Keysight Ecal Module Calibration

For the most accurate vector network analyzer (VNA) measurements, calibrate your Electronic Calibration (Ecal) Module every 12 months

Keysight offers a wide variety of Electronic Calibration Modules

What Happens Without Periodic Ecal Module Calibration?

The Ecal module is fundamentally a highly stable device. With proper use while making connections, storing, and handling, Ecal modules operate within the warranted specifications for the calibration interval. But extreme environments, excessive input, and incorrect handling degrade stability and repeatability. And connector damage can significantly impact measurement accuracy. Here are the results of a case study in which Keysight Technologies, Inc. analyzed 2,000 Ecal modules from customers:

Ecal module Out-of-Tolerances (OOTs) increase as calibration intervals increase.

Ecal units that have not been calibrated in more than three years show an OOT rate three times higher than units calibrated every 12 months. These OOTs are caused by changes in the Ecal internal standards and connector damage from incorrect handling.

VNA measurement results become inaccurate.

Figure 1 shows how an OOT Ecal module impacts VNA measurement results. The blue line shows the measurement results with a properly working Ecal module. The orange line shows the measurement results with an OOT Ecal module, which has a connector defect and has not been calibrated in five years. Note that the orange line is shifted and part of the line is outside of the Smith chart. If your VNA used this Ecal module, your measurement results might have significant error.
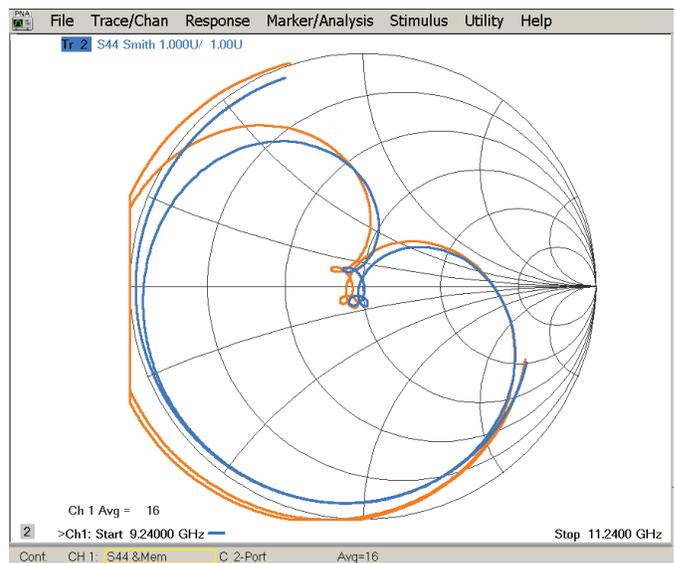

Figure 1. Smith chart showing Ecal modules within tolerance and out-of-tolerance.

Why Calibrate Your Ecal Module Every 12 Months?

During VNA measurements, the Ecal module calibration routine computes the error terms using factory or service center characterization data stored in the Ecal module memory. Accuracy of the characterization data determines the uncertainties of your VNA measurement results. For precise characterization and connector maintenance, Keysight recommends calibrating the Ecal module every 12 months.

Update the Ecal module with precise characterization data.

Characteristics of the Ecal module impedance standards change due to aging, drift, and other factors. To meet the Ecal performance specification, it's critical to periodically update the S-parameter data of the impedance standards stored in the Ecal internal memory.
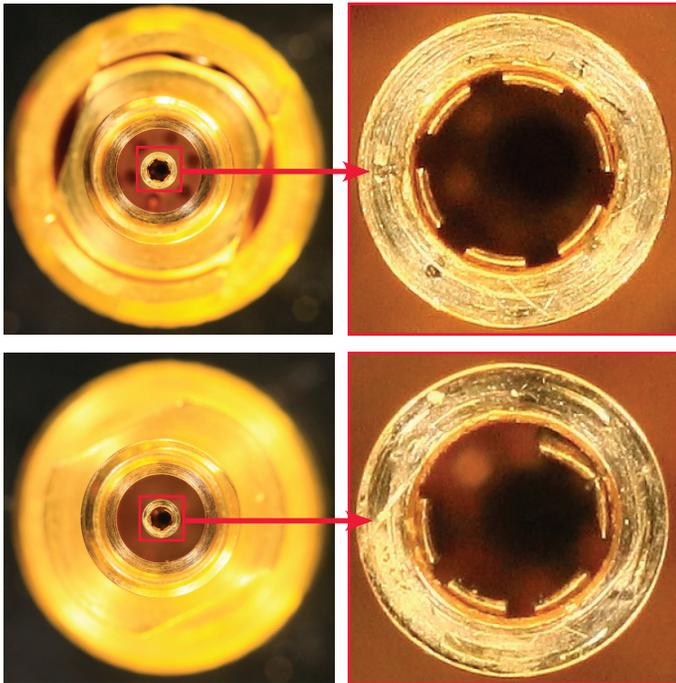

Figure 2. The upper photos show a connector in proper condition. The lower photos show a connector with one damaged and one missing finger. To learn more about connector care, check the Connector Care Quick Reference Card (**http://literature.cdn.keysight.com/litweb/pdf/08510-90360.pdf**).

Maintain connectors in top condition

Defective or damaged connectors degrade Ecal performance—and in turn, degrade your measurement results. Figure 2 shows an example of a damaged connector. During calibration service, Keysight technicians inspect connectors visually, mechanically, and electrically, and then clean them. The result: Confidence in your VNA measurements.

The Advantages of Ecal Module Calibration from Keysight

- Provides the most accurate characterization data
- Updates the data stored in the Ecal internal memory
- Checks stability and repeatability of measurements
- Inspects connectors visually, mechanically, and electrically
- Adjusts pin depth, and replaces inner contact (if damaged)
- Verifies previous measurements (if the received data do not satisfy the Ecal specification)

To avoid getting false passes and false failures during VNA measurements, calibrate your Ecal module every 12 months.

Contact Keysight to schedule service.

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