Calibration Guide

Model OSL Series

Precision Open/Short/Load Calibration Tees

Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA

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To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

Symbols Used in Manuals

Danger

This indicates a very dangerous procedure that could result in serious injury or death, or loss related to equipment malfunction, if not performed properly.

Warning

This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

Caution

This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.

This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

Table of Contents

Chapter 1 — General Information

1-1 Introduction

This guide provides performance verification procedures for Anritsu Model OSL Series Open/Short/Load Calibration Tees.

1-2 Description

The model OSL Series family consists of the following models:

Table 1-1. OSL Series Precision Open/Short/Load Calibration Tees

Anritsu Part Number	Description
OSLN50LF	N male Precision Open/Short/Load, DC to 4 GHz
OSLNF50LF	N female Precision Open/Short/Load, DC to 4 GHz
OSLN50-1	N male Precision Open/Short/Load, DC to 6 GHz
OSLNF50-1	N female Precision Open/Short/Load, DC to 6 GHz
OSLN50	N male Precision Open/Short/Load, DC to 18 GHz
OSLNF50	N female Precision Open/Short/Load, DC to 18 GHz

1-3 Recommended Test Equipment

Table 1-2. Recommended Test Equipment

Equipment	Critical Specification	Recommended Manufacturer/Model
Vector Network Analyzer	Frequency: 40 MHz to 20 GHz	Anritsu Model 37247D or 37347D
Calibration Kit	Connector Type: N Impedance: 50 Ohm Termination: sliding termination	Anritsu Model SC6650
Adapter	Connector: N(m) to K(f)	Anritsu Model 34NKF50
Adapter	Connector: N(f) to K(f)	Anritsu Model 34NFKF50
Digital Multi-meter		Agilent Model 34401A

Chapter 2 — Performance Verification

2-1 Introduction

This chapter contains tests that can be used to verify the performance of the OSL Series Open/Short/Load Calibration Tees.

The tests include:

- Return Loss Verification
- Open and Short 180° Phase Shift Verification
- Precision Load DC Resistance Verification

The Load is verified by measuring the return loss after calibration on the VNA.

The Open and Short 180° phase shift is verified by measuring the phase with a VNA.

2-2 Specifications

Refer to Table 2-1 for the OSL series specifications.

Table 2-1. OSL Series Specifications

	Anritsu Part Number		
Specification	**OSLN50LF OSLNF50LF**	**OSLN50-1 OSLNF50-1**	**OSLN50 OSLNF50**
Frequency Range	DC to 4 GHz	DC to 6 GHz	DC to 18 GHz
Load DC Resistance	50 ± 0.25 Ohm	50 ± 0.25 Ohm	50 ± 0.15 Ohm
Return Loss	42 dB	42 dB	42 dB: DC to 5 GHz 36 dB: 5 to 15 GHz 32dB: 15 to 18 GHz
Open and Short Phase Shift	180° ± 6°	180° ± 10°	180° ± 20°

2-3 Verification Procedures

This section details VNA calibration and:

- “Return Loss Verification Procedures” on page 2-5
- “Open and Short 180° Phase Shift Verification” on page 2-6
- “Precision Load DC Resistance Verification” on page 2-7

Equipment Required

- Anritsu Model 37247D or 37347D Vector Network Analyzer
- Anritsu Model SC6650 N Connector Calibration Kit
- Anritsu Model 34NKF50 or 34NFKF50 Adapter

VNA Calibration Procedure

1. Allow the VNA to warm up for a minimum of 1 hour.
2. Install an appropriate adapter to the VNA Port 1 so the test port has a connector that can mate to the OSL Series Open/Short/Load Calibration Tee. For example, install a 34NFKF50 adapter to VNA Port 1 when testing a male Open/Short/Load Calibration Tee.
3. Insert the Calibration Component Coefficients disk of the SC6650 into the VNA floppy drive.
4. Load the Cal Kit Coefficients disk into the VNA:
   a. Press the **Utility Menu** key
   b. Cal Component Utilities
   c. Install the information from the floppy disk.
5. Press the **Default Program** key to reset the VNA.
6. Press the **BeginCal** key then set the calibration as follows:
   a. CAL METHOD: SOLT
   b. TRANSMISSION LINE TYPE: COAXIAL
   c. CALIBRATION TYPE: REFLECTION ONLY
   d. PORT 1 ONLY (S11)
   e. CALIBRATION DATA POINTS: NORMAL (1601 points maximum)
   f. START frequency: 40 MHz
   g. STOP frequency:

      4 GHz for OSLN50LF or OSLNF50LF;
      6 GHz for OSLN50-1 or OSLNF50-1;
      18 GHz for OSLN50 or OSLNF50

   h. MAXIMUM NUMBER OF DATA POINTS: 401
   i. PORT 1 CONN:

      N (F) for OSLN50LF, OSLN50-1 or OSLN50
      N (M) for OSLNF50LF, OSLNF50-1 or OSLNF50

   j. LOAD TYPE: SLIDING
7. Select START CAL and follow the on screen prompt and connect the appropriate calibration standard(s) to complete the calibration.

Return Loss Verification Procedures

1. Connect the LOAD of the DUT Calibration Tee to the adapter on VNA Port 1.
2. Set the VNA as follows:
   - **a.** Channel Menu: SINGLE CHANEL
   - **b.** CH1
   - **c.** S-parameter: S11
   - **d.** GRAPH TYPE: LOG MAGNITUDE
   - **e.** Auto Scale
   - **f.** Marker Menu: MARKER 1 ON, DISPLAY MARKERS ON
   - **g.** Readout Marker: MARKER TO MAX
   - **h.** The MARKER 1 will display the highest point (worst case in return loss) in frequency and a negative number in dB (for example, –43.123 dB at 3 GHz).
   - **i.** Record the absolute value of MARKER 1 as return loss (for example, 43.123 dB).
   - **j.** The Return Loss spec is 42 dB. The worst case:

     | Marker 1 Readout in dB |

     must be > 42 dB to pass this test.
   - **k.** For OSLN50 and OSLNF50, the return loss is specified for 3 frequency bands. The rotary knob should be used to move the Marker 1 to read out the worst case return loss in each band.

Open and Short 180° Phase Shift Verification

1. Set the VNA as follows:

- **a.** Channel Menu: Single channel
- **b.** Ch 1
- **c.** S-parameter: S11
- **d.** Graph type: Phase
- **e.** Set Scale: resolution 10°/div, reference value 180°; phase shift 10°
- **f.** Limits:

  upper 174°, lower 186°; for OSLN50LF and OSLNF50LF
  upper 170°, lower 190°; for OSLN50-1 and OSLNF50-1
  upper 160°, lower 200°; for OSLN50 or OSLNF50
  display limits ON

2. Connect the SHORT of the DUT Calibration Tee to the adapter on VNA Port 1.

3. Make following selection on the VNA:

- **a.** Ch 1
- **b.** Trace Memory
- **c.** VIEW DATA
- **d.** STORE DATA TO MEMORY
- **e.** VIEW DATA (/) BY MEMORY

4. Remove the SHORT and connect the OPEN of the same DUT Calibration Tee to the adapter on VNA Port 1.

5. The displayed trace must be within the limit lines to pass the specification. The actual value can be verified using markers.

Precision Load DC Resistance Verification

Equipment Required

- Agilent Model 34401A Multi-meter

Procedure

Use an Ohmmeter to measure the DC resistance between the outer conductor and center conductor of the Precision Load and verify that it is within specification (refer to Table 2-1, “OSL Series Specifications).

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Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA
http://www.anritsu.com/