User Manual

3.5mm
Coaxial Calibration Kit

DC to 26.5 GHz
Models: PE5CK1019
PE5CK1020

PE5CK1019

PE5CK1020

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Contents

General Information

Calibration Kit Description

These Pasternack 3.5mm coaxial calibration kits are designed to provide accurate calibrations of network analyzers in the DC to 26.5 GHz range. These kits include all the necessary calibration standards and associated hardware needed for the accurate calibration of most network analyzers. This manual applies to the following model numbers: PE5CK1019 9-piece SOL (Short, Open, Load) calibration kit and PE5CK1020 12-piece SOLT (Short, Open, Load, Through) calibration kit.

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

NOTE: This document, along with the kit data file and datasheet, can be downloaded from pasternack.com.

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 ensure clean mating surfaces, correct alignment when mating, and proper torqueing of connectors. To help maintain the integrity of the components in the 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 to any mated devices.

Calibration

To maintain and certify the calibration kit's ongoing performance to specification, we recommend that all kits be periodically returned to Pasternack for calibration. The typical calibration cycle is one year, although actual needs may vary depending on usage.

Supporting Test Port Adapters

When configuring a test setup, ensure 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 into contact with exposed center conductors that are connected directly to the static-sensitive internal circuits of the network analyzer. Ensure 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

Precision 3.5mm connectors are miniature, instrument-grade, air-dielectric connectors that operate mode-free up to 26.5 GHz. They feature extremely low VSWR and insertion loss and are designed to non-destructively mate with standard 3.5mm connectors. These connectors generally have a high-performance support bead and comply with the proposed *IEEE Standard 287 for Precision Coaxial Connectors*.

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 optimal 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 kit to ensure that connectors on both calibration devices and devices under test (DUTs) have contact pin depths within recommended tolerances.

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 again or replaced immediately. A damaged connector can damage other mated connectors.

Connector Tightening

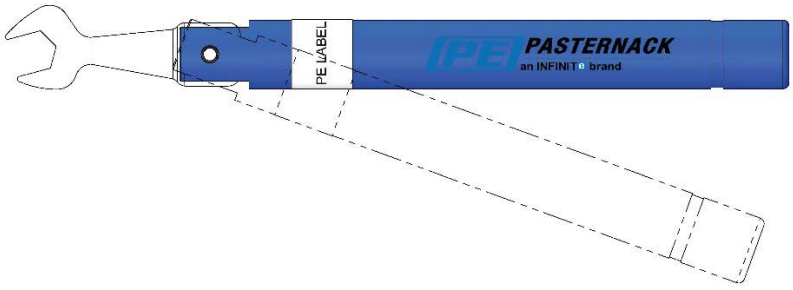
Damage to a calibration standard or attaching connector can occur if the device is turned instead of the connector's coupling nut. ALWAYS turn the coupling nut when making connections. Never turn or spin the connectors.

Always use a torque wrench (Pasternack model PE5019-1A) to final-tighten all connections. This will ensure calibration accuracy and measurement repeatability.

When making connections, an open-end wrench is recommended 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 the calibration kit for this purpose.

Using the torque wrench:
Hand-tighten the connection being torqued by holding the calibration device steady and turning only the coupling 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 over). Do not "fully break" the handle of the torque wrench to reach the specified torque.
- Reverse the previous procedure to disconnect.



Torque wrench handle will break over when preset torque is achieved.
Take note of the wrench bit orientation relative to the direction of motion/rotation.

Calibration Kit Contents

Standard Components SOL – PE5CK1019

1 ea	Short, female	PE5SC3014
1 ea	Short, male	PE5SC3015
1 ea	Open, female	PE5SC3029
1 ea	Open, male	PE5SC3030
1 ea	Load, female	PE5TR1010
1 ea	Load, male	PE5TR1011
1 ea	1/4" X 5/16” Open-End Wrench	PE5TL1001
1 ea	7/16" X 1/2” Wrench	PE5TL1002
1 ea	5/16” Torque Wrench	PE5019-1A

Standard Components SOLT – PE5CK1020

1 ea	Short, female	PE5SC3014
1 ea	Short, male	PE5SC3015
1 ea	Open, female	PE5SC3029
1 ea	Open, male	PE5SC3030
1 ea	Load, female	PE5TR1010
1 ea	Load, male	PE5TR1011
1 ea	Thru, female to female	PE91414
1 ea	Thru, male to male	PE91415
1 ea	Thru, male to female	PE91416
1 ea	1/4" X 5/16” Open-End Wrench	PE5TL1001
1 ea	7/16" X 1/2” Wrench	PE5TL1002
1 ea	5/16” Torque Wrench	PE5019-1A

Standard Definitions

Vector Network Analyzer hardware and test cables have a set of well understood systematic errors that affect the unprocessed measurements made by the instrument. The calibration standards in this kit have precisely-known electrical behavior, and during calibration the VNA software uses the raw measurement data and the known behavior of the standards to calculate the phase and magnitude of up to 12 complex error terms at each frequency point of the calibration. Once calibrated, the instrument applies Vector Error Correction to each data point measured.

Pasternack PE5CK1019 and PE5CK1020 3.5mm Calibration Kits Standards' Definitions				
Short (Male) PE5SC3015				
	Rohde & Schwarz Units		Keysight & Anritsu Units	
Minimum Frequency	0	Hz		
Maximum Frequency	34	GHz		
Length	5.0017	mm		
Delay			16.684	ps
Loss	0.0038	$dB/\sqrt{GHz}$	1.3	GΩ/s
Short (Female) PE5SC3014				
Minimum Frequency	0	Hz		
Maximum Frequency	34	GHz		
Length	5.0017	mm		
Delay			16.684	ps
Loss	0.0038	$dB/\sqrt{GHz}$	1.3	GΩ/s
Open (Male) PE5SC3030				
Minimum Frequency	0	Hz		
Maximum Frequency	34	GHz		
Length	4.344	mm		
Delay			14.499	ps
Loss	0.0033	$dB/\sqrt{GHz}$	1.3	GΩ/s
C0	62.54	fF	62.54E-15	F
C1	-1.284	fF/GHz	-1284E-27	F/Hz
C2	0.1076	fF/GHz^2	107.6E-36	F/Hz^2
C3	-0.001886	fF/GHz^3	-1.89E-45	F/Hz^3
Open (Female) PE5SC3029				
Minimum Frequency	0	Hz		
Maximum Frequency	34	GHz		
Length	4.4344	mm		
Delay			14.49	ps
Loss	0.0033	$dB/\sqrt{GHz}$	1.3	GΩ/s
C0	63.17	fF	63.17E-15	F
C1	-1.178	fF/GHz	-1178E-27	F/Hz
C2	0.1096	fF/GHz^2	109.60E-36	F/Hz^2
C3	-0.002146	fF/GHz^3	-2.15E-45	F/Hz^3

Through (Male/Female) Insertable Device, No Adapter		
Minimum Frequency	0	Hz
Maximum Frequency	34	GHz
Length	0	mm
Delay	0	ps
Loss	0	$dB/\sqrt{GHz}$
Through (Male/Male) PE91415 (1)		
Minimum Frequency	0	Hz
Maximum Frequency	34	GHz
Length	17.375	mm
Loss	0.0065	$dB/\sqrt{GHz}$
Through (Female/Female) PE91414(1)		
Minimum Frequency	0	Hz
Maximum Frequency	34	GHz
Length	17.375	mm
Loss	0.0065	$dB/\sqrt{GHz}$
Through (Male/Female) PE91416(1)		
Minimum Frequency	0	Hz
Maximum Frequency	34	GHz
Length	0	mm
Loss	0.0065	$dB/\sqrt{GHz}$
Match (Male) PE5TR1001		
Minimum Frequency	0	Hz
Maximum Frequency	34	GHz
Match (Female) PE5TR1000		
Minimum Frequency	0	Hz
Maximum Frequency	34	GHz

Footnote 1: Precision Through Standards are contained in kit PE5CK1020 only. For all kits, perform TOSM or SOLT calibrations using the "Unknown Through" method for best results.

Resources

Datasheets:

3.5mm Calibration Kits:
https://www.pasternack.com/images/ProductPDF/PE5CK1019.pdf
https://www.pasternack.com/images/ProductPDF/PE5CK1020.pdf

Torque Wrenches:
https://www.pasternack.com/images/ProductPDF/PE5019-1A.pdf

Website:

Pasternack Calibration Kits:
https://www.pasternack.com/nsearch.aspx?Category=Calibration+Kits+Portable^Calibration+Kits^Calibration+Kits+Components&keywords=calibration+ports+vna&sort=y&searchtype=1&view_type=grid

Pasternack Test and Measurement Products:
https://www.pasternack.com/nsearch.aspx?Category=Calibration+Kits+Portable^Calibration+Kits^Calibration+Kits+Components^Adapters^Data+Cable+assemblies^Cable+assemblies^Connectors^VNA+Test+Cables&keywords=Banana+Alligator+Spade+Breakout+calibration+ports+vna+armored+test&searchtype=1&no_metaphones=0:1&sort=y&view_type=grid

Pasternack Test and Measurement Product Selection Guide:
https://www.pasternack.com/pages/PSG/Test-and-Measurement-Product-Selection-Guide_output/web/Test-and-Measurement-Product-Selection-Guide.html

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