4mm female to 2.4mm female adapter	7921A
1*	2.4mm male to 2.4mm male adapter	7921B
1*	2.4mm female to 2.4mm male adapter	7921C
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	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	3/16-inch double end wrench	7960Z1
1	5/16-inch double end wrench	8770Z6
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 7950CK31 kits, but are not included in the 7950CK30 kits.

COMPONENT SPECIFICATIONS

Air Lines – Models 7943S1.25, 7943S1.50 & 7943S6.25

Frequency Range . . . . . DC to 50.0 GHz
Electrical Length:
- 7943S1.25 . . . . . 1.25cm
- 7943S1.50 . . . . . 1.50cm
- 7943S6.25 . . . . . 6.25cm

Electrical Length Accuracy 0.0025cm
Minimum Return Loss (excluding connector interface) . .48 dB
Nominal Impedance . . . . . 50 ohm

Sliding Terminations – Models 7935A & 7935B

Frequency Range (Terminating Element) . . . . 4.0 to 50.0 GHz
Maximum VSWR (Terminating Element):
- 4.0 to 10.0 GHz 1.10
- 10.0 to 50.0 GHz 1.05

Power Handling . . . . . 0.5 watt CW, 0.5 kW peak
Nominal Impedance . . . . . 50 ohm
Air Line Accuracy (4.0–50.0 GHz) . . . . . 44 dB (Min)
(equivalent return loss of air line impedance)

Fixed Terminations – Models 7931A1 & 7931B1

Frequency Range . . . . . DC to 50.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.016
- 4.0 to 50.0 GHz 1.15

Power Handling . . . . . 0.5 watt CW, 0.25 kW peak
Nominal Impedance . . . . . 50 ohm

Fixed Shorts – Models 7946A & 7946B

Frequency Range . . . . . DC to 50.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±2.0 degrees
Nominal Impedance . . . . . 50 ohm

Open Circuits – Models 7948A1 & 7948B1

Frequency Range . . . . . DC to 50.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±2.0 degrees
Nominal Impedance . . . . . 50 ohm

Precision 2.4mm Adapters – Models 7921A/B/C

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

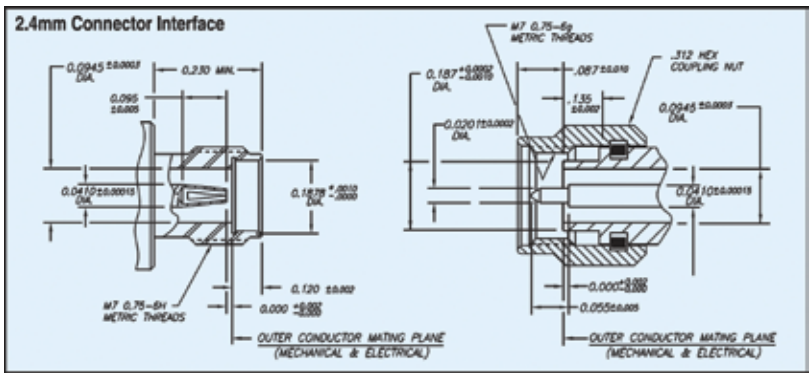
Nominal Impedance . . . . . 50 ohm

(***Note:*** These adapters are included in the 7950CK11/21/31 kits, but are not included in the 7950CK10/20/30 kits.)

Connector Description

The precision 2.4mm connectors on the components in these kits 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 detailed interface specifications please refer to Maury data sheet 5E-064.



2.92mm VNA Calibration Kits from Maury Microwave

8770CK10/11 series, 8770CK20/21 series, and 8770CK30/31 series

Features

- 2.92mm Connectors
- DC to 40 GHz
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Calibration Methods Supported

- 8770CK10/11 – Fixed Load SOLT (DC–40 GHz)
- 8770CK20/21 – Sliding/Fixed Load SOLT (DC–40 GHz)
- 8770CK30/31 – TRM/TRL/LRL (DC–40 GHz)

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Methods

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

The sliding load SOLT kit can accurately measure lower reflection coefficients due to the improved termination performance provided by the sliding load (typically better than 30 dB return loss).

TRL calibration, using Thru, Reflect and Line standards, relies on the characteristic impedance of the air lines (Line). TRL calibration is the most accurate method of measuring devices at low (typically better than 40 dB return loss) and high reflection coefficients.

*Refer to specifications on page 24.

8770CK10/11/20/21 kits are configured for use in performing one-port SOL (Short-Open-Load) response calibrations (a method used for measuring VSWR/ Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

8770CK30/31 TRL/LRL calibration kits contain the components needed to perform TRM, TRL and LRL calibrations. Source match can also be measured using the 15cm air line with the short circuit provided.

8770CK11/21/31 kits include three 2.92mm in-series adapters for applications that require female/female, male/male, or male/female connections. A wide range of between-series adapters in 2.92mm to other types are also available by separate order.

Recommended Accessories

A050A Digital Connector Gage Kit:

Contains two "Thread-on" type, digital gages for measuring female and male contact pin location. They provide an easy and accurate way to measure critical linear interface dimensions of 2.92mm and 3.5mm coaxial connectors.

8799A1 5/16-inch Precision Torque Wrench (8.0 inch lbs):

For proper torquing of 1.85mm, 2.92mm, 2.92mm and 3.5mm connections. Factory preset to 8.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

7909F1 & 7909F2 2.4mm NMD test port adapters:

Precision NMD2.4mm to 2.92mm; DC–40.0 GHz. Saves unnecessary wear and tear on your VNA test port connectors.

See page 64-65 to see all Maury 2.92mm in-series and between series adapters.

Maury 2.92mm VNA Calibration Kits

Maury precision 2.92mm VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. The 8770CK10/20/30 kits do not include adapters; the 8770CK11/21/31 kits include one each of the in-series adapters shown. Other in-series and between-series adapters are sold separately.

Components Included in 8770CK10/11 Kits

QUANTITY	DESCRIPTION	MODEL
1	2.92mm female fixed short circuit	8771F2
1	2.92mm male fixed short circuit	8772F2
1	2.92mm female open circuit termination	8773A2
1	2.92mm male open circuit termination	8773B2
1	2.92mm female fixed termination	8775A3
1	2.92mm male fixed termination	8775B3
1*	2.92mm female to 2.92mm female adapter	8714A2
1*	2.92mm male to 2.92mm male adapter	8714B2
1*	2.92mm female to 2.92mm male adapter	8714C2
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8770CK11 kits, but are not included in the 8770CK10 kits.

Components Included in 8770CK20/21 Kits

QUANTITY	DESCRIPTION	MODEL
1	2.92mm female fixed short circuit	8771F2
1	2.92mm male fixed short circuit	8772F2
1	2.92mm female open circuit termination	8773A2
1	2.92mm male open circuit termination	8773B2
1	2.92mm female fixed termination	8775A3
1	2.92mm male fixed termination	8775B3
1*	2.92mm female to 2.92mm female adapter	8714A2
1*	2.92mm male to 2.92mm male adapter	8714B2
1*	2.92mm female to 2.92mm male adapter	8714C2
1	2.92mm female sliding termination	8777A2
1	2.92mm male sliding termination	8777B2
1	Pin depth adjusting tool	8777S02
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	5/16-inch double end wrench	8770Z6
1	7/16-inch double end wrench	8770Z7
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8770CK21 kits, but are not included in the 8770CK20 kits.

Components Included in 8770CK30/31 Kits

QUANTITY	DESCRIPTION	MODEL
1	2.92mm female fixed short circuit	8771F2
1	2.92mm male fixed short circuit	8772F2
1	2.92mm female fixed termination	8775A3
1	2.92mm male fixed termination	8775B3
1*	2.92mm female to 2.92mm female adapter	8714A2
1*	2.92mm male to 2.92mm male adapter	8714B2
1*	2.92mm female to 2.92mm male adapter	8714C2
1	2.92mm female to male air line (5cm)	8774S5
1	2.92mm female to male air line (5.25cm)	8774S5.25
1	2.92mm female to male air line (6cm)	8774S6
1	2.92mm female to male air line (15cm)	8774S15
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	5/16-inch double end wrench	8770Z6
1	7/16-inch double end wrench	8770Z7
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8770CK31 kits, but are not included in the 8770CK30 kits.

COMPONENT SPECIFICATIONS

Air Lines – Models 8774S15, 8774S6, 8774S5.25 & 8774S5

Frequency Range . . . . . DC to 40.0 GHz
Electrical Length:
- 8774S15 . . . . . 15cm
- 8774S5 . . . . . 5cm
- 8774S6 . . . . . 6cm
- 8774S5.25 . . . . . 5.25cm

Electrical Length Accuracy . . . . . ±0.0025cm
Minimum Return Loss (excluding connector interface) . . 48 dB
Nominal Impedance . . . . . 50 ohm

Sliding Terminations – Models 8777A2 & 8777B2

Frequency Range . . . . . 4.0 to 40.0 GHz
Air Line Accuracy. . . . . 46 dB min, 4.0 to 40.0 GHz
(equivalent return loss of air line impedance)
Maximum VSWR of Terminating Element:
- 4.0 to 10.0 GHz 1.10
- 10.0 to 40.0 GHz 1.05

Nominal Impedance . . . . . 50 ohm
Power Handling . . . . . 0.5 watt CW, 0.5 kW peak
Travel . . . . . Greater than 1/2 wavelength at 4 GHz

Fixed Terminations – Models 8775A3 & 8775B3

Frequency Range . . . . . DC to 40.0 GHz
Maximum VSWR:
- DC to 4.0 GHz 1.016
- 4.0 to 40.0 GHz 1.12

Power Handling . . . . . 0.5 watt CW, 0.25 kW peak
Nominal Impedance . . . . . 50 ohm

Fixed Shorts – Models 8771F2 & 8772F2

Frequency Range . . . . . DC to 40.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±2.0 degrees
Nominal Impedance . . . . . 50 ohm

Open Circuits – Models 8773A2 & 8773B2

Frequency Range . . . . . DC to 40.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±1.5 degrees
Nominal Impedance . . . . . 50 ohm

Precision 2.92mm Adapters – Models 8714A2/B2/C2

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

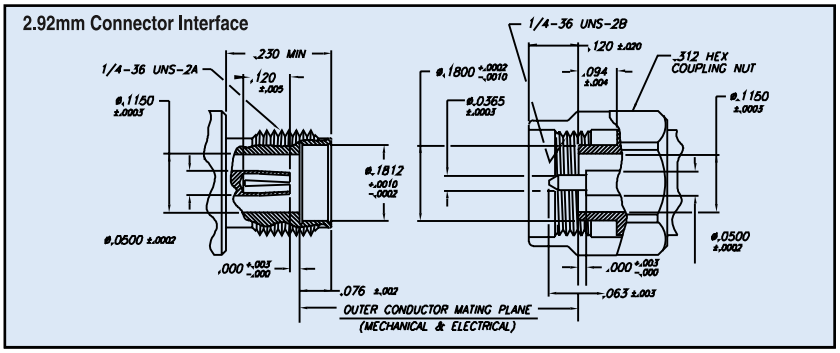
Nominal Impedance . . . . . 50 ohm

(Note: These adapters are included in the 8770CK11/21/31 kits, but are not included in the 8770CK10/20/30 kits.)

Connector Description

The precision 2.92mm connectors on the components in these kits are miniature, instrument grade, air-interface connectors that operate mode free up to 40 GHz, and comply with IEEE standard 287 general precision connector, instrument grade GPC2.92.

For detailed interface specifications please refer to Maury data sheet 5E-063.



3.5mm VNA Calibration Kits from Maury Microwave

8050CK10/11 series, 8050CK20/21 series, and 8050CK30/31 series

Features

- 3.5mm Connectors
- DC to 26.5 GHz
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Calibration Methods Supported

- 8050CK10/11 – Fixed Load SOLT (DC–26.5 GHz)
- 8050CK20/21 – Fixed/Sliding Load SOLT (DC–26.5 GHz)
- 8050CK30/31 – TRM/TRL/LRL (DC–26.5 GHz)

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Methods

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

The sliding load SOLT kit can accurately measure lower reflection coefficients due to the improved termination performance provided by the sliding load (typically better than 30 dB return loss).

TRL calibration, using Thru, Reflect and Line standards, relies on the characteristic impedance of the air lines (Line). TRL calibration is the most accurate method of measuring devices at low (typically better than 40 dB return loss) and high reflection coefficients.

*Refer to specifications on page 27.

8050CK10/11/20/21 kits are configured for use in performing one-port SOL (Short-Open-Load) response calibrations (a method used for measuring VSWR/ Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

8050CK30/31 TRL/LRL calibration kits contain the components needed to perform TRM, TRL and LRL calibrations. Source match can also be measured using the 15cm air line with the short circuit provided.

8050CK11/21/31 kits include three 3.5mm in-series adapters for applications that require female/female, male/male, or male/female connections. A wide range of between-series adapters in 3.5mm to other types are also available by separate order.

A050A

Recommended Accessories

A050A Digital Connector Gage Kit:

Contains two "thread-on" type, digital gages for measuring female and male contact pin location. They provide an easy and accurate way to measure critical linear interface dimensions of 2.92mm and 3.5mm coaxial connectors.

8799A1 5/16-inch Precision Torque Wrench (8.0 inch lbs):

For proper torquing of 1.85mm, 3.5mm, 2.92mm and 3.5mm connections. Factory preset to 8.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

8799A1

8009A & 8009B 3.5mm NMD test port adapters:

Precision 3.5mm to NMD3.5mm; DC–26.5 GHz. Saves unnecessary wear and tear on your VNA test ports.

8009A 8009B

7909B1 & 7909B2 2.4mm NMD test port adapters:

Precision NMD2.4mm to 3.5mm; DC–34.0 GHz. Saves unnecessary wear and tear on your VNA test port connectors.

7909B1 7909B2

See page 66-67 to see all Maury 3.5mm in-series and between series adapters.

Maury 3.5mm VNA Calibration Kits

Maury precision 3.5mm VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. The 8050CK10/20/30 kits do not include adapters; the 8050CK11/21/31 kits include one each of the in-series adapters shown. Other in-series and between-series adapters are sold separately.

8050CK10

8050CK11

8050CK20

8050CK21

8050CK30

8050CK31

Components Included in 8050CK10/11 Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm female fixed short circuit	8046F
1	3.5mm male fixed short circuit	8047F
1	3.5mm female open circuit termination	8048A1
1	3.5mm male open circuit termination	8048B1
1	3.5mm female fixed termination	8031A5
1	3.5mm male fixed termination	8031B5
1*	3.5mm female to 3.5mm female adapter	8021A2
1*	3.5mm male to 3.5mm male adapter	8021B2
1*	3.5mm female to 3.5mm male adapter	8021C2
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8050CK11 kits, but are not included in the 8050CK10 kits.

Components Included in 8050CK20/21 Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm female fixed short circuit	8046F
1	3.5mm male fixed short circuit	8047F
1	3.5mm female open circuit termination	8048A1
1	3.5mm male open circuit termination	8048B1
1	3.5mm female fixed termination	8031A5
1	3.5mm male fixed termination	8031B5
1*	3.5mm female to 3.5mm female adapter	8021A2
1*	3.5mm male to 3.5mm male adapter	8021B2
1*	3.5mm female to 3.5mm male adapter	8021C2
1	3.5mm female sliding termination	8037A
1	3.5mm male sliding termination	8037B
1	Pin depth adjusting tool	8777S02
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	7/16-inch double end wrench	8770Z7
1	5/16-inch double end wrench	8770Z6
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8050CK21 kits, but are not included in the 8050CK20 kits.

Components Included in 8050CK30/31 Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm female fixed short circuit	8046F
1	3.5mm male fixed short circuit	8047F
1	3.5mm female fixed termination	8031A5
1	3.5mm male fixed termination	8031B5
1*	3.5mm female to 3.5mm female adapter	8021A2
1*	3.5mm male to 3.5mm male adapter	8021B2
1*	3.5mm female to 3.5mm male adapter	8021C2
1	3.5mm female to male air line (5cm)	8043S5
1	3.5mm female to male air line (5.25cm)	8043S5.3
1	3.5mm female to male air line (6cm)	8043S6
1	3.5mm female to male air line (15cm)	8043S15
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	7/16-inch double end wrench	8770Z7
1	5/16-inch double end wrench	8770Z6
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8050CK31 kits, but are not included in the 8050CK30 kits.

COMPONENT SPECIFICATIONS

Air Lines – Models 8043S15, 8043S6, 8043S5.3 & 8043S5

Frequency Range . . . . . DC to 26.5 GHz
Electrical Length:
- 8043S15 . . . . . 15cm
- 8043S6 . . . . . 6cm
- 8043S5.3 . . . . . 5.3cm
- 8043S5 . . . . . 5cm

Electrical Length Accuracy . . . . . ±0.0025cm
Minimum Return Loss (excluding connector interface) . . . . . 48 dB
Nominal Impedance . . . . . 50 ohm

Sliding Terminations – Models 8037A & 8037B

Frequency Range . . . . . 2.0 to 34.0 GHz
Maximum VSWR of Terminating Element:
- 2.0 to 4.0 GHz 1.09
- 4.0 to 34.0 GHz 1.05

Air Line Accuracy. . . . . 50 dB min return loss
(equivalent return loss of air line impedance)
Nominal Impedance . . . . . 50 ohm
Power Handling . . . . . 1.0 watt CW, 1.0 kW peak
Travel . . . . . Greater than 1/2 wavelength at 2.0 GHz

Fixed Terminations – Models 8031A5 & 8031B5

Frequency Range . . . . . DC to 26.5 GHz
Maximum VSWR:
- DC to 3.0 GHz 1.020
- 3.0 to 6.0 GHz 1.032
- 6.0 to 20.0 GHz 1.052
- 20.0 to 26.5 GHz 1.083

Power Handling . . . . . 0.25 watt CW, 0.5 kW peak
Nominal Impedance . . . . . 50 ohm

Fixed Shorts – Models 8046F & 8047F

Frequency Range . . . . . DC to 26.5 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±2.0 degrees
Nominal Impedance . . . . . 50 ohm

Open Circuits – Models 8048A1 & 8048B1

Frequency Range . . . . . DC to 26.5 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±1.4 degrees
Nominal Impedance . . . . . 50 ohm

Precision 3.5mm Adapters – Models 8021A2/B2/C2

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

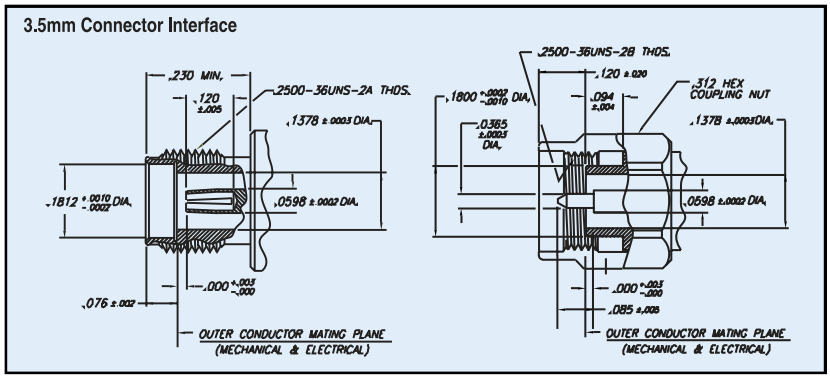
Nominal Impedance . . . . . 50 ohm

(Note: These adapters are included in the 8050CK11/21/31 kits, but are not included in the 8050CK10/20/30 kits.)

Connector Description

The precision 3.5mm connectors on the components in these kits are miniature, instrument grade, air-interface connectors that operate mode free up to 34 GHz, and comply with IEEE standard 287 general precision connector, instrument grade GPC3.5.

For detailed interface specifications please refer to Maury data sheet 5E-062.



7mm VNA Calibration Kits from Maury Microwave

Models 2650CK10, 2650CK20 and 2650CK30

Features

- 7mm Connectors
- DC to 18 GHz
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Calibration Methods Supported

- 2650CK10 – Fixed Load SOLT (DC–18.0 GHz)
- 2650CK20 – Sliding/Fixed Load SOLT (DC–18.0 GHz)
- 2650CK30 (TRL Kit) – TRM/TRL/LRL (DC–18.0 GHz)

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Methods

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

The sliding load SOLT kit can accurately measure lower reflection coefficients due to the improved termination performance provided by the sliding load (typically better than 30 dB return loss).

TRL calibration, using Thru, Reflect and Line standards, relies on the characteristic impedance of the air lines (Line). TRL calibration is the most accurate method of measuring devices at low (typically better than 40 dB return loss) and high reflection coefficients.

*Refer to specifications on page 30.

2650CK10/20 kits are configured for performing one-port SOL (Short-Open-Load) response calibrations (for measuring VSWR/Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

2650CK30 TRL/LRL calibration kits contain the components needed to perform TRM, TRL and LRL calibrations. Source match can also be measured using the 15cm air line with the short circuit provided.

2650CK10/20/30 kits do not include adapters. Maury offers a wide range of between-series adapters in 7mm to other types that can be ordered separately.

Recommended Accessories

A028D Connector Gage Kit:
Contains one metrology-grade "Thread-on" type, dial indicator style gage for measuring the planar contact location. This provides an easy and accurate way to measure critical linear interface dimensions of 7mm coaxial connectors.

2698C2 3/4-inch Precision Torque Wrench (12.0 inch lbs):

For proper torquing of 7mm, LPC7,Type N, NMD3.5, NMD2.92 NMD2.4 connections. Factory preset to 12.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

Ruggedized Test Port Adapters (Available Models):

Model 2633C – NMD3.5mm female to 7mm

Model 7909C – NMD2.4mm female to 7mm

These adapters save wear and tear on your VNA test ports.

See page 69 to see all Maury 7mm in-series and between series adapters.

Maury 7mm VNA Calibration Kits

Maury precision 7mm VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. The 2650CK10/20/30 kits do not include adapters; in-series and between-series adapters are sold separately. (See Maury's Precision Calibration & Interconnect Solutions catalog for adapter specifications. This catalog is available online at maurymw.com.)

2650CK10

2650CK20

2650CK30

Components Included in 2650CK10 Kits

QUANTITY	DESCRIPTION	MODEL
1	7mm fixed short circuit	2615D3
1	7mm open circuit termination	2616D3
1	7mm fixed termination	2610F
1	Foam-lined wood Instrument case	—

Components Included in 2650CK20 Kits

QUANTITY	DESCRIPTION	MODEL
1	7mm fixed short circuit	2615D3
1	7mm open circuit termination	2616D3
1	7mm fixed termination	2610F
1	7mm sliding termination	2608C
1	3/4-inch torque wrench — 12 in. lbs.	2698C2
1	Foam-lined wood Instrument case	—

Components Included in 2650CK30 Kits

QUANTITY	DESCRIPTION	MODEL
1	7mm fixed short circuit	2615D3
1	7mm fixed termination	2610F
1	7mm air line (0.6cm)	2653L
1	7mm air line (3.12cm)	2653S3.12
1	7mm air line (15cm)	2653S15
1	3/4-inch torque wrench — 12 in. lbs.	2698C2
1	Foam-lined wood Instrument case	—

COMPONENT SPECIFICATIONS

Air Lines – Models 2653S3.12, 2653L & 2653S15

Frequency Range . . . . . DC to 18.0 GHz
Electrical Length:
26553S3.12 . . . . . 3.12cm
2653L 0.69cm
2653S15 . . . . . 14.983cm
Electrical Length Accuracy . . . . . ±0.006cm
Return Loss (Min.) – excluding connector interface . . . . 52 dB
Nominal Impedance . . . . . 50 ohm

Sliding Termination – Model 2608C

Frequency Range . . . . . 2.0 to 18.0 GHz
Maximum VSWR of Terminating Element 1.04
Air Line Accuracy. . . . . 62 dB min return loss
(equivalent return loss of air line impedance)
Nominal Impedance . . . . . 50 ohm
Power Handling . . . . . 1.0 watt CW, 5.0 kW peak
Travel . . . . . Greater than 1/2 wavelength at 2.0 GHz

Fixed Termination – Model 2610F

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC — 1.0 GHz 1.005
1.0 — 2.0 GHz 1.01
2.0 — 8.0 GHz 1.03
8.0 — 18.0 GHz 1.06
Nominal Impedance. . . . . 50 ohm
Power Handling . . . . . 1 watt CW 1 kW peak

Fixed Short – Model 2615D3

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.995
Phase Accuracy . . . . . ±0.3 degrees
Nominal Impedance . . . . . 50 ohm

Open Circuit – Model 2616D3

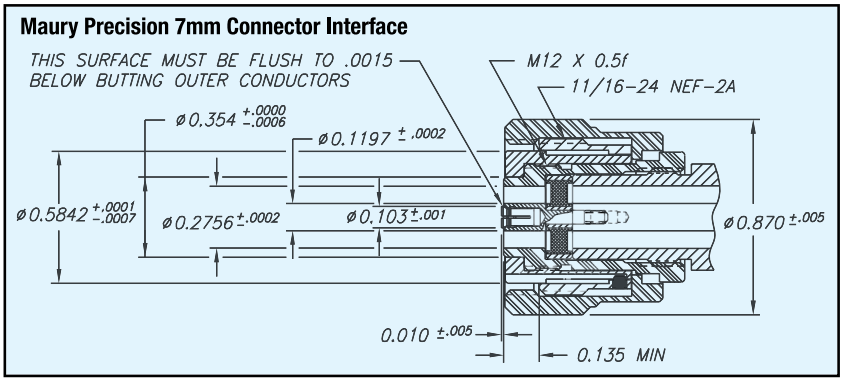
Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.995
Phase Accuracy . . . . . ±0.3 degrees
Nominal Impedance . . . . . 50 ohm

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 complete interface dimensions.

Maury Precision 7mm Connector Interface



Type N VNA Calibration Kits from Maury Microwave

8850CK10/11 series, 8850CK20/21 series and 8850CK30/31 series

Features

> Type N Connectors
> DC to 18 GHz
> Keysight, Rhode & Schwarz and Anritsu VNAs Supported

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If un-corrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Methods

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

The sliding load SOLT kit can accurately measure lower reflection coefficients due to the improved termination performance provided by the sliding load (typically better than 30 dB return loss).

TRL calibration, using Thru, Reflect and Line standards, relies on the characteristic impedance of the air lines (Line). TRL calibration is the most accurate method of measuring devices at low (typically better than 40 dB return loss) and high reflection coefficients.

*Refer to specifications on page 33.

Calibration Methods Supported

> 8850CK10/11 – Fixed Load SOLT (DC–18.0 GHz)
> 8850CK20/21 – Fixed/Sliding Load SOLT (DC–18.0 GHz)
> 8850CK30/31 – TRM/TRL/LRL (DC–18.0 GHz)

8850CK10/11/20/21 kits are configured for use in performing one-port SOL (Short-Open-Load) response calibrations (a method used for measuring VSWR/ Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

8850CK30/31 TRL/LRL calibration kits contain the components needed to perform TRM, TRL and LRL calibrations. Source match can also be measured using the 15cm air line with the short circuit provided.

8850CK11/21/31 kits include three Type N in-series adapters for applications that require female/female, male/male, or male/female connections. A wide range of between-series adapters in Type N to other types are also available by separate order.

Recommended Accessories

A020K Digital Connector Gage Kit:

Contains two "Thread-on" type, digital gages for measuring female and male contact pin location. They provide an easy and accurate way to measure critical linear interface dimensions of Type N coaxial connectors.

2698C2 3/4-inch Precision Torque Wrench (12.0 inch lbs):

For proper torquing of 7mm, LPC7,Type N, NMD3.5, NMD2.92 NMD2.4 connections. Factory preset to 12.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

8829A & 8829B Type N to 3.5mm NMD test port adapters:

Precision Type N to NMD3.5mm; DC–18.0 GHz. Saves unnecessary wear and tear on your VNA test ports.

7909D1 & 7909D2 Type N to 2.4mm NMD test port adapters:

Precision Type N to NMD2.4mm; DC–18.0 GHz. Saves unnecessary wear and tear on your VNA test ports.

A020K

2698C2

7909D1

7909D2

8829A

8829B

See page 70-71 to see all Maury Type N in-series and between series adapters.

Maury Type N VNA Calibration Kits

Maury precision Type N VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. The 8850CK10/20/30 kits do not include adapters; the 8850CK11/21/31 kits include one each of the in-series adapters shown. Other in-series and between-series adapters are sold separately.

8850CK10

8850CK11

8850CK20

8850CK21

8850CK30

8850CK31

Components Included in 8850CK10/11 Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N female fixed short circuit	8806C
1	Type N male fixed short circuit	8807C
1	Type N female open circuit termination	8809B1
1	Type N male open circuit termination	8810B1
1	Type N female fixed termination	2510A6
1	Type N male fixed termination	2510B6
1*	Type N female to Type N female adapter	8828A
1*	Type N male to Type N male adapter	8828B
1*	Type N female to Type N male adapter	8828C
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8850CK11 kits, but are not included in the 8850CK10 kits.

Components Included in 8850CK20/21 Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N female fixed short circuit	8806C
1	Type N male fixed short circuit	8807C
1	Type N female open circuit termination	8809B1
1	Type N male open circuit termination	8810B1
1	Type N female fixed termination	2510A6
1	Type N male fixed termination	2510B6
1*	Type N female to Type N female adapter	8828A
1*	Type N male to Type N male adapter	8828B
1*	Type N female to Type N male adapter	8828C
1	Type N female sliding termination	8834A
1	Type N male sliding termination	8834B
1	3/4-inch torque wrench — 12.0 in. lbs.	2698C2
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8850CK21 kits, but are not included in the 8850CK20 kits.

Components Included in 8850CK30/31 Kits

QUANTITY	DESCRIPTION	MODEL
1	Type N female fixed short circuit	8806G
1	Type N male offset short circuit	8807C
1	Type N female fixed termination	2510A6
1	Type N male fixed termination	2510B6
1*	Type N female to Type N female adapter	8828A
1*	Type N male to Type N male adapter	8828B
1*	Type N female to Type N male adapter	8828C
1	Type N female to Type N male air line (3.12cm)	2553T3.12
1	Type N female to Type N male air line (3.82cm)	2553T3.82
1	Type N female to Type N male air line (15cm)	2553T15
1	3/4-inch torque wrench — 12.0 in. lbs.	2698C2
1	Foam-lined wood Instrument case	—

* These adapters are provided in the 8850CK31 kits, but are not included in the 8850CK30 kits.

COMPONENT SPECIFICATIONS

Air Lines – Models 2553T3.12, 2553T3.82 & 2653T15

Frequency Range . . . . . DC to 18.0 GHz
Electrical Length:
2553T3.12. . . . . 3.12cm
2553T3.82 . . . . . 3.816cm
2553T15 . . . . . 14.983cm
Electrical Length Accuracy . . . . . ±0.01cm
Minimum Return Loss (excluding connector interfaces) . . . . 52 dB
Characteristic Impedance (where skin depth
is negligible). . . . . 50 ohm + 0.2 ohm

Sliding Termination – Model 8834A/B

Frequency Range . . . . . 1.8 to 18.0 GHz
Maximum VSWR of Terminating Element 1.05
Air Line Accuracy. . . . . 54 dB min return loss
(equivalent return loss of air line impedance)
Nominal Impedance . . . . . 50 ohm
Power Handling . . . . . 1.0 watt CW, 1.0 kW peak
Travel . . . . . Greater than 1/2 wavelength at 1.8 GHz

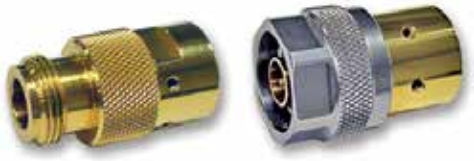
Fixed Terminations – Model 2510A6 & 2510B6

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 2.0 GHz 1.02
2.0 to 4.0 GHz 1.04
4.0 to 18.0 GHz 1.06
Nominal Impedance. . . . . 50 ohm
Power Handling . . . . . .1 watt CW, 1 kW peak

Fixed Shorts – Models 8806G, 8806C & 8807C

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Nominal Impedance . . . . . 50 ohm
Phase Accuracy . . . . . ± 2.0°

Open Circuits – Models 8809B1 & 8810B1



Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.99
Phase Accuracy . . . . . ±2.0°
Nominal Impedance . . . . . 50 ohm

Precision Type N Adapters – Models 8828A/B/C

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

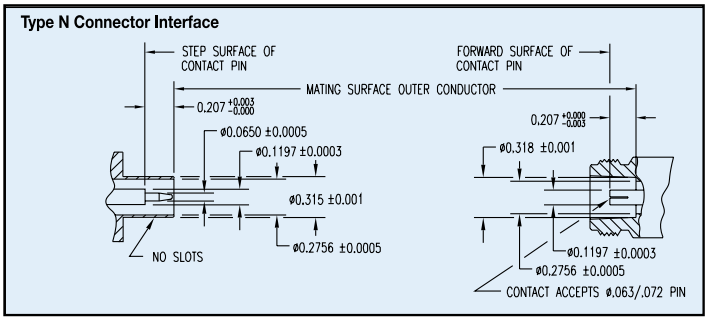
(Note: These adapters are included in the 8850CK11/21/31 kits, but are not included in the 8850CK10/20/30 kits.)

Connector Description

The precision Type N connectors on the components in these kits are instrument grade, air-interface connectors that are rated for operation from DC to 18.0 GHz, and 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 detailed interface specifications please refer to Maury data sheet 5E-049.

Type N Connector Interface



TNC VNA Calibration Kits from Maury Microwave

Models 8650CK10/11 and 8650CK20/21

Features

- TNC Connectors
- DC to 18 GHz
- High Performance
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Methods

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

The sliding load SOLT kit can accurately measure lower reflection coefficients due to the improved termination performance provided by the sliding load (typically better than 30 dB return loss).

8650CK10/11/20/21 kits are configured for use in performing one-port SOL (Short-Open-Load) response calibrations (a method used for measuring VSWR/ Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

Calibration Methods Supported

- 8650CK10 & 8650CK11 – Fixed Load SOLT (DC–18.0 GHz)
- 8650CK20 & 8650CK21 – Sliding/Fixed Load SOLT (DC–18.0 GHz)

A012A

Recommended Accessories

A012A TNC, TNCA, and AFTNC Connector Gage Kit:

Contains a metrology-grade "push-on" "universal" type, dial indicator style gage for measuring the contact pin and dielectric interface locations of MIL-STD, IEC and commercial TNC connectors. *This provides an easy and accurate way to measure these critical linear interface dimensions.

2698G1 9/16-inch Torque Wrench — 12.0 Inch lbs:

For proper torquing of TNCA and MP6 connections. Factory preset to 12.0 inch lbs to ensure the precise torque needed for optimum repeatability. Employs a "break" design that makes it impossible to over-torque your connections.

8619A & 8619B TNC to 3.5mm NMD test port adapters:

Precision TNC to NMD3.5mm; DC–18.0 GHz. Saves unnecessary wear and tear on your VNA test ports.

*It contains interchangeable bushings and pins.

2698G1

8619A

8619B

See page 72 to see all Maury TNC in-series and between series adapters.

Maury TNC VNA Calibration Kits

Maury precision TNC VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. The 8650CK10/20 kits do not include adapters; the 8650CK11/21 kits include one each of the in-series adapters shown. Other in-series and between-series adapters are sold separately.

8650CK10

8650CK11

8650CK20

8650CK21

Components Included in 8650CK10/11 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 fixed termination	332E
1	TNC male fixed termination	332F
1*	TNC female to TNC female adapter	232A11
1*	TNC male to TNC male adapter	232B11
1*	TNC female to TNC male adapter	232C11
1	Foam-lined wood instrument case	—

* These adapters are provided in the 8650CK11 kits, but are not included in the 8650CK10 kits.

Components Included in 8650CK20/21 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 fixed termination	332E
1	TNC male fixed termination	332F
1*	TNC female to TNC female adapter	232A11
1*	TNC male to TNC male adapter	232B11
1*	TNC female to TNC male adapter	232C11
1	TNC female sliding termination	452A1
1	TNC male sliding termination	452B1
1	9/16-inch torque wrench — 12 in. lbs.	2698G1
1	7/16-inch open end wrench	8770Z7
1	Foam-lined wood instrument case	—

* These adapters are provided in the 8650CK21 kits, but are not included in the 8650CK20 kits.

COMPONENT SPECIFICATIONS

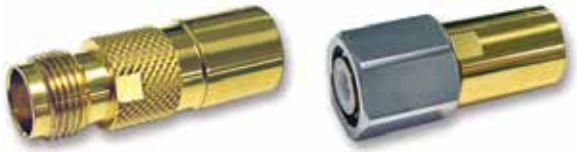
Sliding Terminations – Models 452A1 & 452B1

Frequency Range . . . . . 1.8 to 18.0 GHz
Maximum VSWR of Terminating Element 1.05
Air Line Accuracy. . . . . 56 dB min return loss
(equivalent return loss of air line impedance)
Nominal Impedance . . . . . 50 ohm
Power Handling . . . . . 5.0 watt CW, 1.0 kW peak
Travel . . . . . Greater than 1/2 wavelength at 2.0 GHz

Fixed Terminations – Models 332E & 332F

Frequency Range . . . . . DC — 18.0 GHz
Maximum VSWR:
DC — 4.0 GHz 1.06
4.0 — 12.0 GHz 1.10
12.0 — 18.0 GHz 1.15
Nominal Impedance. . . . . 50 ohm
Power Handling . . . . . 1.0 watt CW 1.0 kW peak

Fixed Short – Models 8615A & 8615B



Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±5.0°
Nominal Impedance . . . . . 50 ohm

Open Circuits – Models 8609B & 8610B

Frequency Range . . . . . DC to 18.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±5.0°
Nominal Impedance . . . . . 50 ohm

Precision TNC Adapters – Models 232A11/B11/C11

Frequency Range . . . . . DC to 18.0 GHz
Maximum VSWR:
DC to 4.0 GHz 1.06
4.0 to 7.0 GHz 1.10
7.0 to 18.0 GHz 1.14
Nominal Impedance . . . . . 50 ohm

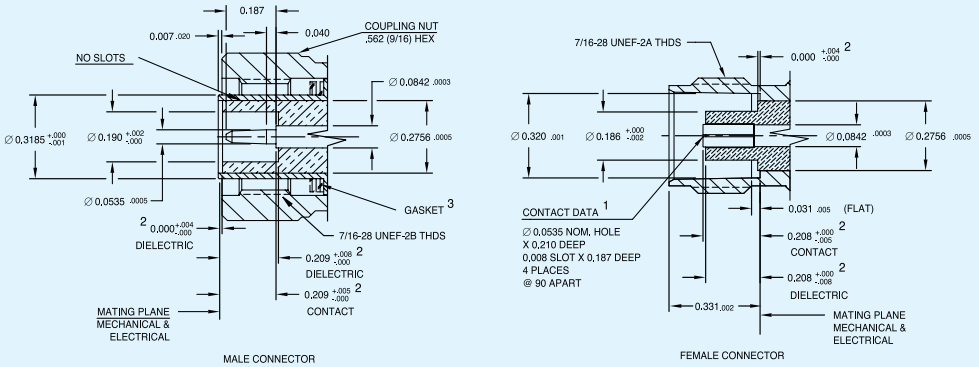
(Note: These adapters are included in the 8650CK11/21 kits, but are not included in the 8650CK10/20 kits.)

Connector Description

The TNC connectors (MPC/TNC) on the components in this kit are precision stainless steel connectors that mate with most commercially available TNC connectors, and especially with those conforming to MIL-C-39012 and MIL-T-81490. They are low VSWR connectors rated from DC to 18.0 GHz.

For interface specifications see Maury data sheet 5E-053.

Maury Precision MPC/TNC Connector Interface



1 The diameter over the slots shall be 0.0842 ± .001 diameter with a 0.0535 ± .00005 diameter x .050 pin inserted in the contact.
2 Dimensions flagged with this note can be inspected with connector gage model A012A only.
3 Gasket can be utilized where weather proofing is required, not normally provided.

AFTNC Fixed Load & Sliding Load VNA Calibration Kits

8680CK10/11 & 8680CK20/21 series

8680CK21

Features

- AFTNC Connectors
- DC to 20 GHz
- High Performance
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Kit Description

Maury Microwave's precision AFTNC fixed load calibration kits are designed for use with a broad range of vector network analyzers (VNAs). With the components in these kits you can make error-corrected measurements of devices supplied with AFTNC connectors from DC to 20.0 GHz. Each kit is supplied with a set of calibration standards; shorts, opens and fixed loads as listed at right.

Calibration Methods Supported

- 8680CK10/11 – Fixed Load SOLT (DC–20.0 GHz)
- 8680CK20/21 – Fixed/Sliding Load SOLT (DC–20.0 GHz)

8680CK10/11/20/21 kits are configured for use in performing one-port SOL (Short-Open-Load) response calibrations (a method used for measuring VSWR/ Return Loss), and full two-port SOLT (Short-Open-Load-Thru) calibration (for performing forward and reverse transmission and reflections measurement).

8680CK11/21 kits include three AFTNC in-series adapters for applications that require female/female, male/male, or male/female connections. A wide range of between-series adapters in AFTNC to other types and special VNA test port adapters (NMD type) are also available by separate order.

Recommended Accessories

A012A TNC, TNCA, and AFTNC Connector Gage Kit:

Contains a metrology-grade "push-on" "universal" type, dial indicator style gage for measuring the contact pin and dielectric interface locations of MIL-STD, IEC and commercial TNC connectors. *This provides an easy and accurate way to measure these critical linear interface dimensions.

2698G1 9/16-inch Torque Wrench — 12.0 Inch lbs:

For proper torquing of TNC and AFTNC connections. Factory preset to 12.0 inch lbs to ensure the precise torque needed for optimum repeatability.

8691A & 8691B AFTNC to 3.5mm NMD test port adapters:

Precision AFTNC to NMD3.5mm; DC–20.0 GHz. Saves unnecessary wear and tear on your VNA test ports.

Components Included in 8680CK10/11 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 fixed termination	8684A
1	AFTNC male fixed termination	8684B
1*	AFTNC female to AFTNC female adapter	8688A
1*	AFTNC male to AFTNC male adapter	8688B
1*	AFTNC female to AFTNC male adapter	8688C
1	Foam-lined wood instrument case	—

* These adapters are provided in the 8680CK11 kits, but are not included in the 8680CK10 kits.

Components Included in 8680CK20/21 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 fixed termination	8684A
1	AFTNC male fixed termination	8684B
1*	AFTNC female to AFTNC female adapter	8688A
1*	AFTNC male to AFTNC male adapter	8688B
1*	AFTNC female to AFTNC male adapter	8688C
1	AFTNC female sliding termination	8683A
1	AFTNC male sliding termination	8683B
1	9/16-inch torque wrench — 12 in. lbs.	2698G1
1	7/16-inch open end wrench	8770Z7
1	Foam-lined wood instrument case	—

* These adapters are provided in the 8680CK21 kits, but are not included in the 8680CK20 kits.

COMPONENT SPECIFICATIONS

Sliding Terminations – Models 8683A & 8683B

Frequency Range . . . . . 2.0 to 20.0 GHz
Maximum VSWR of Terminating Element 1.05
Air Line Accuracy. . . . . 56 dB min return loss
(equivalent return loss of air line impedance)
Nominal Impedance . . . . . 50 ohm
Power Handling . . . . . 5.0 watt CW, 1.0 kW peak
Travel . . . . . Greater than 1/2 wavelength at 2.0 GHz

Fixed Terminations – Models 8684A & 8684B

Frequency Range . . . . . DC — 20.0 GHz
Maximum VSWR:
DC — 4.0 GHz 1.04
4.0 — 12.0 GHz 1.08
12.0 — 20.0 GHz 1.10
Nominal Impedance. . . . . 50 ohm
Power Handling . . . . . 1.0 watt CW 1.0 kW peak

Fixed Short – Models 8686A & 8687A

Frequency Range . . . . . DC to 20.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±2.0 degrees
Nominal Impedance . . . . . 50 ohm

Open Circuits – Models 8685A & 8685B

Frequency Range . . . . . DC to 20.0 GHz
Minimum Reflection Coefficient 0.98
Phase Accuracy . . . . . ±2.0 degrees
Nominal Impedance . . . . . 50 ohm

Precision AFTNC Adapters – Models 8688A, 8688B & 8688C

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

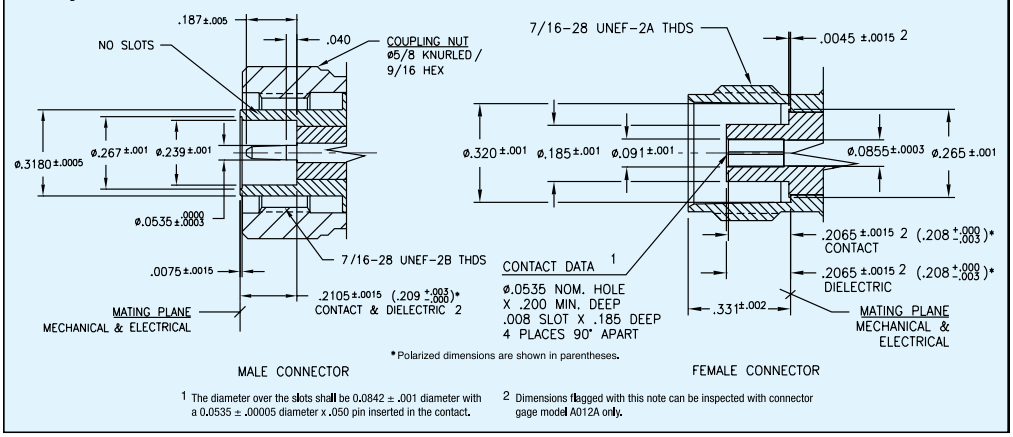
(Note: These adapters are included in the 8680CK11/21 kits, but are not included in the 8680CK10/20 kits.)

Connector Description

The AFTNC connectors (MPC/AFTNC) on the components in this kit are precision stainless steel connectors that mate with most commercially available AFTNC connectors, and especially with those conforming to MIL-C-39012 and MIL-T-81490. They are low VSWR connectors rated from DC to 20.0 GHz.

For interface specifications see Maury data sheet 5E-056.

Maury Precision MPC/AFTNC Connector Interface



BNC VNA Calibration Kits from Maury Microwave

8550CK10 & 8580CK10 models

Features

- 50Ω or 75Ω BNC Connectors
- DC to 10.0 GHz & DC to 12.0 GHz
- Simple Fixed Load Calibration
- Keysight, Rhode & Schwarz and Anritsu VNAs Supported

Calibration Methods Supported

- 8550CK10 (50Ω) – Fixed Load SOLT (DC–10.0 GHz)
- 8580CK10 (75Ω) – Fixed Load SOLT (DC–12.0 GHz)

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If uncorrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as "calibration" of which multiple methods exist.

Calibration Method

SOLT calibration, which uses Short, Open and Load standards, requires precise models of the standards' electrical performance. Fixed load SOLT uses fixed terminations and is adequate for measuring devices with mid-range reflection coefficients. The lowest return loss is limited by the reflection coefficient of the fixed load standard (typically better than 20 dB return loss*).

8550CK10 calibration kits are designed for calibrating Vector Network Analyzers (VNAs) from DC to 10.0 GHz for making 50 ohm measurements of devices with BNC connectors. The 8580CK10 kits are likewise designed for calibrating VNAs that will be used to make measurements of devices with 75Ω BNC connector measurements, from DC to 12 GHz.

A full complement of calibration standards (opens, shorts and fixed terminations, female and male) are included in both the 8550CK10 and 8580CK10 kits. All components are housed in a foam-lined wooden instrument case. Operating instructions with the calibration standard constants can be downloaded from the Maury website. The instruction manual explains how the cal constants can be keyed in from the VNA's front panel. Optional VNA software, specific to your VNA make and model, is sold separately.

Recommended Accessories

A012A 50Ω/75Ω Dial Indicator Style Connector Gage Kit:

This kit contains one (1) "push-on" type gage for measuring the female and male contact pin and dielectric interface locations for 50Ω and 75Ω BNC connectors.

8582D3/D4 Series Phase Matched 75Ω BNC Adapters:

These between series adapters are designed to adapt 75Ω BNC to 7mm. Visit maurymw.com for detailed information.

2621A1/B1 Series Phase Matched 50Ω BNC Adapters:

These between series adapters are designed to adapt 50Ω BNC to 7mm. Visit maurymw.com for detailed information.

A012A

8582D3/D4

2621A1/B1

See page 73 to see all Maury 50Ω and 75Ω BNC between series adapters.

Maury BNC VNA Calibration Kits

Maury precision BNC VNA calibration kits include each of the calibration standards and tools shown in the tables at the right. In-series and between-series adapters are sold separately.

8550CK10

8580CK10

Components Included in 8550CK10 Kits

QUANTITY	DESCRIPTION	MODEL
1	50Ω BNC female fixed short circuit	361N2
1	50Ω BNC male fixed short circuit	361P2
1	50Ω BNC female open circuit	371N2
1	50Ω BNC male open circuit	371P2
1	50Ω BNC female fixed termination	351A2
1	50Ω BNC male fixed termination	351B2
1	Foam-lined wood instrument case	—

Between series adapters are available by separate order.
See page 73 for more information.

Components Included in 8580CK10 Kits

QUANTITY	DESCRIPTION	MODEL
1	75Ω BNC female fixed short circuit	8584A1
1	75Ω BNC male fixed short circuit	8584B1
1	75Ω BNC female open circuit	8585A1
1	75Ω BNC male open circuit	8585B1
1	75Ω BNC female fixed termination	8583A1
1	75Ω BNC male fixed termination	8583B1
1	Foam-lined wood instrument case	—

Between series adapters are available by separate order.
See page 73 for more information.

50Ω BNC COMPONENT SPECIFICATIONS

50Ω Fixed Terminations – Models 351A2 and 351B2

Frequency Range ..... DC to 10.0 GHz

Maximum VSWR:

- DC to 2.0 GHz 1.04
- 2.0 to 4.0 GHz 1.10
- 4.0 to 10.0 GHz 1.20

Nominal Impedance ..... 50 ohm

Power Handling ..... 2.0 watt CW, 1.0 kW peak

50Ω Fixed Shorts – Models 361N2 and 361P2

Frequency Range ..... DC to 10.0 GHz

Reflection Coefficient ..... 0.98 minimum

Phase Accuracy ..... ± 5.0 degrees

Nominal Impedance ..... 50 ohm

50Ω Open Circuits – Models 371N2 and 371P2

Frequency Range ..... DC to 10 GHz

Reflection Coefficient ..... 0.98 minimum

Phase Accuracy ..... ± 5.0 degrees

Nominal Impedance ..... 50 ohm

75Ω BNC COMPONENT SPECIFICATIONS

75Ω Fixed Terminations – Models 8583A1 & 8583B1

Frequency Range ..... DC to 12.0 GHz

Maximum VSWR:

- DC to 2.0 GHz 1.02
- 2.0 to 4.0 GHz 1.04
- 4.0 to 12.0 GHz 1.10

Nominal Impedance ..... 75 ohm

Power Handling ..... 1 watt CW

75Ω Fixed Shorts – Models 8584A1 & 8584B1

Frequency Range ..... DC to 12.0 GHz

Reflection Coefficient ..... 0.98 minimum

Phase Accuracy:

- DC to 2.0 GHz ..... ± 1.0°
- 2.0 to 3.0 GHz ..... ± 2.0°
- 3.0 to 12.0 GHz ..... ± 6.0°

Nominal Impedance ..... 75 ohm

75Ω Open Circuits – Models 8585A1 and 8585B1

Frequency Range ..... DC to 12.0 GHz

Reflection Coefficient ..... 0.98 minimum

Phase Accuracy:

- DC to 2.0 GHz ..... ± 1.0°
- 2.0 to 3.0 GHz ..... ± 2.0°
- 3.0 to 12.0 GHz ..... ± 6.0°

Nominal Impedance ..... 75 ohm

50Ω BNC Connector Description

Maury BNC series connectors are 50-ohm impedance connectors with two-stud bayonet coupling. These connectors conform to MIL-PRF-39012 (formerly MIL-C-39012). The connectors are normally made with stainless steel bodies and with heat treated gold-plated beryllium copper contacts.

75Ω BNC Connector Description

Maury BNC series connectors are 75-ohm impedance connectors with two-stud bayonet coupling. These connectors conform to MIL-PRF-39012 (formerly MIL-C-39012). The connectors are normally made with stainless steel bodies and with heat treated gold-plated beryllium copper contacts.

Waveguide VNA Calibration Kits

CK10/12 & CK30/32 models

Features

- 2.6 to 50 GHz
- WR284 Through WR22
- SSLT and TRL calibration
- Keysight, Anritsu and Rohde & Schwarz VNAs Supported

The Importance of VNA Calibration

Any uncalibrated test setup has systematic errors inherent in the equipment used. The ability to obtain an accurate measurement of a device under test. The basis of network analyzer error correction is the measurement of known electrical standards, such as a thru, open circuit, short circuit, and precision load impedance. By calibrating your network analyzer with these standards, you can compensate for the inherent imperfections.

Description

CK10/12 - The CK10/12 SSLT Waveguide Calibration Kits are designed to provide accurate calibration of vector network analyzers (VNAs) that are used for measurements in standard rectangular waveguide from 2.6 to 50 GHz (WR284–WR22). Each kit includes all the components needed for accurate calibration of most VNAs to ensure high effective directivity after calibration.

CK30/32 - Maury CK30/32 calibration kits are designed to provide accurate Thru-Reflect-Line (TRL), Short-Short-Load-Thru (SSLT) and Offset Load calibrations of vector network analyzers (VNAs) for measurements in rectangular waveguide from 2.6 to 50 GHz (WR284 to WR22). Each kit includes all the components needed for accurate TRL, SSLT or Offset Load calibration of supported VNA models.

*Precision straight sections and a fixed (reference plane) short are also provide as verification standards in the CK12 or CK32 options.

Flange Description

The components in these kits are equipped with Maury Precision Flanges (MPF) which conform to EIA WR standards for rectangular or round waveguide flanges. MPF flanges have precision indexing holes and corresponding indexing pins for precise alignment when mating, which ensures excellent measurement repeatability. Flange diagrams and other details can be found at http://www.maurymw.com. (Use the search feature with search term “MPF”.)

Calibration Methods

CK10/12 - These kits are configured for use in performing one-port SSL (Short-Short-Load) calibrations for measuring VSWR/Return Loss, or full two-port SSLT (Short-Short-Load-Thru) calibrations to perform forward and reverse transmission and reflection measurements.

CK30/32 - These kits are configured for use in performing full two-port TRL (Thru-Reflect-Line) and SSLT (Short-Short-Load-Thru) calibrations; two standard methods for measuring forward and reverse transmission and reflection measurements). They can also be used to perform Offset Load calibrations on VNAs that support that calibration method.

Components Included in CK10/12 Kits

QUANTITY	DESCRIPTION	MODEL
1**	Fixed flush (reference plane) short	344 series
1	1/8-λ fixed offset short	340 series
1	3/8-λ fixed offset short	340 series
1	Precision fixed termination	301 series
1**	Straight section (rectangular)	102/3/6 series
1*	3/32-in. hex ball driver *	J998T2
1	Flange hardware (including the indexing pin set)	—
1	Instrument case	—

Components Included in CK30/32 Kits

QUANTITY	DESCRIPTION	MODEL
1	Fixed flush (reference plane) short	344 series
1	1/4-λ straight section (shim)	322 series
1	Precision fixed termination	301 series
1**	Straight section (rectangular)	102/3/6 series
1*	3/32-in. hex ball driver *	J998T2
1	Flange hardware (including the indexing pin set)	—
1	Instrument case	—

* Included in the K, Q, U and J band kits only.

** Included in CK12/32 kits.

Component Specifications

CK10/12 SSLT & CK30/32 TRL Kits

Fixed Flush Shorts – Model Series 344

These machined fixed shorts are flat-face/flat-plane shorts designed to terminate round or rectangular waveguide connectors at the mating plane, over a frequency range from 2.6 to 50 GHz. They are used to establish a reference plane in systems and in making loss measurements.

1/8λ & 3/8λ Fixed Offset Shorts – Model Series 340

These fixed offset shorts are considered one of the more accurate means of obtaining a 180° phase difference in waveguide. Using these single-piece devices reduces the number of flange interfaces during calibration; helping to maintain an essentially constant magnitude of current flow across the calibration plane. Those in rectangular waveguide are nominally 1/8λ and 3/8λ offset at frequencies near the waveguide band centers. These frequencies are chosen to equalize phase differences at band edges, and thus are not at the exact band centers.

Offset delay ranges from 50.835 – 4.007 ps for the 1/8λ shorts and 152.506 – 12.002 for the 3/8λ shorts; calculated without consideration for the dispersive effect of waveguide if 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.

1/4λ Precision Straight Sections – Model Series 322B

These 322B series 1/4λ straight sections are reduced height spacers or shims which provide an accurately known VSWR which is directly calculable from their mechanical dimensions. The shims are designed for a theoretical VSWR of 1.00. The shims are fabricated from aluminum and are provided with precision indexing holes for excellent flange alignment. 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.

Precision Fixed Terminations – Model Series 301

These low power fixed terminations feature low VSWR (1.025 – 1.040 max up to 50.0 GHz; typically <1.02 from 3.95 to 18.0 GHz). Power handling is rated from 25W (avg)/10kW (peak) to 0.2W (avg)/0.03kW (peak) depending on frequency range.

Verification Stds – Precision Straight Sections

These precision straight sections exhibit low VSWR (1.025 max) across the frequency range of operation. These precision stds can be used along with the fixed flush shorts as verification stds to validate accuracy of calibration.

Available Models

Waveguide Designation (EIA WR NO.)	FREQUENCY RANGE (GHz)	MMC WAVEGUIDE BAND	SSLT CALIBRATION KIT	SSLT CALIBRATION KIT w\ VERIFICATION STD.	TRL CALIBRATION KIT	TRL CALIBRATION KIT w\ VERIFICATION STD.
WR284	2.60 - 3.95	S	WR284CK10	WR284CK12	WR284CK30	WR284CK32
WR229	3.30 - 4.90	E	WR229CK10	WR229CK12	WR229CK30	WR229CK32
WR187	3.95 - 5.85	G	WR187CK10	WR187CK12	WR187CK30	WR187CK32
WR159	4.90 - 7.05	F	WR159CK10	WR159CK12	WR159CK30	WR159CK32
WR137	5.85 - 8.20	C	WR137CK10	WR137CK12	WR137CK30	WR137CK32
WR112	7.05 - 10.0	H	WR112CK10	WR112CK12	WR112CK30	WR112CK32
WR90	8.20 - 12.4	X	WR90CK10	WR90CK12	WR90CK30	WR90CK32
WR75	10.0 - 15.0	M	WR75CK10	WR75CK12	WR75CK30	WR75CK32
WR62	12.4 - 18.0	P	WR62CK10	WR62CK12	WR62CK30	WR62CK32
WR51	15.0 - 22.0	N	WR51CK10	WR51CK12	WR51CK30	WR51CK32
WR42	18.0 - 26.5	K	WR42CK10	WR42CK12	WR42CK30	WR42CK32
WR34	22.0 - 33.0	Q	—	—	WR34CK30	WR34CK32
WR28	26.5 - 40.0	U	WR28CK10	WR28CK12	WR28CK30	WR28CK32
WR22	33.0 - 50.0	J	WR22CK10	WR22CK12	WR22CK30	WR22CK32

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 trans-mission 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 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 Available Models

Model	Sex	Connector Type	Frequency Range (GHz)	VSWR	Power Rating
7831A1	Female	1.85mm	DC - 1.0 1.0 - 10.0 10.0 - 26.5 26.5 - 50	1.02 1.07 1.10 1.20	0.5 watt CW 0.25 kW peak
7831B1	Male				
7931A1	Female	2.4mm	DC - 4.0 4.0 - 50.0	1.016 1.15	0.5 watt CW 0.25 kW peak
7931B1	Male				
8775A3	Female	2.92mm	DC - 4.0 4.0 - 40.0	1.016 1.12	0.5 watt CW 0.25 kW peak
8775B3	Male				
8031A5	Female	3.5mm	DC - 3.0 3.0 - 6.0 6.0 - 20.0 20.0 - 26.5	1.02 1.032 1.052 1.083	0.5 watt CW 0.25 kW peak
8031B5	Male				
2610F	-	7mm	DC - 1.0 1.0 - 2.0 2.0 - 8.0 8.0 - 18.0	1.005 1.01 1.03 1.06	1 watt CW 1 kW peak
2510A6	Female	Type N	DC - 2.0 2.0 - 4.0 4.0 - 18.0	1.02 1.04 1.06	1 watt CW 1 kW peak
2510B6	Male				
8583A1	Female	BNC 75Ω	DC - 2.0 2.0 - 4.0 4.0 - 12.0	1.02 1.04 1.10	1 watt CW
8583B1	Male				
351A2	Female	BNC 50Ω	DC - 2.0 2.0 - 4.0 4.0 - 10.0	1.04 1.10 1.20	2 watt CW 1 kW peak
351B2	Male				
332E	Female	TNC	DC - 4.0 4.0 - 12.0 12.0 - 18.0	1.06 1.10 1.15	1 watt CW 1 kW peak
332F	Male				

Precision Fixed Terminations

Waveguide (301 series)

Features

> Low VSWR
> 2.6 to 50 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 pages 80-82 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)
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	(7.9)
K301	18.00 — 26.50	1.025	42	UG595/U	0.5	0.2	2.8	(7.1)
Q301A	22.00 — 33.00	1.025	34	UG1530/U	0.5	0.2	4.25	(10.8)
U301	26.50 — 40.00	1.025	28	UG599/U	0.5	0.2	2.2	(5.6)
J301A	33.00 — 50.00	1.040	22	UG383[1]	0.5	0.1	1.6	(4.1)

[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.

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 (47-48) provide detailed descriptions and specifications for all of the coaxial and waveguide sliding terminations offered by Maury.

Sliding Terminations

2.4mm, 2.92mm, 3.5mm, 7mm, Type N, and TNC

Features

- Integral Connectors
- "Flush Set" Adjustment[4]
- "Pull Back" Mechanism & Lock[5]
- 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"[4] 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"[5] 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).

TNC 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

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 10.0 GHz — 50.0 GHz, 1.05	42 dB (4.0 — 50.0 GHz)	0.5 watts CW, 0.5 kW peak
7935B	2.4mm male			
7935C	2.4mm boxed set (1 ea. 7935A female and 7935B male) [3]			
8777A2	2.92mm (K) female	4.0 GHz — 10.0 GHz, 1.10 10.0 GHz — 40.0 GHz, 1.05	46 dB (4.0 — 40.0 GHz)	0.5 watts CW, 0.5 kW peak
8777B2	2.92mm (K) male			
8777C2	2.92mm (K) boxed set (1 ea. 8777A2 female and 8777B2 male) [3]			
8037A	3.5mm female	2.0 GHz — 4.0 GHz, 1.09 4.0 GHz — 34.0 GHz, 1.05	50 dB (4.0 — 34.0 GHz)	1.0 watts CW, 1.0 kW peak
8037B	3.5mm male			
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]			
452A1	TNC female [6]	1.8 GHz — 18.0 GHz, 1.05	56 dB	5.0 watt CW, 1.0 kW peak
452B1	TNC male [6]			

[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.

[4] Does not apply to TNC.

[5] Does not apply to TNC or 7mm.

[6] Precision stainless steel TNC per ES-2047.

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.

Many of the shorts listed in this section are components of the Maury VNA calibration kits described on pages 16-41 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.

Available Models

Model	Sex	Connector Type	Frequency Range (GHz)	Phase Accuracy	Reflection Coefficient	Offset Length (Inches)
7846A	Female	1.85mm	DC - 67.0	± 4.0°	0.98	0.1968
7847A	Male					
7946A	Female	2.4mm	DC - 50.0	± 2.0°	0.98	0.2000
7946B	Male					
8771F2	Female	2.92mm	DC - 40.0	± 2.0°	0.98	0.1970
8772F2	Male					
8046F	Female	3.5mm	DC - 26.5	± 2.0°	0.98	0.1970
8047F	Male					
360D	Female	3.5mm\SMA*	DC - 40.0	± 2.0°	0.99	0.0000
360B	Male					
2615D3	-	7mm	DC - 18.0	± 0.3°	0.995	0.0000
8806C	Female	Type N	DC - 18.0	± 2.0°	0.98	0.2892
8806G						0.4972
8807C	Male					0.4972
8584A1	Female	BNC 75Ω	DC - 2.0 2.0 - 3.0 3.0 - 12.0	± 1.0° ± 2.0° ± 6.0°	0.98	0.3937
8584B1	Male					
361N2	Female	BNC 50Ω	DC - 12.4	± 5.0°	0.98	0.1410
361P2	Male					
8615A	Female	TNC	DC - 18.0	± 5.0°	0.98	0.5000
8615B	Male					0.7000

* Flush shorts that can be used with SMA, 3.5mm and 2.92mm

Waveguide Fixed Flush Shorts

Model Series 344

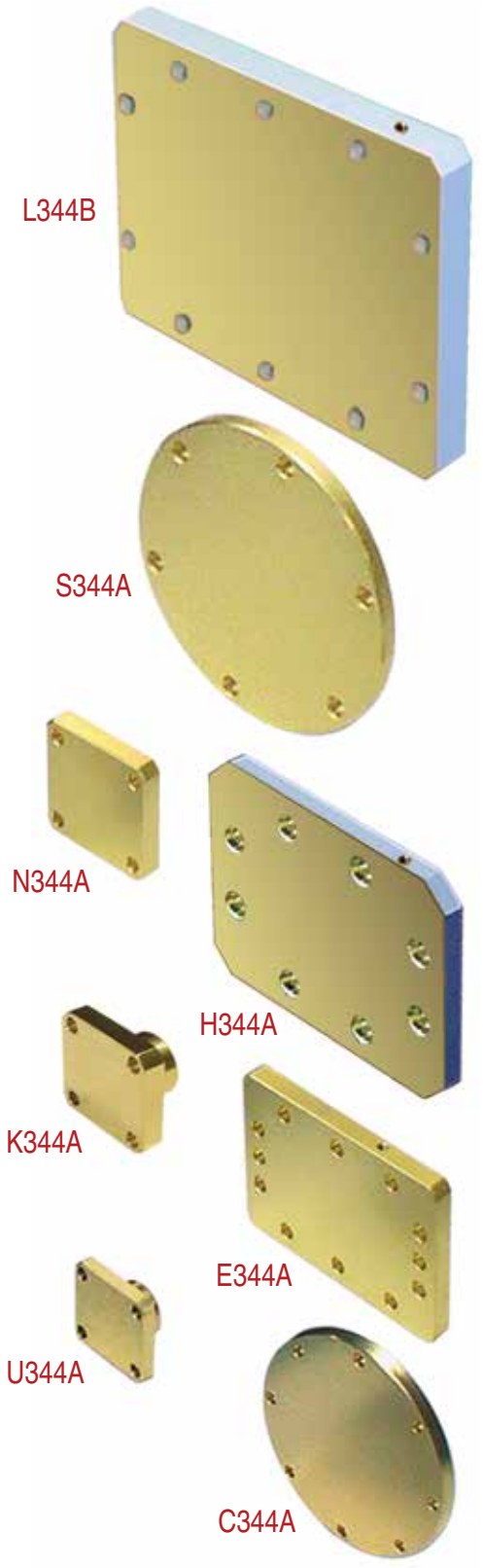
Description

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 2.6 to 50.0 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 CK12/30/32 series VNA calibration kits as listed on pages 42-43. They may also be purchased separately as spare or replacement parts for these kits.

Available Models

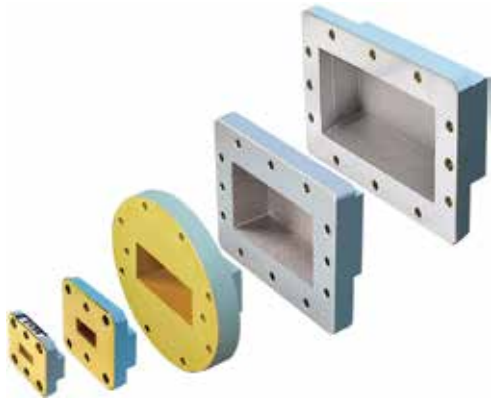
MODEL	MATES WITH EQUIVALENT FLANGE	EIA WR NUMBER	FREQUENCY RANGE (GHz)
S344A	UG53/U	284	2.6 — 3.95
E344B	CPR229F	229	3.3 — 4.9
G344A	UG149A/U	187	3.95 — 5.85
F344B	CPR159F	159	4.9 — 7.05
C344A	UG344/U	137	5.85 — 8.2
H344A	UG51/U	112	7.05 — 10.0
X344A	UG39/U	90	8.2 — 12.4
M344A	MPF75	75	10.0 — 15.0
P344A	UG419U	62	12.4 — 18.0
N344A	MPF51	51	15.0 — 22.0
K344A	UG595/U	42	18.0 — 26.5
K344D	UG425/U		
1	—	34	22.0 — 33.0
U344A	UG599/U	28	26.5 — 40.0
1	UG383/U	22	33.0 — 50.0

[1] Use K344D.



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]
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
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

[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 Keysight network analyzers. Anritsu analyzers use the actual mechanical offset in centimeters.

Opens

General Information

Shielded, coaxial opens are used in the calibration of vector network analyzers to provide a nominal 180° phase offset from a compatible reference short over a wide range of 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 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 371N2/P2 and 8585A1/B1 models are designed for limited frequency ranges as determined by their connector types.

In all cases, the specification "Phase Accuracy" is defined as phase deviation from a nominal unit.

Available Models

MODEL	SEX	CONNECTOR TYPE	FREQUENCY RANGE (GHZ)	PHASE ACCURACY	MINIMUM REFLECTION COEFFICIENT
7948A1 7948B1	female male	2.4mm	DC – 50.0	±2.0°	0.98
8773A2 8773B2	female male	2.92mm (K)	DC – 40.0	±1.5°	0.98
8048A1 8048B1	female male	3.5mm	DC – 26.5	±1.4°	0.98
2616D3	—	7mm	DC – 18.0	±0.3°	0.995
8809B1 8810B1	female male	Type N	DC – 18.0	±2.0°	0.99
8609B 8610B	female male	TNC	DC – 18.0	±5.0°	0.98
371N2 371P2	female male	BNC 50Ω	DC – 12.4	±5.0°	0.98
8585A1 8585B1	female male	BNC 75Ω	DC – 12.0	DC – 2.0 = ±1.0° 2.0 – 3.0 = ±2.0° 3.0 – 12.0 = ±6.0°	0.98

1 See Maury data sheet 5C-027.

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 and type N.

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 2503A (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 2503A 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. 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.

Precision Air Lines Available Models

Model	Connector Type	Frequency Range (GHz)	Electrical Length (cm)	Electrical Length Accuracy	Minimum Return Loss	Odd 1/4 Wavelength Frequency (GHz)
7843S0.96	1.85mm	DC - 67.0	0.960	±0.0025	48dB	(2n + 1) 7.8
7843S1.15			1.150			(2n + 1) 6.5
7843S3.00			3.000			(2n + 1) 2.5
7943S1.25	2.4mm	DC - 50.0	1.250	±0.0025	48dB	(2n + 1) 6.0
7943S1.50			1.500			(2n + 1) 5.0
7943S6.25			6.250			(2n + 1) 1.2
8774S15	2.92mm	DC - 40.0	14.990	±0.0025	48dB	(2n + 1) 0.50
8774S6			6.000			(2n + 1) 1.25
8774S5.25			5.250			(2n + 1) 1.43
8774S5			4.997			(2n + 1) 1.50
8043S15	3.5mm	DC - 26.5	14.990	±0.0025	48dB	(2n + 1) 0.50
8043S6			6.000			(2n + 1) 1.25
8043S5.3			5.298			(2n + 1) 1.41
8043S5			4.997			(2n + 1) 1.50
8042C	3.5mm*	DC - 18.0	14.990	±0.02	<1.004 + 0.0035f(GHz)	(2n + 1) 0.50
8042D			9.993			(2n + 1) 0.75
2653S15	7mm	DC - 18.0	14.983	±0.005	<1.005	(2n + 1) 0.50
2653S3.12			3.120			(2n + 1) 1.50
2653L			0.693			(2n + 1) 10.81
2603A	7mm*	DC - 18.0	29.979	±0.015	<1.004 + 0.003f(GHz)	(2n + 1) 0.25
2603B			19.986			(2n + 1) 0.375
2553T15	Type N	DC - 18.0	14.983	±0.01	<1.004 + 0.001f(GHz)	(2n + 1) 0.50
2553T5			4.994			(2n + 1) 1.50
2553T3.82			3.816			(2n + 1) 1.96
2553T3.12			3.123			(2n + 1) 2.40
2503A	Type N*	DC - 18.0	29.979	±0.02	<1.03 + 0.003f(GHz)	(2n + 1) 0.83
2503B			19.986			(2n + 1) 0.84

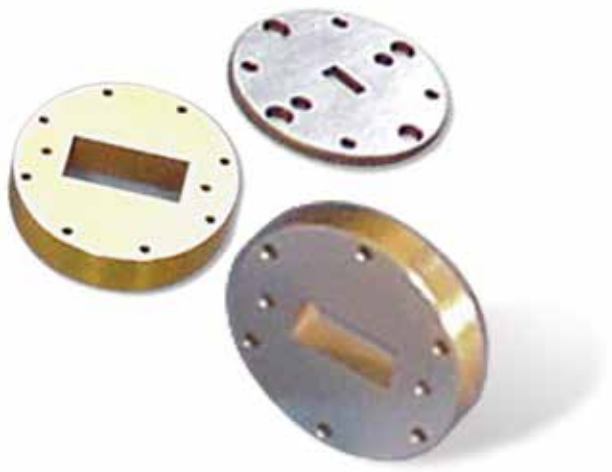
* Indicates Bead Supported Airlines

Waveguide Precision Straight Section (Shim)

Model Series 322B

Description

These 322B series 1/4λ straight sections are reduced height spacers or shims which provide an accurately known VSWR which is directly calculable from their mechanical dimensions. The shims are designed for a theoretical VSWR of 1.00. The shims are fabricated from aluminum and are provided with precision indexing holes for excellent flange alignment. 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.



Available Models

Model	Frequency Range (GHz)	EIA WR Number	Length		Delay (pS)
			Inches	(CM)	
S322B1.198	2.6 - 3.95	284	1.198	(3.0429)	101.5334
E322B0.9468	3.3 - 4.9	229	0.948	(2.4079)	80.34527
G322B0.807	3.95 - 5.85	187	0.807	(2.0498)	68.39518
F322B0.641	4.9 - 7.05	159	0.642	(1.6307)	54.41104
C322B0.539	5.85 - 8.2	137	0.539	(1.3691)	45.68154
H322B0.447	7.05 - 10.0	112	0.447	(1.1354)	37.88432
X322B0.382	8.2 - 12.4	90	0.382	(0.9703)	32.37541
M322B0.311	10.0 - 15.0	75	0.311	(0.7899)	26.35799
P322B0.253	12.4 - 18.0	62	0.253	(0.6426)	21.44236
N322B0.209	15.0 - 22.0	51	0.209	(0.5309)	17.71325
K322B0.175	18.0 - 26.5	42	0.175	(0.4445)	14.83167
Q322B0.1418	22.0 - 33.0	34	0.142	(0.3601)	12.01789
U322B0.118	26.5 - 40.0	28	0.118	(0.2997)	10.00078
J322B0.0946	33.0 - 50.0	22	0.0946	(0.2403)	8.017576

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 and type N 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.

Available Models

Model		Connector Type	Frequency Range (GHz)	Nominal VSWR	Accuracy (GHz)	
Female	Male				DC - 12.0	12.0 - 50.0
7933A1.20	7933B1.20	2.4mm	DC - 50.0	1.20	±0.09	±0.13
7933A1.50	7933B1.50			1.50	±0.10	±0.20
7933A2.00	7933B2.00			2.00	±0.14	±0.25

Model		Connector Type	Frequency Range (GHz)	Nominal VSWR	Accuracy (GHz)	
Female	Male				DC - 12.0	12.0 - 40.0
8778A1.20	8778B1.20	2.92mm	DC - 40.0	1.20	±0.08	±0.13
8778A1.50	8778B1.50			1.50	±0.10	±0.20
8778A2.00	8778B2.00			2.00	±0.14	±0.25

Model		Connector Type	Frequency Range (GHz)	Nominal VSWR	Accuracy (GHz)	
Female	Male				DC - 12.0	12.0 - 26.5
8033A1.20	8033B1.20	3.5mm	DC - 26.5	1.20	±0.07	±0.10
8033A1.50	8033B1.50			1.50	±0.09	±0.17
8033A2.00	8033B2.00			2.00	±0.12	±0.22

Model		Connector Type	Frequency Range (GHz)	Nominal VSWR	Accuracy (GHz)		
Female	Male				DC - 8.0	8.0 - 12.4	12.4 - 18.0
2611C		7mm	DC - 18.0	1.20	±0.05	±0.06	±0.10
2611E				1.50	±0.06	±0.08	±0.17
2611G				2.00	±0.10	±0.12	±0.22

Model		Connector Type	Frequency Range (GHz)	Nominal VSWR	Accuracy (GHz)		
Female	Male				DC - 8.0	8.0 - 12.4	12.4 - 18.0
2561C	2562C	Type N	DC - 18.0	1.20	±0.06	±0.07	±0.07
2561E	2562E			1.50	±0.08	±0.09	±0.07
2561G	2562G			2.00	±0.12	±0.12	±0.07

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.

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.

Waveguide-to-Waveguide Adapters

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 Keysight 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.

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, etc.; all common systems connectors – type N, TNC, etc.

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 Keysight 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/2.4mm/2.92mm/3.5mm Test Port Adapters

2633, 7809, 7909, 8719, 8009, and 8829 Series

Features

- Low VSWR
- DC to 67 GHz (Usable to 70 GHz)
- Protects VNA Test Ports
- Ruggedized for Long Life

Description

Maury's NMD adapters are precision, low VSWR adapters designed to connect directly to the NMD-style test ports on certain Keysight 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. They 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.

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.

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.

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.

7809A1

7809A2

7809B1

7809B2

7809F1

7809F2

7809G

7809H

8719E

8719F

Key Literature: Maury data sheet 2B-049, 2B-049A, 2B-050, 2B-051, 2B-052, 2B-053, 2B-074.

NMD1.85mm/2.4mm/2.92mm/3.5mm Test Port Adapters Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
7809A1	NMD1.85mm female	1.85mm female	DC - 26.5 ≤ 1.10 26.5 - 40.0 ≤ 1.15 40.0 - 67.0 ≤ 1.20	0.993	(2.52)
7809A2	NMD1.85mm female	1.85mm male		0.993	(2.52)
7809F1	NMD1.85mm female	2.92mm female	DC - 20.0 ≤ 1.10 20.0 - 40.0 ≤ 1.16	1.072	(2.72)
7809F2	NMD1.85mm female	2.92mm male		1.072	(2.72)
7809B1	NMD1.85mm female	3.5mm female	DC - 10.0 ≤ 1.06 10.0 - 20.0 ≤ 1.10 20.0 - 34.0 ≤ 1.12	1.085	(2.76)
7809B2	NMD1.85mm female	3.5mm male		1.085	(2.76)
7909A1	NMD2.4mm female	2.4mm female	DC - 26.5 ≤ 1.10 26.5 - 40.0 ≤ 1.15 40.0 - 50.0 ≤ 1.20	1.240	(3.15)
7909A2	NMD2.4mm female	2.4mm male		1.270	(3.23)
7909K	NMD2.4mm female	NMD2.4mm male		1.317	(3.35)
7909F1	NMD2.4mm female	2.92mm female	DC - 20.0 ≤ 1.10 20.0 - 40.0 ≤ 1.16	1.291	(3.279)
7909F2	NMD2.4mm female	2.92mm male		1.291	(3.279)
7909J	NMD2.4mm female	NMD2.92mm male		1.247	(3.17)
7909B1	NMD2.4mm female	3.5mm female	DC - 10.0 ≤ 1.06 10.0 - 20.0 ≤ 1.10 20.0 - 34.0 ≤ 1.12	1.060	(2.7)
7909B2	NMD2.4mm female	3.5mm male		1.020	(2.6)
7909H	NMD2.4mm female	NMD3.5mm male		1.317	(3.35)
7909C	NMD2.4mm female	7mm	DC - 4.0 ≤ 1.05 4.0 - 12.0 ≤ 1.07 12.0 - 18.0 ≤ 1.10	2.040	(5.18)
7909D1	NMD2.4mm female	Type N female	DC - 4.0 ≤ 1.08 4.0 - 12.0 ≤ 1.12 12.0 - 18.0 ≤ 1.14	1.280	(3.25)
7909D2	NMD2.4mm female	Type N male		1.640	(4.17)
8009A	NMD3.5mm female	3.5mm female	DC - 18.0 ≤ 1.08 18.0 - 26.5 ≤ 1.12	1.450	(3.68)
8009B	NMD3.5mm female	3.5mm male		1.490	(3.79)
8009F	NMD3.5mm female	NMD3.5mm male		1.490	(3.79)
2633C	NMD3.5mm female	7mm	DC - 18.0 ≤ 1.018 + 0.003f	1.780	(4.53)
8829A	NMD3.5mm female	Type N female	DC - 6.0 ≤ 1.04 6.0 - 18.0 ≤ 1.08	2.040	(5.18)
8829B	NMD3.5mm female	Type N male		2.200	(5.59)

1.85mm Adapters

In-Series and Between-Series

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.

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).

1.85mm

7821A 7821B 7821C

2.4mm

7824A 7824B 7824C 7824D

2.92mm

7826A 7826B 7826C 7826D

3.5mm

7827A 7827B 7827C 7827D

Key Literature: Maury data sheet 2B-070, 2B-071, 2B-072, 2B-073.

1.85mm Adapters Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
7821A[1]	1.85mm female	1.85mm female	DC - 26.5 ≤ 1.06 26.5 - 40.0 ≤ 1.10 40.0 - 67.0 ≤ 1.15	0.750	(1.905)
7821B[1]	1.85mm male	1.85mm male		0.750	(1.905)
7821C[1]	1.85mm female	1.85mm male		0.750	(1.905)
7824A[2]	1.85mm female	2.4mm female	DC - 26.5 ≤ 1.06 26.5 - 40.0 ≤ 1.10 40.0 - 50.0 ≤ 1.15	0.750	(1.905)
7824B[2]	1.85mm female	2.4mm male		0.750	(1.905)
7824C[2]	1.85mm male	2.4mm female		0.750	(1.905)
7824D[2]	1.85mm male	2.4mm male		0.750	(1.905)
7826A[3]	1.85mm female	2.92mm female	DC - 4.0 ≤ 1.05 4.0 - 20.0 ≤ 1.08 20.0 - 40.0 ≤ 1.12	0.657	(1.669)
7826B[3]	1.85mm female	2.92mm male		0.657	(1.669)
7826C[3]	1.85mm male	2.92mm female		0.657	(1.669)
7826D[3]	1.85mm male	2.92mm male		0.657	(1.669)
7827A[4]	1.85mm female	3.5mm female	DC - 4.0 ≤ 1.05 4.0 - 26.5 ≤ 1.08 26.5 - 34.0 ≤ 1.12	0.657	(1.669)
7827B[4]	1.85mm female	3.5mm male		0.657	(1.669)
7827C[4]	1.85mm male	3.5mm female		0.657	(1.669)
7827D[4]	1.85mm male	3.5mm male		0.657	(1.669)

[1-4] References to families that are phase matched.

2.4mm Adapters

In-Series and Between-Series

Description

In-Series 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 Keysight 8510, etc. The models 7921D and E are bulk-head and panel mount feed-thru adapters respectively, and are designed for instrumentation applications.

Between-Series 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 inter-changed for VNA measurement of non-insertable devices.

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).

2.4mm

2.92mm

3.5mm

7mm

Type N

Key Literature: Maury data sheet 2B-001.

2.4mm Adapters Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
7921A[1]	2.4mm female	2.4mm female	DC - 26.5 ≤ 1.06 26.5 - 40.0 ≤ 1.10 40.0 - 67.0 ≤ 1.15	0.750	(1.905)
7921B[1]	2.4mm male	2.4mm male		0.750	(1.905)
7921C[1]	2.4mm female	2.4mm male		0.750	(1.905)
7921D[2]	2.4mm female	2.4mm female		0.860	(2.18)
7824A[3]	1.85mm female	2.4mm female	DC - 26.5 ≤ 1.06 26.5 - 40.0 ≤ 1.10 40.0 - 50.0 ≤ 1.15	0.750	(1.905)
7824B[3]	1.85mm female	2.4mm male		0.750	(1.905)
7824C[3]	1.85mm male	2.4mm female		0.750	(1.905)
7824D[3]	1.85mm male	2.4mm male		0.750	(1.905)
7926A[4]	2.4mm female	2.92mm female	DC - 4.0 ≤ 1.05 4.0 - 20.0 ≤ 1.08 20.0 - 40.0 ≤ 1.12	0.650	(1.65)
7926B[4]	2.4mm female	2.92mm male		0.650	(1.65)
7926C[4]	2.4mm male	2.92mm female		0.650	(1.65)
7926D[4]	2.4mm male	2.92mm male		0.650	(1.65)
7927A[5]	2.4mm female	3.5mm female	DC - 18.0 ≤ 1.06 18.0 - 26.5 ≤ 1.08 26.5 - 34.0 ≤ 1.12	0.657	(1.669)
7927B[5]	2.4mm female	3.5mm male		0.657	(1.669)
7927C[5]	2.4mm male	3.5mm female		0.657	(1.669)
7927D[5]	2.4mm male	3.5mm male		0.657	(1.669)
7922A[6]	2.4mm female	7mm	DC - 4.0 ≤ 1.03 4.0 - 12.0 ≤ 1.07 12.0 - 18.0 ≤ 1.08	1.280	(3.25)
7922B[6]	2.4mm male	7mm		1.280	(3.25)
7923A[7]	2.4mm female	Type N female	DC - 4.0 ≤ 1.07 4.0 - 18.0 ≤ 1.12	1.220	(3.10)
7923B[8]	2.4mm female	Type N male		1.580	(4.02)
7923C[7]	2.4mm male	Type N female		1.200	(3.05)
7923D[8]	2.4mm male	Type N male		1.560	(3.96)

[1-8] References to families that are phase matched.

2.92mm Adapters

In-Series and Between-Series

Description

In-Series 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 Keysight 8510, etc. The 8714D1 and 8714E1 are bulkhead and panel mount feedthru adapters respectively, designed for instrumentation applications.

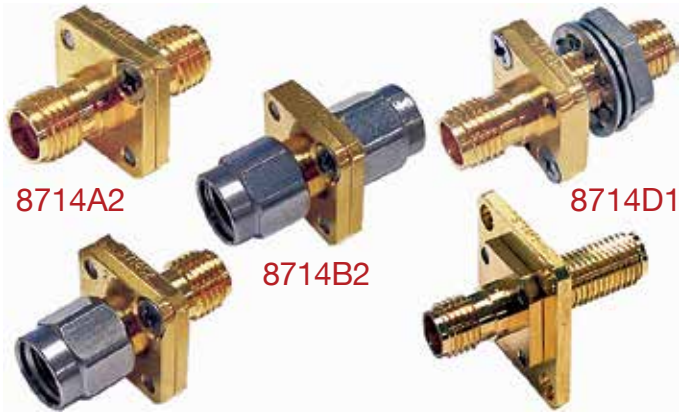
Between-Series Description - The precision adapters in these model series are designed to allow devices with 2.92mm connectors to mate with devices and cables bearing 7mm or Type N connectors. When properly mated, they provide a low VSWR connection with low insertion loss and high repeatability. Made 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.

2.92mm Connector Description

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).

2.92mm



Type N

7mm

Key Literature: Maury data sheet 2B-003, 2B-042, 2B-043.

2.92mm Adapters Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
8714A2[1]	2.92mm female	2.92mm female	DC - 4.0 ≤ 1.05 4.0 - 20.0 ≤ 1.08 20.0 - 40.0 ≤ 1.12	0.650	(1.65)
8714B2[1]	2.92mm male	2.92mm male		0.650	(1.65)
8714C2[1]	2.92mm female	2.92mm male		0.650	(1.65)
8714D1[2]	2.92mm female	2.92mm female		0.850	(2.15)
8714E1[2]	2.92mm female	2.92mm female		0.850	(2.15)
7826A[3]	1.85mm female	2.92mm female	DC - 4.0 ≤ 1.05 4.0 - 20.0 ≤ 1.08 20.0 - 40.0 ≤ 1.12	0.657	(1.669)
7826B[3]	1.85mm female	2.92mm male		0.657	(1.669)
7826C[3]	1.85mm male	2.92mm female		0.657	(1.669)
7826D[3]	1.85mm male	2.92mm male		0.657	(1.669)
7926A[4]	2.4mm female	2.92mm female	DC - 4.0 ≤ 1.05 4.0 - 20.0 ≤ 1.08 20.0 - 40.0 ≤ 1.12	0.650	(1.65)
7926B[4]	2.4mm female	2.92mm male		0.650	(1.65)
7926C[4]	2.4mm male	2.92mm female		0.650	(1.65)
7926D[4]	2.4mm male	2.92mm male		0.650	(1.65)
8725A[5]	2.92mm female	7mm	DC - 4.0 ≤ 1.05 4.0 - 12.0 ≤ 1.07 12.0 - 18.0 ≤ 1.10	1.670	(4.24)
8725B[5]	2.92mm male	7mm		1.670	(4.24)
8723A[6]	2.92mm female	Type N female	DC - 4.0 ≤ 1.07 4.0 - 12.0 ≤ 1.10 12.0 - 18.0 ≤ 1.15	1.614	(4.099)
8723B[7]	2.92mm female	Type N male		1.914	(5.014)
8723C[6]	2.92mm male	Type N female		1.614	(4.099)
8723D[7]	2.92mm male	Type N male		1.914	(5.014)

[1-7] References to families that are phase matched.

3.5mm Adapters

In-Series and Between-Series

Description

In-Series Description - These precision 3.5mm adapters are low VSWR and low loss models that operate from DC to 34 GHz. The 8021A2/B2/C2 series are designed for in-series adapting and are phase matched, making them ideal for use in precision measurement applications. They are minimum length and feature a square-flanged body to prevent them from rolling off flat surfaces. They serve as "test port savers" when used with network analyzers such as the Keysight PNA-X, etc.

Several designs are available for instrumentation applications: 8021D1 is a bulkhead feedthru model, 8021E1 is a panel mount model.

Between-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.

3.5mm

8021A2 8021B2 8021C2

8021D1 8021E1

TNC

8025A1 8025C1

BNC

8023A 8028B

Type N

8023C 8023B1

Key Literature: Maury data sheet 2B-017, 2B-017A, 2B-022, 2B-022D, 2B-022E, 2B-025, 2B-025A, 2B-028, 2B-033, 2B-034, and 2B-036.

3.5mm Adapters Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
8021A2[1]	3.5mm female	3.5mm female	DC - 18.0 ≤ 1.05 18.0 - 26.5 ≤ 1.08 26.5 - 34.0 ≤ 1.12	0.650	(1.65)
8021B2[1]	3.5mm male	3.5mm male		0.650	(1.65)
8021C2[1]	3.5mm female	3.5mm male		0.650	(1.65)
8021D1[2]	3.5mm female	3.5mm female	DC - 18.0 ≤ 1.07 18.0 - 26.5 ≤ 1.10 26.5 - 34.0 ≤ 1.14	0.850	(2.15)
8021E1[2]	3.5mm female	3.5mm female		0.850	(2.15)
7827A[3]	1.85mm female	3.5mm female	DC - 4.0 ≤ 1.05 4.0 - 26.5 ≤ 1.08 26.5 - 34.0 ≤ 1.12	0.657	(1.669)
7827B[3]	1.85mm female	3.5mm male		0.657	(1.669)
7827C[3]	1.85mm male	3.5mm female		0.657	(1.669)
7827D[3]	1.85mm male	3.5mm male		0.657	(1.669)
7927A[4]	2.4mm female	3.5mm female	DC - 18.0 ≤ 1.06 18.0 - 26.5 ≤ 1.08 26.5 - 34.0 ≤ 1.12	0.657	(1.669)
7927B[4]	2.4mm female	3.5mm male		0.657	(1.669)
7927C[4]	2.4mm male	3.5mm female		0.657	(1.669)
7927D[4]	2.4mm male	3.5mm male		0.657	(1.669)
8022S[5]	3.5mm female	7mm	DC - 4.0 ≤ 1.04 4.0 - 18.0 ≤ 1.08	1.220	(3.10)
8022T[5]	3.5mm male	7mm		1.220	(3.10)
8023A[6]	3.5mm female	Type N female	DC - 4.0 ≤ 1.065 4.0 - 18.0 ≤ 1.13	1.620	(4.11)
8023B1[6]	3.5mm female	Type N male		1.620	(4.11)
8023C[6]	3.5mm male	Type N female		1.620	(4.11)
8023D1[6]	3.5mm male	Type N male		1.620	(4.11)
8025A1[7]	3.5mm female	TNC female	DC - 4.0 ≤ 1.04 4.0 - 8.0 ≤ 1.14 8.0 - 18.0 ≤ 1.20	1.610	(4.10)
8025B1[7]	3.5mm female	TNC male		1.610	(4.10)
8025C1[7]	3.5mm male	TNC female		1.610	(4.10)
8025D1[7]	3.5mm male	TNC male		1.610	(4.10)
8028A[8]	3.5mm female	BNC female	DC - 4.0 ≤ 1.10 4.0 - 10.0 ≤ 1.20	2.000	(5.08)
8028B[9]	3.5mm female	BNC male		1.910	(4.85)
8028C[8]	3.5mm male	BNC female		2.000	(5.08)
8028D[9]	3.5mm male	BNC male		1.910	(4.85)
8682A	3.5mm female	AFTNC female	DC - 4.0 ≤ 1.04 4.0 - 12.0 ≤ 1.06 12.0 - 20.0 ≤ 1.08	1.34	(3.40)
8682B	3.5mm female	AFTNC male		1.29	(3.28)
8682C	3.5mm male	AFTNC female		1.34	(3.40)
8682D	3.5mm male	AFTNC male		1.29	(3.28)

[1-9] References to families that are phase matched.

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 3.5mm 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	ADAPTS SIDE B	FREQUENCY RANGE (GHz)	MAXIMUM VSWR (GHz)
8006E1 8006E11 8006E21 8006Q1	QT3.5mm™ (m) with no nut QT3.5mm™ (m) with 3/8" diameter nut QT3.5mm™ (m) with 9/16" diameter nut 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.

7mm Adapters

Between-Series

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 62-67 for 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	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
7922A[1]	2.4mm female	7mm	DC - 4.0 ≤ 1.03 4.0 - 12.0 ≤ 1.07 12.0 - 18.0 ≤ 1.08	1.280	(3.25)
7922B[1]	2.4mm male	7mm		1.280	(3.25)
8725A[2]	2.92mm female	7mm	DC - 4.0 ≤ 1.05 4.0 - 12.0 ≤ 1.07 12.0 - 18.0 ≤ 1.10	1.670	(4.24)
8725B[2]	2.92mm male	7mm		1.670	(4.24)
8022S[3]	3.5mm female	7mm	DC - 4.0 ≤ 1.04 4.0 - 18.0 ≤ 1.08	1.220	(3.10)
8022T[3]	3.5mm male	7mm		1.220	(3.10)
2606C[4]	7mm	Type N female	DC - 4.0 ≤ 1.03 4.0 - 9.0 ≤ 1.04 9.0 - 18.0 ≤ 1.07	1.510	(3.84)
2606D[4]	7mm	Type N male		1.510	(3.84)
2622A1	7mm	TNC female	DC - 4.0 ≤ 1.05 4.0 - 18.0 ≤ 1.15	1.680	(4.26)
2622B	7mm	TNC male		1.550	(3.94)
2625A[5]	7mm	SMA female	DC - 4.0 ≤ 1.05 4.0 - 10.0 ≤ 1.08 10.0 - 18.0 ≤ 1.16	1.670	(4.24)
2625B[5]	7mm	SMA male		1.670	(4.24)
8582D3[6]	7mm	BNC 75Ω female	DC - 12.0 ≤ 1.60	2.060	(5.23)
8582D4[6]	7mm	BNC 75Ω male		2.060	(5.23)

[1-6] References to families that are phase matched.

Key Literature: Maury data sheets 2B-030, 2Z-001, 2Z-025P and 2Z-069.

Type N Adapters

In-Series and Between-Series

Description

In-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.

Between-Series 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.

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 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.

TNC

8817B

Type N

8828A

8828C

8828B

8821B1

BNC

8821A1

Key Literature: Maury data sheet 2B-029, 2B-006B, 2B-016, 2B-011, 2B-045, 2B-056, 2B-057 and 2B-058.

Type N Adapters Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
8828A[1]	Type N female	Type N female	DC - 4.0 ≤ 1.03 4.0 - 10.0 ≤ 1.05 10.0 - 18.0 ≤ 1.09	2.500	(6.35)
8828B[1]	Type N male	Type N male		2.500	(6.35)
8828C[1]	Type N female	Type N male		2.500	(6.35)
7923A	2.4mm female	Type N female	DC - 4.0 ≤ 1.07 4.0 - 18.0 ≤ 1.12	1.220	(3.10)
7923B	2.4mm female	Type N male		1.580	(4.02)
7923C	2.4mm male	Type N female		1.200	(3.05)
7923D	2.4mm male	Type N male		1.560	(3.96)
8723A[2]	2.92mm female	Type N female	DC - 4.0 ≤ 1.07 4.0 - 12.0 ≤ 1.10 12.0 - 18.0 ≤ 1.15	1.614	(4.099)
8723B[3]	2.92mm female	Type N male		1.914	(5.014)
8723C[2]	2.92mm male	Type N female		1.614	(4.099)
8723D[3]	2.92mm male	Type N male		1.914	(5.014)
8023A[4]	3.5mm female	Type N female	DC - 4.0 ≤ 1.065 4.0 - 18.0 ≤ 1.13	1.620	(4.11)
8023B1[4]	3.5mm female	Type N male		1.620	(4.11)
8023C[4]	3.5mm male	Type N female		1.620	(4.11)
8023D1[4]	3.5mm male	Type N male		1.620	(4.11)
2606C[5]	7mm	Type N female	DC - 4.0 ≤ 1.03 4.0 - 9.0 ≤ 1.04 9.0 - 18.0 ≤ 1.07	1.510	(3.84)
2606D[5]	7mm	Type N male		1.510	(3.84)
8817A	Type N female	TNC female	DC - 4.0 ≤ 1.065 4.0 - 8.0 ≤ 1.10 8.0 - 12.0 ≤ 1.12 12.0 - 18.0 ≤ 1.14	1.170	(2.97)
8817B	Type N female	TNC male		1.500	(3.81)
8817C	Type N male	TNC female		1.530	(3.89)
8817D	Type N male	TNC male		1.86	(4.72)
8821A1	Type N female	BNC female	DC - 4.0 ≤ 1.08 4.0 - 10.0 ≤ 1.20	2.370	(6.02)
8821B1	Type N female	BNC male		2.010	(5.11)
8821C1	Type N male	BNC female		2.460	(6.25)
8821D1	Type N male	BNC male		2.100	(5.33)

[1-7] References to families that are phase matched.

TNC Adapters

In-Series and Between-Series

TNC

232A2 232B2 232C2

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 two 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 also used with some modifications – in the 232A2/B2/C2 models.

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 8650CK series VNA calibration kits (see pages 34-36).

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.

Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
232A11	TNC female	TNC female	DC - 4.0 ≤ 1.06 4.0 - 7.0 ≤ 1.10 7.0 - 18.0 ≤ 1.14	1.350	(3.43)
232B11	TNC male	TNC male		1.350	(3.43)
232C11	TNC female	TNC male		1.350	(3.43)
232A2	TNC female	TNC female	DC - 4.0 ≤ 1.06 4.0 - 7.0 ≤ 1.10 7.0 - 18.0 ≤ 1.14	1.350	(3.43)
232B2	TNC male	TNC male		1.350	(3.43)
232C2	TNC female	TNC male		1.350	(3.43)
8025A1	3.5mm female	TNC female	DC - 4.0 ≤ 1.04 4.0 - 8.0 ≤ 1.14 8.0 - 18.0 ≤ 1.20	1.610	(4.10)
8025B1	3.5mm female	TNC male		1.610	(4.10)
8025C1	3.5mm male	TNC female		1.610	(4.10)
8025D1	3.5mm male	TNC male		1.610	(4.10)
2622A1	7mm	TNC female	DC - 4.0 ≤ 1.05 4.0 - 18.0 ≤ 1.15	1.680	(4.26)
2622B	7mm	TNC male		1.550	(3.94)
8817A	Type N female	TNC female	DC - 4.0 ≤ 1.065 4.0 - 8.0 ≤ 1.10 8.0 - 12.0 ≤ 1.12 12.0 - 18.0 ≤ 1.14	1.170	(2.97)
8817B	Type N female	TNC male		1.500	(3.81)
8817C	Type N male	TNC female		1.530	(3.89)
8817D	Type N male	TNC male		0.186	(4.72)

Key Literature: Maury data sheets 2B-007 and 2B-046.

BNC & SMA Adapters

BNC Connector Description

Maury BNC series connectors are 75-ohm or 50-ohm impedance connectors with two-stud bayonet coupling. These connectors conform to MIL-C-39012. The connectors are normally made with stainless steel bodies with heat treated gold plated beryllium copper contacts

SMA Connector Description

The Maury SMA connectors are miniature, instrument grade, dielectric loaded interface connectors that are rated for operation from DC to 18 GHz. The comply with Mil-C-39012. NOTE: SMA connectors, 3.5mm connectors, and 2.92mm connectors are mateable

Available Models

MODEL	CONNECTORS		FREQUENCY RANGE (GHz) AND MAXIMUM VSWR	INSERTION LENGTH	
	SIDE A	SIDE B		INCHES	(CM)
8028A[1]	3.5mm female	BNC 50Ω female	DC - 4.0 ≤ 1.10 4.0 - 10.0 ≤ 1.20	2.000	(5.08)
8028B[2]	3.5mm female	BNC 50Ω male		1.910	(4.85)
8028C[1]	3.5mm male	BNC 50Ω female		2.000	(5.08)
8028D[2]	3.5mm male	BNC 50Ω male		1.910	(4.85)
2625A[3]	7mm	SMA female	DC - 4.0 ≤ 1.05 4.0 - 10.0 ≤ 1.08 10.0 - 18.0 ≤ 1.16	1.670	(4.24)
2625B[3]	7mm	SMA male		1.670	(4.24)
8582D3[4]	7mm	BNC 75Ω female	DC - 12.0 ≤ 1.60	2.060	(5.23)
8582D4[4]	7mm	BNC 75Ω male		2.060	(5.23)
8821A1	Type N female	BNC 50Ω female	DC - 4.0 ≤ 1.08 4.0 - 10.0 ≤ 1.20	2.100	(5.33)
8821B1	Type N female	BNC 50Ω male		2.010	(5.11)
8821C1	Type N male	BNC 50Ω female		2.460	(6.25)
8821D1	Type N male	BNC 50Ω male		2.370	(6.02)

[1-6] References to families that are phase matched.

Waveguide-To-Coaxial Adapters — Right Angle Launch

WR90–WR22 to 2.4mm, 2.92mm, 3.5mm, 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 waveguide sizes, covering frequencies from 8.2 to 50 GHz. They adapt to 2.4mm, 2.92mm, 3.5mm, 7mm, and type N coaxial connector types.

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 80. 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 . . . . . 8.2 – 50.0 GHz (in waveguide bands)

Flanges . . . . . Cover Type, see page 80

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
1	1.10
6	1.15
3	1.20

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.

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
8.20 – 12.40	90	—	—	—	—	X200A2	X200B2
10.00 – 15.00	75	—	—	—	—	M200A2	M200B2
12.40 – 18.00	62	—	—	—	—	P200A2	P200B2
15.00 – 22.00	51	—	—	—	—	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	—	—
33.00 – 50.00	22	J236A3	J236B3	—	—	—	—

Right Angle Launch EIA WR to 7mm and Type N Connectors

FREQUENCY RANGE (GHz)	EIA WR NUMBER	MODEL (BY COAXIAL CONNECTOR TYPE)		
		7mm	Type N female	Type N male
8.20 – 12.40	90	X209D2	X213D2	X214D2
10.00 – 15.00	75	M209D2	M213D2	M214D2
12.40 – 18.00	62	P209D2	P213D2	P214D2

Waveguide-To-Coaxial Adapters — End Launch

WR430–WR22 to 2.4mm, 2.92mm, 3.5mm, 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 8.2 to 50 GHz. They adapt to 2.4mm, 2.92mm, 3.5mm, 7mm, type N and SMA coaxial connector types.

Description

Maury end launch adapters feature low VSWR and low insertion loss. Except where noted, flanges are in accordance with the listing on page 80. 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 . . . . . 2.8 – 50.0 GHz (in waveguide bands)

Flanges . . . . . Cover Type, see page 80

K233B8
WR42 -to-2.92mm
Male

U237A1
WR28 -to-2.4mm
Female

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

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.

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
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	—	—
33.00 – 50.00	22	J237A6	J237B6	—	—	—	—

End Launch EIA WR to 7mm and Type N Connectors

FREQUENCY RANGE (GHz)	EIA WR NUMBER	MODEL (BY COAXIAL CONNECTOR TYPE)		
		7mm	Type N female	Type N male
8.20 – 12.40	90	X229A2	X221A2	X221B2
10.00 – 15.00	75	M229A2	M221A2	M221B2
12.40 – 18.00	62	P229A2	P221A2	P221B2

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 Straight Sections

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 S 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.

Available Models

MODEL	FREQUENCY RANGE (GHz)	LENGTH	
		INCHES	(CM)
S102C5	2.60 - 3.95	5.0	(12.7)
E102G5	3.30 - 4.90	5.0	(12.7)
G102C5	3.95 - 5.85	5.0	(12.7)
F102C5	4.90 - 7.50	5.0	(12.7)
C103C5	5.85 - 8.20	5.0	(12.7)
H103A5	7.05 - 10.0	5.0	(12.7)
X103A5	8.20 - 12.4	5.0	(12.7)
M103A5	10.0 - 15.0	5.0	(12.7)
P103A5	12.4 - 18.0	5.0	(12.7)
N102F4	15.0 - 22.0	4.0	(10.2)
K103A4	18.0 - 26.5	4.0	(10.2)
Q106D	22.0 - 33.0	4.0	(10.2)
U103A4	26.5 - 40.0	4.0	(10.2)
J106B1	33.0 - 50.0	2.2	(5.6)

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 57) 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.

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)

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. Please note that Maury does not sell flanges alone.

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 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
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	Keysight 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

Additional Maury Microwave Products

General Information

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.

Attenuators

Maury Microwave's AT-series of fixed coaxial attenuators are used to reduce the power of a RF, MW or mmW signal without distorting its signal quality/waveform. Attenuators are often used to lower the amplitude of a signal to a measurable level or to protect a measurement instrument from damage. Attenuators are also used to improve matching between components by improving the return loss (twice insertion loss) and effectively reducing the VSWR seen by adjacent components. Key attenuator parameters include attenuation, frequency bandwidth, power handling, VSWR and quality/repeatability of connector.

Maury AT-series attenuators are part of the ColorConnect™ family. Following the proposed IEEE high-frequency connector/adapter color convention, AT-series attenuators are the first commercially available attenuators 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.

Torque Wrenches

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 accessory kits, and can be ordered separately by the model numbers listed below. If this list doesn't include the right kit for your application, please contact our Sales Department or your local Maury representative for assistance.

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.

Stub Tuners

Stub tuners are basic laboratory tools used for matching load impedances to provide for maximum power transfer between a generator and a load, and 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.

Stub tuners are impedance transformers that are designed 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. Each stub must be movable over one-half wavelength at the lowest frequency of operation in order to provide all possible shunt susceptances; therefore, the low frequency limit of a tuner is determined by the frequency at which the maximum stub travel equals one-half wavelength. Tuners, particularly multiple-stub models, are still usable below this limit. Other than the limitation of the connectors, there is no higher frequency limit; however, various models are offered for size convenience.

The spacing between the stubs of multiple-stub tuners determines the range of impedances that can be matched and the ease of tuning . The stub spacing of Maury double- and triple-stub tuners has been selected for general broadband applications. Triple-stub tuners are more convenient to use since tuning sensitivity is relatively independent of stub spacing.

Maury produces a comprehensive line of broadband stub tuners designed to satisfy the majority of applications. These tuners are available in double- and triple-stub configurations with frequency ranges extending from 0.2 to 18.0 GHz.

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.

Noise Components & Accessories

Maury offers a wide range of calibrated adapters and adapter sets that are used with the MT7118J99 cryogenic termination and the MT7108J99 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.

Test Port Cable Assemblies

Series 8944C, 8946C, 8954C, and 8948C

Features

- For VNA Applications
- Ruggedized Test Port Connectors
- For Use with 1.85mm, 2.4mm, 3.5mm, and 7mm Test Ports

Description

Maury 8944, 8946, 8954 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.

Available Models – Cable Assemblies

Kit Model	Type	Cable Length		Frequency Range (GHz)	Cable O.D. (Normal)		Bend Radius (Minimum)		Normal Impedance
		Inches	(CM)		Inches	(CM)	Inches	(CM)	
8954C25 8954C38	NMD1.85mm NMD1.85mm	25.0 38.0	(63.5) (96.5)	DC — 67.0	0.6	(1.524)	2.25	(6.35)	50 ohm
8946C25 8946C38	NMD2.4mm NMD2.4mm			DC — 50.0					
8944C25 8944C38	NMD3.5mm NMD3.5mm			DC — 26.5					
8948C25 8948C38	7mm 7mm			DC — 18.0					

Specifications (25-inch Length Cables)

	8954C25	8946C25	8944C25	8948C25
Maximum Frequency	67 GHz	50 GHz	26.5GHz	18 GHz
Insertion Loss	5.15dB typ 6.00dB max	2.65dB typ 3.65dB max	1.30dB typ 1.60dB max	1.00dB typ 1.25dB max
VSWR	1.35 typ 1.50 max	1.25 typ 1.45 max	1.20 typ 1.30 max	1.20 typ 1.30 max
Phase Stability	5.00° typ 8.60° max	1.50° typ 4.50° max	2.00° typ 4.00° max	2.00° typ 2.85° max
Amplitude Stability	0.02dB typ 0.10dB max	0.01dB typ 0.10dB max	0.01dB typ 0.10dB max	0.02dB typ 0.10dB max

Specifications (38-inch Length Cables)

	8954C38	8946C38	8944C38	8948C38
Maximum Frequency	67 GHz	50 GHz	26.5GHz	18 GHz
Insertion Loss	7.20dB typ 8.20dB max	4.00dB typ 5.20dB max	1.80dB typ 2.20dB max	1.45dB typ 1.75dB max
VSWR	1.35 typ 1.50 max	1.38 typ 1.45 max	1.20 typ 1.30 max	1.20 typ 1.30 max
Phase Stability	6.00° typ 10.60° max	4.00° typ 9.00° max	2.00° typ 7.50° max	4.00° typ 5.20° max
Amplitude Stability	0.02dB typ 0.15dB max	0.03dB typ 0.15dB max	0.02dB typ 0.15dB max	0.02dB typ 0.15dB max

Stability™ Maury Microwave

Microwave/RF Cable Assemblies

Series SC-185, 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.

Typical Configurations

Part Number	Length*	Connector 1**	Connector 2**	Frequency
SC-185-MM-24	24 in.	1.85mm male	1.85mm male	67 GHz
SC-185-MM-36	36 in.			
SC-185-MM-48	48 in.			
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-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.			

* Custom lengths are available by special order.

** 1.85mm, 2.4mm, 2.92mm, 3.5mm connectors available in male and female.

Stability™ Specifications

STABILITY™ Cable Type	Frequency	Typical Phase Stability with Flexure	Typical Amplitude Stability with Flexure
SC-185	67 GHz	±8.0°	±0.08 dB
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-185	SC-24	SC-292	SC-35	SC-N
Maximum Frequency	67 GHz	50 GHz	40 GHz	26.5 GHz	18.0 GHz
VSWR	1.40 typ/ 1.50 max	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)	1.79 dB/ft	1.52 dB/ft	0.84 dB/ft	0.67 dB/ft	0.54 dB/ft
Impedance (nominal)	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm
Phase Stability vs Bending[2]	±8° typ/ ±15.6° max	±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]	±0.08 dB typ/ ±0.10 dB max	±0.05 dB typ/ ±0.08 dB max	±0.05 dB typ/ ±0.10 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 page 87).

[2] Per IEC 60966-1, section 8.6, method 1.

[3] Per IEC 60966-1, section 8.4.

Mechanical/Environmental Properties

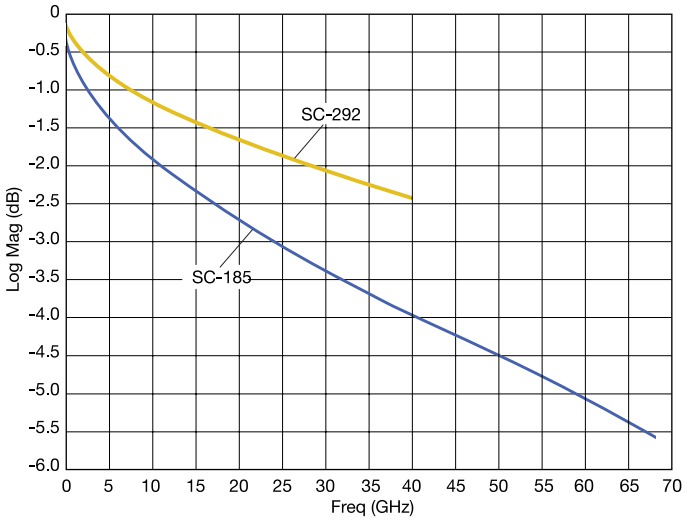
STABILITY™ Cable Type	SC-185, SC-24, SC-292, SC-35 and SC-N	
Center Conductor Material	Silver-Plated Copper-Clad Steel	
Maximum Outer Diameter	SC-292/SC-35/SC-N 0.277 in (7.04mm)	SC-185/SC-24 0.244 (6.20mm)
Nominal Weight	1.61 oz/ft (150g/m)	1.02 oz/ft (95g/m)
Min. Static Bend Radius / Min. Dynamic Bend 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.

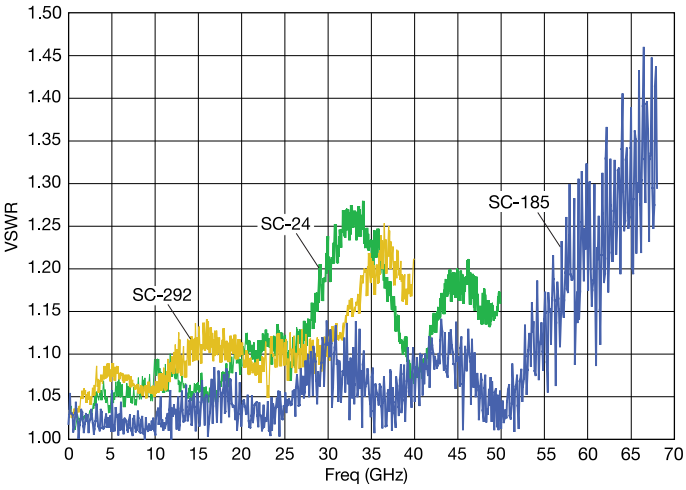
[5] Per MIL-C-87104.

[6] Per SAE AS5756.

Maury Stability™ 36" Cable Assembly Typical Insertion Loss



Maury Stability™ 36" Cable Assembly Typical VSWR



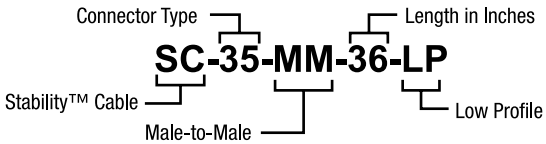
Stability™ Low-Profile Cable Assemblies (-LP)

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[1]. Available with 2.4mm, 1.85mm, 3.5mm and 2.92mm connectors.

[1] For 2.92mm and 3.5mm connectors only.

Ordering Instructions for Stability™ Low Profile (-LP) Cable Assemblies

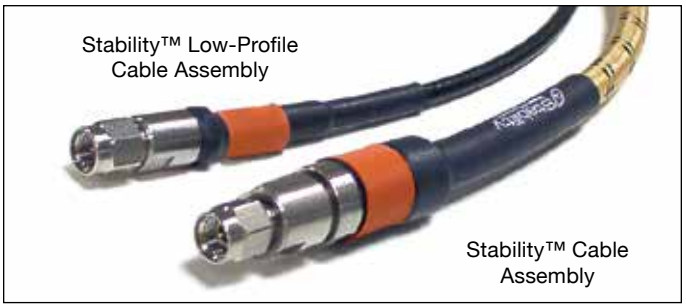
To specify a Stability™ Low Profile Cable Assembly, add "-LP" at the end of the SC model number, as shown in the example below. Available with 3.5mm, 2.92mm and 2.4mm connectors.



Mechanical/Environmental Properties (-LP)

STABILITY™ Cable Type	SC-185, SC-24, 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[2]	>20,000
Crush Resistance	>23 lb/inch (4kN/m)
Operating Temperature Range	–67 ~ +257°F (–55 ~ +125°C)
Fire Resistance[3]	Yes
RoHS/REACH	Yes

[2] Per IEC 60966-1, section 9.3. [3] Per MIL-C-87104.

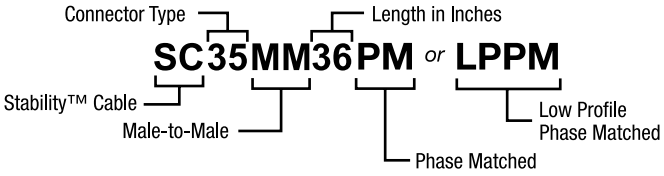


Stability™ Phase-Matched (PM) Cable Assembly Sets

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 below. "PM" indicates standard configuration Phase-Matched sets; "LPPM" indicates Low Profile configuration, Phase-Matched sets.



Stability™ Swept 90° Cable Assemblies (-RT)

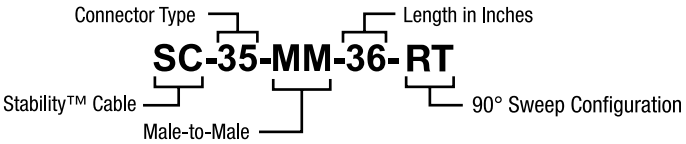
Stability™ Swept 90° Cable Assemblies are designed for applications requiring a fixed and stable bend where traditional cable assemblies may be inconvenient. With a bend radius of 1.43 inches and a cable-to-connector length of 3.3 inches, Stability™

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.

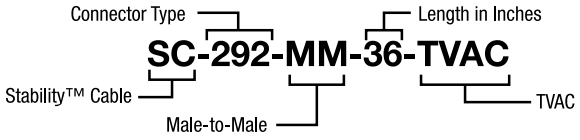


Stability™ Thermal Vacuum Cable Assemblies (-TV)

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 (-TV) Cable Assemblies

To specify a Stability™ Thermal Vacuum Cable Assembly, add "-TV" at the end of the SC model number, as shown in the example at the right.



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Utility™ Maury Microwave

ORDER THESE AND OTHER IN-STOCK PRODUCTS
ONLINE AT MAURYMW.COM

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

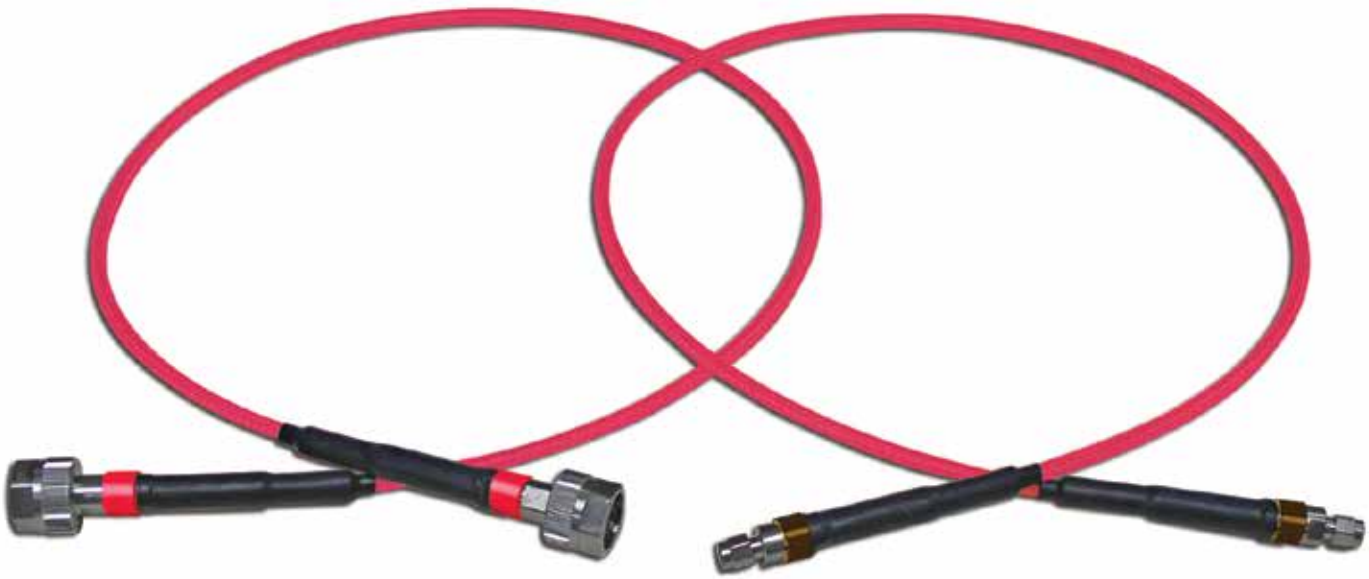
Features and Benefits

- 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.

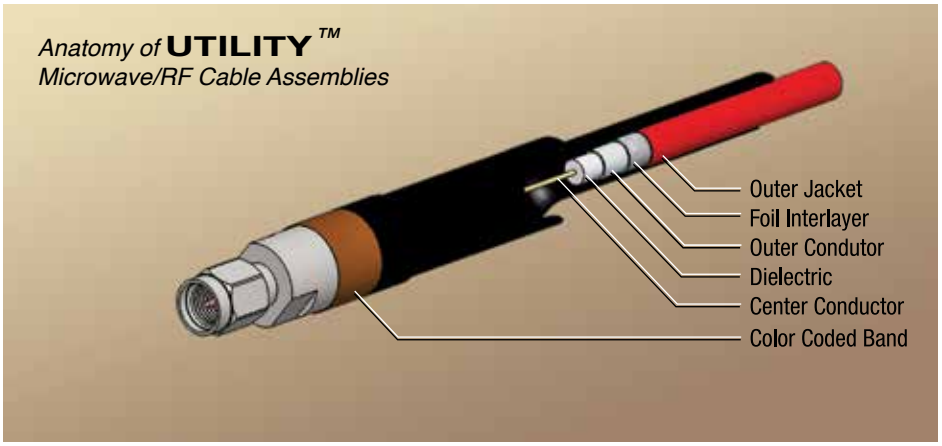
[4] Per MIL-C-87104.

Available Models

Part Number	Length[5]	Connector 1[6]	Connector 2[6]	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.

[6] SMA connectors available in male and female.



ColorConnect™ Precision Attenuators

AT-Series

AT-24-01-03 AT-292-01-03 AT-SMA-01-03

AT-Series Attenuators

Features

- Fixed Coaxial Attenuators
- Precision 2.4mm, 2.92mm & SMA Male/Female Connectors
- Color Coded For Easy Identification

Description

Maury Microwave's AT-series of fixed coaxial attenuators are used to reduce the power of a RF, MW or mmW signal without distorting its signal quality/waveform. Attenuators are often used to lower the amplitude of a signal to a measurable level or to protect a measurement instrument from damage. Attenuators are also used to improve matching between components by improving the return loss (twice insertion loss) and effectively reducing the VSWR seen by adjacent components. Key attenuator parameters include attenuation, frequency bandwidth, power handling, VSWR and quality/repeatability of connector.

ColorConnect™ Color Coding

Maury AT-Series attenuators are part of the ColorConnect™ family. Following the proposed IEEE high-frequency connector/adapter color convention, AT-Series attenuators are the first commercially available attenuators 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.

Proposed IEEE High-Frequency Connector/Adapter Color Convention

(Available with Maury ColorConnect™ Precision Adapters)

ORDER THESE AND OTHER IN-STOCK PRODUCTS
ONLINE AT MAURYMW.COM

ColorConnect™ Precision Attenuators Available Models

Model	Connector 1	Connector 2	Frequency Range	Power Handling (W)	Attenuation (dB)	VSWR (max)
AT-SMA-02-03	SMA male	SMA female	DC – 26.5	2	3	1.5:1
AT-SMA-02-06	SMA male	SMA female	DC – 26.5	2	6	1.5:1
AT-SMA-02-10	SMA male	SMA female	DC – 26.5	2	10	1.5:1
AT-SMA-02-20	SMA male	SMA female	DC – 26.5	2	20	1.5:1
AT-292-01-03	2.92mm male	2.92mm female	DC – 40.0	1	3	1.4:1
AT-292-01-06	2.92mm male	2.92mm female	DC – 40.0	1	6	1.4:1
AT-292-01-10	2.92mm male	2.92mm female	DC – 40.0	1	10	1.4:1
AT-292-01-20	2.92mm male	2.92mm female	DC – 40.0	1	20	1.4:1
AT-24-01-03	2.4mm male	2.4mm female	DC – 50.0	1	3	1.75:1
AT-24-01-06	2.4mm male	2.4mm female	DC – 50.0	1	6	1.75:1
AT-24-01-10	2.4mm male	2.4mm female	DC – 50.0	1	10	1.75:1
AT-24-01-20	2.4mm male	2.4mm female	DC – 50.0	1	20	1.75:1

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. The "TW" series has color coded bands corresponding to the Color Connect series identification.

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.

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[4]
2698C2	7mm, N[1], NMD3.5, NMD2.92, NMD2.4, NMD1.85	0.75 HEX	12 ±0.8	BLUE
2698G1	TNC[2]	0.562 HEX	12 ±0.8	BLUE
2698K1	7-16	1.062 HEX	20 ±1.2	GREEN
8799A1[3]	3.5mm, 2.92mm, 2.4mm, 1.85mm	0.312 HEX	8 ±0.5	RED
8799D1	SMA	0.312 HEX	5 ±0.3	BLACK
TW-5	SMA	0.312 HEX	5 ±0.5	BROWN[5]
TW-8	3.5mm, 2.92mm, 2.4mm, 1.85mm,	0.312 HEX	8 ±0.8	BLUE, GREEN, YELLOW, ORANGE[5]
TW-12	7mm, N[1], NMD3.5, NMD2.92, NMD2.4, NMD1.85	0.750 HEX	12 ±1.2	RED[5]

1 Precision N connectors supplied with 3/4 hex nuts.

2 Precision TNC connectors supplied with 9/16 hex nuts.

3 WARNING: Do Not Use on SMA connectors. Damage can result.

4 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.

5 Has color coded bands corresponding to the Color Connect series identification.

Connector Gages and Connector Gage Kits

General Information

Features

- Direct Reading, Self-Checking
- Accurate, Easy to Use
- Digital and/or Dial Indicator Styles

A048A 1.85mm/2.4mm Digital Connector Gage Kit

A048A (Female) and A048B (Male) Digital Gages with Master Blocks (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 and Type N 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, SMA and SMP/GPO™[1] 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] 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	0.0001	A035E	Two metrology grade “thread-on” gages measure female and male contact pin interface locations.	2Y-022A
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
BNC or TNC	0.0005	A012A	One “push-on” gage measures female and male contact pin and dielectric interface locations.	2Y-009
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
SMP/GPO™ 1	0.0005	A042A	Three “push-on” gages measures SMP connectors’ contact pin and dielectric interface locations.	2Y-031

1 GPO™ is a trademark of the Gilbert Engineering Co., Inc.

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.

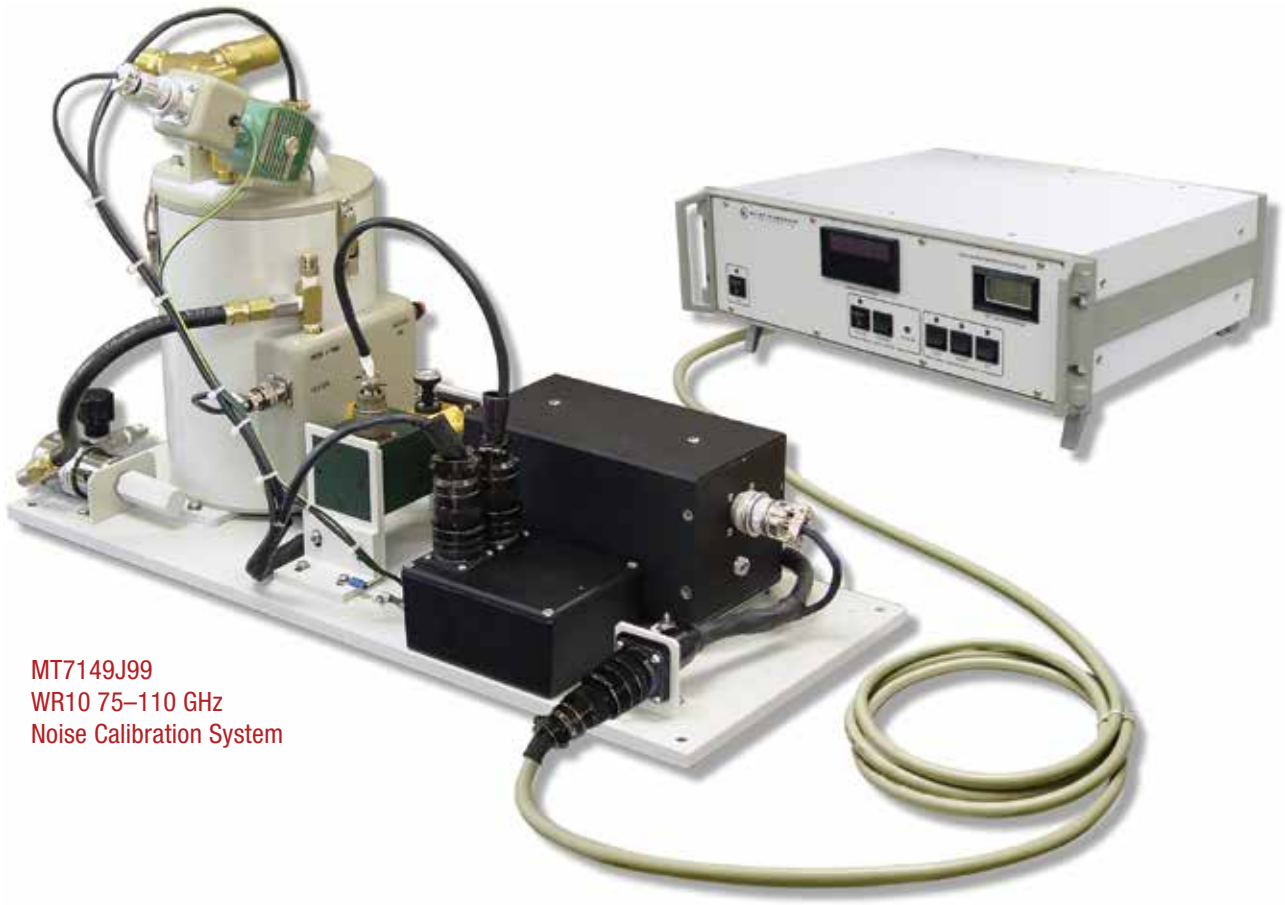
Stub tuners work as impedance transformers to introduce a variable shunt susceptance into a coaxial transmission line. They consist of one or more short-circuited, variable length lines (stubs) connected at right angles to the primary transmission line. To provide all possible shunt susceptances, each 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	SMA	STUB TRAVEL INCHES	(cm)	STUB SPACING INCHES	(cm)
DOUBLE-STUB	0.2 — 0.5	1778G	—	30.0	(76.2)	4.6	(11.7)
	0.4 — 1.0	1778A	1719A	15.0	(38.1)	4.6	(11.7)
	0.8 — 4.0	1778B	1719B	7.5	(19.1)	2.0	(5.1)
	2.0 — 12.0	1778C	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	1719D	1.75	(4.4)	0.5	(1.3)
TRIPLE-STUB	0.2 — 0.5	1878G	—	30.0	(76.2)	4.6 (11.7) /	2.0 (5.1)
	0.4 — 1.0	1878A	1819A	15.0	(38.1)	4.6 (11.7) /	2.0 (5.1)
	0.8 — 4.0	1878B	1819B	7.5	(19.1)	1.0 (2.5) /	0.75 (1.9)
	2.0 — 18.0	1878C	1819C	3.0	(7.6)	0.75 (1.9) /	0.5 (1.3)
	4.0 — 18.0	1878D	1819D	1.75	(4.4)	0.75 (1.9) /	0.5 (1.3)

Noise Calibration Systems and Components



MT7149J99
WR10 75–110 GHz
Noise Calibration System

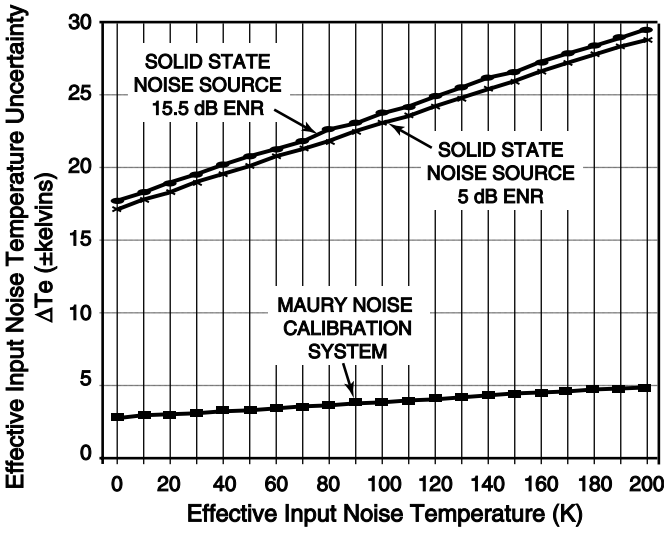
Introduction

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.



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 page 98).

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 100-101.)

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 105-108.)

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 MT7118J99 cryogenic termination and the MT7108J99 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 102 and 108.)

Noise Calibration Systems and Components

(Continued)

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. Included is MT7250 series Noise Calibration Swept Data Module 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.

MT155J

The MT155J controller can be located up to 25 feet (7.6 meters) away from the mounting plate.

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 (LN2) 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
MT7091J99	10.0 — 12.4	WR90	MPF90 [2]	Dual-load
MT7093J99	10.0 — 15.0	WR75	MPF75B [3]	Dual-load
MT7094J99	15.0 — 22.0	WR51	MPF51B [3]	Dual-load
MT7095J99	18.0 — 26.5	WR42	UG595/U	Dual-load
MT7096J99	26.5 — 40.0	WR28	UG599/U	Dual-load
MT7097J99	33.0 — 50.0	WR22	UG383/U	Dual-load
MT7100J99	50.0 — 75.0	WR15	UG385/U	Dual-load
MT7149J99	75.0 — 110.0	WR10	UG385/U	Dual-load
MT7098J99	DC — 18.0	Coaxial	7mm	Dual-load
MT7208J99 [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.

Cryogenic Noise Terminations (Cold Loads)

MT7025J99 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 swept data calibration report which includes VSWR and available output noise temperature data at standard frequencies. See Maury data sheet 4E-020, which provides specifics for the MT7250 series Noise Calibration Swept Data Module, a software tool 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 98). 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.

MT7118J99 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 MT7118J99 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 MT7118J99 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 MT7118J99 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 MT7118J99 can be optimized for VSWR and input noise temperature over other bandwidths. For calibration 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 102) 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 frequencies, see the information on Maury's MT7250 series Noise Calibration Swept Data Module software (pages 103 –104), or consult our Sales Department.

Waveguide Cryogenic Terminations

MT70xx Series


MT7025J99

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

Description

Maury offers waveguide cryogenic terminations in several styles and a wide range of waveguide sizes from WR430 through WR15. The table below represents a typical sample of the available terminations.

Waveguide terminations are calibrated within the waveguide band (using Maury MT7250 Noise Calibration Swept Data Module (see pages 103-104). 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 104) 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)
MT7040J99	7.05 — 10.0	WR112 [1, 2]	1.08
MT7041J99	10.0 — 12.4	WR90 [2]	1.10
MT7042J99	10.0 — 15.5	WR75 [3]	1.08
MT7043J99	13.0 — 15.0	WR62 [2]	1.10
MT7044J99	15.0 — 22.0	WR51 [3]	1.10
MT7021J99	18.0 — 26.5	WR42 [2]	1.08
MT7022J99	26.5 — 40.0	WR28 [2]	1.10
MT7023J99	33.0 — 50.0	WR22 [2]	1.10
MT7025J99	50.0 — 75.0	WR15 [2]	1.15
MT7027J99	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

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 calibrated 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.

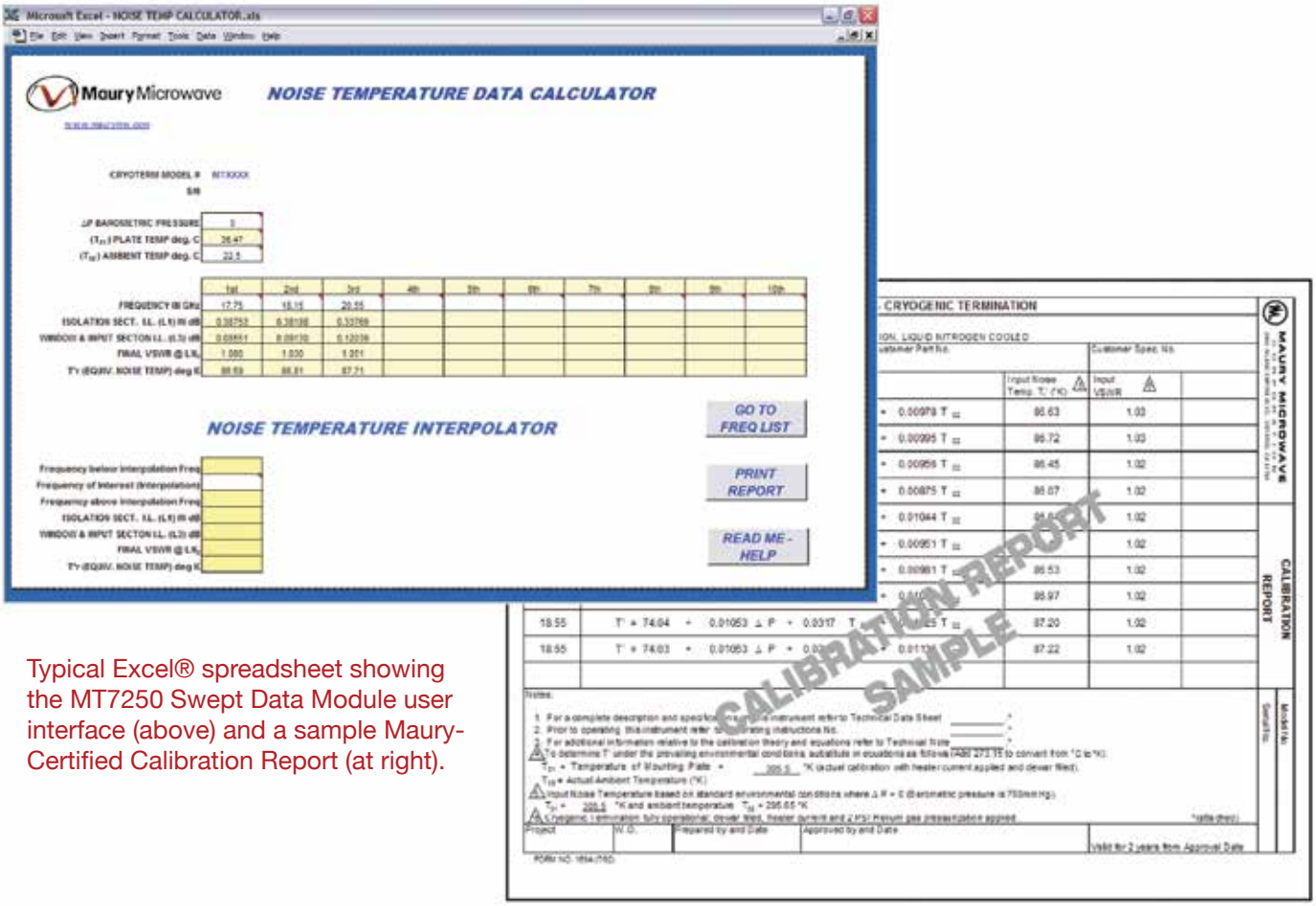
[1] Not provided.

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 104), 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.



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

Thermal Noise Terminations (Hot Loads)

Introduction

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.

Maury 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 103-104.

Coaxial Thermal Termination

MT7108B

MT151C MT7108J99

Description

Maury offers a single thermal noise termination model (the MT7108J99), 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 MT7108J99 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 specified frequencies. (Maury's MT7250 series Noise Calibration Swept Data Module is included 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 MT7108J99 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 MT7108J99'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).

A certified calibration report with traceability to NIST is provided with each unit.

1 See Maury data sheet 4E-020 for details, and pages 103-104 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

MT151C

MT7090J99

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 calibrated at frequencies within the applicable frequency range. Maury's MT7250 series Noise Calibration Swept Data Module is included 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
MT7005J99	3.7 – 4.2	WR229 [2]	1.07
MT7081J99	10.0 – 12.4	WR90 [3]	1.10
MT7082J99	10.0 – 15.0	WR75 [3]	1.08
MT7009J99	15.0 – 22.0	WR51	1.10
MT7084J99	18.0 – 26.5	WR42 [3]	1.08
MT7085J99	26.5 – 40.0	WR28 [3]	1.10
MT7086J99	33.0 – 50.0	WR22 [3]	1.10
MT7088J99	50.0 – 75.0	WR15 [3]	1.20
MT7090J99	75.0 – 110.0	WR10 [3]	1.15

1 See Maury data sheet 4E-020 and pages 103-104 in this volume.

2 Flange mates with applicable CPR and CMR flanges.

3 Flange mates with the applicable military (UG) flange.

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

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.

A typical foam-lined Instrument case with one (1) model MT7090J99, one (1) calibrated MT151C Controller and one (1) Operating Manual.

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.

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