Maury Microwave

User Guide

Precision TNC Coaxial Calibration Kit

DC to 18 GHz

Models: 8650CK10/11
8650CK20/21

8650-511 (A) 2/15

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8650CK20/21

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General Information

Calibration Kit Description

This series of **Precision TNC** coaxial calibration kits is designed to provide accurate calibrations of network analyzers in the **DC to 18.0 GHz** range. Each of these kits includes all the necessary calibration standards and associated hardware needed for the accurate calibration of most network analyzers.

Refer to the ***Calibration Kits*** *Contents* section (see Appendix, Date Sheet Resources) for information on included components and available kit options.

NOTE: This document, calibration constants software, and data sheet can be downloaded from our website: ***maurymw.com***

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

Maintenance

This calibration kit is relatively maintenance free if the components are handled with the same care that is appropriate to all precision equipment. As with any precision component, proper care should be taken to assure clean mating surfaces, correct alignment when mating, and proper torquing of connectors or waveguide coupling screws. To help maintain the integrity of the components in this kit, routine visual inspection and cleaning of mating surfaces is recommended. Failure to do so may result in degraded repeatability and accuracy, as well as damage any mated devices.

Calibration

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

Supporting Test Port Adapters

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

Electrostatic Discharge Precautions

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

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

Connector Description

The **TNC connectors (MPC/TNC)** supplied on the components in this kit are precision connectors that mate with MIL-C-39012 and MIL-T-81490 connectors. They are low VSWR connectors rated from DC to 18 GHz. For interface specifications for these connectors, see Maury data sheet ***5E-053***.

Connector Care

Precision connectors must be handled carefully if accurate calibrations and measurements are to be obtained. All connectors should be inspected prior to each use. For optimum measurement results, all interfaces should be visually inspected under magnification and cleaned on a regular basis. Proper connector contact pin depths should also be verified through regular inspections using a connector gage, such as the Maury Microwave A012E connector gage kit, to insure that the connectors on both calibration devices and devices under test (DUTs) have contact pin depths within recommended tolerances. Refer to Maury data sheet ***5E-053*** (available on our website) for proper pin depth specifications.

Care should be used whenever aligning connectors. Tighten connector coupling nuts using an appropriate torque wrench while holding the opposing connector with an open-end wrench.

When disconnecting devices, take care not to rock or bend any of the connections. Disconnect devices by disengaging the coupling nuts and gently pulling the connectors apart in a straight line.

Always use protective covers on all connectors when devices are not in use.

Should a connector become damaged, it should be repaired before it is used any further or replaced immediately. A damaged connector can damage other mated connectors.

Connector Tightening

Damage to a calibration device or attaching connector can occur if the device is turned instead of the connector nut. ALWAYS turn the nut when making connections. Never turn the device itself.

Always use a torque wrench (Maury model **2698G1**) to final-tighten all connections. This will insure calibration accuracy and measurement repeatability.

When making connections, a **7/16 inch** open-end wrench may be required to hold the body of one device stationary while torquing the nut on the other device or cable. This open-end wrench is supplied with this calibration kit for this purpose.

Using the torque wrench, hand-tighten the connection to be torqued by holding the calibration device steady and turning only the nut.

- Hold the torque wrench with your thumb and index finger, behind the groove in the handle (see **Figure 1**).
- Tighten the connection until the ball in the handle crests on the cam (as the handle begins to break). Do not "fully break" the handle of the torque wrench to reach the specified torque.
- Reverse the previous procedure to disconnect the connection.

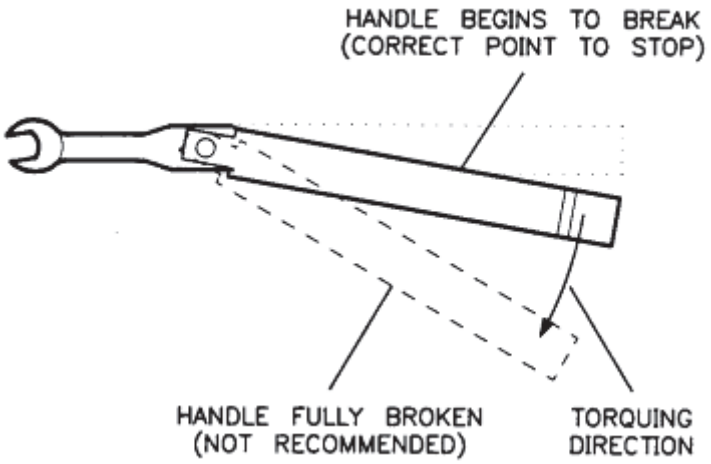

Figure 1. Using the Torque Wrench

Calibration Kit Contents

Standard Components – 8650CK10

1 ea	Short, female	8615A
1 ea	Short, male	8615B
1 ea	Open, female	8609B
1 ea	Open, male	8610B
1 ea	Fixed Termination, female	332E
1 ea	Fixed Termination, male	332F
1 ea	Case Assembly	

Standard Components – 8650CK11

1 ea	Short, female	8615A
1 ea	Short, male	8615B
1 ea	Open, female	8609B
1 ea	Open, male	8610B
1 ea	Fixed Termination, female	332E
1 ea	Fixed Termination, male	332F
1 ea	Adapter, male to male	232B11
1 ea	Adapter, female to male	232C11
1 ea	Adapter, female to female	232A11
1 ea	Case Assembly	

Standard Components – 8650CK20

1 ea	Short, female	8615A
1 ea	Short, male	8615B
1 ea	Open, female	8609B
1 ea	Open, male	8610B
1 ea	Fixed Termination, female	332E
1 ea	Fixed Termination, male	332F
1 ea	Sliding Termination, female	452A1
1 ea	Sliding Termination, male	452B1
1 ea	9/16 Torque Wrench, 12in.lbs	2698G1
1 ea	Wrench, 7/16	8770Z7
1 ea	Case Assembly	

Standard Components – 8650CK21

1 ea	Short, female	8615A
1 ea	Short, male	8615B
1 ea	Open, female	8609B
1 ea	Open, male	8610B
1 ea	Fixed Termination, female	332E
1 ea	Fixed Termination, male	332F
1 ea	Adapter, male to male	232B11
1 ea	Adapter, female to male	232C11
1 ea	Adapter, female to female	232A11
1 ea	Sliding Termination, female	452A1
1 ea	Sliding Termination, male	452B1
1 ea	9/16 Torque Wrench, 12in.lbs	2698G1
1 ea	Wrench, 7/16	8770Z7
1 ea	Case Assembly	

Anritsu Network Analyzers

Table 1. Male Standard Definitions for Anritsu

Male Open Device	
C0	79.000 e-15
C1	0.000 e-27
C2	40.000 e-36
C3	0.000 e-45
Offset Length	2.403 cm
Serial Number	00000

Male Short Device	
Offset Length	2.527 cm
Serial Number	00000

Table 2. Female Standard Definitions for Anritsu

Female Open Device	
C0	79.000 e-15
C1	0.000 e-27
C2	40.000 e-36
C3	0.000 e-45
Offset Length	1.681 cm
Serial Number	00000

Female Short Device	
Offset Length	1.805 cm
Serial Number	00000

For specific loading instructions, see ***Anritsu loading instructions,*** which can be downloaded from our website: ***maurymw.com***.

Keysight Network Analyzers

Table 3. Standard Definitions for Keysight

Standard (1)			C0 x10^{-15} F	C1 x10^{-27} F/Hz	C2 x10^{-36} F/Hz^2	C3 x10^{-45} F/Hz^3	Fixed or Sliding (2)	Offset			Frequency GHz		Coax or W/G	Standard Label
	Type	Description	L0 x10^{-12} H	L1 x10^{-24} H/Hz	L2 x10^{-33} H/Hz^2	L3 x10^{-42} H/Hz^3		Delay ps	Z_0 (3) Ω	Loss (4) GΩ/s	Min	Max		
	Short	8615A Female Short	0.0	0.0	0.0	0.0		60.208	50	0.7	0.0	999.0	Coax	Short-F-
	Open	8609B Female Open	79.0	0.0	40.0	0.0		56.086	50	0.7	0.0	999.0	Coax	Open-F-
	Load	Broadband Female Load					Fixed	0.0	50	0.7	0.0	999.0	Coax	Load-F-(5)
	Thru	Thru						0.0	50	0.7	0.0	999.0	Coax	Thru (6)
	Load	Sliding Female Load					Sliding	0.0	50	0.7	1.999	999.0	Coax	Load-F- (7)
	Load	Lowband Female Load					Fixed	0.0	50	0.7	0.0	2.001	Coax	Load-F-(5)
	Short	8615B Male Short	0.0	0.0	0.0	0.0		84.292	50	0.7	0.0	999.0	Coax	Short-M-
	Open	8610B Male Open	79.0	0.0	40.0	0.0		80.169	50	0.7	0.0	999.0	Coax	Open-M-
	Load	Lowband Male Load					Fixed	0.0	50	0.7	0.0	2.001	Coax	Load-M-(5)
	Load	Sliding Male Load					Sliding	0.0	50	0.7	1.999	999.0	Coax	Load-M- (7)
	Load	Broadband Male Load					Fixed	0.0	50	0.7	0.0	999.0	Coax	Load-M-(5)

(1) Open, short, load, delay/thru, or arbitrary impedance.
(2) Load or arbitrary impedance only.
(3) Z_0 normalized.
(4) Skin loss factor, normalized at 1 GHz.
(5) Test ports connected directly.

For specific loading instructions, see ***Keysight loading instructions***, which can be downloaded from our website: ***maurymw.com***

Rohde & Schwarz Network Analyzers

Table 4. Standard Definitions for Rohde & Schwarz

Short (M) Label = 8615B Min Freq = 0 Hz Max Freq = 18.0 GHz Length = 25.270 mm Loss = 0.01025 dB/$\sqrt{GHz}$	Through (MF) Label = 0 cm Thru Min Freq = 0 Hz Max Freq = 18.0 GHz Length = 0 mm Loss = 0 dB/$\sqrt{GHz}$
Short (F) Label = 8615A Min Freq = 0 Hz Max Freq = 18.0 GHz Length = 18.050 mm Loss = 0.007321 dB/$\sqrt{GHz}$	Match (M) Label = 332( ) Min Freq = 0 Hz Max Freq = 18.0 GHz
Open (M) Label = 8610B Min Freq = 0 Hz Max Freq = 18.0 GHz Length = 24.034 mm Loss = 0.009749 dB/$\sqrt{GHz}$ C0 = 79.0 fF C1 = 0.0 fF/GHz C2 = 0.04 fF/GHz^2 C3 = 0.0 fF/GHz^3	Match (F) Label = 332( ) Min Freq = 0 Hz Max Freq = 18.0 GHz Sliding Match (M) Label = 452( ) Min Freq = 2.0 GHz Max Freq = 18.0 GHz
Open (F) Label = 8609B Min Freq = 0 Hz Max Freq = 18.0 GHz Length = 16.814 mm Loss = 0.0068202 dB/$\sqrt{GHz}$ C0 = 79.0 Ff C1 = 0.0 fF/GHz C2 = 0.04 fF/GHz^2 C3 = 0.0 fF/GHz^3	Sliding Match (F) Label = 452( ) Min Freq = 2.0 GHz Max Freq = 18.0 GHz

For specific loading instructions, see ***Rohde & Schwarz loading instructions***, which can be downloaded from our website: ***maurymw.com***.

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Appendix

Data Sheet Resources

2Z-062 – Precision TNC VNA Calibration Kits
http://maurymw.com/pdf/datasheets/2Z-062.pdf

2Y-001 – Connector Gages and Connector Gage Kits
http://maurymw.com/pdf/datasheets/2Y-001.pdf

2Y-009 – Precision BNC/TNC Connector Gage Kit
http://maurymw.com/pdf/datasheets/2Y-009.pdf

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

5E-053 – Precision TNC connectors
http://maurymw.com/pdf/datasheets/5E-053.pdf

Contacts

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Web Resources

Maury Calibration Kits
http://maurymw.com/Precision/VNA_Cal_Kits.php

Maury Precision Coaxial and Waveguide-to-Coaxial Adapters
http://maurymw.com/Finder/Adapter_Finder.php

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