

Precision Terminations

28 Series 50 Ohm Termination



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Anritsu affixes the CE Conformity marking onto its conforming products in accordance with Council Directives of The Council Of The European Communities in order to indicate that these products conform to the EMC and LVD directive of the European Union (EU).

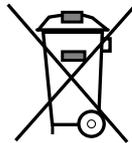


C-tick Conformity Marking

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European Parliament and Council Directive 2002/96/EC

Equipment Marked with the crossed-out Wheelie Bin symbol complies with the European Parliament and Council Directive 2002/96/EC (the "WEEE Directive") in the European Union.



For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

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 risk from a very dangerous condition or procedure that could result in serious injury or death and possible loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Warning



This indicates a risk from a hazardous condition or procedure that could result in light-to-severe injury or loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Caution



This indicates a risk from a hazardous procedure that could result in loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

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.

For Safety

Warning



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

Warning



This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Caution



Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

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Chapter 1 — General Information

1-1 Introduction

This manual describes the 28 series 50 ohm terminations. It provides specifications, performance verification instructions, and a list of precautions the user should observe when using terminations.

Description

The 28 series terminations consist of GPC-7, WSMA, N, K, V, W1, and 0.8 mm precision connector bodies.

1-2 Specifications

| | |
|-------------|--|
| Note | All models max input power 0.5 watts (+27 dBm). Characteristic impedance is 50 ohms. |
|-------------|--|

Table 1-1. Performance Specifications for 28 Series Precision Terminations

| Model | Test Port Connector | Frequency Range (GHz) | SWR |
|----------------------|---------------------|-----------------------|---|
| 28N50-3 | N Male | DC to 8 | 1.03 Max |
| 28N50-2 | N Male | DC to 18 | 1.02 Max |
| 28NF50-2 | N Female | | |
| 28A50-1 | GPC-7 | | |
| 28S50-1 | WSMA Male | DC to 26.5 | 1.020 to 18.5 GHz 1.135 to 26.5 GHz |
| 28SF50-1 | WSMA Female | | |
| 28K50A | K Male | DC to 40 | 1.040 to 20 GHz 1.052 to 40 GHz |
| 28KF50A | K Female | | |
| 28V50D | V Male | DC to 70 | 1.018 to 2.5 GHz 1.032 to 4 GHz 1.052 to 40 GHz 1.083 to 50 GHz 1.106 to 70 GHz |
| 28VF50D | V Female | | |
| 28W50 | W1 Male | DC to 110 | 1.052 to 20 GHz 1.065 to 65 GHz 1.253 to 90 GHz 1.499 to 110 GHz |
| 28WF50 | W1 Female | DC to 110 | 1.052 to 20 GHz 1.065 to 65 GHz 1.288 to 90 GHz 1.499 to 110 GHz |
| 28.850 ^a | 0.8 mm Male | DC to 145 | 1.052 to 40 GHz 1.065 to 80 GHz 1.222 to 145 GHz |
| 28.8F50 ^a | 0.8 mm Female | | |

a. Specifications are Typical

1-3 Pin Depth

Anritsu terminations are high-quality, precision laboratory instruments. Proper pin depth of mating connectors are essential in making proper connection.

Measuring Pin Depth

The center pin of termination connectors have a precision pin depth tolerance. Connectors on test devices that mate with terminations may not be precision types and may not have the proper depth. The connector's pin depth must be measured to assure proper and accurate connection. Connector pin depth is illustrated in [Figure 1-1](#).

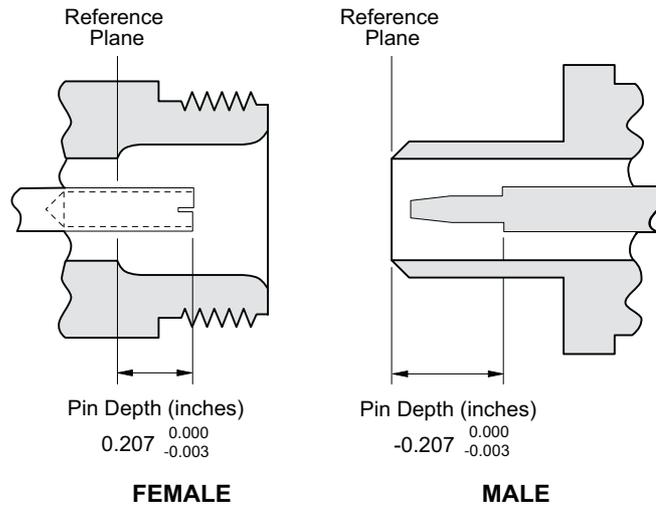
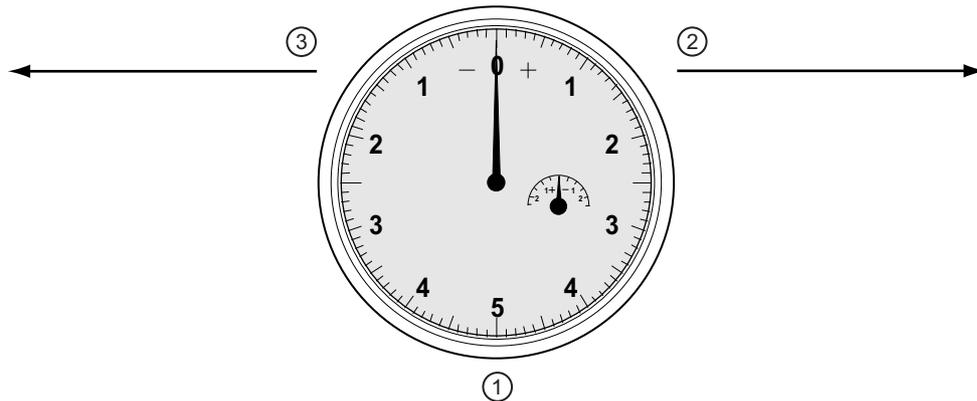


Figure 1-1. N Connector Pin Depth Definition

Before mating, use a pin depth gauge (Figure 1-2) to measure the pin depth of the device that will mate with the termination. If the termination is mated with a connector having a destructive pin depth, damage will likely occur to the termination. (A destructive pin depth has a center pin that is too long in respect to the connector’s reference plane.)



| | |
|---|--|
| 1 | Pin Depth Gauge with needle setting at zero. |
| 2 | Positive needle direction clockwise to the right. |
| 3 | Negative needle direction counter-clockwise to left. |

Figure 1-2. Pin Depth Gauge Scale

Refer to Table 1-2. When measuring pin depth, if the test device connector measures out of tolerance in the “+” region of the gauge (Figure 1-2) the center pin is too long. Mating under this condition will likely damage the termination connector. If the test device connector measures out of tolerance in the “-” region, the center pin is too short. While this will not cause any damage, it will result in a poor connection and a degradation in performance.

Table 1-2. Terminations Pin-Depth

| Port / Connector Type | Pin Depth (Inch) | |
|-----------------------|------------------|-----------------|
| GPC-7 | 0.000 | -0.003 |
| N Male | -0.207 | 0.000 -0.003 |
| N Female | +0.207 | 0.000 -0.003 |
| WSMA Male | -0.0025 | -0.0035 |
| WSMA Female | 0.000 | -0.001 |
| K Male | 0.000 | |
| K Female | -0.003 | |
| V Male | 0.000 | |
| V Female | -0.002 | |

1-4 Precautions

Avoid Over Torquing Connectors

Proper connector torque is essential to assure optimum measurement accuracy. Over torquing connectors is destructive as it may damage the connector's center pin. See [Table 1-3](#) for torque recommendations.

Table 1-3. Torque Wrench Recommendations

| Conn. Type | Torque Wrench Model # | Torque Spec (in-lbs) | Open End Wrench Model # |
|--------------|-----------------------|----------------------|-------------------------|
| GPC-7 | 01-200 | 12 | NA |
| N | | | |
| SMA / 3.5 mm | 01-201 | 8 | 01-204 |
| K (2.92 mm) | | | |
| V (1.85 mm) | | | |
| W1 (1 mm) | 01-504 | 4 | 01-505 |
| 0.8 mm | 01-524 | 4 | 01-525 |

Do Not Disturb Tuning Washers on Connector Center Pins

The center conductor on terminations contain a small tuning washer located near the point of mating ([Figure 1-3](#)). This washer compensates for minor impedance discontinuities at the interface. The washer's location is critical to the RF component's performance. Care must be taken to assure the small tuning washer is not damaged.

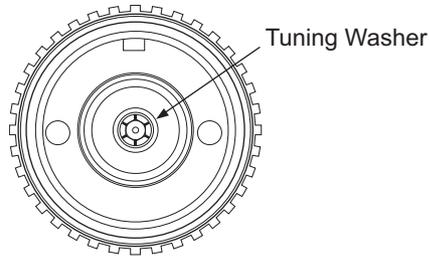


Figure 1-3. Tuning Washer on GPC-7 Connector

Note The tuning washer is shown on a GPC-7 connector. A similar washer may be installed on any Anritsu precision connectors.

Avoid Applying Excessive Power

The 28 series terminations have a maximum power rating of 0.5 watts. Applying power levels beyond these values can damage the termination.

Avoid Mechanical Shock

Do not drop or mishandle the terminations. Anritsu terminations are laboratory-quality devices and must be handled with care.

1-5 Performance Verification

The performance of precision terminations can be verified using a vector network analyzer (VNA). Calibration measurements with an Anritsu VNA are traceable to the National Institute of Standards and Technology (NIST). [Table 1-4](#) lists the recommended Anritsu calibration kits and calibration types for each termination interface.

Table 1-4. Recommended Calibration Kit

| Termination Interface | Calibration Kit Model Number | Calibration Type |
|-----------------------|------------------------------|--|
| SMA / 3.5 mm | 3650A-1 | Sliding termination |
| GPC-7 | 3651A-1 | Sliding termination |
| N | 3653A | SOLT ^a |
| K | 3652A-1 | Sliding termination |
| V | 3654D-1 | Sliding termination |
| W1 | 3656B | Offset short ^a |
| 0.8 mm | 3559 | Offset short ^a |
| WSMA | N/A | Calibration/Verification at factory ^b |

a. Sliding terminations are unavailable for the N, W1, and 0.8 mm interface.

b. Contact Anritsu for calibration and verification of WSMA components. <http://www.anritsu.com>

A sliding termination calibration is recommended in cases when high return loss accuracy is required.

1-6 Maintenance

Note Anritsu recommends that no maintenance other than cleaning be attempted by the customer. The termination should be returned to Anritsu for repair and/or service when needed.

Keep Termination Connectors Clean

The terminations performance can be disturbed by dirt and other contamination adhering to connector interfaces. When not being used, store and protect the termination's connectors with vinyl caps.

Connector Cleaning

The cleaning of connectors is essential for maintaining good electrical performance. The connectors should be checked for cleanliness before making any measurements (or calibration). The cleaning procedure is listed below.

Required Items

- Low pressure compressed air (solvent free)
- Lint-free narrow-tipped cotton swabs
- Isopropyl alcohol
- Microscope

Cleaning Procedure

Caution Use care not to disturb the tuning washer on the center conductor.
See [“Do Not Disturb Tuning Washers on Connector Center Pins”](#) on page 1-4.

1. Remove loose particles on the mating surfaces and threads etc. using low-pressure compressed air.
2. The threads of the connector should be cleaned with a cotton swab.
3. Clean mating plane surfaces using alcohol on cotton swabs ([Figure 1-4](#)).
4. Use only enough solvent to clean the surface.
5. Do not spray solvents directly on to connector surfaces or use contaminated solvents.
6. Use a narrow tipped cotton swab.
7. Use the least possible pressure to avoid damaging connector surfaces.
8. When the connector threads are clean, the connections can be hand-tightened to within a half a turn of the proper torque. Refer to [Table 1-3](#) for proper torquing of the connectors.

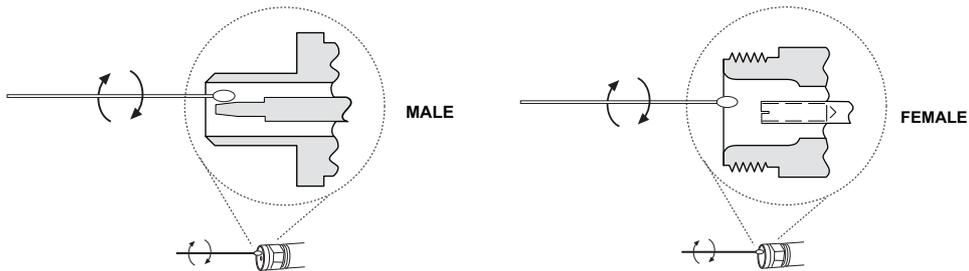


Figure 1-4. Cleaning Technique Using Cotton Swabs

Anritsu



 Anritsu utilizes recycled paper and environmentally conscious inks and toner.

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