COPPER MOUNTAIN
TECHNOLOGIES

Automatic Calibration Modules

Performance Test Manual

Version October, 2015

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The Planar automatic calibration modules are designed for calibration of vector network analyzers (Analyzer) in fully automatic mode. Except as noted, all models are referred to interchangeably in this document as "the Module". The Module switches to the impedance states one by one in the process of calibration. The Analyzer calibration coefficients are calculated using the measured S-parameters of the Module impedance states and the data stored in the Module memory.

Table 1 The Module hardware configurations

Model	Connector type	Zo, [Ohm]	Upper frequency, [MHz]
ACM6000T - 011	type N, female – type N, female	50	6000
ACM6000T - 012	type N, male – type N, female	50	6000
ACM6000T - 111	3.5 mm, female – 3.5 mm, female	50	6000
ACM6000T - 112	3.5 mm, male – 3.5 mm, female	50	6000
ACM8000T - 011	type N, female – type N, female	50	8000
ACM8000T - 012	type N, male – type N, female	50	8000
ACM8000T - 111	3.5 mm, female – 3.5 mm, female	50	8000
ACM8000T - 112	3.5 mm, male – 3.5 mm, female	50	8000
ACM4000T - 511	type N (75 Ohm), female – type N (75 Ohm), female	75	4000
ACM4000T - 512	type N (75 Ohm), male – type N (75 Ohm), female	75	4000

The Module's recommended performance test interval is once each year.

1 SAFETY INSTRUCTIONS

Carefully read through the following safety instructions before starting the performance test of the Module. The Module must be used only by skilled and specialized staff or thoroughly trained personnel with the required skills and knowledge of safety precautions.

The Module complies with INSTALLATION CATEGORY II as well as POLLUTION DEGREE 2 as defined in IEC61010–1. The Module is a MEASUREMENT CATEGORY I (CAT I). Do not use the Module as a CAT II, III, or IV device.

The Module is for INDOOR USE only.

The Module has been tested as a stand-alone device and in combination with the accessories supplied by Copper Mountain Technologies, in accordance with the requirements of the standards described in the Declaration of Conformity. If the Module is integrated with another system, compliance with related regulations and safety requirements are to be confirmed by the builder of the system.

- NEVER OPERATE THE MODULE IN THE ENVIRONMENT CONTAINING INFLAMMABLE GASSES OR FUMES.
- OPERATORS MUST NOT REMOVE THE COVER OR ANY PART OF THE HOUSING. THE MODULE MUST NOT BE REPAIRED BY THE OPERATOR. COMPONENT REPLACEMENT OR INTERNAL ADJUSTMENT MUST BE PERFORMED BY QUALIFIED MAINTENANCE PERSONNEL ONLY.

Electrostatic discharge can damage the Module when connected or disconnected from other devices. Static charge can build up on the operator's body and damage the sensitive circuits of internal components of the Module. To avoid damage from electric discharge, do the following:

- ALWAYS USE A DESKTOP ANTISTATIC MAT UNDER THE DUT.
- ALWAYS WEAR A GROUNDING WRIST STRAP CONNECTED TO THE DESKTOP ANTISTATIC MAT VIA DAISY - CHAINED 1 MΩ RESISTOR.

Observe all general safety precautions related to operation of electrically energized equipment.

2 PERFORMANCE TESTS

A list of the performance tests is contained in Table 2.

Table 2

Test Description	Section
VISUAL INSPECTION	6.1
Gaging Connectors	6.2
Performance verification tests	6.3
Parameters stability and connectors repeatability test	6.3.1
Effective parameters test	6.3.2

IF THE MODULE FAILS ANY OF THE TESTS LISTED IN TABLE 2, DO NOT CONDUCT FURTHER TESTS. ISSUE A NON-COMPLIANCE NOTICE.

UPON COMPLETION OF THE PERFORMANCE TEST, VISUALLY CHECK THE TEST PORT CONNECTORS OF THE MODULE UNDER TEST FOR ANY CONTAMINATION AND DAMAGE. IF FOREIGN PARTICLES ARE OBSERVED, CLEAN THE CONNECTORS.

3 TEST EQUIPMENT

The equipment required for performance testing is listed in Table 3.

Table 3

Test Equipment and Specifications
Copper Mountain Technologies Planar 804/1 Vector Network Analyzer: frequency range 100 kHz to 8 GHz.
For verification to "Grade A" specifications, a SOLT Calibration Kit with data-based calibration standard definitions, or TRL Calibration Kit is required with performance as follows: Upper operating frequency ≥8 GHz for verification of the Module with 50 Ohm connectors. Upper operating frequency ≥4 GHz for verification of the Module with 75 Ohm connectors. The effective system data are established after performing a suitable system error calibration of the vector network analyzer: for 50 Ohm kit: - directivity ≥ 47 dB; - source match ≥ 40 dB; - load match ≥ 47 dB; - reflection tracking ≤ 0.04 dB; - transmission tracking ≤ 0.06 dB. for 75 Ohm kit - directivity ≥ 42 dB; - source match ≥ 39 dB; - load match ≥ 42 dB; - reflection tracking ≤ 0.10 dB; - transmission tracking ≤ 0.10 dB. Individual standard requirements for a SOLT Calibration Kit: for 50 Ohm kit / for 75 Ohm kit - Matched Load: max reflection coefficient: 0.05 (-26 dB) / 0.05 (-26 dB) magnitude measurement uncertainty: ≤ 0.0044 (47 dB) / ≤ 0.0080 (42 dB) - Open and Short: phase difference between Open and Short: (180 ± 30) degree / (180 ± 30) degree magnitude / phase measurement uncertainty: ≤ 0.008 / 0.5 degree / ≤ 0.012 / 0.7 degree Recommended number of points of data-based definitions is 1,601 in the frequency range from 300 kHz to 8 GHz for verification of the Module with 50 Ohm connectors, and from 300 kHz to 4 GHz for verification of the Module with 75 Ohm connectors. For verification to "Grade B" specifications, a kit including a precision sliding load is required. For verification to "Grade C" specifications, a precision SOLT Calibration Kit with polynomial coefficients is required.
Connector Gage Kit for gaging type N, type N (75 Ohm) or 3.5 mm connectors depending on the Module hardware configurations: accuracy ±5 μm.

Test Equipment and Specifications
Torque wrench with a torque range: - from 1.1 to 1.7 Nm for type N connectors (50 and 75 Ohm); - from 0.8 to 1.0 Nm for 3.5 mm connectors.
Phase- and amplitude-stable test cable (RF cable): Upper operating frequency ≥8 GHz for verification of the Module with 50 Ohm connectors. Upper operating frequency ≥4 GHz for verification of the Module with 75 Ohm connectors.
Coaxial adapters with metrology grade connectors from type N, male to type N or 3.5 mm (compatible connector type depending on the Module hardware configurations).
Copper Mountain Technologies 8AP50NM75NF Impedance Matching Pad: DC frequency range up to 8 GHz, type N, male – type N (75 Ohm), female connectors.
Wrench (spanner) which fits devices to be connected.
Personal Computer (PC): Windows XP / VISTA/ 7/ 8, processor 1 GHz, memory 1 GB, interface USB 2.0.

ALL THE TEST EQUIPMENT SHALL BE VERIFIED AND HAVE VALID VERIFICATION OR CALIBRATION CERTIFICATES.

EQUIPMENT SIMILAR TO THAT LISTED CAN BE USED PROVIDED THE SPECIFICATIONS SHOWN IN THE TABLE ARE SATISFIED.

4 AMBIENT CONDITIONS

Execute the performance tests under the following ambient conditions:

- Ambient temperature must be maintained within the range over which the calibration standards maintain conformance to their specifications (e.g. +20°C to +26°C), or the error-corrected range, over which the network analyzer maintains its specified performance while corrections are turned on (e.g. ±1°C of measurement calibration temperature) whichever is more strict.
- Relative air humidity: ≤80 % at 25 °C;
- Atmospheric pressure: 630 to 800 mm Hg.

5 PREPARATION FOR TEST

Verification personnel should thoroughly read and understand the manuals of the Module and test equipment to be used.

Confirm the required test environment is available.

Keep the Module in an off state for at least two hours in the test ambient conditions if it was stored in conditions other than those specified.

Visually check the calibration kit standards for contaminated or damaged connectors. If necessary perform gaging of the standards' connectors.

DO NOT USE DEVICES IF ANY DAMAGE OR IMPROPER MATING DIMENSIONS ARE OBSERVED.

Test equipment should be properly grounded and warmed up for the times specified in the corresponding manuals.

6 PERFORMANCE TEST PROCEDURE

The Module performance verification can be automated using "Calibration Verification" software program (in this document as "performance test program") contained in the firmware of the Analyzer produced by Copper Mountain Technologies.

Click the [System, Misc Setup, Calibration Verification] softkeys of the Analyzer software. The performance test program will be started. Summary description of the program is given in Appendix A.

The verification procedure consists of calibrating the stable vector network analyzer with a precision calibration kit and the Module, and definition of analyzer calibration coefficients (error terms) twice. The difference between calibration coefficients obtained after performing two calibrations must fall within the total uncertainty limits at all frequencies for test to pass. The total uncertainty limits are the sum of the measurement uncertainties for the calibration standards and the uncertainties associated with the Module being verified. The calibration standards data must be provided with the calibration kit and has a traceable path to national standards.

6.1 VISUAL INSPECTION

6.1.1 Check the Module under test for missing accessories in accordance with the Module operating manual.

6.1.2 Check the Module connectors (PORT A and PORT B) for contamination. If necessary, clean the connectors as described below:

• Clean the connector surfaces shown by arrows in figure 1 with a lint-free cotton swab dampened with isopropyl alcohol.

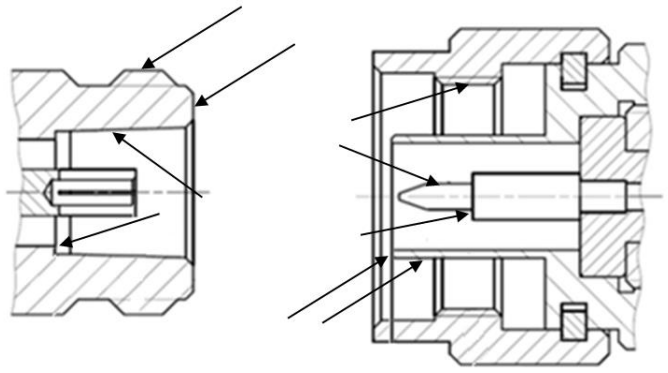


Figure 1. Type N, female (left); type N, male (right) connectors

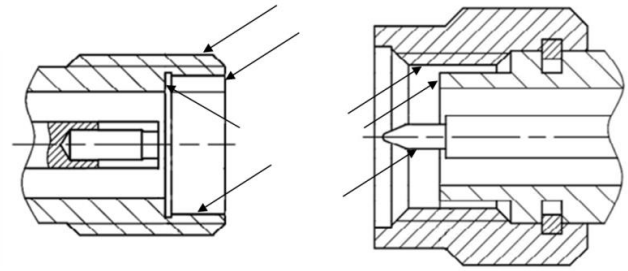


Figure 2. 3.5 mm, female (left) and 3.5 mm, male (right) connectors

- Air-blow other inner surfaces of the connector.
- Dry the connector making sure that there is no alcohol inside.
- Check the connector for any contamination again.
- Clean again if necessary.

DO NOT USE ANY METAL OBJECTS TO CLEAN THE CONNECTORS.

6.1.3 Check the connectors for mechanical damage (dents or irregularities on the inner and outer conductors).

6.1.4 Check the Module housing for mechanical damage and loose components (check for any sound while rotating the Module), traces of corrosion on metal parts, damaged coatings, or illegible markings.

6.1.5 Check the USB cable for damage.

THE TEST IS CONSIDERED TO BE PASSED:

- The Module has all accessories listed in the operation manual.
- The connectors do not have any mechanical damage.
- There are no deep scratches or dents in the Module housing.
- There is no sound in the housing from loose components.
- There is no evidence of metal corrosion.
- The coatings are not damaged.
- The label markings are legible.
- The USB cable is not damaged.

DO NOT PERFORM FURTHER PERFORMANCE TESTS WITH THE MODULES THAT HAVE DEFECTS SUCH AS MECHANICAL DAMAGE OR ARE MISSING COMPONENTS. SUCH DEVICES SHOULD BE DISCARDED OR SENT FOR REPAIR.

6.2 Gaging Connectors

6.2.1 To perform connector gaging of the Module, use an appropriate Gage for the complimentary gender including a block or another available common gage set designed for gaging type N (50 and 75 Ohm) or 3.5mm connectors. Follow the gaging procedures specified in the manual to the gage set you are using.

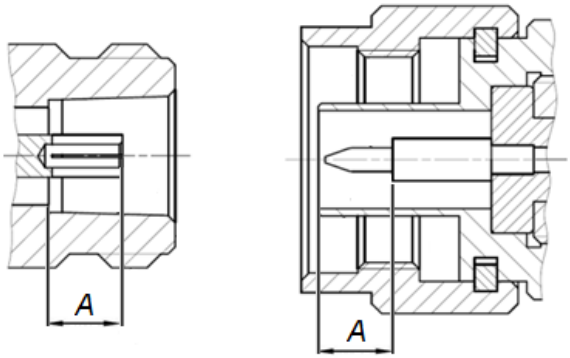


Figure 3. Type N, female (left) and type N, male (right) connectors

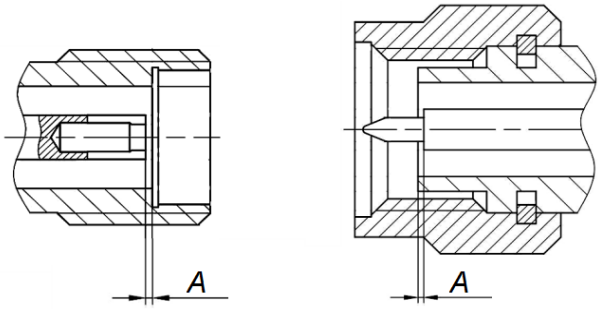


Figure 4. 3.5 mm, female (left) and 3.5 mm, male (right) connectors

6.2.2 Note that normally, gages are intended for preventive maintenance and trouble-shooting purposes only. Such connector gages are only capable of performing coarse measurements. However, with proper technique, the gages are useful in detecting gross pin depth errors in connectors of the Module. To reduce random errors and achieve maximum accuracy, take the average of several measurements made with different gage orientations to the connector.

6.2.3 Enter the measured values in Table 4

Table 4. Gaging connectors

Port	Lower limit [mm]	Measured value [mm]	Upper limit [mm]
type N, male	5.28		5.36
type N, female	5.18		5.26
type N (75 Ohm), male	5.28		5.36
type N (75 Ohm), female	5.18		5.26
3.5 mm, male	-0.08		+0.08
3.5 mm, female	-0.08		+0.08

THE TEST IS CONSIDERED TO BE PASSED IF THE MEASURED VALUES OF THE MODULE CONNECTORS FOR BOTH PORTS ARE WITHIN THE SPECIFICATIONS INDICATED IN TABLE 4.

6.3 Performance Verification

Connect the Module under test to the PC using the USB cable. Allow the Module a 15 minute warm-up time before starting performance verification tests. Allow the Analyzer time to warm up in accordance with its operating manual.

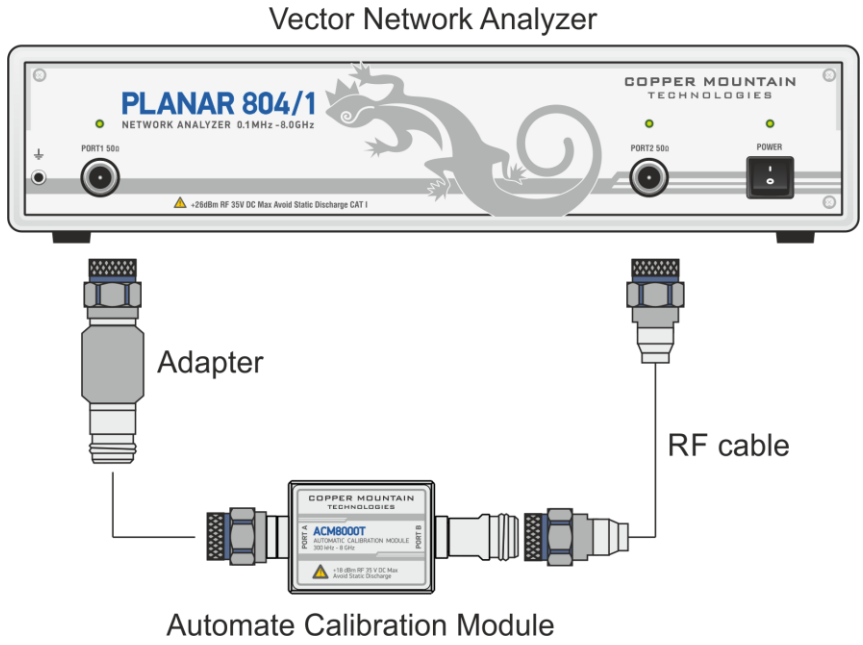
To start the performance test program contained in the firmware of the Analyzer click the [System, Misc Setup, Calibration Verification] softkeys of the Analyzer software.

6.3.1 Parameters stability and connectors repeatability test

6.3.1.1 Connect the Module to the Analyzer. Refer to the measurement setup in Figure 5 or Figure 6.

IF POSSIBLE, CONNECT ONE PORT OF THE MODULE DIRECTLY TO THE ANALYZER, WITHOUT AN RF CABLE, BUT INSTEAD BY USING A METROLOGY GRADE ADAPTER.

ON THE SECOND SIDE OF THE MODULE UNDER TEST, USE AN ADDITIONAL METROLOGY GRADE ADAPTER CONNECTED TO AN RF CABLE (REFER TO THE MODULE HARDWARE CONFIGURATIONS, TABLE 1).



(additional adapter connected to RF cable is not shown)

Figure 5. Typical measurement setup for verification of the Module with 50 Ohm connectors

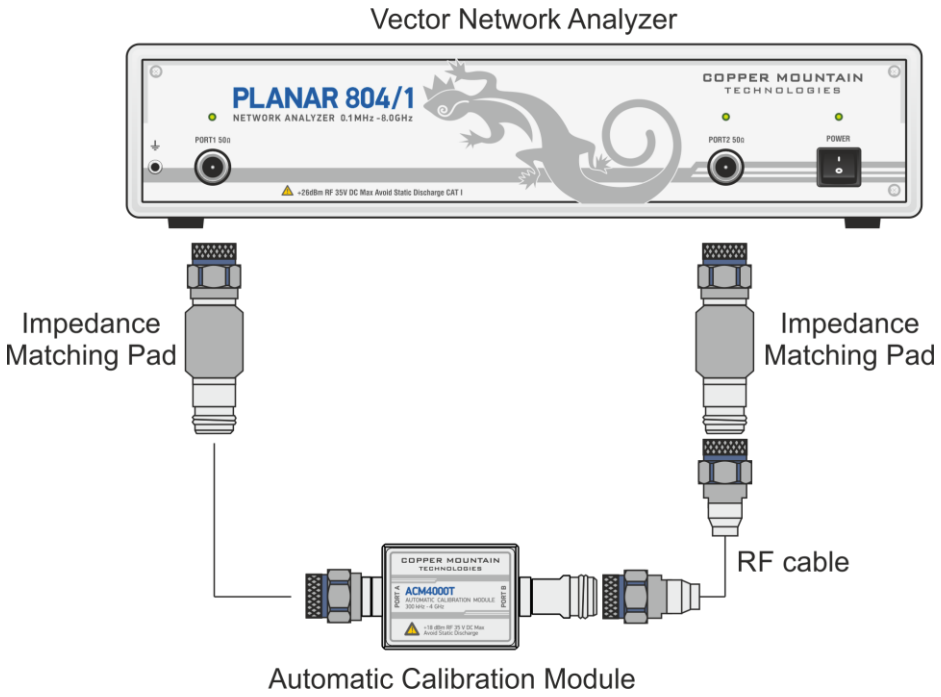


Figure 6. Typical measurement setup for verification of the Module with 75 Ohm connectors

To achieve maximum measurement repeatability, connect the devices as follows:

- Carefully align the connectors of the devices being connected.
- Rotate the nut of the male connector allowing the threads to engage so that the inner conductor of the male connector was inside the inner conductor of the female connector (see figure 7).
- Tighten with light finger pressure avoiding rotation of the mating planes at the same time.

WARNING! ROTATE THE NUT OF THE MALE CONNECTOR ONLY. AVOID ROTATION OF THE DEVICES.

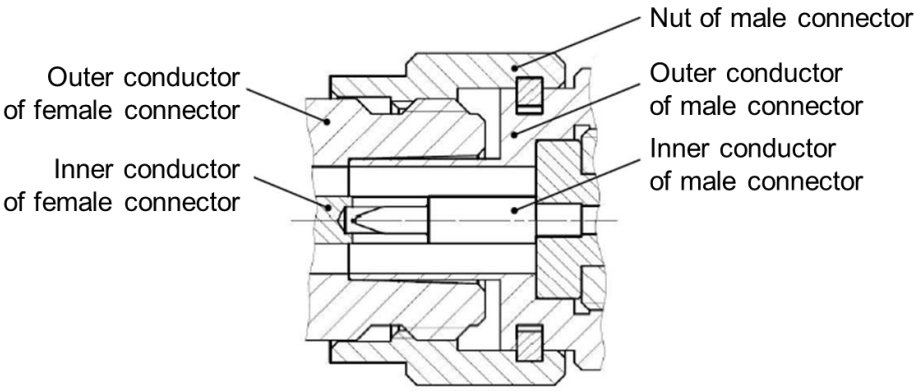


Figure 7. Connection example

- Use a torque wrench to tighten the male connector nut. Use a spanner to prevent the connected devices from rotation.

Disconnect the connectors in reverse order. When loosening or disconnecting the male connector nut, hold the device being disconnected to prevent its inner conductor from being damaged. Anytime the cable is repositioned, allow some time for it to relax internally and achieve a stable state before measuring. Ten seconds is usually sufficient.

6.3.1.2 Preset the Analyzer [System, Preset, Ok]. Perform the settings on the Analyzer listed in Table 5.

Table 5. The Analyzer settings during verification

The Analyzer settings	Values for verification of the Module with 50 Ohm connectors	Values for verification of the Module with 75 Ohm connectors
frequency range	ACM Specified Frequency Range	
IF bandwidth	300 Hz	300 Hz
number of measurement points	1601	1601
output power level	-5 dBm	0 dBm

6.3.1.3 Click the [AutoCal, Start] softkeys of the performance test program for verified calibration. The verification calibration program can be found in [System, Misc. Setup, Calibration Verification]. Wait until the Analyzer calibration in fully automatic mode is complete. After calibration, save data file with the Analyzer settings and calibration coefficients clicking the [Save/Recall, Save State, File] softkeys of the Analyzer software. Name the saved file "acm.sta".

6.3.1.4 Disconnect both ports of the ACM and then reconnect it in the same orientation. Perform second-tier calibration clicking [AutoCal, Start] softkeys of the performance test program for reference calibration with checked "Second-Tier" checkbox. Do not move RF cable during calibration.

VERIFIED AND REFERENCE CALIBRATION SHOULD BE PERFORMED SEQUENTIALLY WITHOUT LONG INTERRUPTION.

6.3.1.5 When verified and reference calibrations are complete, verify that the Module parameters listed in Table 6 are within the stability limits in the operating frequency range. See Figures 8 and 9 for examples of measurement results obtained with the performance test program. Enter measured values (the closest to stability limit) into the corresponding cell of the Table 6.

Table 6

Parameter	Lower stability limit [dB]	Measured value [dB]	Upper stability limit [dB]
for the Module with 50 Ohm connectors			
directivity	–		-55
reflection tracking	-0.03		0.03
transmission tracking	-0.03		0.03
for the Module with 75 Ohm connectors			
directivity	–		-45
reflection tracking	-0.05		0.05
transmission tracking	-0.05		0.05

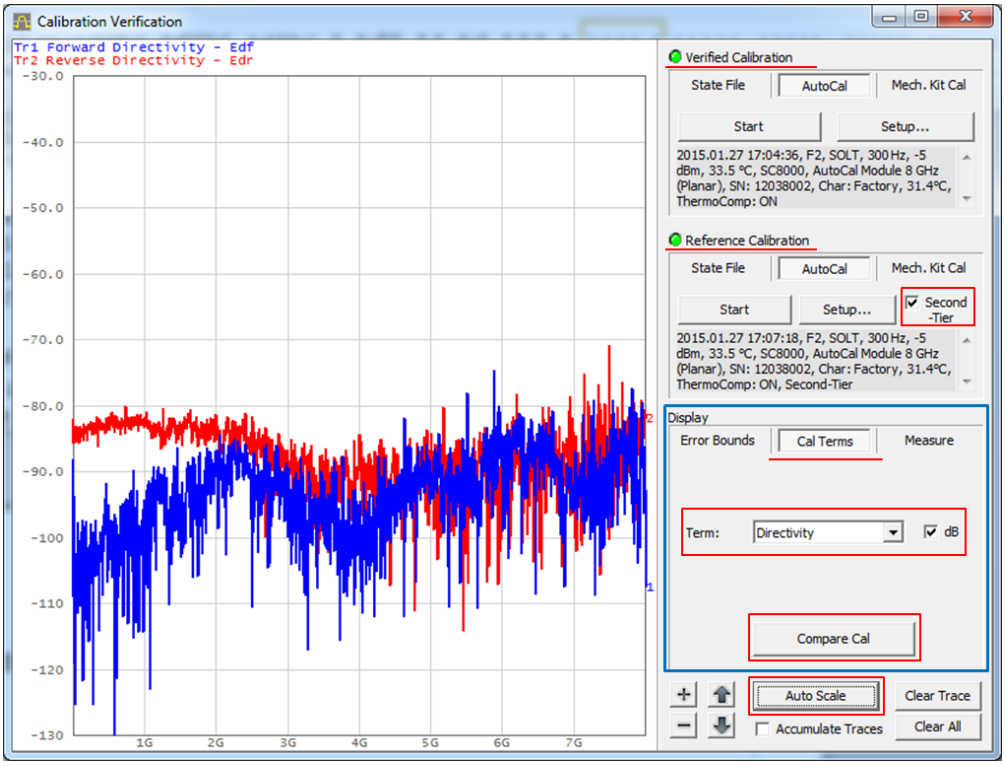


Figure 8. Typical directivity stability

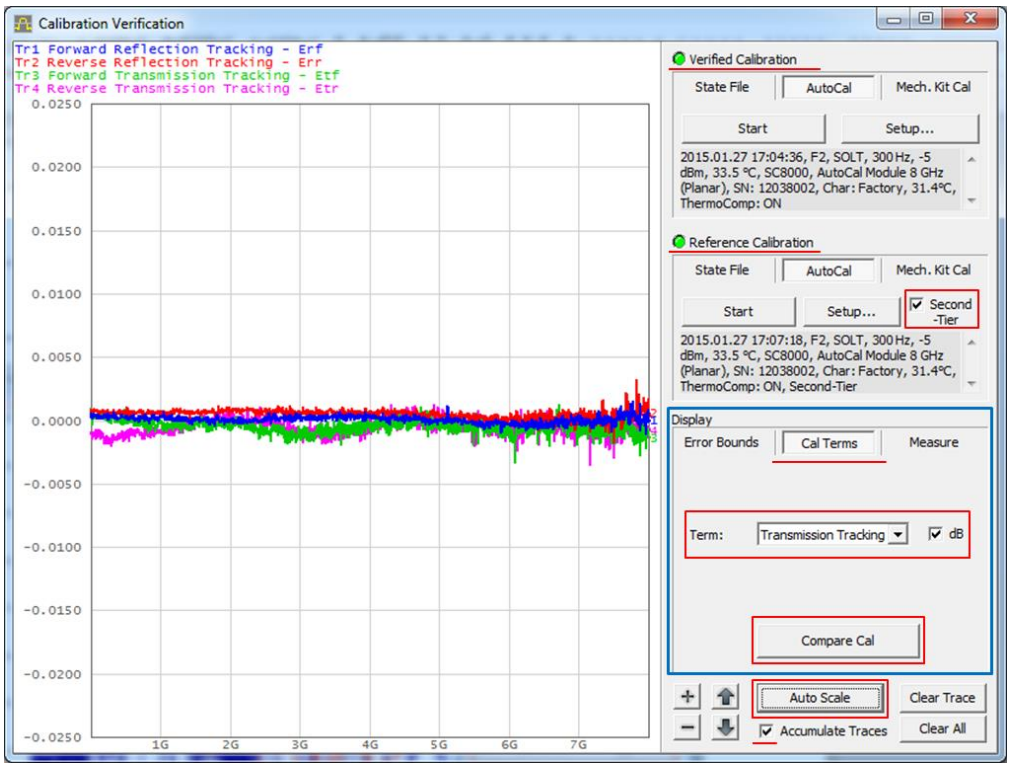


Figure 9. Typical reflection and transmission stabilities

6.3.1.6 Disconnect the Module, rotate the Module approximately 120°, and connect it back. Again perform second-tier calibration clicking [AutoCal, Start] softkeys of the performance test program for reference calibration with checked "Second-Tier" checkbox. After calibration, check that the Module parameters listed in Table 6 are within the stability limits (connectors repeatability is acceptable).

RECONNECTION OF THE MODULE SHOULD BE PERFORMED WITH MINIMAL CHANGES IN THE POSITION OF RF CABLE.

6.3.1.7 Repeat 6.3.1.6 once more.

THE TEST IS CONSIDERED TO BE PASSED IF IN ALL CASES THE MODULE PARAMETERS STABILITIES ARE WITHIN THE SPECIFICATIONS INDICATED IN TABLE 6.

6.3.2 Effective parameters test

6.3.2.1 Prepare the calibration kit shown in Table 2 for operation in accordance with his operating manual. It is recommended to check the calibration kit definition (all standards of the kit) in the Analyzer software against the kit documentation. Add any definitions which are not available in the Analyzer software. For more details about calibration kit management please refer to the Analyzer operating manual.

6.3.2.2 Disconnect the Module from the Analyzer (refer to the measurement setup in Figure 5 or Figure 6). Go to the Analyzer software. Perform full 2-port calibration with the kit using menu Calibration.

CONNECTION OF THE CALIBRATION KIT STANDARDS SHOULD BE PERFORMED WITH MINIMAL CHANGES IN THE POSITION OF RF CABLE.

USE A TORQUE WRENCH TO TIGHTEN THE MALE CONNECTOR NUT. USE A SPANNER TO PREVENT THE CONNECTED DEVICES FROM ROTATION.

IT'S RECOMMENDED TO PERFORM SOLR FULL TWO-PORT CALIBRATION FOR VERIFICATION OF THE MODULE WITH THE SAME CONNECTORS TYPE (E.G. FOR FEMALE-FEMALE OR MALE-MALE PORT CONNECTORS) IF USING A KIT WITH DATA-BASED CALIBRATION STANDARD DEFINITIONS.

6.3.2.3 After calibration, save data file with the Analyzer settings and calibration coefficients clicking the [Save/Recall, Save State, File] softkeys. Name the saved file "kit.sta".

6.3.2.4 Return to the performance test program. Load "acm.sta" file for verified calibration and "kit.sta" file for reference calibration.

6.3.2.5 Perform calibration comparison, verify that the Module parameters listed in Table 7, Table 8, or Table 9, are within the total uncertainty limits in the operating frequency range for Grade A, Grade B, or Grade C respectively. See Figures 11 and 12 for examples of measurement results obtained with the performance test program. Enter measured values (the closest to limit) into the corresponding cell of the Table.

To determine effective directivity, source match and reflection tracking, choose Cal Terms tab, select the term from dropdown menu, and push **Compare Cal** softkey in the performance test program.

To determine effective transmission tracking, choose Error Bounds tab, select S21 & S12 from Error Bound dropdown menu, select Matched Line from DUT Class dropdown menu, Bounds to dB checkbox is active, and push **Compare Cal** softkey.

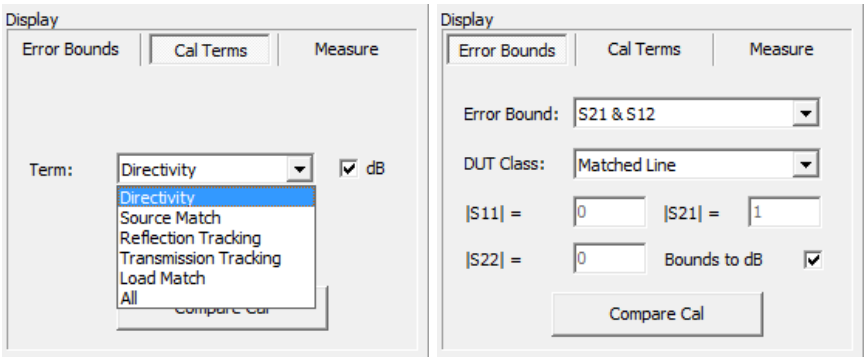


Figure 10. Display group settings during effective parameters determination

Table 7 - Verification Criteria "Grade A"

Effective parameter	Lower total uncer-tainty limit [dB]	Measured value [dB]	Upper total uncer-tainty limit [dB]
for Modules with 50 Ohm connectors			
directivity	–		-44
source match	–		-37
reflection tracking	-0.06		0.06
transmission tracking	-0.08		0.08
for Modules with 75 Ohm connectors			
directivity: 300 kHz to 1 MHz 1MHz to 4 GHz	–		 -37 -39
source match: 300 kHz to 1 MHz 1MHz to 4 GHz	–		 -34 -36
reflection tracking: 300 kHz to 1 MHz 1MHz to 4 GHz	 -0.20 -0.15		 0.20 0.15
transmission tracking: 300 kHz to 1 MHz 1MHz to 4 GHz	 -0.20 -0.15		 0.20 0.15

Table 8 – Verification Criteria "Grade B"

Effective parameter	Lower total uncer-tainty limit [dB]	Measured value [dB]	Upper total uncer-tainty limit [dB]
for Modules with 50 Ohm connectors			
directivity	–		-42
source match	–		-35
reflection tracking	-0.10		0.10
transmission tracking	-0.08		0.08
for Modules with 75 Ohm connectors			
directivity: 300 kHz to 1 MHz 1MHz to 4 GHz	–		 -35 -37
source match: 300 kHz to 1 MHz 1MHz to 4 GHz	–		 -32 -34
reflection tracking: 300 kHz to 1 MHz 1MHz to 4 GHz	 -0.30 -0.25		 0.30 0.25
transmission tracking: 300 kHz to 1 MHz 1MHz to 4 GHz	 -0.30 -0.25		 0.30 0.25

Table 9 – Verification Criteria "Grade C"

Effective parameter	Lower total uncer-tainty limit [dB]	Measured value [dB]	Upper total uncer-tainty limit [dB]
for Modules with 50 Ohm connectors			
directivity	–		-38
source match	–		-31
reflection tracking	-0.15		0.15
transmission tracking	-0.10		0.20
for Modules with 75 Ohm connectors			
directivity: 300 kHz to 1 MHz 1MHz to 4 GHz	–		 -31 -33
source match: 300 kHz to 1 MHz 1MHz to 4 GHz	–		 -28 -30
reflection tracking: 300 kHz to 1 MHz 1MHz to 4 GHz	 -0.40 -0.30		 0.40 0.30
transmission tracking: 300 kHz to 1 MHz 1MHz to 4 GHz	 -0.40 -0.30		 0.40 0.30

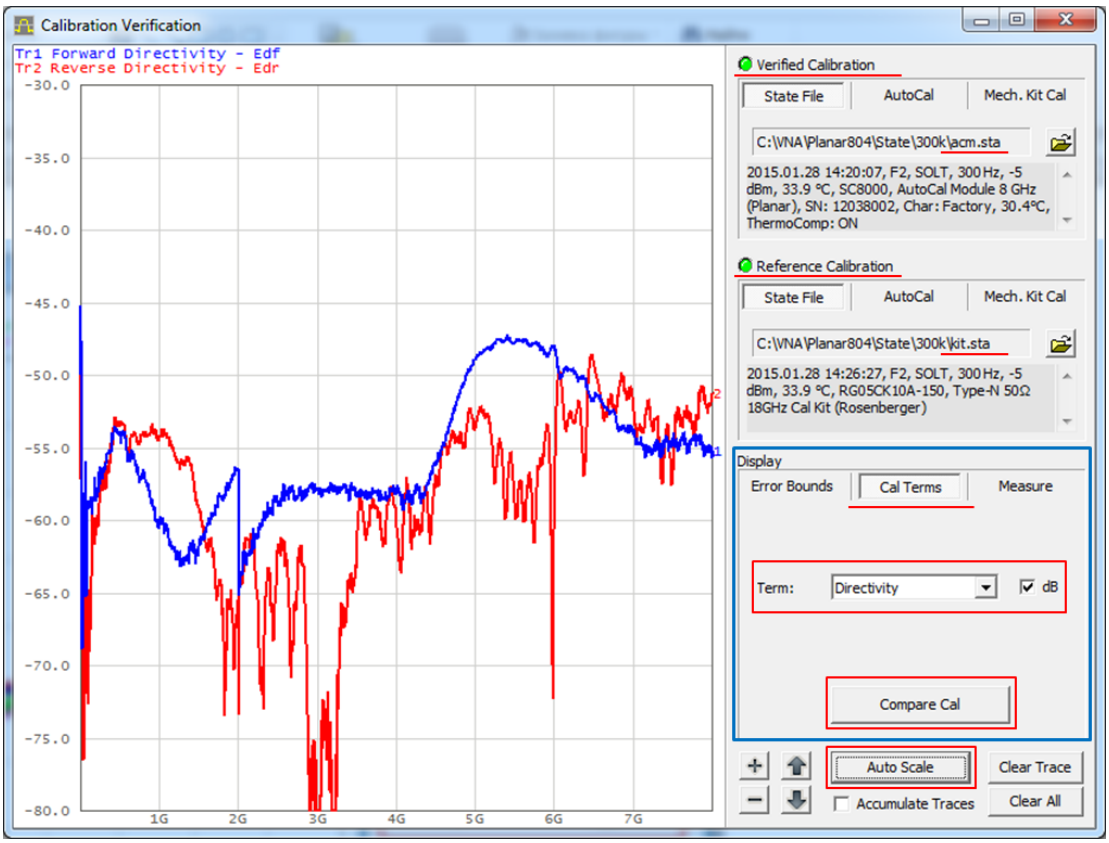


Figure 11. Typical effective directivity

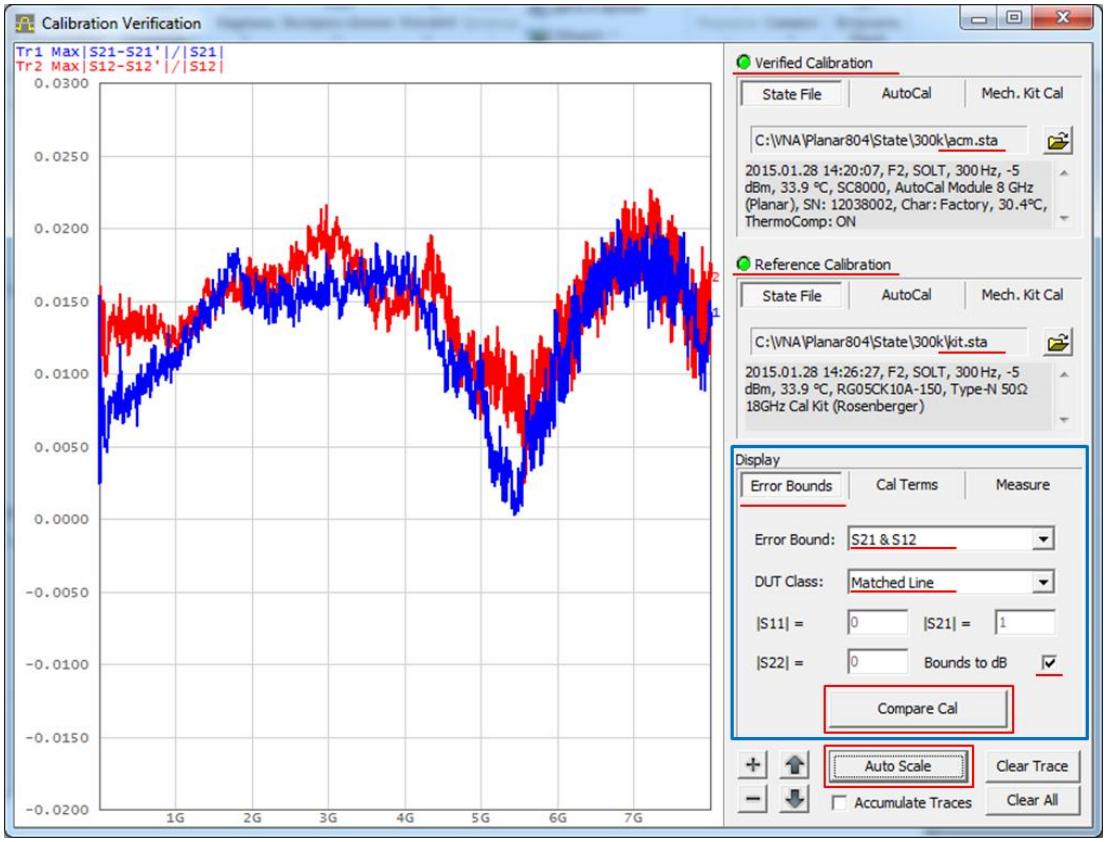


Figure 12. Typical effective transmission tracking

If measurement results do not fall within the total uncertainty limits, perform the Analyzer calibration with the kit and the Module consistently once more, and save state files. Execute calibration comparison again.

It's recommended verify connectors of all devices for contamination and mechanical damage, and perform the calibration kit stability test (refer to Appendix B).

THE TEST IS CONSIDERED TO BE PASSED IF THE MEASURED EFFECTIVE PARAMETERS ARE WITHIN THE SPECIFICATIONS INDICATED IN TABLE 7, TABLE 8, OR TABLE 9, FOR GRADE A, GRADE B, OR GRACE C VERIFICATION RESPECTIVELY.

7 PERFORMANCE TEST REPORTS

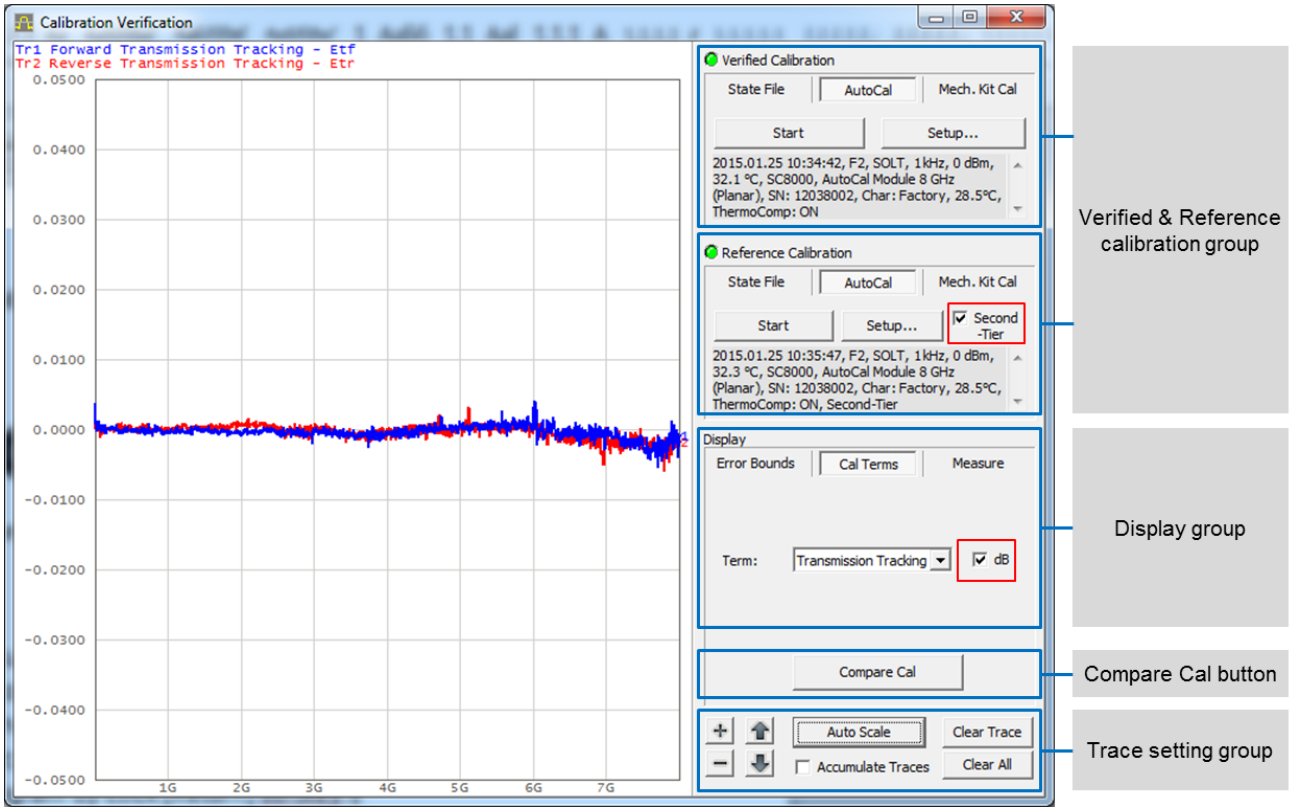
Performance test reports are to be filled in during execution of the test procedure.

If the test is passed, a performance test certificate is issued.

If the Module has failed the performance test, the previous performance test certificate is cancelled and a non-compliance notice stating the reasons for test failure is issued.

Appendix A - Calibration Verification program

Summary description for the verification procedure



TO CALCULATE AN EFFECTIVE ERROR TERMS IT'S NECESSARY TO PERFORM TWO ANALYZER ERROR CALIBRATION CONSISTENTLY USING VERIFIED AUTOMATIC CALIBRATION MODULE AND A REFERENCE CALIBRATION KIT, OR LOAD DATA FROM STATE FILES CONTAINING CALIBRATION COEFFICIENTS WITH THE SAME ANALYZER SETTINGS.

Verified & Reference calibration group:

State file – calculation Analyzer error terms using data file (*.sta) saved after performing calibration.

AutoCal – calibration is performed with a Module (automatic mode), then Analyzer error term is determinated.

Mech. Kit Cal – calibration is performed with a kit (manual mode), then Analyzer error term is determinated.

When calibration was done brief information about Analyzer settings and kit appears in the text area.

If Second-Tier checkbox is checked reference calibration will be performed with a calibration coefficients obtained after first verified calibration (second-tier Analyzer error correction).

Light green indicator demonstrates calibration was done.

Display group allows you to select type of the error bounds or effective error term that will be displayed on the graph as well as choose units with a dB checkbox.

Compare Cal – button for calculation effective error terms after performing two calibration of the Analyzer: verified and reference.

Trace setting group – scaling, cleaning or accumulation of traces shown on the graph.

Appendix B - Calibration kit stability test

Verification steps

Prepare the calibration kit for operation in accordance with his operating manual. It is recommended to check the calibration kit definition (all standards of the kit) in the Analyzer software against the kit documentation. Add any definitions which are not available in the Analyzer software. For more details about calibration kit management please refer to the Analyzer operating manual.

Perform two sequential full 2-port calibrations with the kit using menu Calibration in the Analyzer software. Refer to the measurement setup in Figure 5 or Figure 6 (do not connect the Module). Save each calibration result as a state file (*.sta) clicking the [Save/Recall, Save State, File] softkeys. Name the saved files kit1.sta and kit2.sta respectively.

Compare the two calibrations using the performance test program. Load "kit1.sta" file for verified calibration and "kit2.sta" file for reference calibration. Verify that the kit parameters listed in Table 1 are within the stability limits.

Table 1

Parameter	Lower stability limit [dB]	Measured value [dB]	Upper stability limit [dB]
for the kit with 50 Ohm connectors			
directivity	–		-60
source match	–		-60
reflection tracking	-0.03		0.03
transmission tracking	-0.03		0.03
for the kit with 75 Ohm connectors			
directivity	–		-50
source match	–		-50
reflection tracking	-0.05		0.05
transmission tracking	-0.05		0.05

To determine directivity, source match and reflection tracking stability, choose Cal Terms tab, select the term from dropdown menu, and push **Compare Cal** softkey in the performance test program.

To determine effective transmission tracking stability, choose Error Bounds tab, select S21 & S12 from Error Bound dropdown menu, select Matched Line from DUT Class dropdown menu, Bounds to dB checkbox is active, and push **Compare Cal** softkey.

If measurement results do not fall within the stability limits, repeat the test. Execute calibration comparison again. Previously, verify connectors of all devices for contamination and mechanical damage, and confirm the required test environment is available.

THE TEST IS CONSIDERED TO BE PASSED IF THE KIT PARAMETERS STABILITIES ARE WITHIN THE SPECIFICATIONS INDICATED IN TABLE 1.