Next-Level Measurements: Easier, Faster, and More Accurate with the New Picotest Component Test Fixture

Calibration and measurement accuracy are critical in power integrity and impedance analysis, but they're often hindered by time-consuming setups, inconsistent connections, and external interference. Picotest's new Calibration Test Fixture (CTF) addresses these challenges head-on, offering a faster, easier, and most importantly, **repeatable** measurement process. By eliminating the need for SMA connectors on mount boards and integrating internal ground loop isolation, the CTF streamlines your workflow while improving measurement reliability. Whether you're performing impedance or full 2-port calibration, the CTF ensures consistent results, making it an essential tool for high-precision measurements.

The CTF kit comes with all the mounts necessary for impedance calibration and full 2-port calibration. This blog will specifically focus on impedance calibration and measurement on the Bode 500 VNA; however, the CTF is compatible with any VNA for full 2-port or impedance calibration.

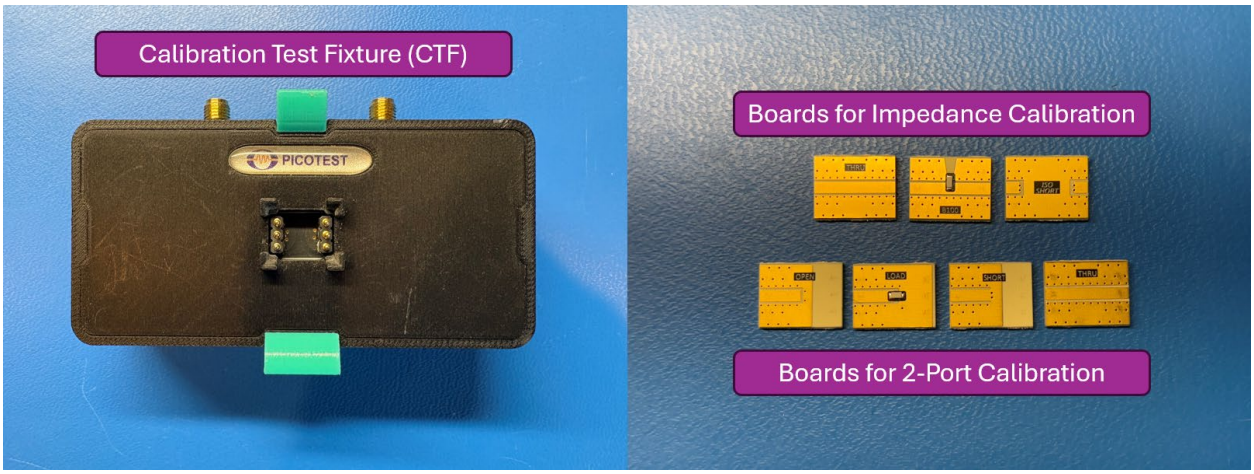

Figure 1: Picotest's Calibration Test Fixture (left) and Calibration Boards for Impedance Calibration and Full 2-Port Calibration (right)

How to Calibrate Using the Calibration Test Fixture and the Bode 500

We will be walking through calibration and measurement using the CTF on a Bode 500 for a Shunt-Thru Impedance Analysis, but this procedure can also be followed using the Bode 100. For impedance calibration, we will use the *THRU, B100,* and *ISO SHORT* boards, as shown in Figure 2.

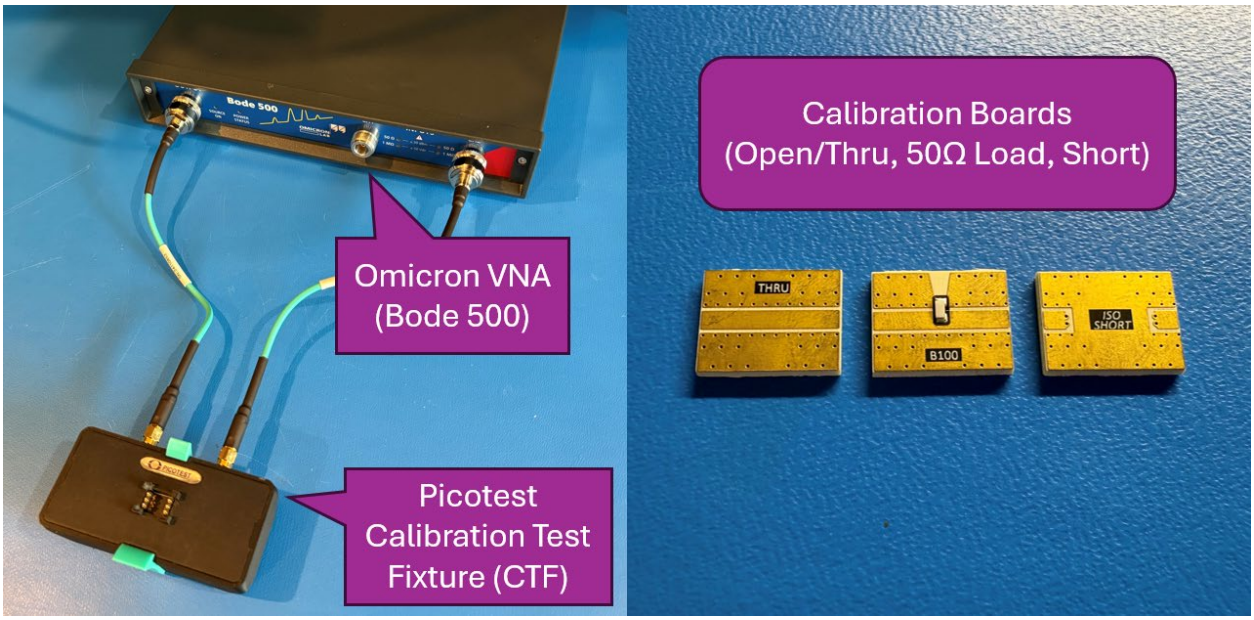

Figure 2: Equipment Required for Impedance Calibration on the Bode 500

After powering on the Bode 500, with cables connected for calibration as shown in Figure 2, follow the steps below to calibrate your measurement setup prior to making measurements on your DUT. A torque wrench is included to help make sure your connections are secure.

Step 1: In the Bode Analyzer Suite, if starting a new project, select *Impedance Analysis* > *Shunt-Thru*. Otherwise, open your existing project.

Step 2: Set your desired frequency sweep settings and change the *Source Level* to 16 dBm (or 13 dBm if using the Bode 100).

Set the *Attenuator* level to 0 dB and the *Receiver Bandwidth* to at least half of your start frequency.

- Setting the Receiver Bandwidth to half of your start frequency will allow accurate readings at the lower frequencies of your sweep while also maintaining a proper signal-to-noise ratio. The recommended initial starting point is setting this to 30 Hz. However, as per the Bode 500 datasheet the maximum dynamic range can be achieved by setting this to 10Hz if desired. Sweeps may take longer as the BW is lowered.

Step 3: Under the *Home* tab, select the *User-Range Impedance Calibration* > *Perform New Calibration*.

Step 4: Perform the Open calibration using the THRU board. To do so, place the calibration board **FACE DOWN** on the CTF.

Press ***FIRMLY*** and hold, as shown in Figure 3, then select "*Start*" next to *Open* in the Open/Short/Load calibration. Once the Open calibration is complete, you will see "*Performed*" next to the corresponding step.

- NOTE - if you receive an overload warning during the Open calibration, exit the calibration screen and increase the *Attenuator* level ONLY for the Open calibration step. Change the attenuation level back to 0 dB for Load and Short.

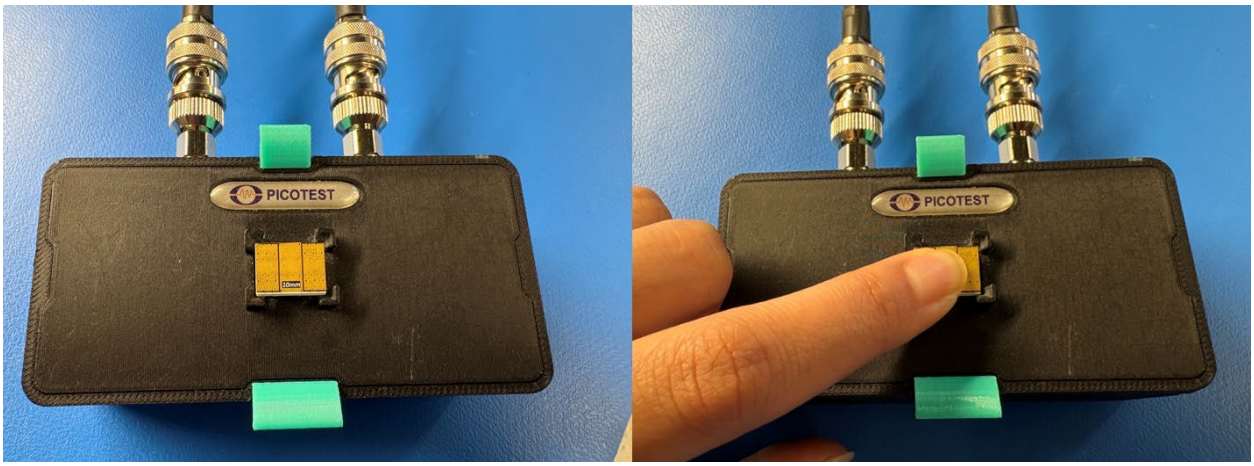

Figure 3: With the Calibration Board on the CTF, Press Firmly and Hold for the Entire Duration of Calibration Step

Step 5: Perform the Load calibration using the B100 board, with the same method as used in step 4.

Step 6: Perform the Short calibration using the ISO SHORT board, with the same method as used in step 4.

Step 7: Confirm that all calibration steps were completed, as shown in Figure 4.

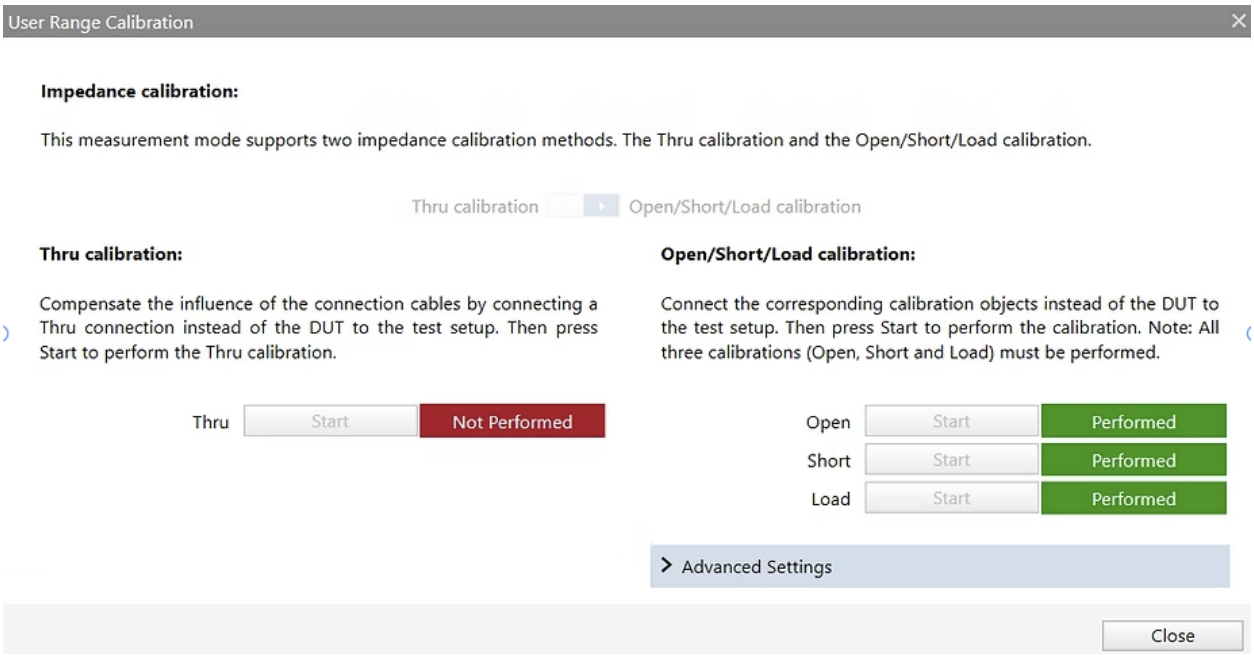

Figure 4: Completed Calibration in the Bode Analyzer Suite

Step 8: Press **Close** to exit the calibration screen.

Step 9: Use the ISO SHORT board to obtain a noise floor measurement. This should be in the 10's of micro-ohms or better (see Fig. 5).

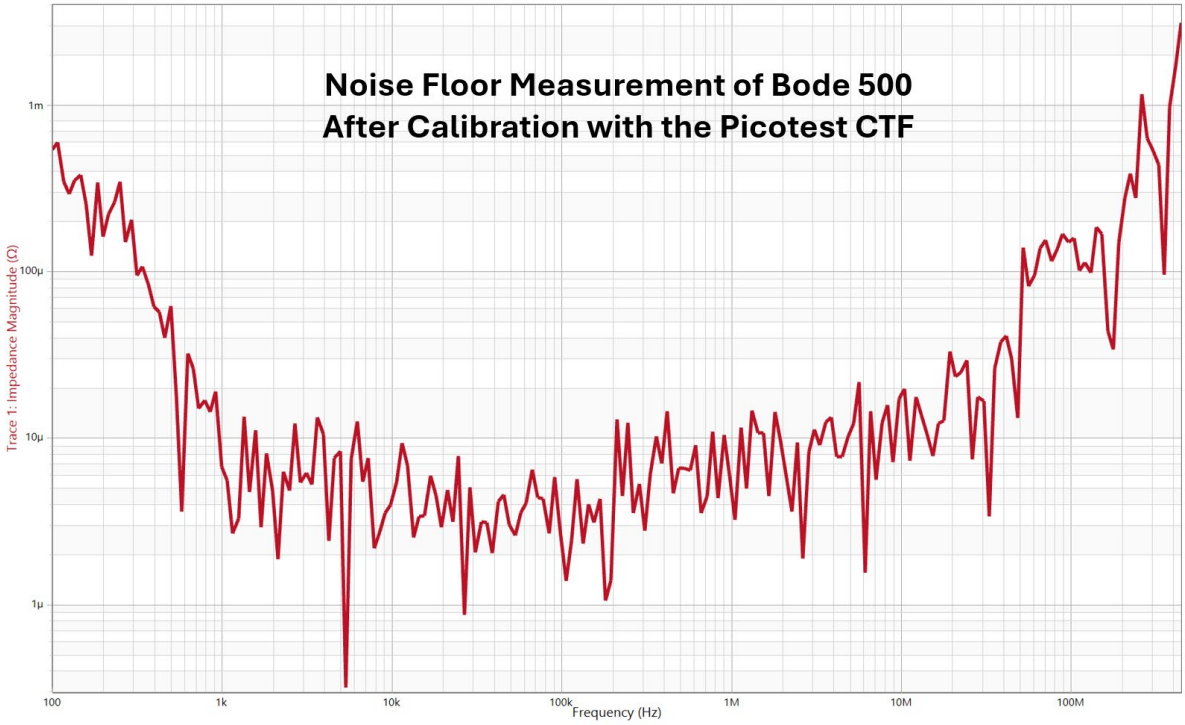

Figure 5: Noise Floor on Bode 500 After Calibrating with the CTF

Step 10: Always measure a known DUT after completing calibration to ensure you have obtained a proper calibration. Once you've confirmed your calibration, you are now ready to measure your component!

The full 2-port calibration on VNAs such as the Keysight E5061B or the Rohde & Schwarz ZNL will follow the same general steps (i.e., short, open, load for each individual port), then an additional step of a thru calibration measurement. For more detailed steps on 2-port calibration, see 2-Port Impedance Measurement using the P2102A Probe and E5061B VNA.

How to Measure a DUT Using the CTF and Bode 500

To measure a DUT, simply mount your component on a CTF mount board and press and hold this board onto the CTF, similarly to what was done during calibration (See Figure 3). Begin the sweep by going to the *Home* tab and pressing either *Continuous* or *Single*. Save your waveform by pressing *Measurement* > *New Memory* in the rightmost pane of the Bode Analyzer Suite. Ensure you hold your DUT to the CTF for the entirety of the sweep (~30 seconds).

Conclusion

The Picotest Calibration Test Fixture (CTF) simplifies and enhances the calibration and measurement workflow on VNAs, delivering faster setup times, more reliable results, and the repeatability required for confidence in analysis. By removing common sources of error, the CTF sets a new standard for impedance and 2-port calibration accuracy when measuring components. This makes it an invaluable tool for anyone working in power integrity, RF, or high-speed signal environments. In an upcoming blog post, we'll explore how the CTF DC Bias Adapter features enable accurate and convenient **DC bias measurements**, expanding its capabilities even further. Stay tuned!

References

1. Omicron Bode 500 Vector Network Analyzer | Signal Edge Solutions
2. Omicron Bode 100 Vector Network Analyzer | Signal Edge Solutions
3. 2-Port Impedance Measurement using the P2102A Probe and E5061B VNA | Signal Edge Solutions

Feature Comparison Table

Feature/Test Fixture	Component Test Fixture (CTF)	Universal Calibrator UC10	P2102A 2-Port Probe	Notes
Ease of Use	Easiest	Easier	Easy	B-TCA and CTF are used similarly, both require soldering the component to a specialized test board, as does the UC-10.
Requires Part to be mounted on specialized test board	Yes	Yes	No	The UC10 supports 0201-0603 sized parts. Other custom board sizes are available for order.
Ability to Test Different Sized Components	Yes	Yes	Yes	The UC10 supports 0201-0603 sized parts. Other custom board sizes are available for order.
Part Size limits	0201-1210, 7343, Custom	0201-1210, 7343, Custom	0402-1206, Custom	Similar sized parts can be tested (magnetics, etc.) CTF and UC share common PCB mounts. Custom mounts are availble for purchase.
Calibration Board Material	Precision HF	Precision HF	Precision HF	
Relative Accuracy	Most Accurate	Most Accurate	Most Accurate	
Absolute Accuracy (10% limit)	30pH	10pH	50pH	Floor should be an order of magnitude below nominal ESL
Impedance Floor	31pH	100fH	224pH	
Q Measurement (Imag/Real)	Limited	Limited	Limited	Since Q is a function of Tan(theta) sensitivity near 90 degrees is very high and phase error doesn't allow accurate Q. Better phase accuracy offers better Q support
Bode SPICE Model Capable	Yes	Yes	Yes	SPICE model accuracy/fidelity is a function of Absolute Accuracy
Usabiltity with other VNAs	Yes	Yes	Yes	
Calibration type supported	Impedance/SOL or full 2-port	Impedance/SOL or full 2-port	Impedance/SOL or full 2-port	Bode 100/500 does not support 2-full port calibration
Frequency Limits	DC - 3GHz+	DC - 3GHz	DC - 300MHz	1GHz for Keysight E5061B, 500 Hz minimum for DC Bias adapter usage
Base Cost	$3495 (Introductory)	$1495 (Introductory)	$2,995	
Extra Board Costs	$80	$40		
Connectors	3.5mm	3.5mm	SMA/BNC	
DC Bias Support for Capacitors	Yes, 0-75V maximum	Possible with instrument bias	Possible with instrument bias	Keysight E5061B/R&S ZNB has internal DC bias, Bode 100/500 does not Highest DC Bias in the industry
Ground Loop Isolation	Yes	External Unit Required (J2102B, etc.)	External Unit Required	
Summary	Good all around solution for measuring components, modeling and simulation correlation	Best for Bode 100/500 but requires several calibration steps, can test many parts after calibration stored	Best for browsing and quick testing, may be hard to land probe	Both CTF and UC are ideal for Bode 100/500 and both can support both Z cal and S cal without a cal kit (ideal cal thanks to matching mounts). UC consumables are more expensive because of the expensive connectors, but also highest frequency support.
Product Includes	One (1) Component Test Fixture One (1) SMA torque wrench One (1) N torque wrench Known DUT kit: One (1) 1.2nH Inductor, One (1) 50 mOhm DUT, One (1) 1 mOhm DUT, One (1) Ceramic Capacitor Impedance calibration kit: Three (3) calibration boards - to be used with Bode 100/500 2-port calibration kit: Three (3) calibration boards - to be used with E5601B and other VNAs Five (5) blank boards (0402-1206) DC Bias Adapter Two (2) PDN cables 12" BNC-SMA One (1) Molex 4-pin cable	UC10-3.5mm calibrator board 8mm SMA calibrated torque wrench One (1) blank test board – supports various sized capacitors Test board with 1.2nH + 100pH (8%) chip inductor (board can be re-used) Board holder	Probe, multiple heads, Cables	

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