

Calibration Guide

Model 15 Series

N Type Armored Test Port Extension Cables



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产品中有毒有害物质或元素的名称及含量

For Chinese Customers Only NLNB

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr(VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	×	○	×	×	○	○
机壳、支架 (Chassis)	×	○	×	×	○	○
其他(电缆、风扇、 连接器等) (Appended goods)	×	○	×	×	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。
 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

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Safety Symbols

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.

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Chapter 1 — General Information

1-1 Introduction

This guide provides performance verification procedures for Anritsu N Type Model 15 Series Armored Test Port Extension Cables.

1-2 Description

The N Type Model 15 Series Test Port Extension Cable family consists of the following models:

Table 1-1. N Type Model 15 Series Test Port Extension Cables

Anritsu Cable Part Number	Frequency (GHz)	Connector "A" Precision	Connector "B" Precision	Length (meters)	Return Loss Match (dB)	Insertion Loss Full Cable (dB @ Max Freq)	Impedance (ohms)
15NNF50-1.5A	3.3	N-male	N-female	1.5	21	1.1	50
15NNF50-3.0A	3.3	N-male	N-female	3.0	21	2.1	50
15NNF50-5.0A	3.3	N-male	N-female	5.0	21	3.5	50
15NN50-1.5A	3.3	N-male	N-male	1.5	21	1.1	50
15NN50-3.0A	3.3	N-male	N-male	3.0	21	2.1	50
15NN50-5.0A	3.3	N-male	N-male	5.0	21	3.5	50
15NN50-1.5C	6.0	N-male	N-male	1.5	18	1.5	50
15NN50-3.0C	6.0	N-male	N-male	3.0	18	3.0	50
15NN50-5.0C	6.0	N-male	N-male	5.0	18	5.0	50
15NNF50-1.5C	6.0	N-male	N-female	1.5	18	1.5	50
15NNF50-3.0C	6.0	N-male	N-female	3.0	18	3.0	50
15NNF50-5.0C	6.0	N-male	N-female	5.0	18	5.0	50
15NNF50-0.3B	18.0	N-male	N-female	0.3	17	0.5	50
15NNF50-0.6B	18.0	N-male	N-female	0.6	17	1.1	50
15NNF50-1.5B	18.0	N-male	N-female	1.5	17	2.7	50
15NNF50-3.0B	18.0	N-male	N-female	3.0	17	5.4	50
15NNF50-5.0B	18.0	N-male	N-female	5.0	17	9.0	50
15NN50-0.3B	18.0	N-male	N-male	0.3	17	0.5	50
15NN50-0.6B	18.0	N-male	N-male	0.6	17	1.1	50
15NN50-3.0B	18.0	N-male	N-male	3.0	17	5.4	50

1-3 Recommended Test Equipment

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	Anritsu Model 3653
Adapter	Connector: N(m) to K(f)	Anritsu Model 34NKF50
Adapter	Connector: N(f) to K(f)	Anritsu Model 34NFKF50 (2 each)
Adapter	Connector: N(m) to N(m)	Anritsu Model 34NN50A
Test Port Cable	Connector: N(f) to N(m)	Anritsu Model 3670N50-2

Chapter 2 — Performance Verification

2-1 Introduction

This chapter contains tests that can be used to verify the performance of the 15 Series Test Port Cables. The tests include:

- Return Loss Verification
- Insertion Loss Verification

2-2 Specifications

Refer to [Table 1-1 on page 1-1](#) for specification for 15 Series Test Port Cables.

2-3 Return Loss and Insertion Loss for N(m) to N(f) Cables

Using 15NNF50-1.5C as an Example

Equipment Required

- Anritsu Model 37247D or 37347D Vector Network Analyzer
- Anritsu Model 3653 N Connector Calibration Kit
- Anritsu Model 34NKF50 Adapter
- Anritsu Model 34NFKF50 Adapter
- Anritsu Model 3670N50-2 Test Port Cable

VNA Calibration

1. Allow the VNA to warm up for a minimum of 1 hour.
2. Install a 34NFKF50 adapter to VNA Port 1. Install a 34NKF50 adapter to VNA Port 2.
3. Connect the N(f) connector end of the 3670N50-2 cable to the 34NKF50 adapter on VNA Port 2.
4. Press the **Default Program** key to reset the VNA.
5. Load the Cal Kit Coefficients disk into the VNA.
 - a. Press the Utility Menu key
 - b. Select the Cal Component Utilities
 - c. Install information from the floppy disk
6. Set up the VNA for a Full 12-Term calibration:
 - a. Press “Begin Cal”
 - b. Ensure that the Cal Method is “SOLT” and the Transmission Line type is “Coaxial”
 - c. Make the following selections to set up the calibration:
 - i. Next Cal Step
 - ii. Full 12-Term
 - iii. Excludes Isolation
 - iv. Normal (1601 Points Maximum)
 - v. Start: 40 MHz
 - vi. Stop: 6 GHz” (or 3.3 GHz or 18 GHz depending on which cable will be tested)
 - vii. 401 Max Points
 - viii. Next Cal Step
 - ix. Port 1 Connector type “Type N(f)”
 - x. Port 2 Connector type “Type N(m)”
 - xi. Broadband
 - xii. Start Cal
7. Follow instructions on the VNA display to complete the calibration.

Return Loss Measurement

1. Connect the 15NNF50-1.5C (DUT cable) between the 34NFKF50 adapter on VNA Port 1 and the 3670N50-2 cable on VNA Port 2.
2. Set the VNA as follows:
 - a. Channel Menu: SINGLE CHANEL
 - b. Ch 1
 - 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, -26.399 dB at 5.9 GHz).
 - i. Record the absolute value of MARKER 1 as return loss (for example 26.399 dB).
 - j. The Return Loss spec is 18 dB. The worst case, | Marker 1 Readout in dB | must be > 18 dB to pass this test.
 - k. Channel Menu: SINGLE CHANEL, Ch 4
 - l. S-parameter: S22
 - m. Graph Type: LOG MAGNITUDE
 - n. Repeat [Step e](#) to [Step j](#).

Insertion Loss Measurement

The following example is for a 15NNF50-1.5C cable:

1. Keep the 15NNF50-1.5C DUT cable between the 34NFKF50 adapter on VNA Port 1 and the 3670N50-2 cable on VNA Port 2.
2. Set the VNA as follows:
 - a. Channel Menu: SINGLE CHANEL
 - b. Ch 2
 - c. S-parameter: S12
 - d. Graph Type: LOG MAGNITUDE
 - e. Auto Scale
 - f. Marker Menu: Marker 1 ON, Display Markers ON
 - g. Readout Marker: MARKER TO MIN
 - h. The MARKER 1 will display the lowest point (worst case in insertion loss) in frequency and a negative number in dB (for example, -1.128 dB at 6 GHz).
 - i. Record the absolute value of MARKER 1 as insertion loss (for example, 1.128 dB).
 - j. The Insertion Loss spec is 1.5 dB. The worst case, | Marker 1 Readout in dB | must be < 1.5 dB to pass this test.
 - k. Channel Menu: SINGLE CHANEL, Ch 3
 - l. S-parameter: S21
 - m. Graph Type: LOG MAGNITUDE
 - n. Repeat [Step e](#) to [Step j](#).

2-4 Return Loss and Insertion Loss for N(m) to N(m) Cables

Using 15NN50-1.5C as an Example

Equipment Required

- Anritsu Model 37247D or 37347D Vector Network Analyzer
- Anritsu Model 3653 N Connector Calibration Kit
- Anritsu Model 34NFKF50 Adapter, 2 each
- Anritsu Model 34NN50A Adapter
- Anritsu Model 3670N50-2 Test Port Cable

VNA Calibration

1. Allow the VNA to warm up for a minimum of 1 hour.
2. Install a 34NFKF50 adapter to VNA Port 1. Install a second 34NFKF50 adapter to VNA Port 2.
3. Connect a 34NN50A adapter to the 34NFKF50 adapter on VNA Port 1 and connect the N(m) connector end of 3670N50-2 cable to the 34NFKF50 adapter on VNA Port 2.
4. Press the Default Program key to reset the VNA.
5. Load the Cal Kit Coefficients disk into the VNA:
 - a. Utility Menu key
 - b. Cal Component Utilities
 - c. Install information from the floppy disk

2-4 Return Loss and Insertion Loss for N(m) to N(m) Cables

6. Perform a Full 12-Term Calibration on Port 1 and Port 2 using the following steps:

- a.** Press “Begin Cal”
- b.** Ensure that the Cal Method is “SOLT” and the Transmission Line type is “Coaxial”
- c.** Make the following selections to set up the calibration:
 - i.** Next Cal Step
 - ii.** Full 12-Term
 - iii.** Excludes Isolation
 - iv.** Normal (1601 Points Maximum)
 - v.** Start: 40 MHz
 - vi.** Stop: 3.3 or 6 or 18 GHz depending on which cable will be tested
 - vii.** 401 Max Points
 - viii.** Next Cal Step
 - ix.** Port 1 Connector type: “Type N (m)”
 - x.** Port 2 Connector type: “Type N(f)”
 - xi.** Broadband
 - xii.** Start Cal”

7. Follow instructions on the VNA display to complete the calibration

8. Save the calibration as follow:

- a.** Press **Save/Recall Menu** key
- b.** Save
- c.** FRONT PANEL SETUP AND CAL DATA ON HARD DISK
- d.** CREATE NEW FILE
- e.** Enter a file name, “cable 1” for example, then select DONE

9. Disconnect the 34NN50A adapter from the 34NFKF50 adapter on VNA Port 1 but keep the 34NN50A adapter connected to the 3670N50-2 cable. You will perform a second Full 12- term calibration.
 - a. Press “Begin Cal”
 - b. Ensure that the Cal Method is “SOLT” and the Transmission Line type is “Coaxial”
 - c. Make the following selections to set up the calibration:
 - i. Next Cal Step
 - ii. Full 12-Term
 - iii. Excludes Isolation
 - iv. Normal (1601 Points Maximum)
 - v. Start: 40 MHz
 - vi. Stop: 6 GHz
 - vii. 401 Max Points
 - viii. Next Cal Step
 - ix. Port 1 Connector type: “Type N(f)”
 - x. Port 2 Connector type: “Type N(m)”
 - xi. Broadband
 - xii. Start Cal
10. Follow instructions on the VNA display to complete the calibration.
11. Save the calibration as follow:
 - a. Press the **Save/Recall Menu** key
 - b. Save
 - c. FRONT PANEL WETUP AND CAL DATA ON HARD DISK
 - d. CREATE NEW FILE
 - e. Enter a file name, “cable 2” for example, then select “DONE”
12. Disconnect the 3670N50-2 cable from the 34NN50A adapter but keep the 34NN50A connected to the 34NFKF50 adapter on VNA Port 1.

2-4 Return Loss and Insertion Loss for N(m) to N(m) Cables

13. Connect the 23NF50 Short (from the 3653 cal kit box) to the 34NN50A adapter.
14. Press the **Ch 1** and the **Ref Plane** button.
15. Select "AUTO" and record the number displayed on TIME (for example, 212.1890 ps).
16. Enter the Offset Length of the 23NF50 (e.g. 8.9962 mm, this is read from the Cal Kit Coefficient floppy disk) to DISTANCE. Record the new number displayed on TIME (for example, 29.9177 ps).
17. Enter 0 to DISTANCE. The TIME will change to 0 also.
18. Subtract the Time reading from step 16 from the Time reading from step 15 (e.g., 212.1890 ps – 29.9177 ps = 182.2713 ps).
19. Press **Appl** button, select ADAPTER REMOVAL.
20. Enter the calculated value in step 18 (e.g., 182.2713 ps) to ELECTRICAL LENGTH OF THE ADAPTER and select REMOVE ADAPTER
21. Select READ CAL FILE OF THE X TEST PORT FROM HARD DISK (ADAPTER ON PORT 2)
22. Select the "cable 2", press the **ENTER** button.
23. Select READ CAL FILE OF THE Y TEST PORT FROM HARD DISK (ADAPTER ON PORT 1).
24. Select the "cable 1", press the **ENTER** button.
25. Remove the 23NF50 short and the 34NN50A adapter from the 34NFKF50 adapter on VNA Port 1.
26. This completes the Adapter Removal calibration.

Return Loss Measurement

1. Connect the 15NN50-1.5C (DUT cable) between the 34NFKF50 adapter on VNA Port 1 and the 3670N50-2 cable on VNA Port 2.
2. Set the VNA as follows:
 - a. Channel Menu: SINGLE CHANEL
 - b. Ch 1
 - 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, - 26.399 dB at 5.9 GHz)
 - i. Record the absolute value of MARKER 1 as return loss (for example, 26.399 dB).
 - j. The Return Loss spec is 18 dB. The worst case, | Marker 1 Readout in dB | must be > 18 dB to pass this test.
 - k. Channel Menu: SINGLE CHANEL, Ch 4
 - l. S-parameter: S22
 - m. Graph Type: LOG MAGNITUDE
 - n. Repeat [Step e](#) to [Step j](#).

Insertion Loss Measurement

1. Keep the DUT cable (for example, 15NN50-1.5C) connected between the 34NFKF50 adapter on VNA Port 1 and the 3670N50-2 cable on VNA Port 2.
2. Set the VNA as follows:
 - a. Channel Menu: SINGLE CHANNEL
 - b. Ch 2
 - c. S-parameter: S12
 - d. Graph Type: LOG MAGNITUDE
 - e. Auto Scale
 - f. Marker Menu: Marker 1 ON, Display Markers ON
 - g. Readout Marker: MARKER TO MIN
 - h. The MARKER 1 will display the lowest point (worst case in insertion loss) in frequency and a negative number in dB (for example, -1.128 dB at 6 GHz).
 - i. Record the absolute value of MARKER 1 as insertion loss (for example, 1.128 dB).
 - j. The Insertion Loss spec is 1.5 dB. The worse case, | Marker 1 Readout in dB | must be < 1.5 dB to pass this test.
 - k. Channel Menu: SINGLE CHANNEL, Ch 3
 - l. S-parameter: S21
 - m. Graph Type: LOG MAGNITUDE
 - n. Repeat [Step e](#) to [Step j](#)

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