

VNA Calibration Kit Components Finder

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

Cal Kit Components Information Finder

Connector Type

	• Fixed Terminations		• Sliding Terminations		• Fixed Flush & Fixed Offset Shorts		• Sliding Shorts		• Opens		• Air Lines (Beadless)		• Air Lines (Bead Supported)		• Precision Mismatches		• Precision Mismatch Sets		• Two-Port Mismatch Standards		• Connector Gauge Kits *		• Directional Couplers		• Torque Wrenches		
• 1.85mm	52	62	66			79	80											92									94
• 2.4mm	52	62	667			79	81					86	88							92							94
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• C	56		73																	92							
• HN	56		73																								
• SC	56		73																	92							94
• BNC (50 ohm)	56		73		79															92							
• BNC (75 ohm)	55		73		79															92							
• TNC	57	63	70		79							87	88							92							94
• AFTNC	57	63	71		79															92							94
• TNCA	57	63	71		79															92							94
• SMA		63		77																92							94
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• 14mm (GR 900 Equiv)	59	63	72				85					87								92	93						94
• 7-16	59		72		79	85														92							94
• Waveguide Components	60	65	74, 75	78												89											

* Maury also offers connector gages and gage kits for ZMA/BZ and Multiport connectors. See their listings on page 92. Digital gages and gage kits are available for 1.85mm/2.4mm and 2.92mm (K)/3.5mm connectors.

Maury Cal Kit Components

General Information

Fixed Terminations

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

Sliding Terminations

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

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

Fixed Flush and Fixed Offset Shorts

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

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

Sliding Shorts

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

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

Opens

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

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

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

Air Lines (Beaded and Beadless)

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

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

Precision Mismatches and Mismatch Air Line Sets

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

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

Connector Gage Kits

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

Precision Fixed Terminations

General Information



Fixed Terminations –

A precision fixed termination (or load) consists of an immovable, (fixed) termination which, when mated to the end of a transmission line or cable, absorbs nearly all of the signal energy traveling toward it. An ideal “matched” condition exists when a termination with an impedance value of Z_0 , is connected to the end of a transmission line or cable that also has a characteristic impedance of Z_0 . Such an ideal “matched” condition (one with no mismatch between the termination and its mated line or cable) is critical if a voltage standing wave ratio (VSWR) of 1.0:1 is to be

achieved in a system with a 50 or 75 ohm impedance value. Simply put, the more closely the 1.0:1 ratio is approached, the more accurate the measurements that can be made from a system.

Maury precision fixed terminations are designed to exacting specifications and are as close to the ideal impedance as it is mechanically possible to make them. The following pages (pages 50 through 58) provide detailed information about the various types of precision fixed terminations offered by Maury. Most are normally sold as components of Maury VNA calibration kits, but may also be purchased separately as replacement parts or spares.

Precision Fixed Terminations

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

Features

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

Description

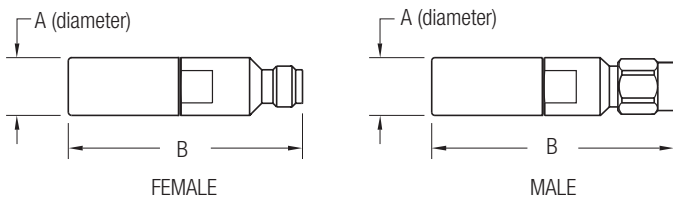
The 7831/32 and 7931 model series fixed terminations, which have 1.85mm and 2.4mm connectors respectively, are precision low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Depending on the frequency range and required calibration effectiveness of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

Connector Descriptions

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

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

Dimensions – Inches (cm)



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

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

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

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



Available Models

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

Specifications

Frequency Range, VSWR (See Available Models chart)

Power Rating 0.5 watt CW, 0.25 kW peak

Nominal Impedance 50 ohm

Connectors:

7831 series 1.85mm ¹

7832 series 1.85mm ¹

7931 series 2.4mm ²

Size (See Dimensions)

Precision Fixed Terminations

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

Features

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

Description

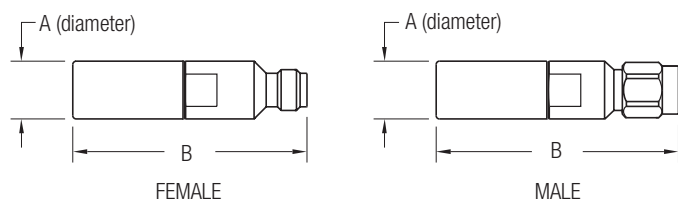
The 8775 and 8031 model series fixed terminations, which have 2.92mm and 3.5mm connectors respectively, are precision low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Depending on the frequency range and required calibration effectiveness of your network analyzer (VNA or SNA), specific models can be used for full or lowband one-port Z₀ calibration and full two-port isolation calibration. The 2.92mm (K) and 3.5mm connectors used on these terminations are mating compatible with each other, and with SMA connectors.

Connector Descriptions

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

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

Dimensions – Inches (cm)



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

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

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

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



Available Models

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

Specifications

Frequency Range, VSWR (See Available Models chart)

Power Rating 0.5 watt CW, 0.25 kW peak

Nominal Impedance 50 ohm

Connectors:

8775 series 2.925mm (K) ¹

8031 series 3.5mm ²

Size (See Dimensions)

Precision Fixed Terminations

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

Features

- ▶ Low VSWR
- ▶ DC to 18 GHz

Description

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

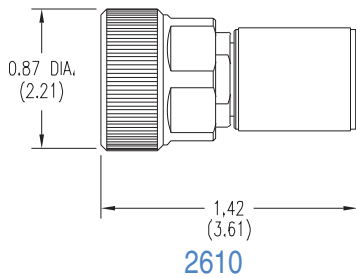
Connector Descriptions

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

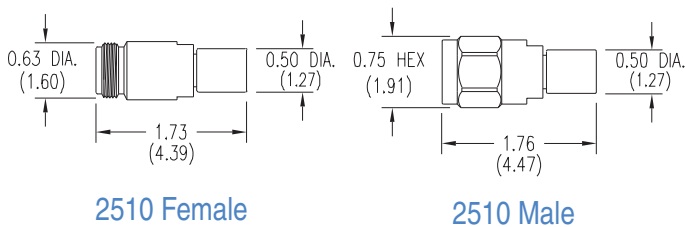
The connectors on the 2510 series terminations are Maury precision stainless steel type N connectors that mate with most of the precision type N connectors commonly used today, including those complying with MIL-C-39012 and MIL-T-81490. They are low VSWR connectors rated from DC to 18 GHz.

Dimensions – Inches (cm)

7mm



Type N



Available Models

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

Specifications

Frequency Range, VSWR (See Available Models chart)

Power Rating 1 watt CW, 1 kW peak

Nominal Impedance 50 ohm

Connectors:

2610 series 7mm ¹

2510 series Type N ²

Size (See Dimensions)

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

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

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

Precision Fixed Terminations

Type N 75 ohm (8883 series)

BNC 75 ohm (8583 series)

Features

- ▶ Low VSWR
- ▶ DC to 2 GHz

Description

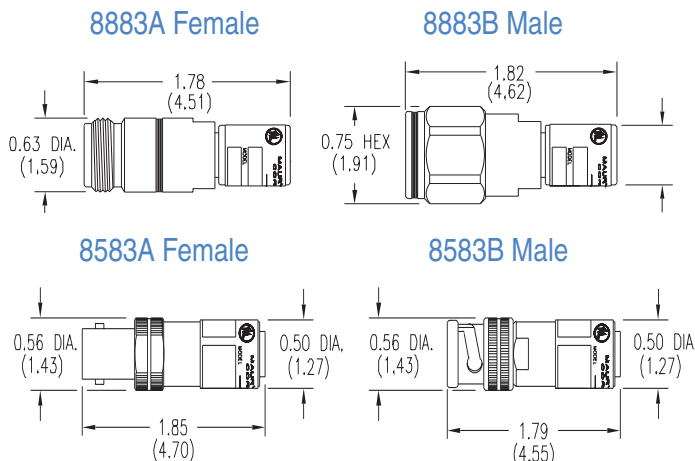
The 8883 series and 8583 series fixed terminations are precision, low VSWR, 75 ohm terminations equipped with type N and BNC connectors, respectively. These terminations are suited to a wide variety of general purpose and precision laboratory applications; however, their primary usage is for 75 ohm reference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

Connector Description

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

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

Dimensions – Inches (cm)



Key Literature: Maury data sheet 2Z-036



8883A

8883B



8583A

8583B

Specifications

Model 8883A – Female type N 75 ohm fixed termination

Model 8883B – Male type N 75 ohm fixed termination

Frequency Range DC – 2.0 GHz

Maximum VSWR 1.01

Power Rating 1 watt CW

Nominal Impedance 75 ohm

Connectors:

8883A Precision 75 ohm type N female¹

8883B Precision 75 ohm type N male¹

Size (see Dimensions)

Model 8583A – Female BNC 75 ohm fixed termination

Model 8583B – Male BNC 75 ohm fixed termination

Frequency Range DC – 2.0 GHz

Maximum VSWR 1.02

Power Rating 1 watt CW

Nominal Impedance 75 ohm

Connectors:

8583A Precision 75 ohm BNC female

8583B Precision 75 ohm BNC male

Size (see Dimensions)

Precision Fixed Terminations

HN, SC, BNC and C

(335, 336, 351, and 354 series)

Features

- ▶ Low VSWR
- ▶ DC to 10 GHz

Description

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

These compact, lightweight, rugged terminations are available with HN, SC, BNC, and C connectors. Most are sufficiently well matched for low frequency VNA Z₀ calibrations and all can be used for isolation calibrations within the appropriate frequency range.

Connector Descriptions

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

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

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

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

Dimensions – Inches (cm)

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

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



Available Models

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

Specifications

Frequency Range, VSWR (See Available Models chart)

Power Rating:

- HN and SC 1 watt CW, 1 kW peak
- BNC and C 2 watt CW, 1 kW peak

Nominal Impedance 50 ohm

Size (See Dimensions)

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

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

Precision Fixed Terminations

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

Features

- ▶ Low VSWR
- ▶ DC to 20 GHz

Description

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

Connector Description

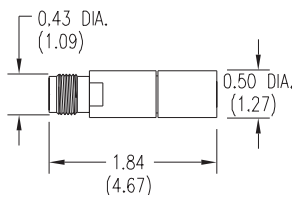
Maury TNC connectors (MPC/TNC) on the are precision stainless steel connectors that mate with MIL-C-39012 and MIL-T-81490 connectors. These low VSWR connectors rated from DC to 18.0 GHz.

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

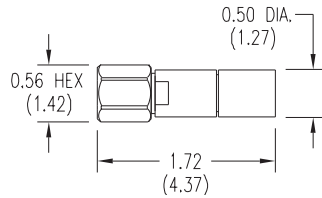
Maury TNCA connectors fully comply with the requirements of MIL-STD 348A. The male connector utilizes a solid outer conductor configuration to provide consistent measurement results. Connector bodies are fabricated from stainless steel for strength and durability.

Dimensions – Inches (cm)

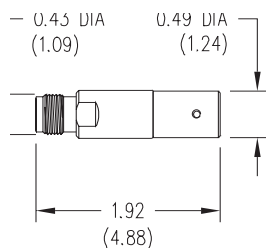
332A Female



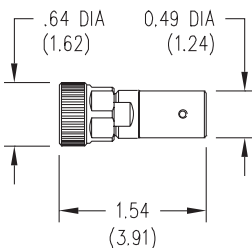
332B Male



8684A & 8674A Female



8684B & 8674B Male



Available Models

MODEL FEMALE	MODEL MALE	FREQUENCY RANGE (GHz)	MAXIMUM VSWR	CONNECTOR TYPE
332A	332B	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.10 1.15 1.20	TNC ¹
332E	332F	DC – 4.0 4.0 – 12.0 12.0 – 18.0	1.06 1.10 1.15	TNC ¹
332G	332H	DC – 2.0 2.0 – 4.0	1.02 1.05	TNC ¹
332A3	332B3	DC – 3.0 3.0 – 6.0	1.02 1.04	TNC ¹
332A8	332B8	DC – 3.0 3.0 – 13.5	1.03 1.06	TNC ¹
332A9	332B9	DC – 3.0 3.0 – 18.0	1.03 1.10	TNC ¹
332A5	332B5	DC – 12.0 12.0 – 18.0	1.25 1.10	TNC ¹
8684A	8684B	DC – 4.0 4.0 – 12.0 12.0 – 20.0	1.04 1.08 1.10	AFTNC ²
8674A	8674B	DC – 4.0 4.0 – 12.0 12.0 – 20.0	1.04 1.08 1.10	TNCA ³

Specifications

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

¹ Precision TNC per Maury data sheet 5E-053.
² Precision TNC MIL-C-87104/2 per Maury data sheet 5E-056.
³ Precision TNC MIL-STD 348A per Maury data sheet 5E-058.

Precision Fixed Terminations

LCP/OSP™ (8783 series)

Features

- ▶ Low VSWR
- ▶ DC to 18 GHz

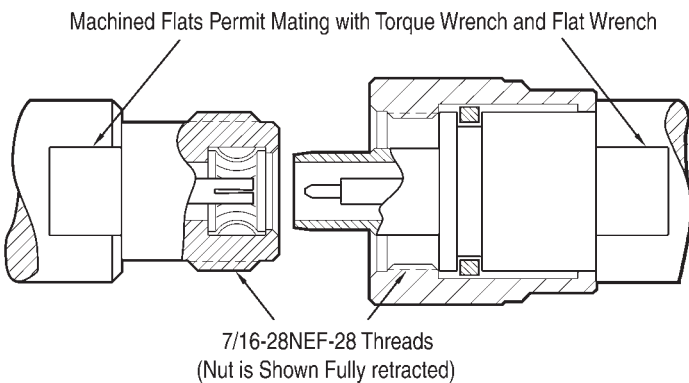
Description

The 8783 series fixed terminations are equipped with Maury LCP/OSP™ connectors, which are precision, broadband, low VSWR terminations suited to a wide variety of general purpose and precision laboratory applications. Their unique coupling mechanism is an improvement on the original OSP™ design that significantly enhances the performance of these connectors (see Connector Description below). Depending upon the frequency range and required calibration effectiveness of your VNA, PNA, or SNA, specific models can be used for full or lowband one-port Z₀ calibration and full two-port, isolation calibration.

Connector Description

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

Maury OSP™ Improvements



8783A

8783B

Specifications

Model 8783A female LCP/OSP™ fixed termination

Model 8783B male LCP/OSP™ fixed termination

Frequency Range DC to 18.0 GHz

Maximum VSWR:

DC to 1.0 GHz	1.03
1.0 to 6.0 GHz	1.05
6.0 to 18.0 GHz	1.08

Power Rating 1 watt CW, 0.5 kW peak

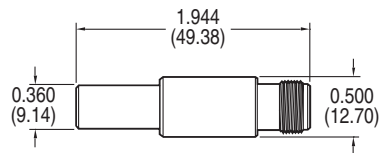
Reference Impedance 50 ohm (nominal)

Connectors LCP/OSP™

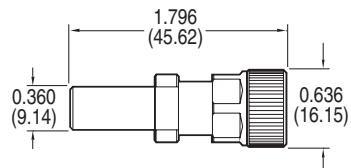
Size (see Dimensions)

Dimensions – Inches (cm)

8783A Female



8783B Male



Precision Fixed Terminations 14mm – GR900 Equivalent (2410A)

Features

- ▶ Low VSWR
- ▶ DC to 8.5 GHz

Description

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

Connector Description

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

Dimensions – Inches (cm)

See the diagram at right.

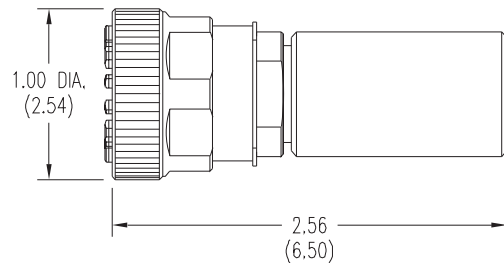


2410A

Specifications

Model 2410A Precision 14mm Fixed Termination

Frequency Range	DC to 8.5 GHz
Maximum VSWR:	1.005 + 0.004 GHz
Power Rating	3 watts CW, 1 kW peak
Reference Impedance	50 ohm (nominal)
Connector	14mm (MPC14)
Size	(see diagram below)



Precision Fixed Terminations 7-16 (2710 Series)

Features

- ▶ Low VSWR
- ▶ DC to 7.5 GHz

Description

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

Connector Description

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



2710A



2710B

Specifications

Model 2710A Female Precision 7-16 Fixed Termination

Model 2710B Male Precision 7-16 Fixed Termination

Frequency Range	DC to 7.5 GHz
Maximum VSWR:	
DC to 4.0 GHz	1.02
4.0 to 7.5 GHz	1.03
Power Rating	3 watts CW, 1 kW peak
Reference Impedance	50 ohm (nominal)
Connector	Precision 7-16
Size in inches (cm):	

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

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

Precision Fixed Terminations

Waveguide (301 series)

Features

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

Description

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

Waveguide Flange Description

The waveguide flanges used on these terminations are Maury Precision Flanges (MPF) in rectangular, or round configurations. MPF flanges have precision indexing holes and removable indexing pins for excellent measurement repeatability. The millimeter waveguide flanges in the WR22 and smaller sizes are of a unique Maury-pioneered design featuring a raised outer rim to prevent the flanges from cocking during connection. These flanges will mate with corresponding UG ()/U flanges. (See page 128 for flange details.)



R301A



K301



P301A

Available Models

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

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

Sliding Terminations

General Information



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

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

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

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

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

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

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

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

Sliding Terminations — Metrology Grade

1.85mm, 2.4mm, 2.92mm and 3.5mm

Features

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

Description

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

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

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

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

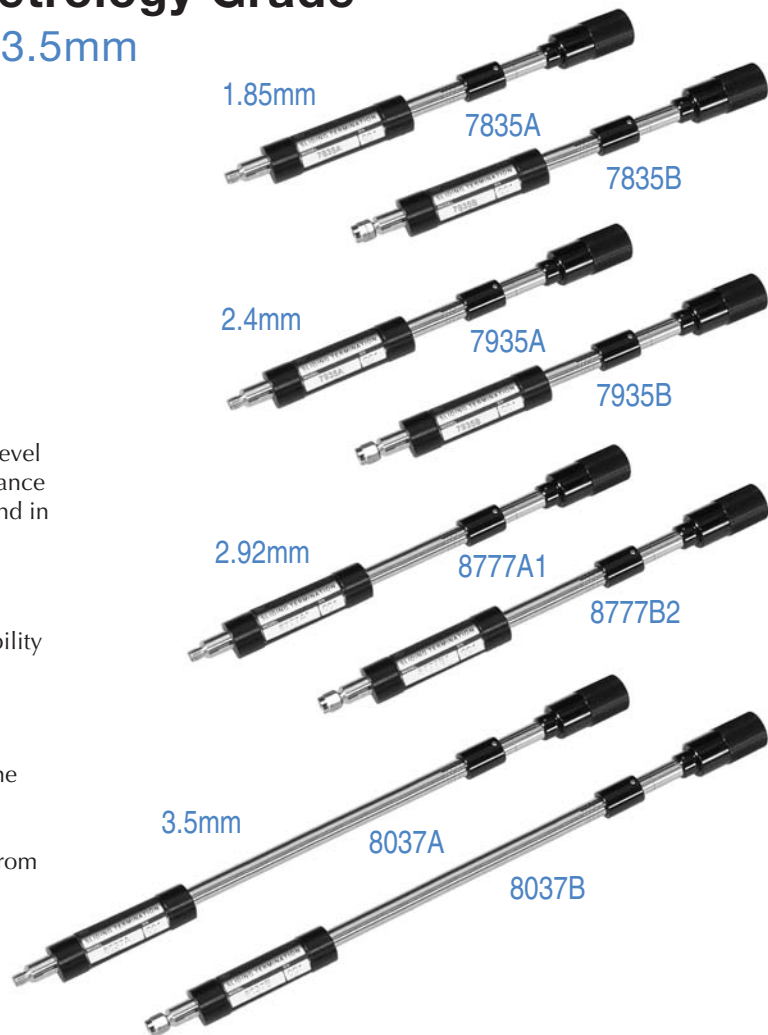
Specifications

MODEL	CONNECTOR TYPE	FREQUENCY RANGE & MAXIMUM VSWR ¹	AIR LINE ACCURACY ²	POWER HANDLING
7835A	1.85mm female	8.0 GHz — 67.0 GHz, 1.05	42 dB (4.0 — 67.0 GHz)	0.5 watts CW, 0.5 kW peak
7835B	1.85mm male			
7835C	1.85mm boxed set (1 ea. 7835A female and 7835B male) ³			
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			
8777A1	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
8777B1	2.92mm (K) male			
8777C1	2.92mm (K) boxed set (1 ea. 8777A1 female and 8777B1 male) ³			
8037A	3.5mm female	2.0 GHz — 4.0 GHz, 1.09 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			

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

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

³ Supplied in a foam-lined wood instrument case.



Sliding Terminations — Precision Dedicated Connectors

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

Features

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



Description

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

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

Specifications

Frequency Range See chart
 VSWR (terminating element) See chart
 Power Rating See chart
 Nominal Impedance 50 ohm
 Air Line Accuracy See chart
 Travel >1/2 wavelength at lowest rated frequency
 Connectors See chart
 Note: Wood instrument cases are provided with many of these units or are available as optional accessories.

Available Models

MODEL	CONNECTOR TYPE	FREQUENCY RANGE & MAXIMUM VSWR ¹	AIR LINE ACCURACY ²	POWER HANDLING
2517H	LPC7A ³	2.0 GHz — 18.0 GHz, 1.04	52 dB	1.0 watt CW, 5.0 kW peak
453A1	Type N female ⁴	1.8 GHz — 18.0 GHz, 1.05	56 dB	5.0 watt CW, 1.0 kW peak
453B1	Type N male ⁴			
493A	Type N female ⁴	0.9 GHz — 18.0 GHz, 1.10		
493B	Type N male ⁴	1.8 GHz — 18.0 GHz, 1.05		
452A1	TNC female ⁵	1.8 GHz — 18.0 GHz, 1.05		
452B1	TNC male ⁵			
487A	SMA female ⁶	0.9 GHz — 1.8GHz, 1.10		
487B	SMA male ⁶	1.8 GHz — 18.0 GHz, 1.05		
8683A	AFTNC female ⁷	2.0 GHz — 4.0 GHz, 1.04		
8683B	AFTNC male ⁷	4.0 GHz — 20.0 GHz, 1.05		
8673A	TNCA female ⁸	2.0 GHz — 4.0 GHz, 1.04		
8673B	TNCA male ⁸	4.0 GHz — 20.0 GHz, 1.05		
2408A1	LPC14 ⁹	0.9 GHz — 1.5 GHz, 1.08	64 dB	2.0 watts CW, 2.0 kW peak
		1.5 GHz — 2.0 GHz, 1.04		
		2.0 GHz — 8.5 GHz, 1.03		

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

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

³ Air interface connector per Maury data sheet 5E-061 with a spring-loaded, self-centering, center pin that mates with standard 7mm connectors.

⁴ Precision stainless steel type N per Maury data sheet 5E-049.

⁵ Precision stainless steel TNC per ES-2047.

⁶ Precision stainless steel SMA per MIL-C-39012.

⁷ Precision TNC MIL-C-87104/2 per Maury data sheet 5E-056.

⁸ Precision TNCA MIL-STD 348A per Maury data sheet 5E-058.

⁹ Movable center conductor permits setting of connector interface conditions.

Sliding Terminations — Modular Connectors

3.5mm, 7mm (LPC7) and Type N

Features

- ▶ Interchangeable Precision Connectors
- ▶ Greater than $1/2\text{-}\lambda$ Travel at Lowest Frequency
- ▶ Broadband, Low-Reflection

Description

These precision sliding terminations have interchangeable precision, beadless connectors, eliminating the need for separate loads for different connector sexes or types as noted in the chart below. The 8035A has a single center conductor and interchangeable female and male center contacts and connector bodies. The 2507 and 2517A are true modular instruments provided with interchangeable LPC7 and type N (female and male) connectors. Precision adapters for other connectors (including SC, HN, BNC and C) are also available as options.

The 8035A is characterized by highly accurate, 50 ohm air line impedance and low terminating element VSWR. The 2507 and 2517A are high precision, movable, low-reflection, broadband terminations .

In all of the models listed below, the travel of the movable loads is at least $1/2$ wavelength (at the lowest rated frequency) so that frequencies within the rated phase range of the load reflection can be reversed and separated from other in-system reflections. The connectors are beadless (air dielectric), and the movable center conductors can be set to the correct connector interface conditions with the aid of an appropriate connector gage.

All three models are provided in foam-lined wooden instrument cases.

Available Models

MODEL	CONNECTOR TYPE(S)	FREQUENCY RANGE & MAXIMUM VSWR ¹	AIR LINE ACCURACY ²	POWER HANDLING
8035A	3.5mm ³	2.0 GHz — 4.0 GHz, 1.09 (<1.06 typ) 4.0 GHz — 34.0 GHz, 1.05 (<1.03 typ)	44 dB	1.0 watt CW, 1.0 kW peak
8784E	LCP/OSP ⁴	2.0 GHz — 4.0 GHz, 1.09 (<1.06 typ) 4.0 GHz — 18.0 GHz, 1.05 (<1.03 typ)	44 dB	1.0 watt CW, 1.0 kW peak
2507	Beadless LPC7 ⁵ Type N female ⁶ Type N male ⁶	0.9 GHz — 1.5 GHz, 1.08 1.5 GHz — 2.0 GHz, 1.05 2.0 GHz — 18.0 GHz, 1.03	56 dB	1.0 watt CW, 5.0 kW peak
2517A	Beadless LPC7 ⁵ Type N female ⁶ Type N male ⁶	1.8 GHz — 18.0 GHz, 1.05	54 dB	1.0 watt CW, 1.0 kW peak

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

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

³ See Maury data sheet 5E-062 for interface specifications.

⁴ Precision LCP/OPS™ per Maury data sheet 5E-065.

⁵ Air interface connector per Maury data sheet 5E-061 with a spring-loaded, self-centering, center pin that mates with standard 7mm connectors.

⁶ Precision stainless steel type N per Maury data sheet 5E-049.



Specifications

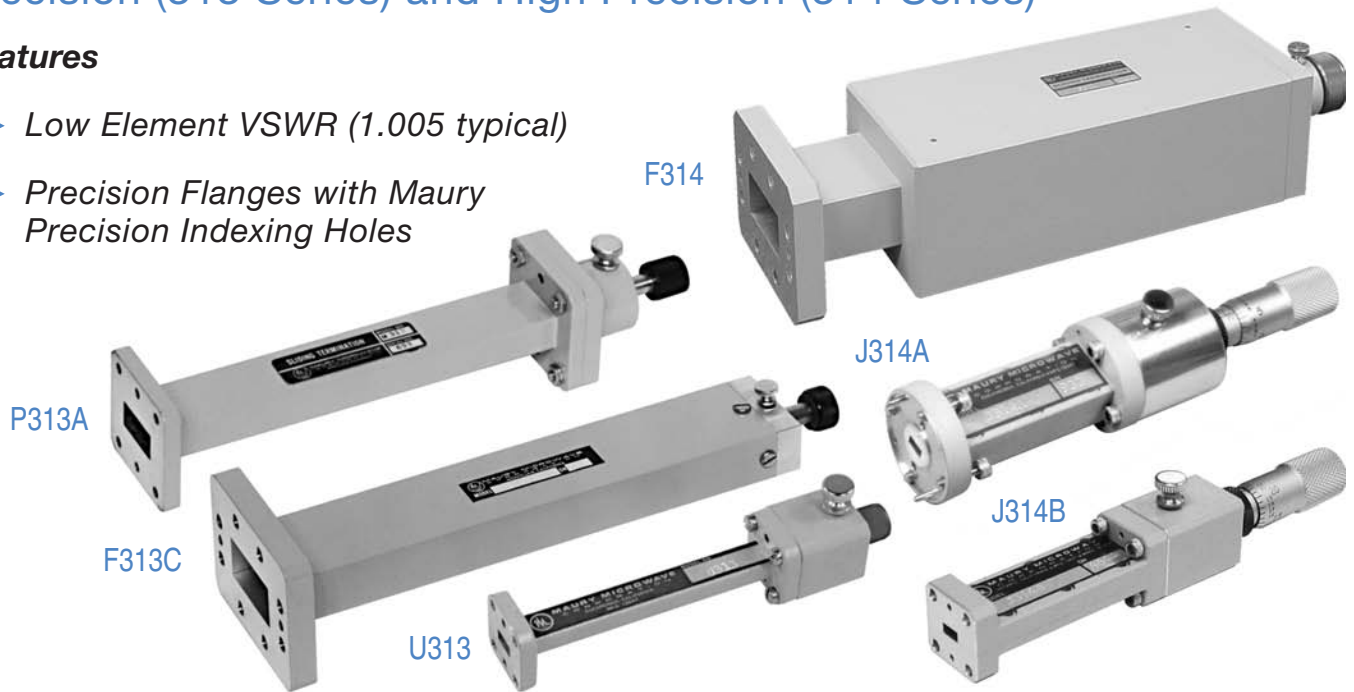
Frequency Range	See chart
VSWR (terminating element)	See chart
Power Rating	See chart
Nominal Impedance	50 ohm
Air Line Accuracy	See chart
Travel	>1/2 wavelength at lowest rated frequency
Connectors	See chart
Center Conductor	Silver plated stainless steel
Accessories (provided)	Wood Instrument case and operating instructions

Sliding Terminations — Waveguide

Precision (313 Series) and High Precision (314 Series)

Features

- ▶ Low Element VSWR (1.005 typical)
- ▶ Precision Flanges with Maury Precision Indexing Holes



Description

These precision sliding terminations are ideal for use as impedance standards for VNA calibration, and are included in many of the VNA calibration kits offered by Maury. They feature a typical effective return loss greater than 45 dB (313 series) or greater than 50 dB

(314 series). Element travel in both series is greater than 1/2 waveguide wavelength (at the lowest rated frequency) so that effective frequencies within the rated phase range of the load reflection can be reversed and separated from other in-system reflections.

Available Models

FREQUENCY RANGE (GHz)	EIA WR NUMBER	EQUIVALENT FLANGE	MAXIMUM ELEMENT VSWR	POWER HANDLING WATTS (w)	PRECISION MODEL & MAX. HOUSING VSWR	HIGH PRECISION MODEL & MAX. HOUSING VSWR ¹
1.7 — 2.6	430	UG435/U	1.01 ²	8.0	R313A 1.01	R314 1.005
2.2 — 3.3	340	CPR340F	1.01	7.0	D313A 1.01	— —
2.6 — 3.95	284	UG584/U	1.01	6.0	S313A 1.01	S314 1.005
3.3 — 4.9	229	CPR229F	1.01	5.0	E313F 1.01	E314 1.005
3.95 — 5.85	187	UG149A/U	1.01	5.0	G313 1.01	G314 1.005
4.90 — 7.05	159	CPR159F	1.01	4.0	F313C 1.01	F314 1.005
5.85 — 8.2	137	UG344/U	1.01	3.0	C313 1.01	C314 1.005
7.05 — 10.0	112	UG51/U	1.01	2.0	H313 1.01	H314 1.005
8.2 — 12.4	90	UG39/U	1.01	2.0	X313 1.012	X314 1.005
10.0 — 15.0	75	MPF75	1.01	1.5	M313 1.013	M314 1.006
12.4 — 18.0	62	UG419/U	1.01	1.0	P313A 1.015	P314 1.006
15.0 — 22.0	51	MPF51	1.01	0.5	N313 1.025	N314 1.008
18.0 — 26.5	42	UG595/U	1.01	0.5	K313 1.02	K314 1.01
22.0 — 33.0	34	UG1530/U ³	1.015	0.5	— —	Q314A 1.01
26.5 — 40.0	28	UG599/U	1.015	0.5	U313 1.025	U314 1.015
33.0 — 50.0	22	UG383 ³	1.02	0.5	— —	J314A 1.015
50.0 — 75.0	15	UG385/U ³	1.02	0.5	— —	V314B 1.015
60.0 — 90.0	12	UG387/U ³	1.025	0.5	— —	Y314B 1.015
75.0 — 110.0	10	UG387/U ³	1.025	0.5	— —	Z314B 1.015

¹ Housings are machined.

² 1.02 maximum at 1.7 to 2.1 GHz.

³ Units are provided with Maury MPF series flanges with index holes which mate with the UG flanges shown.

Fixed Flush and Fixed Offset Shorts

General Information

Fixed flush and fixed offset short circuit terminations (shorts) are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA) and scalar network analyzers (SNA). Offset shorts can be used for banded calibrations of VNA. Those with the longest offset are often used to evaluate the calibration effectiveness of a VNA by measuring the effective source match after calibration.

In general, the shorting plane of fixed flush shorts is at the connector reference plane, and at some predetermined offset in offset shorts. The shorting plane of some fixed offset shorts can also be relative to a reference offset established by another short. (e.g.: the 8046 and 8047 series shown on page 68).

Many of the shorts listed in this section are components of the Maury VNA calibration kits described on pages 1 through 48 of this catalog. Others are available as supplements to the components in these kits. In all cases, the specification "Phase Accuracy" is defined in this section as phase deviation from a nominal unit.



1.85mm Precision Fixed Offset Shorts

Model Series 7846 (female) and 7847 (male)

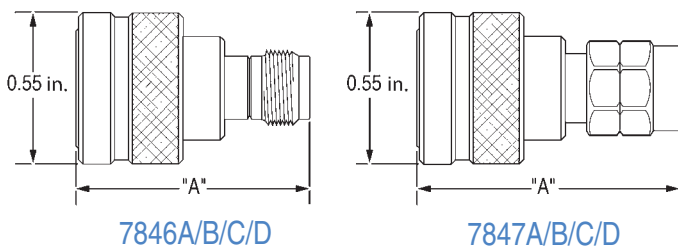
Description

These fixed offset shorts are designed to perform short, short, short (SSS) calibrations on VNAs equipped with 1.85mm test port connectors, including the Agilent PNA series. The 7846A and 7847A are sold as primary components of Maury's 7850 and 7860 series VNA calibration kits; the other models are also included in the 7850A calibration kits as offset shorts which are offset relative to the 7846A and 7847A. All series 7846 and 7847 models may also be purchased separately as replacement parts or spares.

Specifications

Frequency Range DC to 67.0 GHz ¹
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy ² ± 4.0°

Reference Dimensions



¹ Operates to 70 GHz.

² Phase accuracy is phase deviation from a nominal unit.



7846A

7847A

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
7846A ³	female	0.980	(2.4384)	0.1968 ³	(0.4999)
7846B	female	1.022	(2.5451)	0.2386	(0.6060)
7846C	female	1.052	(2.6213)	0.2690	(0.6833)
7846D	female	1.096	(2.7330)	0.3125	(0.7938)
7847A ³	male	0.945	(2.4003)	0.1968 ³	(0.4999)
7847B	male	0.987	(2.5070)	0.2386	(0.6060)
7847C	male	1.017	(2.5832)	0.2690	(0.6833)
7847D	male	1.061	(2.6949)	0.3125	(0.7938)

³ Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (shown in this table) from the offset length of their appropriate reference short (i.e., 7846A or 7846B).

2.4mm Precision Fixed Offset Shorts

Models 7946A (female) and 7946B (male)

Description

These fixed offset shorts are used to establish the reference plane of calibration for vector network analyzers with 2.4mm test port connectors, including the Agilent PNA series. They are sold as part of Maury's 7950 and 7960 series VNA calibration kits, or may be purchased separately as replacement parts or spares.

Specifications

Frequency Range DC to 50.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 2.0^\circ$

Available Models

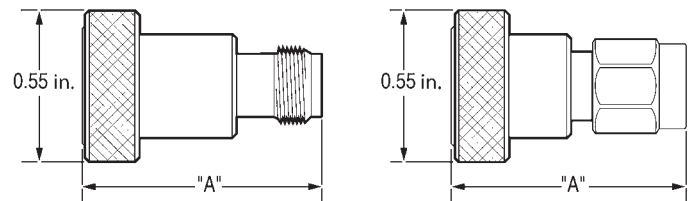
MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
7946A	female	0.830	(2.1082)	0.2	(0.508)
7946B	male	0.797	(2.0244)	0.2	(0.508)



7946A

7946B

Reference Dimensions



7946A

7946B

2.92mm Precision Fixed Shorts

Model Series 8771 (female) and 8772 (male)

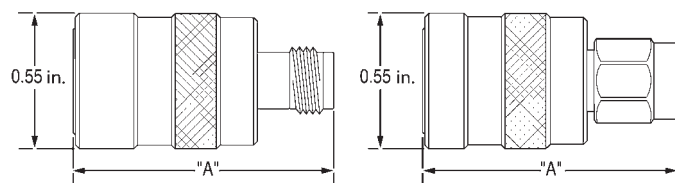
Description

These fixed offset shorts mate with the 2.92mm (K) test port connectors on various vector network analyzers, including the Agilent PNA series. The 8771F1 and 8772F1 are reference shorts which are sold as part of Maury's 8770 and 8760 series VNA calibration kits, but may also be purchased separately as replacement parts or spares. The other models in these series are also sold separately as calibration kit accessories.

Specifications

Frequency Range DC to 40.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 2.0^\circ$

Reference Dimensions



8771F1

8772F1



8771F1

8772F1

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH		1/4-λ FREQ (GHz)
		INCHES	(CM)	INCHES	(CM)	
8771A1	female	1.856	(4.7142)	1.1803	(2.9980)	3.0
8771B1	female	1.364	(3.4646)	0.6885	(1.7488)	6.0
8771C1	female	1.162	(2.9515)	0.4862	(1.2349)	10.2
8771D1	female	1.080	(2.7432)	0.4040	(1.0262)	14.24
8771E1	female	1.005	(2.5527)	0.3295	(0.8369)	22.24
8771F1 ¹	female	0.873	(2.2174)	0.1970 ¹	(0.5004)	REF
8772A1	male	1.897	(4.8184)	1.1803	(2.9980)	3.0
8772B1	male	1.405	(3.5687)	0.6885	(1.7488)	6.0
8772C1	male	1.203	(3.0556)	0.4862	(1.2349)	10.2
8772D1	male	1.121	(2.8473)	0.4040	(1.0262)	14.24
8772E1	male	1.046	(2.6568)	0.3295	(0.8369)	22.24
8772F1 ¹	male	0.914	(2.3216)	0.1970 ¹	(0.5004)	REF

¹ Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (show in this table) from the offset length of their appropriate reference short (i.e., 8771F1 or 8772F1).

3.5mm Precision Fixed Offset Shorts

Model Series 8046 (female) and 8047 (male)

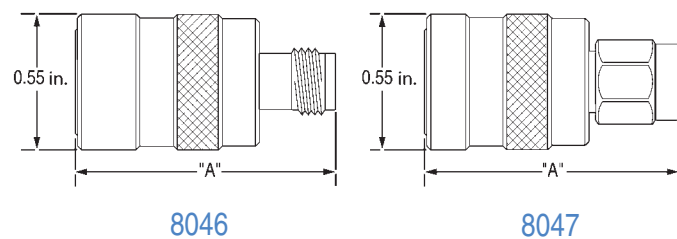
Description

These shorts mate with the 3.5mm test port connectors on various VNAs, including the Agilent PNA series. The "F" models are reference shorts and are sold as part of Maury's 8050 and 8060 series VNA calibration kits; the other models are offset relative to the 8046F and 8047F, and are sold separately as supplemental parts for those VNA calibration kits.

Specifications

Frequency Range DC to 34.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy ± 2.0°

Reference Dimensions



8046A



8047A



Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH		1/4- λ FREQ (GHz)
		INCHES	(CM)	NCHES	(CM)	
8046A	female	1.856	(4.7142)	1.1803	(2.9980)	3.0
8046B	female	1.364	(3.4646)	0.6885	(1.7488)	6.0
8046C	female	1.162	(2.9515)	0.4862	(1.2349)	10.2
8046D	female	1.080	(2.7432)	0.4040	(1.0262)	14.24
8046E	female	1.005	(2.5527)	0.3295	(0.8369)	22.24
8046F ¹	female	0.873	(2.2174)	0.1970 ¹	(0.5004)	REF
8047A	male	1.897	(4.8184)	1.1803	(2.9980)	3.0
8047B	male	1.405	(3.5687)	0.6885	(1.7488)	6.0
8047C	male	1.203	(3.0556)	0.4862	(1.2349)	10.2
8047D	male	1.121	(2.8473)	0.4040	(1.0262)	14.24
8047E	male	1.046	(2.6568)	0.3295	(0.8369)	22.24
8047F ¹	male	0.914	(2.3216)	0.1970 ¹	(0.5004)	REF

¹ Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (shown in this table) from the offset length of their appropriate reference short (i.e., 8046F or 8047F).

3.5mm/SMA Reference Fixed Flush Shorts

Models 360D (female) and 360B (male)

Description

These true coplanar, reference plane shorts mate with the 3.5mm, SMA and 2.92mm (K) test port connectors on various VNAs, including the Agilent PNA series. The 360D has a return loss of less than 0.2 dB with a phase offset of less than 2 degrees. The 360D and 360B are sold as supplemental parts for use with Maury's 8050 and 8060 series VNA calibration kits.

Specifications

Frequency Range DC to 26.5 GHz
 (useable to 40 GHz)
 Minimum Reflection Coefficient 0.99
 Nominal Impedance 50 ohm
 Phase Accuracy ± 2.0°

Available Models

MODEL	SEX	"A" DIMENSION	
		INCHES	(CM)
360D	female	0	(0)
360B	male	0	(0)

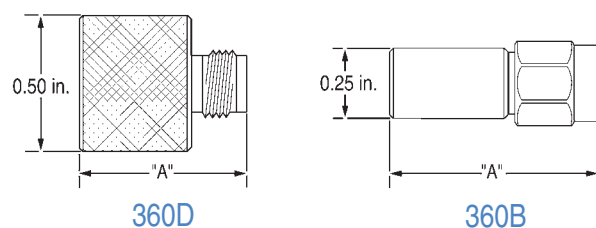
360D



360B



Reference Dimensions



7mm Precision Reference Fixed Flush Shorts

Model Series 2615

Description

These true coplanar, reference fixed shorts are designed to terminate an APC7 connector at its mating plane, and are used to establish a reference plane in systems as well as in loss measurements. 2615A3 is a flat face/flat plane short, 2615B3 includes a collet contact to support the inner conductor of series 2653 reference air lines, and 2615D3 has a precision hole (for the same purpose) in place of the collet contact. Two of these shorts are included in Maury 7mm VNA calibration kits; 2615D3 is a component of 2650 series kits, and 2615B3 is a component of 2660 series kits. All of the models shown here are also sold separately as replacement parts or spares.



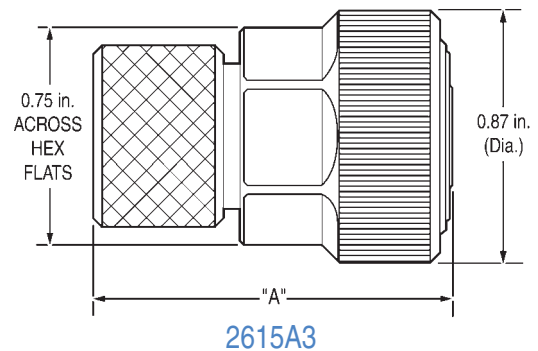
Specifications

Frequency Range DC to 18.0 GHz
 Minimum Reflection Coefficient 0.995
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 0.3^\circ$

Available Models

MODEL	"A" DIMENSION		OFFSET LENGTH	
	INCHES	(CM)	INCHES	(CM)
2615A3	1.250	(3.1750)	0	(0)
2615B3	1.250	(3.1750)	0	(0)
2615D3	1.250	(3.1750)	0	(0)

Reference Dimensions



7mm Precision Fixed Offset Shorts

Model Series 2649

Description

These very low loss fixed offset shorts are offset electrically from the reference plane of the APC7 connector established by 2615 series flush shorts. The offset length is held to ± 0.0025 cm. A set of four (2649A/B/C/D) in a foam-lined wood instrument case can be ordered as model 2649R.



2649C

Specifications

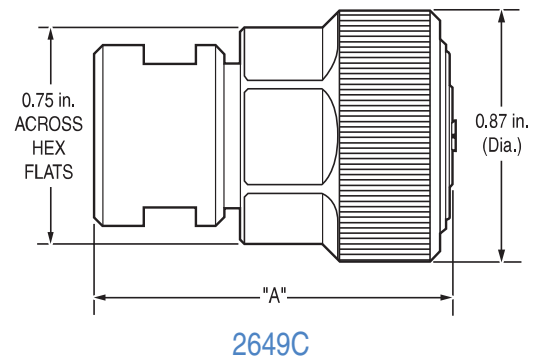
Frequency Range DC to 18.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 2.0^\circ$

Available Models

MODEL FREQ	"A" D MENSION		RELATIVE OFFSET LENGTH ¹		1/4- λ (GHz)
	INCHES	(CM)	INCHES	(CM)	
2649A	1.583	(4.0208)	0.9833	(2.4976)	3.00
2649B	1.091	(2.7711)	0.4915	(1.2484)	6.00
2649C	1.250	(3.1750)	0.2892	(0.7346)	10.20
2649D	1.250	(3.1750)	0.2070	(0.5258)	14.24

¹ Relative to the 0 (zero) offset of the 2615 series.

Reference Dimensions



Type N Precision Fixed Offset Shorts

Model Series 8806 (female) and 8807 (male)

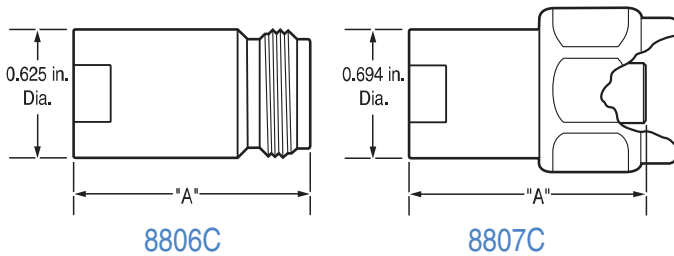
Description

These very low loss fixed offset shorts are offset electrically from the reference plane of the type N connector. The 8806C and 8807C are included as components of Maury's 8850 and 8860 VNA calibration kits. The 8806G is also included in the 8860 kit for use in TRL calibrations. The other models in these series may be purchased separately to complement those included in the kits.

Specifications

Frequency Range DC to 18.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 2.0^\circ$

Reference Dimensions



8806C



8807C

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8806A	female	1.942	(4.9327)	0.9833	(2.498)
8806B	female	1.451	(3.6855)	0.4915	(1.248)
8806C	female	1.248	(3.1699)	0.2892	(0.735)
8806D	female	1.166	(2.9616)	0.2070	(0.526)
8806G ¹	female	1.456	(3.6982)	0.4972	(1.263)
8807A	male	1.791	(4.5491)	1.1913	(3.026)
8807B	male	1.300	(3.3020)	0.6995	(1.777)
8807C ¹	male	1.097	(2.7864)	0.4972	(1.263)
8807D	male	1.015	(2.5781)	0.4150	(1.054)

¹ 8806G and 8807C are matched (have the same electrical length) for use in TRL calibrations.

TNC¹ Precision Fixed Offset Shorts

8606, 8607, and 8615 Series

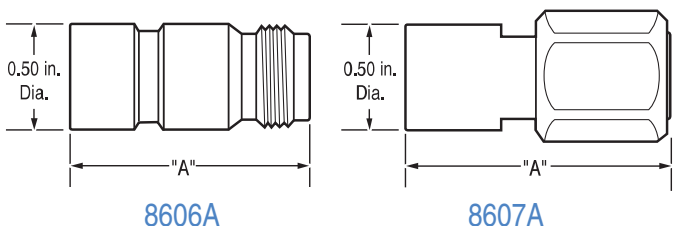
Description

These very low loss fixed offset shorts are offset electrically from the reference plane of the TNC connector. The offset length is held to ± 0.005 cm.

Specifications

Frequency Range DC to 18.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 5.0^\circ$

Reference Dimensions



8615A



8615B

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH		1/4- λ FREQ (GHz)
		INCHES	(CM)	INCHES	(CM)	
8615A ²	female	1.431	(3.6347)	0.5000 ²	(1.2700)	REF
8606A	female	2.123	(5.3824)	1.1920	(3.0277)	3.00
8606B	female	1.777	(4.5136)	0.8460	(2.1488)	6.00
8606C	female	1.635	(4.1529)	0.7035	(1.7869)	10.20
8606D	female	1.577	(4.0056)	0.6455	(1.6396)	14.25
8615B ²	male	1.300	(3.3020)	0.7000 ²	(1.7780)	REF
8607A	male	1.992	(5.0597)	1.1820	(3.0023)	3.00
8607B	male	1.646	(4.1808)	0.8360	(2.1234)	6.00
8607C	male	1.504	(3.8202)	0.6935	(1.7615)	10.20
8607D	male	1.446	(3.6728)	0.6355	(1.6142)	14.25

² Reference shorts and reference offset lengths for these two model series. The relative offset length of other models in each series is derived by subtracting their offset lengths (shown in this table) from the offset length of their appropriate reference short (i.e., 8615A or 8615B).

¹ Precision TNC per Maury Data Sheet 5E-053.

AFTNC¹ Precision Fixed Offset Shorts

Models 8686A (female) and 8687A (male)

Description

These fixed offset shorts are reference plane shorts that are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA), including the Agilent PNA series. They are sold as part of Maury's 8680A and 8680B series VNA calibration kits, or may be purchased separately as replacement parts or spares.

Specifications

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

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8686A	female	1.744	(4.4298)	0.9833	(2.498)
8687A	male	1.366	(3.4964)	0.4915	(1.248)

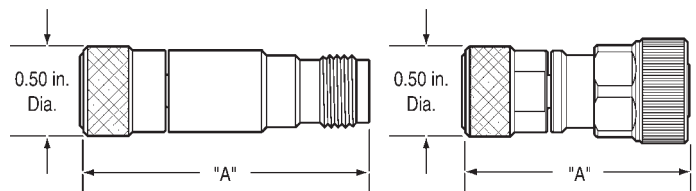
¹ Precision AFTNC per MIL-C-87104/2 per Maury data sheet 5E-056.



8686A

8687A

Reference Dimensions



8686A

8687A

TNCA² Precision Fixed Offset Shorts

Models 8676A (female) and 8677A (male)

Description

These fixed offset shorts are reference plane shorts that are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA), including the Agilent PNA series. They are sold as part of Maury's 8670A and 8670B series VNA calibration kits, or may be purchased separately as replacement parts or spares.

Specifications

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

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8676A	female	1.744	(4.4298)	0.9833	(2.498)
8677A	male	1.366	(3.4964)	0.4915	(1.248)

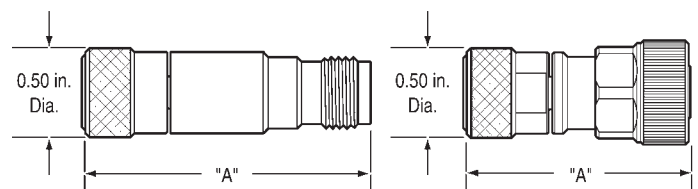
² Precision TNCA per MIL-STD 328A per Maury data sheet 5E-058.



8676A

8677A

Reference Dimensions



8676A

8677A

14mm Precision Reference Fixed Flush Shorts

Model Series 2415

Description

These true coplanar, reference fixed flush shorts are designed to terminate an 14mm connector at its mating plane, and are used to establish a reference plane in systems as well as in loss measurements. 2415A1 is a flat face/flat plane short, 2415B1 includes a collet contact to support the inner conductor of series 2453 reference air lines, and 2415D1 has a precision hole (for the same purpose) in place of the collet contact. The 2415D1 is included as a component of Maury's 2450 VNA calibration kits. The other models in these series may be purchased separately to complement those included in the kits.

Specifications

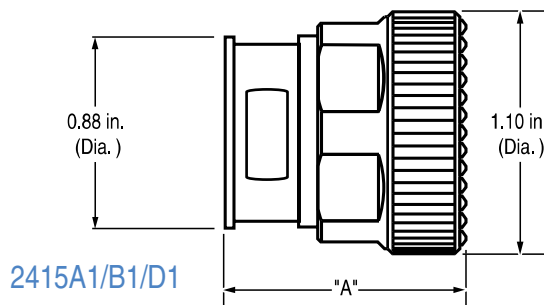
Frequency Range DC to 8.5 GHz
 Minimum Reflection Coefficient 0.995
 Nominal Impedance 50 ohm
 Connector 14mm (mating compatible with GR900)
 Phase Accuracy $\pm 0.2^\circ$

Available Models

MODEL	"A" DIMENSION		OFFSET LENGTH	
	INCHES	(CM)	INCHES	(CM)
2415A1	1.00	(2.45)	0.00	(0.00)
2415B1	1.00	(2.45)	0.00	(0.00)
2415D1	1.00	(2.45)	0.00	(0.00)



Reference Dimensions



LCP/OSP™ Fixed Offset Shorts

Model Series 8781

Description

These fixed offset shorts are used to establish reference planes in transmission systems and as key elements in the calibration of vector network analyzers (VNA), including the Agilent PNA series. They are sold as part of Maury's 8780 series VNA calibration kits, or may be purchased separately as replacement parts or spares.

Specifications

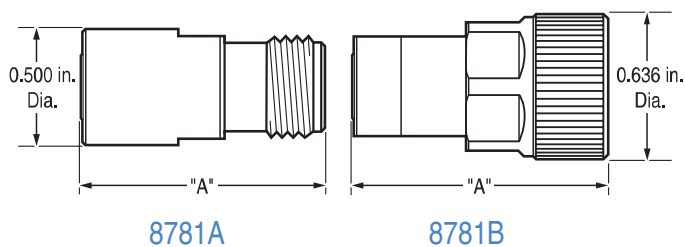
Frequency Range DC to 18.0 GHz
 Minimum Reflection Coefficient 0.98
 Nominal Impedance 50 ohm
 Phase Accuracy $\pm 2.0^\circ$

Available Models

MODEL	SEX	"A" DIMENSION		OFFSET LENGTH	
		INCHES	(CM)	INCHES	(CM)
8781A	female	1.050	(2.6670)	0.3270	(0.8306)
8781B	male	1.103	(2.8016)	0.3270	(0.8306)



Reference Dimensions



Waveguide Fixed Flush Shorts

Model Series 344

Description

These machined fixed shorts are designed to terminate round or rectangular waveguide connectors at the mating plane. They are used to establish a reference plane in systems and in making loss measurements. They are flat face/flat plane shorts that cover frequencies from 1.12 to 110.0 GHz. They may be ordered with user-specified flanges; with or without Maury precision indexing holes. These shorts are included as components of Maury's 7005/6/7 series VNA calibration kits as listed on pages 44–48. They may also be purchased separately as spare or replacement parts for these kits.

Available Models

MODEL	MATES WITH EQUIVALENT FLANGE	EIA WR NUMBER	FREQUENCY RANGE (GHz)
L344B	CPR650F	650	1.12 — 1.7
R344B	CPR430F / UG435A/U	430	1.7 — 2.6
D344B	CPR340F	340	2.2 — 3.3
S344A	UG53/U	284	2.6 — 3.95
S344B	CPR284F		
S344C	CMR284		
E344B	CPR229F	229	3.3 — 4.9
E344C	CMR229		
G344A	UG149A/U	187	3.95 — 5.85
G344B	CPR187F		
G344C	CMR187		
F344B	CPR159F	159	4.9 — 7.05
F344C	CMR159		
C344A	UG344/U	137	5.85 — 8.2
C344B	CPR137F		
C344C	CMR137		
H344A	UG51/U	112	7.05 — 10.0
H344B	CPR112F		
H344C	CMR112		
X344A	UG39/U	90	8.2 — 12.4
X344B	CPR90F		
X344C	CMR90		
M344A	MPF75	75	10.0 — 15.0
P344A	UG419U	62	12.4 — 18.0
N344A	MPF51	51	15.0 — 22.0
K344A	UG595/U	42	18.0 — 26.5
K344D	UG425/U		
K344E	UG595/U ¹	42	18.0 — 26.5
3	—	34	22.0 — 33.0
U344A	UG599/U	28	26.5 — 40.0
3	UG381/U		
3	UG383/U		
3	—		
V344D	UG385/U	15	50.0 — 75.0
V344E	UG385/U ²	15	50.0 — 75.0
4	UG387U	12	60.0 — 90.0
4	—	10	75.0 — 110.0



F344B



C344A



X344A



P344A



U344A



V344D

¹ Same as K344D with index holes.

² Same as V344D with index holes.

³ Use K344D.

⁴ Use V344D.

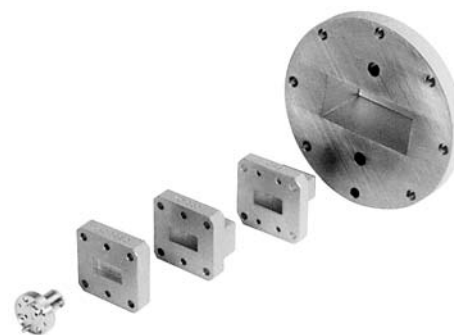
Waveguide Fixed Offset Shorts

Model Series 340

Description

Offset shorts with $1/8$ and $3/8$ wavelength offsets are considered one of the more accurate means of obtaining a 180° phase difference in waveguide. Using these single-piece devices will reduce the number of flange interfaces during calibration. This helps to maintain an essentially constant magnitude of current flow across the calibration plane.

The chart below lists the offset shorts available from Maury. Those in rectangular guide are nominally $1/8$ and $3/8$ wavelength offset at a frequency near the waveguide band center. These will not be the exact band center as the frequency is chosen to equalize the phase differences at the band edges.



Available Models

BAND	EIA WR NUMBER	FREQUENCY RANGE (GHz)	MODEL	OFFSET (cm)	DELAY (ps) ¹
L	WR650	1.12 — 1.7	L340A1	3.581	119.488
			L340A3	10.744	358.497
R	WR430	1.7 — 2.6	R340F1	2.336	77.946
			R340F3	7.010	233.904
S	WR284	2.6 — 3.95	S340B1	1.524	50.852
			S340B2	4.572	152.555
E	WR229	3.3 — 4.9	E340B3	1.359	45.346
			E340B4	4.077	136.038
G	WR187	3.95 — 5.85	G340B1	1.026	34.235
			G340B3	3.078	102.704
F	WR159	4.9 — 7.05	F340C1	0.815	27.194
			F340C3	2.446	81.616
C	WR137	5.85 — 8.2	C340F1	0.686	22.890
			C340F3	2.058	68.670
H	WR112	7.05 — 10.0	H340B1	0.571	19.067
			H340B3	1.714	57.191
HS	WR102	7.0 — 11.0	HS340A	0.558	16.684
			HS340B	1.676	55.923
X	WR90	8.2 — 12.4	X340B1	0.483	16.116
			X340B3	1.448	48.316
M	WR75	10.0 — 15.0	M340C1	0.396	13.213
			M340C3	1.189	39.674
P	WR62	12.4 — 18.0	P340A1	0.352	11.745
			P340A2	1.055	35.202
N	WR51	15.0 — 22.0	N340A	0.267	8.909
			N340B	0.800	26.694
K	WR42	18.0 — 26.5	K340A1	0.251	8.365
			K340A2	0.752	25.095
U	WR28	26.5 — 40.0	U340B	0.150	5.005
			U340C	0.450	15.015
J	WR22	33.0 — 50.0	J340A1	0.120	4.007
			J340B1	0.360	12.022
V	WR15	50.0 — 75.0	V340A1	0.080	2.669
			V340A3	0.240	8.008
Z	WR10	75.0 — 110.0	Z340A1	0.054	1.802
			Z340A3	0.162	5.405

¹ Offset delay is calculated without consideration for the dispersive effect of waveguide, that is, assuming the short is in air dielectric coaxial line. This conforms to the convention established for Agilent network analyzers. Anritsu analyzers use the actual mechanical offset in centimeters.

Sliding Shorts

General Information

A sliding short is a movable short circuited termination in a precision air line which is used in a variety of laboratory measurement applications. These devices are used to establish a reference plane in a transmission system, as tuning elements in the development of microwave components (mixers, amplifiers, etc.), and tuning high precision CW reflectometer systems. An important application is the calibration of vector network analyzers (VNA). The use of a sliding short for such a calibration is particularly effective when the VNA is to be used for the measurement of highly reflective devices.

The primary criteria for a quality coaxial sliding short are a) a precision transmission structure (air line), b) consistent low noise contacts on the inner and outer conductors and c) a precision connector. Maury manufactures coaxial sliding shorts with a range of performance and operational convenience features. Among the classes available are modular units with interchangeable connectors, high precision devices with dedicated connectors, and rugged general purpose units.

Modular Sliding Shorts

Models 2508A, 2518A, 8036A, 8779A, and 8779B

Features

- ▶ *Broad Frequency Range*
- ▶ *Precision Air Lines*
- ▶ *Interchangeable Connectors*

Description

The 2508A, 2518A, and 8036A sliding shorts are true modular instruments. These units are provided with interchangeable connector bodies and center conductors so that measurements may be made in type N (female or male), or 7mm with the 2508A and 2518A, or 3.5mm (female or male) with the 8036A.

The connectors used on these units are air-dielectric (beadless) and the center conductor is movable; therefore, with the aid of an appropriate connector gage, the center pin of the connector can be set to the desired interface condition.

Specifications

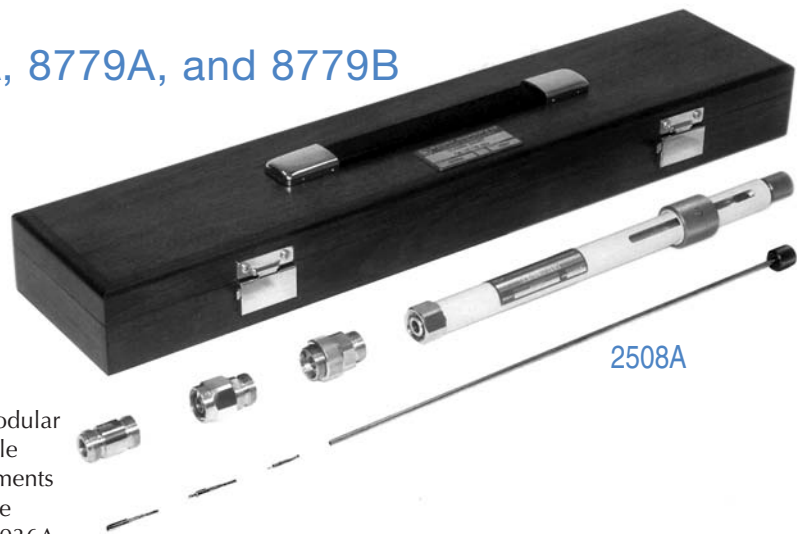
Frequency Range See Available Models Chart

VSWR (excluding transmission line loss):

2.92mm	4.0 to 18.0 GHz, 100:1 18 to 26.5 GHz, 75:1 26.5 to 40.0 GHz, 50:1
3.5mm	2.0 to 18.0 GHz, 100:1 18 to 26.5 GHz, 75:1 26.5 to 34.0 GHz, 50:1
7mm	2.0 to 18 GHz, 100:1
Type N	2.0 to 18 GHz, 100:1

Impedance 50 ohm ±0.3%

Travel > 1/2-λ at the lowest rated frequency



Available Models

MODEL	FREQUENCY RANGE (GHz)	CONNECTOR	AIR LINE ACCURACY ¹
2508A	0.9 – 18.0	LPC7 ² , Type N female and male	56 dB
2518A	1.8 – 18.0		
8036A	2.0 – 34.0	3.5mm female and male	44 dB
8779A1	4.0 – 20.0	2.92mm female	42 dB
	20.0 – 40.0		40 dB
8779B1	4.0 – 20.0	2.92mm male	42 dB
	20.0 – 40.0		40 dB

¹ Equivalent return loss of the air line impedance (50 ohm ref.)

² Air interface connector with a spring loaded, self-centering center pin that mates with standard 7mm connectors.

Sliding Shorts

High Precision

Features

- ▶ 0.9 to 18.0 GHz
- ▶ Precision Air Lines
- ▶ Dedicated Connectors



2604A

Specifications

Frequency Range See Available Models Chart
 VSWR (excluding transmission line loss) 100:1 minimum
 Impedance 50 ohm ±0.3%
 Travel > 1/2 wavelength at the lowest rated frequency

Description

These models are movable shorts with dedicated connectors in precision air lines. The inherent low reflection and accurate transmission line of these instruments, coupled with efficient beryllium copper inner and outer conductor contacting fingers, provide an excellent short circuit. The travel of the shorting plane of these instruments is at least 1/2 wavelength at the lowest rated frequency to permit reversal of the reflection phase.

Available Models

MODEL	FREQUENCY RANGE (GHz)	CONNECTOR	AIR LINE ACCURACY ¹
1959A	1.8 – 18.0	SMA female	56 dB
1959B	1.8 – 18.0	SMA male	
2604A	0.9 – 18.0	7mm	

¹ Equivalent return loss of the air line impedance (50 ohm ref.)

General Purpose Sliding Shorts

Model Series 1909 and 1978

Specifications

Frequency Range See Available Models Chart
 Impedance 50 ohm
 Travel 1/2 wavelength at the lowest rated frequency
 Connectors See Available Models Chart



1978D1

Available Models

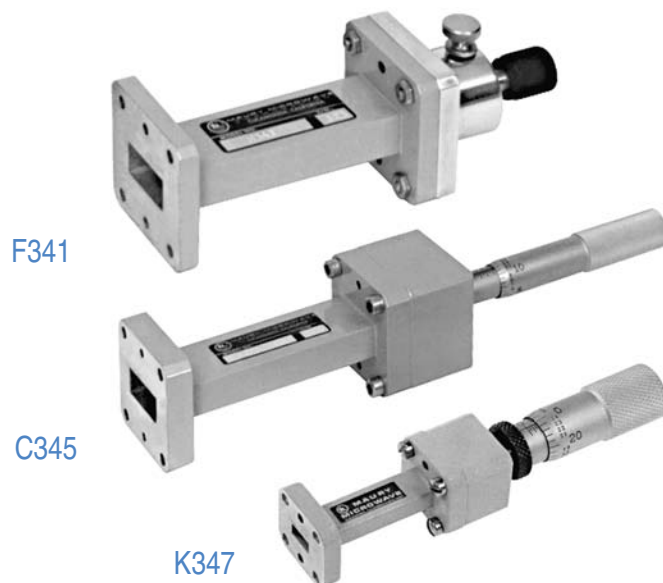
MODEL	FREQUENCY RANGE (GHz)	CONNECTOR	SHORT TRAVEL (in.)	LENGTH CLOSED (lin.)
1909A1	0.2 – 0.5	SMA female	30.0	32.6
1909A2	0.2 – 0.5	SMA male	30.0	32.6
1909B1	0.4 – 1.0	SMA female	15.0	17.6
1909B2	0.4 – 1.0	SMA male	15.0	17.6
1909C1	0.8 – 4.0	SMA female	7.5	10.1
1909C2	0.8 – 4.0	SMA male	7.5	10.1
1909D1	2.0 – 12.0	SMA female	3.0	5.6
1909D2	2.0 – 12.0	SMA male	3.0	5.6
1978A1	0.2 – 0.5	Precision N female	30.0	32.6
1978A2	0.2 – 0.5	Precision N male	30.0	32.6
1978B1	0.4 – 1.0	Precision N female	15.0	17.6
1978B2	0.4 – 1.0	Precision N male	15.0	17.6
1978C1	0.8 – 4.0	Precision N female	7.5	10.1
1978C2	0.8 – 4.0	Precision N male	7.5	10.1
1978D1	2.0 – 12.0	Precision N female	3.0	5.6
1978D2	2.0 – 12.0	Precision N male	3.0	5.6

Waveguide Sliding Shorts

Series 341, 345 and 347

Description

Maury waveguide sliding shorts are convenient, low loss, movable shorts for use in a variety of microwave techniques. They can be used with waveguide tees as a variable shunt for tuning or impedance matching applications and they are a necessary device for tuning high performance tuned reflectometer systems. They are valuable for establishing a reference impedance for the calibration and error analysis of waveguide measurement systems. Maury offers three grades of waveguide sliding shorts; series 341, featuring an uncalibrated sliding shaft with a position lock (called an “uncalibrated drive”); series 345, featuring a 0.001-inch resolution micrometer drive (or “calibrated drive”); and series 347 high precision drive, featuring a sliding shaft with a position lock for rapid adjustment, plus a 0.001-inch resolution micrometer for fine adjustment.



Available Models

MODEL	DRIVE TYPE	EIA WR NUMBER	FREQUENCY RANGE (GHz)	EQUIVALENT FLANGE
R341B	Uncalibrated	430	1.7 — 2.6	CPR430F
S341	Uncalibrated	284	2.6 — 3.95	UG53/U
E341B	Uncalibrated	229	3.3 — 4.9	CPR229F
G341	Uncalibrated	187	3.95 — 5.85	UG149A/U
F341B	Uncalibrated	159	4.90 — 7.05	CPR159F
C345	Calibrated	137	5.85 — 8.2	UG344/U
H345	Calibrated	112	7.05 — 10.0	UG51/U
X345	Calibrated	90	8.2 — 12.4	UG39/U
M345	Calibrated	75	10.0 — 15.0	MPF75
P345	Calibrated	62	12.4 — 18.0	UG419/U
K345	Calibrated	42	18.0 — 26.5	UG595/U
U345	Calibrated	28	26.5 — 40.0	UG599/U
S347	High Precision	284	2.6 — 3.95	UG53/U
C347	High Precision	137	5.85 — 8.2	UG344/U
H345	High Precision	112	7.05 — 10.0	UG51/U
X347A	High Precision	90	8.2 — 12.4	UG39/U
M347	High Precision	75	10.0 — 15.0	MPF75
P347	High Precision	62	12.4 — 18.0	UG419/U
K347	High Precision	42	18.0 — 26.5	UG595/U
U347	High Precision	28	26.5 — 40.0	UG599/U
J347A	High Precision	22	33.0 — 50.0	UG383/U

Opens

General Information

Shielded, coaxial open circuit terminations (opens) are used in the calibration of vector network analyzers (VNAs) to provide a nominal 180 degree phase offset from a compatible reference short circuit over a broad range of microwave frequencies.

At these frequencies, open circuit terminations are inherently imperfect. Shielding the open essentially eliminates radiation loss, but creates a residual frequency-sensitive capacitance. An accurate knowledge of the open's effective capacitance is essential to an accurate calibration of the analyzer.

Maury opens are characterized for effective capacitance versus frequency by means of a fourth order polynomial curve fit, and the nominal capacitance coefficients are provided with each unit. We offer several innovative designs that improve the consistency and repeatability of the open's capacitance coefficients resulting in improved effective source match of the calibrated VNA ¹.

One design (seen in the 14mm and 7mm models shown below) uses a beadless captivated dielectric rod in place of the center conductor contact. This rod depresses the spring-loaded contact of the test port connector so that it is flush with the outer conductor mating plane. This creates highly accurate, precisely repeatable open circuit conditions which improve the



calibration effectiveness and measurement accuracy of the open.

Another design (seen in most of the sexed models listed below) uses a center contact that is captivated and set at the factory to be essentially flush with the outer conductor mating plane, thereby eliminating dependence on test port connector tolerances and adding a high degree of performance consistency to the open.

The 371N1/P1, 8585A/B, and 8885A/B models are designed for limited frequency ranges as determined by their connector types. Models 8885A and 8885B have shielded shells without center conductors or supporting dielectric rods.

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

Specifications and Available Models

MODEL	SEX	CONNECTOR TYPE	FREQUENCY RANGE (GHz)	NOMINAL IMPEDANCE	PHASE ACCURACY	MINIMUM REFLECTION COEFFICIENT
7848A	female	1.85mm	DC – 70.0	50 ohm	± 5.0 degrees	0.98
7848B	male	1.85mm	DC – 70.0	50 ohm	± 5.0 degrees	0.98
7948A	female	2.4mm	DC – 50.0	50 ohm	± 2.0 degrees	0.98
7948B	male	2.4mm	DC – 50.0	50 ohm	± 2.0 degrees	0.98
8773A1	female	2.92mm (K)	DC – 40.0	50 ohm	± 1.5 degrees	0.98
8773B1	male	2.92mm (K)	DC – 40.0	50 ohm	± 1.5 degrees	0.98
8048A1	female	3.5mm	DC – 26.5	50 ohm	± 1.4 degrees	0.98
8048B1	male	3.5mm	DC – 26.5	50 ohm	± 1.4 degrees	0.98
2616D3	—	7mm	DC – 18.0	50 ohm	± 0.3 degrees	0.995
8809B1	female	Type N	DC – 18.0	50 ohm	± 2.0 degrees	0.99
8810B1	male	Type N	DC – 18.0	50 ohm	± 2.0 degrees	0.99
8609B	female	TNC	DC – 18.0	50 ohm	± 5.0 degrees	0.98
8610B	male	TNC	DC – 18.0	50 ohm	± 5.0 degrees	0.98
8685A	female	AFTNC	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8685B	male	AFTNC	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8675A	female	TNCA	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8675B	male	TNCA	DC – 20.0	50 ohm	± 2.0 degrees	0.98
8782A	female	OSP™	DC – 18.0	50 ohm	± 2.0 degrees	0.99
8782B	male	OSP™	DC – 18.0	50 ohm	± 2.0 degrees	0.99
371N1	female	BNC	DC – 12.4	50 ohm	± 5.0 degrees	0.98
371P1	male	BNC	DC – 12.4	50 ohm	± 5.0 degrees	0.98
2416D1	—	14mm (GR900)	DC – 8.5	50 ohm	± 0.2 degrees	0.997
2716A	female	7-16	DC – 7.5	50 ohm	± 1.00 degrees	0.99
2716B	male	7-16	DC – 7.5	50 ohm	± 1.25 degrees	0.99
8585A	female	BNC	DC – 2.0	75 ohm ²	± 1.0 degrees	0.98
8585B	male	BNC	DC – 2.0	75 ohm ²	± 1.0 degrees	0.98
8885A	female	Type N	DC – 4.0	75 ohm ²	± 1.0 degrees	0.98
8885B	male	Type N	DC – 4.0	75 ohm ²	± 1.0 degrees	0.98

¹ See Maury data sheet 5C-027.

² The 8585 and 8885 series opens are for use in 75 ohm calibrations only. These units should never be mated to 50 ohm connectors, as this could result in damage to the 75 ohm female center conductor contact, and would produce an unreliable, unstable electrical connection.

Precision Air Lines

General Information

Coaxial air lines are air-dielectric transmission lines with highly accurate dimensions that can be used as fundamental impedance standards in measurement and calibration applications, and may also be used to establish reference positions for measurements.

Maury offers air lines with bead supported and/or beadless connectors in a variety of popular types including, 1.85mm, 2.4mm, 2.92mm (K), 3.5mm, 7mm, type N, 14mm, and 7-16.

Bead supported air lines offer greater convenience and easier connections (the center conductor is automatically aligned by the dielectric bead for easy connection); beadless air lines offer better impedance and electrical length accuracies, as well as lower VSWR (the center conductor floats free in the air line body, and the male connector nut is retractable to facilitate insertion of the center conductor contact before the thread-on connection tightened).

The photos at the right (above) show end views of two type N air lines. On the left is a model 2503F (representing Maury's bead supported design) and on the right is a model 2553T5 (representing Maury's beadless design). The low-loss dielectric bead in the 2503F keeps the center conductor precisely centered in the body of the air line. The photo on the right



2503F

2553T5

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 $1/4-\lambda$ frequency rating. This rating indicates the frequencies at which the electrical length is an odd multiple of a $1/4$ wavelength where $n = \text{zero or an integer}$.

1.85mm Beadless Air Lines

Model Series 7843

Features

- ▶ DC to 67.0 GHz (Operates to 70.0 GHz)
- ▶ Virtually Reflectionless
- ▶ 1.85mm Connectors

Description

These reference air lines are beadless 1.85mm coaxial transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard. They are rated for a frequency range from DC to 67 GHz and are virtually reflectionless. Fabricated from beryllium copper, they are gold-plated to prevent tarnishing.

Specifications

Frequency Range DC to 67.0 GHz
 Electrical Length See Available Models Chart
 Electrical Length Accuracy 0.0025cm
 Minimum Return Loss (excluding connector interface) ... 48 dB
 Nominal Impedance 50 ohm



Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
7843S0.96	1.85mm female to male	0.96	(2n + 1) 7.8
7843S1.15	1.85mm female to male	1.15	(2n + 1) 6.5
7843S3.00	1.85mm female to male	3.00	(2n + 1) 2.5

2.4mm Beadless Air Lines Model Series 7943

Features

- ▶ DC to 50.0 GHz
- ▶ Virtually Reflectionless
- ▶ 2.4mm Connectors

Description

The Maury 7943 series reference air lines are beadless 2.4mm coaxial transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard utilizing precision 2.4mm connectors. These air lines are fabricated from beryllium copper and are gold plated for low loss and to prevent tarnishing.

Specifications

Frequency Range DC to 50 GHz (usable to 54 GHz)
 Minimum Return Loss (excluding connector interfaces) . . . 48 dB
 Electrical Length See Available Models Chart
 Electrical Length Accuracy ±0.0025cm
 Nominal Impedance 50 ohm



Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
7943G	2.4mm female to male	2.998	(2n + 1) 2.5
7943H	2.4mm female to male	4.997	(2n + 1) 1.5
7943S1.25	2.4mm female to male	1.25	(2n + 1) 6.0
7943S1.50	2.4mm female to male	1.50	(2n + 1) 5.0
7943S6.25	2.4mm female to male	6.25	(2n + 1) 1.2

2.92mm Beadless Air Lines Model Series 8774

Features

- ▶ DC to 40.0 GHz
- ▶ Virtually Reflectionless
- ▶ 2.92mm Connectors

Description

The 8774C series female to male and 8774B series male to male reference air lines are beadless precision 2.92mm coaxial transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard, utilizing precision 2.92mm connectors. Fabricated from beryllium copper, these air lines are gold plated for low loss and to prevent tarnishing.

Specifications

Frequency Range DC to 40 GHz
 Minimum Return Loss (excluding connector interfaces) . . . 48 dB
 Electrical Length See Available Models Chart
 Electrical Length Accuracy ±0.0025cm
 Nominal Impedance 50 ohm



Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
8774C15	2.92mm female to male	14.990	(2n + 1) 0.50
8774C7.5	2.92mm female to male	7.495	(2n + 1) 1.00
8774C6	2.92mm female to male	6.000	(2n + 1) 1.25
8774C5.25	2.92mm female to male	5.250	(2n + 1) 1.43
8774C5	2.92mm female to male	4.997	(2n + 1) 1.50
8774C3	2.92mm female to male	2.998	(2n + 1) 2.50
8774B15	2.92mm male to male	14.990	(2n + 1) 0.50
8774B7.5	2.92mm male to male	7.495	(2n + 1) 1.00
8774B6.8	2.92mm male to male	6.795	(2n + 1) 1.10

3.5mm Beadless Air Lines

Model Series 8043

Features

- ▶ DC to 26.5 GHz
- ▶ Virtually Reflectionless
- ▶ Precision 3.5mm Connectors



8043S15

Description

The 8043S series female to male and 8043M series male to male reference air lines are beadless, precision, coaxial 3.5mm transmission lines which are held to extremely tight tolerances to provide a highly accurate 50 ohm impedance standard. Fabricated from beryllium copper, they are gold-plated to prevent tarnishing, with a special stainless steel coupling nut on the male connectors that can be retracted for ease of assembly. All units are equipped with machined flats to permit the use of torque wrenches for proper mating.

Specifications

Frequency Range DC to 26.5 GHz
 Minimum Return Loss (excluding connector interfaces) . . . 48 dB
 Electrical Length See Available Models Chart
 Electrical Length Accuracy ±0.0025cm
 Nominal Impedance 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
8043S15	3.5mm female to male	14.990	(2n+1) 0.50
8043S10	3.5mm female to male	9.993	(2n+1) 0.75
8043S7.5	3.5mm female to male	7.495	(2n+1) 1.00
8043S6	3.5mm female to male	6.000	(2n+1) 1.25
8043S5.3	3.5mm female to male	5.298	(2n+1) 1.41
8043S5	3.5mm female to male	4.997	(2n+1) 1.50
8043M10	3.5mm male to male	9.993	(2n+1) 0.75
8043M7.2	3.5mm male to male	7.195	(2n+1) 1.04
8043M6.8	3.5mm male to male	6.795	(2n+1) 1.10

3.5mm Bead Supported Air Lines

Model Series 8042

Features

- ▶ DC to 18.0 GHz
- ▶ Virtually Reflectionless
- ▶ Precision 3.5mm Connectors



8042E

Description

The 8042 series precision air lines utilize 3.5mm connectors in which the center conductor is supported by a low-loss dielectric bead. The air lines are fabricated from gold-plated, copper alloys to prevent tarnishing.

Specifications

Frequency Range DC to 18.0 GHz
 VSWR (typical) <1.004 + 0.0035f(GHz)
 Electrical Length See Available Models Chart
 Electrical Length Accuracy ±0.02cm
 Nominal Impedance 50 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
8042C	3.5mm female to male	14.990	(2n+1) 0.50
8042D	3.5mm female to male	9.993	(2n+1) 0.75
8042E	3.5mm female to male	7.495	(2n+1) 1.00
8042G	3.5mm female to male	4.997	(2n+1) 1.50

7mm Beadless Air Lines

Model Series 2653S

Features

- ▶ DC to 18.0 GHz
- ▶ Virtually Reflectionless
- ▶ LPC7 Connectors

Description

Maury 2653 series reference air lines are high precision, extremely low reflection, 7mm coaxial air lines equipped with beadless LPC7 connectors¹ and self-aligning, spring-loaded pins on the center conductors for an accurately aligned, tightly-toleranced interface.

Specifications

Frequency Range DC to 18.0 GHz
 VSWR >56 dB return loss²
 Nominal Impedance 50 ohms
 Accuracy of Electrical Length ±0.004cm

Available Models

MODEL	ELECTRICAL LENGTH (cm)	ODD $\lambda/4$ FREQUENCY (GHz)*
2653S3	2.996	(2n + 1) 2.50
2653S4	3.994	(2n + 1) 1.875
2653S5	4.994	(2n + 1) 1.50
2653S6	5.993	(2n + 1) 1.25
2653S7.5	7.493	(2n + 1) 1.00
2653S9.2	9.239	(2n + 1) 0.81
2653S10	9.988	(2n + 1) 0.75
2563S15	14.983	(2n + 1) 0.50
2563S20	19.980	(2n + 1) 0.375
2653S30	29.969	(2n + 1) 0.25

* Frequencies at which the air line is an odd multiple of quarter wavelengths. N is zero or any integer.

7mm Beadless Air Line Kits

Sets of 2653S air lines are also supplied as kits; 2653K2 is a set of 6 air lines with 1 each 2653S3, 2653S5, 2653S6, 2653S7.5, 2653S10, and 2653S15. 2653K3 adds 1 each 2653S20, and 2653S30 to those in 2653K2 for a total of 8. Both kits are supplied in attractive, foam-lined wooden cases.

7mm Bead Supported Air Lines

Model Series 2603

Features

- ▶ DC to 18.0 GHz
- ▶ Virtually Reflectionless
- ▶ Precision 7mm Connectors

Description

Maury 2603 precision air lines are coaxial air line sections with 7mm connectors³ manufactured to extremely close tolerances to provide an accurate 50 ohm impedance standard. The air lines are fabricated from copper alloys with a gold-flash protective coating (except those over 15cm which have silver-layered stainless steel center conductors to eliminate sag). The center conductors are supported by a low-loss dielectric bead.

Specifications

Frequency Range DC to 18.0 GHz
 VSWR <1.004 + 0.003f (GHz)
 Characteristic Impedance 50 + 0.12 ohms
 Accuracy of Electrical Length ±0.004cm

Available Models

MODEL	ELECTRICAL LENGTH (cm)	ODD $\lambda/4$ FREQUENCY (GHz)*
2603A	29.979	(2n + 1) 0.25
2603B	19.986	(2n + 1) 0.375
2603C	14.990	(2n + 1) 0.50
2603D	9.993	(2n + 1) 0.75
2603E	7.495	(2n + 1) 1.00
2603F	5.996	(2n + 1) 1.25
2603G	4.997	(2n + 1) 1.50

* Frequencies at which the air line is an odd multiple of quarter wavelengths. N is zero or any integer.

7mm Bead Supported Air Line Kits

Sets of 2603 air lines are also supplied as kits; 2603K is a set of 6 airlines consisting of 1 each 2603A, 2603B, 2603C, 2603D, 2603E, and 2603G. 2603L is a set of 7 air lines consisting of all those included in 2603K plus 1 each 2603F. Both kits are supplied in attractive, foam-lined wooden cases.

¹ LPC7 is a beadless connector that mates with standard precision 7mm connectors.

² See Maury data sheet 2X-210 (Fig. 1) for typical return loss data.

³ Precision 7mm connector per Maury data sheet 5E-060.

Type N Beadless Air Lines

Model Series 2553

Features

- ▶ DC to 18.0 GHz
- ▶ Virtually Reflectionless
- ▶ Beadless Type N Connectors

Description

The 2553T series reference air lines utilize beadless type N connectors which are integral to the air lines, thereby producing extremely low reflection transmission lines. The complete air lines (inner and outer conductor) are fabricated from gold-plated, low-loss copper alloys.

Specifications

Frequency Range DC to 18.0 GHz
 VSWR $<1.02 + 0.002f$ (GHz)
 Electrical Length See Available Models Chart
 Electrical Length Accuracy $\pm 0.01\text{cm}$
 Characteristic Impedance
 (where skin depth is negligible) $50 + 0.2 \text{ ohm}^1$

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
2553T30	Type N female to male ²	29 969	(2n + 1) 0.25
2553T15	Type N female to male ²	14 983	(2n + 1) 0.50
2553T10	Type N female to male ²	9 988	(2n + 1) 0.75
2553T7.5	Type N female to male ²	7.493	(2n + 1) 1.00
2553T6	Type N female to male ²	5 993	(2n + 1) 1.25
2553T5	Type N female to male ²	4 994	(2n + 1) 1.50
2553T3.82	Type N female to male ²	3.816	(2n + 1) 1.96
2353T3.12	Type N female to male ²	3.123	(2n + 1) 2.40
2553T3	Type N female to male ²	2 9969	(2n + 1) 2.50

Type N Beadless Air Line Kits

The 2553K is a kit consisting of six reference air lines from the chart above supplied in an attractive foam-lined wood instrument case.

Type N Bead Supported Air Lines

Model Series 2503

Features

- ▶ DC to 18.0 GHz
- ▶ Virtually Reflectionless
- ▶ Precision Type N Connectors

Description

The 2503 series precision air lines utilize stainless steel type N connectors in which the center conductor is supported by a low-loss dielectric bead. The air lines (inner and outer conductor) are fabricated from gold-plated, low-loss copper alloys.

Specifications

Frequency Range DC to 18.0 GHz
 VSWR $<1.03 + 0.003f$ (GHz)
 Electrical Length See Available Models Chart
 Electrical Length Accuracy $\pm 0.02\text{cm}$
 Characteristic Impedance
 (where skin depth is negligible) $50 + 0.2 \text{ ohm}$

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
2503A	Type N female to male ³	29 979	(2n + 1) 0.25
2503B	Type N female to male ³	19 986	(2n + 1) 0.375
2503C	Type N female to male ³	14 990	(2n + 1) 0.50
2503D	Type N female to male ³	9 993	(2n + 1) 0.75
2503E	Type N female to male ³	7.495	(2n + 1) 1.00
2503F	Type N female to male ³	5 996	(2n + 1) 1.25
2503G	Type N female to male ³	4 997	(2n + 1) 1.50

Type N Bead Supported Air Line Kits

Air lines kits, model 2503K (consisting of one each 2503A, C, D, E, G) and model 2503L (consisting of one each 2503A, B, C, D, E, F, G) are available and are supplied in an attractive foam-lined wood instrument case.

¹ Impedance = 49.987 ohms based on nominal dimensions and tolerances of the conductors, and the equation: $Z = 59.939 \text{ Log}_e D/d$, $D = \text{I.D. inner conductor}$, $d = \text{O.D. outer conductor}$.

² Beadless precision type N connectors, one female and one male.

³ Precision stainless steel type N per Maury data sheet 5E-049.

14mm Beadless Air Lines

Model Series 2453

Features

- ▶ DC to 8.5 GHz
- ▶ Virtually Reflectionless
- ▶ LPC14 Connectors¹

Description

The 2453 series are beadless, virtually reflectionless, coaxial 14mm reference air lines with spring-loaded tips on the ends of the inner conductor to mate with 14mm connectors². VSWR is <1.006 at 8.5 GHz. The lines are fabricated from beryllium copper and are gold-plated to prevent tarnishing.

Specifications

Frequency Range DC to 8.5 GHz
 VSWR <1.001 + 0.0005f (GHz)
 Electrical Length See Available Models Chart
 Electrical Length Accuracy ±0.005cm
 Characteristic Impedance
 (where skin depth is negligible) 50 + 0.05 ohm²

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
2453A	Precision 14mm ²	29.979	(2n + 1) 0.25
2453B	Precision 14mm ²	19.986	(2n + 1) 0.375
2453C	Precision 14mm ²	14.990	(2n + 1) 0.50
2453D	Precision 14mm ²	9.993	(2n + 1) 0.75
2453E	Precision 14mm ²	7.495	(2n + 1) 1.00
2453F	Precision 14mm ²	5.996	(2n + 1) 1.25
2453G	Precision 14mm ²	4.997	(2n + 1) 1.50
2453H	Precision 14mm ²	2.998	(2n + 1) 2.50

14mm Beadless Air Line Kits

The 2453K is a kit consisting of one (each) of 2453C, D, E, F, G and H, from the chart above, supplied in an attractive foam-lined wood instrument case.

7-16 Beadless Air Lines

Model Series 2735A

Features

- ▶ DC to 7.5 GHz
- ▶ Virtually Reflectionless
- ▶ Precision 7-16 Connectors

Description

The 2735A series are beadless, virtually reflectionless, coaxial 7-16 reference air lines. The lines are fabricated from beryllium copper and are gold-plated to prevent tarnishing.

Specifications

Frequency Range DC to 7.5 GHz
 VSWR <1.004 + 0.0035f (GHz)
 Electrical Length See Available Models Chart
 Electrical Length Accuracy ±0.005cm
 Characteristic Impedance 50 + 0.05 ohm

Available Models

MODEL	CONNECTORS	ELECTRICAL LENGTH (cm)	ODD 1/4-WAVELENGTH FREQUENCY (GHz)
2735A30	7-16 female to male	29.979	(2n + 1) 0.25
2735A7.5	7-16 female to male	7.495	(2n + 1) 1.00
2735A6	7-16 female to male	3.996	(2n + 1) 1.25

7-16 Precision Air Line Kits

The 2735K kits consist of the reference air lines listed in the chart above provided in an attractive foam-lined wood instrument case. (See Maury data sheet 2Z-041A for test port adapter options.)



¹ A precision beadless 14mm connector that mates with GR900 connectors.

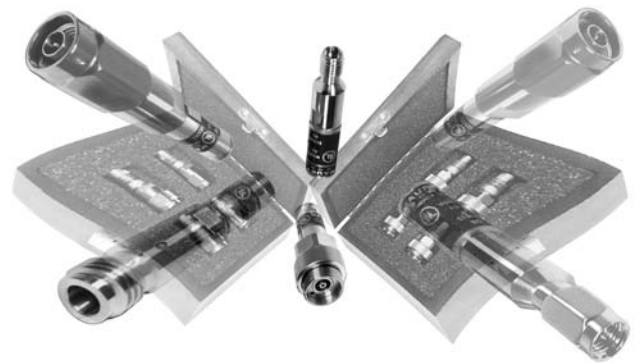
² Impedance = 49.987 ohms based on nominal dimensions and tolerances of the conductors, and the equation: $Z = 59.939 \log_e D/d$, D = I.D. inner conductor, d = O.D. outer conductor.

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 shown in this section are fitted with 2.4mm, 2.92mm, 3.5mm, 7mm, type N, TNC, and 14mm connectors. Please consult with our sales staff for application assistance. The units are also available as sets or kits packaged in foam-lined wood instrument cases. (See page 88.)

Precision Mismatches

2.4mm, 2.92mm & 3.5mm Connectors

2.4mm Standard Mismatches

Models 7933A1/A2 and 7933B1/B2

Specifications

Frequency Range DC to 50.0 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided VNA data 2.0 to 50.0 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 0.5 W average, 0.5 kW peak

2.92mm Standard Mismatches

Models 8778A1/A2 and 8778B1/B2

Specifications

Frequency Range DC to 40.0 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided VNA data 2.0 to 40.0 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 0.5 W average, 0.5 kW peak

3.5mm Standard Mismatches

Models 8033A1/A2/A3 and 8033B1/B2/B3

Specifications

Frequency Range DC to 26.5 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided VNA data 2.0 to 26.5 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 0.5 W average, 0.5 kW peak

2.4mm Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)	
FEMALE	MALE		DC – 12.0	12.0 – 50.0
7933A1.10	7933B1.10	1.10	±0.08	+0.13 -0.10
7933A1.20	7933B1.20	1.20	±0.09	±0.13
7933A1.30	7933B1.30	1.30	±0.09	±0.17
7933A1.50	7933B1.50	1.50	±0.10	±0.20
7933A1.75	7933B1.75	1.75	±0.12	±0.22
7933A2.00	7933B2.00	2.00	±0.14	±0.25

2.92mm Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)	
FEMALE	MALE		DC – 12.0	12.0 – 40.0
8778A1.10	8778B1.10	1.10	±0.08	+0.13 -0.10
8778A1.15	8778B1.15	1.15	±0.08	±0.13
8778A1.20	8778B1.20	1.20	±0.08	±0.13
8778A1.25	8778B1.25	1.25	±0.08	±0.13
8778A1.30	8778B1.30	1.30	±0.09	±0.17
8778A1.50	8778B1.50	1.50	±0.10	±0.20
8778A1.75	8778B1.75	1.75	±0.12	±0.22
8778A2.00	8778B2.00	2.00	±0.14	±0.25

3.5mm Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)	
FEMALE	MALE		DC – 12.0	12.0 – 26.5
8033A1.10	8033B1.10	1.10	±0.06	±0.08
8033A1.20	8033B1.20	1.20	±0.07	±0.10
8033A1.30	8033B1.30	1.30	±0.08	±0.12
8033A1.50	8033B1.50	1.50	±0.09	±0.17
8033A1.75	8033B1.75	1.75	±0.11	±0.19
8033A2.00	8033B2.00	2.00	±0.12	±0.22
8033A2.50	8033B2.50	2.50	±0.13	±0.23
8033A3.00	8033B3.00	3.00	±0.15	±0.25

Precision Mismatches

7mm, Type N, TNC and 14mm Connectors



7mm Standard Mismatches

Models 2611A/B/C/D/E/F/G

Specifications

Frequency Range DC to 18.0 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided 2.0 to 18.0 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 1 W average, 1 kW peak

7mm Available Models

MODEL	NOMINAL VSWR	ACCURACY (GHz)			RESISTANCE (OHMS)
		DC – 8.0	8.0 – 12.4	12.4 – 18.0	
2611A	1.05	±0.05	±0.05	+0.07 -0.05	47.6
2611B	1.10	±0.05	±0.05	±0.07	45.5
2611C	1.20	±0.05	±0.06	±0.09	41.7
2611D	1.30	±0.05	±0.07	±0.10	38.5
2611E	1.50	±0.06	±0.08	±0.15	33.3
2611F	1.75	±0.08	±0.10	±0.17	28.6
2611G	2.00	±0.10	±0.12	±0.20	25.0

Type N Standard Mismatches

Models 2561A/B/C/D/E/F/G and 2562A/B/C/D/E/F

Specifications

Frequency Range DC to 18.0 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided 2.0 to 18.0 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 1 W average, 1 kW peak

Type N Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)			RESISTANCE (OHMS)
FEMALE	MALE		DC – 8.0	8.0 – 12.4	12.4 – 18.0	
2561A	2562A	1.05	±0.05	±0.05	+0.08 -0.05	47.6
2561B	2562B	1.10	±0.06	±0.06	±0.08	45.5
2561C	2562C	1.20	±0.06	±0.07	±0.10	41.7
2561D	2562D	1.30	±0.06	±0.08	±0.12	38.5
2561E	2562E	1.50	±0.08	±0.09	±0.17	33.3
2561F	2562F	1.75	±0.10	±0.11	±0.19	28.6
2561G	2562G	2.00	±0.12	±0.12	±0.22	25.0

TNC¹ Standard Mismatches

Models 8611C/D/E/G and 8612G

Specifications

Frequency Range DC to 18.0 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided 2.0 to 18.0 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 1 W average, 1 kW peak

TNC¹ Available Models

MODEL		NOMINAL VSWR	ACCURACY (GHz)		RESISTANCE (OHMS)
FEMALE	MALE		DC – 10.0	10.0 – 18.0	
8611C	8612C	1.20	±0.08	±0.15	41.7
8611D	8612D	1.30	±0.09	±0.15	38.5
8611E	8612E	1.50	±0.10	±0.18	33.3
8611F	8612F	1.75	±0.13	±0.20	28.6
8611G	8612G	2.00	±0.15	±0.25	25.0

14mm Standard Mismatches

Model 2411E

Specifications

Frequency Range DC to 8.5 GHz
 Nominal VSWR See Available Models Chart
 VSWR Accuracy See Available Models Chart
 Calibration Data Provided 2.0 to 8.5 GHz
 Nominal Calibration Impedance Reference 50 ohm
 Power Handling 1 W average, 1 kW peak

14mm Available Model

MODEL	NOMINAL VSWR	ACCURACY (GHz)			RESISTANCE (OHMS)
		DC – 1.0	1.0 – 4.0	4.0 – 8.5	
2411B	1.10	±0.02	±0.03	±0.04	55
2411C	1.20	±0.03	±0.04	±0.05	60
2411D	1.30	±0.04	±0.05	±0.06	65
2411E	1.50	±0.05	±0.06	±0.07	75

¹ Precision TNC per Maury Data Sheet 5E-053.

Precision Mismatches

Mismatch Sets

Maury offers standard mismatches in sets containing a selection of mismatch values including the nominal matched load (typically, 1.05 VSWR). These sets, available with 7mm, type N female or male, 3.5mm, 2.92mm, 2.4mm, and TNC connectors, are packaged in foam-lined wooden instrument cases. Each mismatch is provided with an individual calibration report.



2611L

2.4mm, 2.92mm, and TNC Mismatch Sets

Please consult our Sales Department for availability of mismatch sets with TNC, 2.92mm and 2.4mm connectors.

3.5mm Mismatch Sets

The 8033K mismatch set is made up of all six each female and male of the 3.5mm mismatches from 1.10 through 2.00 VSWR shown on page 86. The set is packaged in a foam-lined wooden instrument case, and each mismatch value is provided with an individual calibration report.

7mm and Type N Mismatch Sets

Two types of sets are offered in these connector styles: sets with model suffix "L" contain one each of four mismatch values – a nominally matched load, 1.20, 1.50 and 2.00 VSWR. Sets with the model suffix "M" contain one each of all mismatch values indicated on page 86. The basic model follows those noted on page 87, i.e.: 2611L/M, 7mm; 2561L/M, type N female; 2562L/M, type N male. For example: 2562L describes a mismatch set with type N male connectors containing the four mismatches noted above.



2562L

Special Kits

Custom mismatch kits, combining different connector types and values, can be configured. Please consult our Sales Department and reference model 9476(x).

Instrument Cases

Standard mismatches in the various connector styles and mismatch values are available as individual units. Should you wish to purchase individual units and configure a custom set, Maury can offer the following foam-lined wood instrument cases to provide suitable laboratory storage.

2611S1	houses 4 units
2611S2	houses 8 units
2611S3	houses 12 units
8650Z1	houses 24 units

Waveguide Two-Port Mismatch Standard Sets

322A Series

Features

- ▶ Two-Port Calculable Standards
- ▶ Reduced Height 1.00, 1.10, 1.25, 1.50, 2.00 VSWR Spacers
- ▶ $1/4 \lambda$ at Midband

J322A



X322A

Description

These 322 series models are two-port calculable waveguide standard sets. The sets consist of five reduced height spacers which provide an accurately known VSWR which is directly calculable from the mechanical dimensions. The spacers are fabricated from aluminum and are provided with precision indexing holes for excellent flange alignment. Indexing pins and mounting hardware are also provided. The sets are packaged in foam-lined wood instrument cases.

The standards in these sets are extremely stable and easy to use for a variety of calibration applications. Their simple geometry allows direct calculation of reflection, loss, transfer and group delay characteristics and makes them ideally suited for quickly checking the performance and accuracy of automated network analyzers.

To order the 1.00 VSWR shim by itself, please add "1.00" to the model number. (Example: X322A1.00)

Available Models

MODEL	FREQUENCY RANGE (GHz)	EIA WR NUMBER	EQUIVALENT FLANGE	$1/4\lambda$ FREQUENCY (GHz)	LENGTH INCHES (CM)	WAVEGUIDE TOLERANCE	PS DELAY WITH AIR DIELECTRIC
R322A	1.7 — 2.6	430	CPR430F	2.112	1.840 (4.6736)	±0.005	155.9444
S322A	2.6 — 3.95	284	UG584/U	3.221	1.198 (3.0429)	±0.004	101.5334
E322A	3.3 — 4.9	229	CPR229F	4.042	0.948 (2.4079)	±0.003	80.34527
G322A	3.95 — 5.85	187	UG149A/U	4.826	0.807 (2.0498)	±0.002	68.39518
F322A	4.90 — 7.05	159	CPR159F	5.906	0.642 (1.6307)	±0.002	54.41104
C322A	5.85 — 8.2	137	UG344/U	6.960	0.539 (1.3691)	±0.0015	45.68154
H322A	7.05 — 10.0	112	UG51/U	8.438	0.447 (1.1354)	±0.0010	37.88432
X322A	8.2 — 12.4	90	UG39/U	10.129	0.382 (0.9703)	±0.0010	32.37541
M322A	10.0 — 15.0	75	MPF75 ¹	12.322	0.311 (0.7899)	±0.0010	26.35799
P322A	12.4 — 18.0	62	UG419/U	15.030	0.253 (0.6426)	±0.0008	21.44236
N322A	15.0 — 22.0	51	MPD51	18.249	0.209 (0.5309)	±0.0008	17.71325
K322A	18.0 — 26.5	42	UG595/U	21.941	0.175 (0.4445)	±0.0005	14.83167
U322A	26.5 — 40.0	28	UG599/U	32.693	0.118 (0.2997)	±0.0005	10.00078
J322A	33.0 — 50.0	22	MPF22 ¹	40.824	0.0946 (0.2403)	±0.0005	8.017576
T322A	40.0 — 60.0	19	MPF19 ¹	49.261	0.0777 (0.1974)	±0.00025	6.585261
V322A	50.0 — 75.0	15	MPF15 ¹	61.518	0.0630 (0.1600)	±0.00025	5.339401
Y322A	60.0 — 90.0	12	MPF12 ¹	73.772	0.0529 (0.1344)	±0.00025	4.483402
Z322A	75.0 — 110.0	10	MPF10 ¹	91.221	0.0424 (0.1077)	±0.00025	3.593501

¹ Provided with Maury "MPF" precision type flanges with indexing holes.

Two-Port Mismatch Air Line Standards (Individual Units and Sets)

General Information

Mismatch air line sets are two-port, $1/4\text{-}\lambda$ VSWR standards consisting of coaxial air lines employing a design that features a precision outer conductor with beadless connectors and a set of inner conductors with increasing diameters. The inner conductors produce accurately known reflection coefficients which are directly calculable from and traceable to the air line dimensions¹.

Air line standard sets are extremely stable and easy to use for a variety of applications. Their simple geometry allows direct calculation of reflection, loss, transfer and group delay characteristics, making them ideally suited for checking the performance and accuracy of network analyzers. The sets described here utilize beadless connectors and rely on the mating connectors for center conductor support.



3.5mm Two-Port Mismatch Air Line Standards

Model 8044S15 & 8044S60

Features

- ▶ DC to 26.5 GHz
- ▶ Separated Step Discontinuity
- ▶ Beadless 3.5mm Connectors

Description

Maury offers the 8044S15 and the 8044S60 as individual two-port mismatch standards in 3.5mm line size and connector type. A key design feature of these units is that the step discontinuity is separated from the connector interface for better accuracy².

Both models also feature a precision outer conductor with beadless 3.5mm connectors, and a stepped center conductor. The center conductors are designed to produce an accurately known VSWR which is directly calculable from the mechanical dimension.



8044S60

Specifications

Frequency Range	.....	DC to 26.5 GHz
VSWR:		
$\Gamma = 0.15$	.....	1.350 ± 0.025
$\Gamma = 0.60$	.....	4.00 ± 0.25
Reference Impedance	.....	50 ohm
Nominal Overall Electrical Length	.....	10cm
Nominal Mismatch Section Electrical Length	.....	7.5cm
Odd $1/4\text{-}\lambda$ Frequencies	.....	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25 GHz

¹ Beatty, R.W., "Calculated and Measured S11, S21, and Group Delay for Simple Types of Coaxial and Rectangular Waveguide 2-port Standards", NBS Technical Note No. 657, Dec. 1974.

² Maury, M.A. Jr., and Simpson, G.R., "Two-Port Verification Standards in 3.5mm and 7mm for Vector Automatic Network Analyzers", Microwave Journal, June, 1984; pp. 101-110.

7mm Two-Port Mismatch Air Line Standard Set

Model 2654A

Features

- ▶ DC to 18.0 GHz
- ▶ Beadless LPC7 Connectors

Description

The 2654A Beadless Mismatch Air Line Set was designed for use in coaxial systems employing 7mm connectors. The air line connectors are beadless LPC7 connectors that mate with standard 7mm connectors, and rely on the mating connector for center conductor support.

Each set consists of:

- A) One (1) outer conductor.
- B) Five (5) inner conductors (see specification for corresponding VSWR values).
- C) A foam-lined, wood instrument case for protection and storage.



Specifications

Frequency Range	DC to 18.0 GHz
Nominal Impedance	49.987 for 1.00 VSWR
Mismatch Values (VSWR)	1.00, 1.10, 1.25, 1.50, 2.00 (based on nominal impedance)
Electrical Length	.7495cm
Odd 1/4-λ Frequencies	.1, 3, 5, 7, 9, 11, 13, 15, 17 GHz

7mm Two-Port Mismatch Air Line Standard Sets

Model 2654B

Features

- ▶ DC to 18.0 GHz
- ▶ Beadless LPC7(F) Connectors

Description

The Maury 2654B precision air line standard set contains calculable two-port 7mm coaxial air lines¹. These standards are provided with the step discontinuity separated from the connector interface for better accuracy².

The set consists of a precision outer conductor with beadless 7mm connectors and three center conductors. Each center conductor has a different diameter to produce an accurately known VSWR which is directly calculable from the mechanical dimension. They employ self-centering, spring-loaded pins to allow connection easily without tools.

Also available are the Maury 2654S15 and 2654S60 which are individual two-port standards with $\Gamma = 0.15$ and 0.60 , respectively.



Specifications

Frequency Range	DC to 18.0 GHz
VSWR:	
$\Gamma = 0$	1.005 maximum
$\Gamma = 0.15$	1.350 ± 0.025
$\Gamma = 0.60$	4.00 ± 0.25
Reference Impedance	50 ohm
Nominal Overall Electrical Length	10cm
Nominal Mismatch Section Electrical Length	.75cm
Odd 1/4-λ Frequencies	.1, 3, 5, 7, 9, 11, 13, 15, 17 GHz

¹ Beatty, R.W., "Calculated and Measured S₁₁, S₂₁, and Group Delay for Simple Types of Coaxial and Rectangular Waveguide 2-port Standards", NBS Technical Note No. 657, Dec. 1974.

² Maury, M.A. Jr., and Simpson, G.R., "Two-Port Verification Standards in 3.5mm and 7mm for Vector Automatic Network Analyzers", Microwave Journal, June, 1984; pp. 101-110.

Connector Gages and Connector Gage Kits

General Information

Features

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



Description

These 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.

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-049
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-048

Available Models - Dial Indicator Style

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	A028	One "push-on" gage measures planar contact location.	2Y-005
7mm	0.0001	A028D	One "thread-on" metrology grade gage measures planar contact location.	2Y-005A
N	0.001	A007A	One "push-on" gage measures female and male contact pin location.	2Y-002
N	0.00025	A020A	One "push-on" gage measures female and male contact pin location.	2Y-003
N	0.0001	A020D	Two metrology grade "thread-on" gages measure female and male contact pin interface locations.	2Y-003A
N (75 ohms)	0.0001	A020G	One "push-on" gage measures female and male contact pin location of 75ohm type N connectors.	2Y-003G
N, BNC, TNC, C or SC	0.00025	A025A	One "push-on" gage measures female and male contact pin location.	2Y-016
BNC or TNC	0.0005	A012A	Two "push-on" gages measure female and male contact pin and dielectric interface locations.	2Y-009
AFTNC, TNC or TNCA	0.0001	A012E	Six "push-on" "universal" gages measure all contact pin and dielectric interface locations of all MIL-STD, IEC and commercial TNC connectors.	2Y-028
SMA	0.0005	A027	Two "push-on" gages measure female and male contact pin interface locations.	2Y-004
SMA	0.0005	A027A	Four "push-on" gages measure female and male contact pin and dielectric interface locations.	2Y-004
SMA	0.0005	A027G	Two "push-on" gages measure female and male 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 steplless 0.085-inch male pin dimension.	2Y-004
OSP™ 1	0.00025	A039C	One "push-on" gage measures female and male contact pin location.	2Y-026
14mm (GR900)	0.0001	A024	One "push-on" gage measures planar contact location of 14mm and 7mm connectors.	2Y-006
7-16	0.0001	A041A	One "push-on" gage measures female and male contact pin location.	2Y-027
SMP/GPO™ 2	0.0005	A042A	Three "push-on" gages measures SMP connectors' contact pin and dielectric interface locations.	2Y-031
Multiport	0.0001	A045A	Six "push-on" gages measures multiport connectors' contact pin and dielectric locations.	2Y-029
ZMA/BZ	0.0001	A046A	Six "push-on" gages measures ZMA and BZ connectors' contact pin and dielectric locations.	2Y-030

¹ OSP™ (the Omni-Spectra designation) is a trademark of M/A-Com.

² GPO™ is a trademark of the Gilbert Engineering Co., Inc.

Coaxial Directional Couplers

Model Series 4030 and 4090

Features

- ▶ High Directivity
- ▶ Broadband Operation
- ▶ Precision Connectors
- ▶ Low VSWR
- ▶ High Tracking Accuracy

Description

The 4030 and 4090 series of precision directional couplers are designed to provide high directivity and an accurate sample of forward or reflected power over octave bandwidths or greater. They are primarily intended for laboratory type applications where an extremely stable and rugged device is required.

The couplers, when used singly or in pairs, are ideally suited for high accuracy swept frequency measurements or reflection coefficient and insertion loss. The use of precision couplers has numerous advantages and applications such as when used with network analyzer systems and in power level measurements.

Units, as provided, are calibrated at five frequencies and are available with either 7mm¹ or 14mm² connectors on the mainline with a precision stainless steel type N female connector on the secondary (coupled) line input.



Specifications

Frequency Range Octave bands or greater, see charts
 Nominal Coupling 10 dB
 Tracking (unit to unit, when paired) 0.03 dB
 Directivity Generally >40 dB, see charts
 VSWR see charts
 Nominal Impedance 50 ohm
 Power Handling 30 watts
 Connectors:

Main Line 7mm (series 4030); 14mm (series 4090)
 Coupled Line Type N (female)

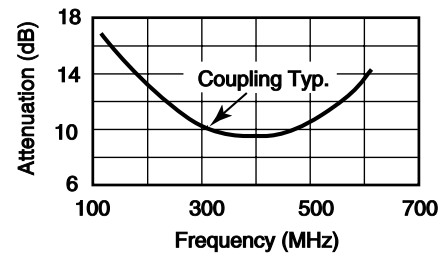


Figure A. Coupling Curve for 0.1 to 0.6 GHz Couplers

Available Models - 7mm (Series 4030)

FREQUENCY RANGE (GHz)	MODEL	DIRECTIVITY (DB)	COUPLING FREQ SENSITIVITY (dB)	VSWR		OVERALL LENGTH (INCHES)
				MAIN	SECONDARY	
0.95 – 2.2	4031	40 (typical >45)	±1.0	1.10 6	1.15 7	10.70
1.7 – 4.2	4032	40 (typical >43)	±1.2	1.15	1.20	3.70
3.7 – 8.3	4033	35 (typical >38)	±1.2	1.20	1.25	6.35

Available Models - 14mm (Series 4090)

FREQUENCY RANGE (GHz)	MODEL	DIRECTIVITY (DB)	COUPLING FREQ SENSITIVITY (dB)	VSWR		OVERALL LENGTH (INCHES)
				MAIN	SECONDARY	
0.10 – 0.6	4096A	46 (typical >50)	See Figure A	1.05	1.08	13.15
0.50 – 1.0	4097	46 (typical >50)	±1.0	1.05	1.10	9.14
0.75 – 1.5	4094	45	±1.0	1.05	1.10	7.88
1.50 – 3.0	4095	42	±1.0	1.07	1.10	6.51

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

² Precision 14mm connector, mating compatible with GR900.

Torque Wrenches

All Models

Description

Maury's torque wrenches are recommended for tightening coaxial connectors in order to obtain optimum repeatability and prolong connector life. They employ a "break" design so it is impossible to over-torque a coupled junction, and torque can be applied in either direction. Each Maury torque wrench is factory preset to the proper in. lbs for tightening its coaxial connector type, and the color coded handles make it easy to select the correct wrench from your toolbox at a glance.

Maury torque wrenches are included in many of our VNA calibration kits, and can be ordered separately by the model numbers listed in the chart below. If the wrench you need isn't shown in this chart, please contact our Sales Department or your local Maury representative for assistance.

Note: The models shown are delivered in a non-calibrated state unless calibration is requested at the time they are ordered. Maury highly recommends annual recalibration of these torque



2698G1

8799A1

2698C2

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 TYPE	WRENCH SIZE	PRESET TORQUE (INCH LBS)	HANDLE COLOR ¹
8799A1 ²	1.85mm, 2.4mm, 2.92mm (K), and 3.5mm	5/16-in. hex	8 ± 0.3	Red
8799D1	SMA, OSM	5/16-in. hex	5 ± 0.3	Black
8799E1	OSSM, MPC8	1/4-in. hex	5 ± 0.3	Black
2698C2	7mm, LPC7, Precision Type N (with 3/4-inch hex nuts), NMD3.5, NMD2.92, NMD2.4	3/4-in. hex	12 ± 0.4	Blue
2698G1	Precision TNC (with 9/16 hex nuts), MPC6	9/16-in. hex	12 ± 0.4	Blue
2698H1	LPC/OSP™ (Precision LCP/OSP™ per Maury data sheet 5E-065)	9/16-in. hex	8 ± 0.3	Red
2698J1	SC	13/16-in. hex	12 ± 0.4	Blue
2498T1	MPC14, LPC14 (Precision 14mm connectors that are essentially the same as GR900)	1-in. hex	12 ± 0.4	Blue
2698K1	7-16	1-1/16 hex	20 ± 0.5	Green

¹ Handle color represents torque value: blue = 12 in. lbs; red = 8 in. lbs; black = 5 in. lbs; green = 20 in. lbs (unless otherwise marked on the nameplate).

² Do not use on SMA connectors. Significant damage may result.