SERIES MS462XX
VECTOR NETWORK MEASUREMENT SYSTEM
VERIFICATION KITS

OPERATION AND
MAINTENANCE MANUAL

Anritsu

490 JARVIS DRIVE | MORGAN HILL, CA 95037-2809

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Chapter 1
Contents and Operation

1-1 INTRODUCTION

This chapter lists the contents of the verification kits.

NOTE

The components in these kits of the highest quality and accuracy. All components are NIST (National Institute of Standards Technology) traceable, which means that the components are very accurate and repeatable. Handle with care.

1-2 PURPOSE

The verification kits let you verify the performance of a calibrated vector network measurement system. The components in these kits are based upon standards that are traceable to the NIST. They provide the basis for issuing a calibration certification label.

1-3 ONLINE MANUALS

This manual is available on CD ROM as an Adobe Acrobat™ (*.pdf) file. The file can be viewed using Acrobat Reader™, a free program that is also available on the CD ROM. This file is “linked” such that the viewer can choose a topic to view from the displayed “bookmark” list and “jump” to the manual page on which the topic resides. The text can also be word-searched. CD ROM part numbers are available on ANRITSU’s Internet home page (http://www.global.anritsu.com). You can also contact ANRITSU Customer Service for price and availability.

1-4 KIT CONTENTS

Contents of the verification kits are listed on the following pages

Model 3663LF (Type N) Verification Kit

This kit (Figure 1-1) includes the following items:

Index 1 Verification Kit disks

Index 2 42N-50, 50 dB Attenuator

Index 3 42N20, 20 dB Attenuator

Index 4 42NOP-20, N Mismatch Attenuator

CAUTION

The disk included in the Verification Kit is for use by ANRITSU service personnel. It contains component data used during the automated verification procedure that is accomplished with an external PC. It is NOT INTENDED TO BE USED WITH ANRITSU MS462XX internal floppy disk drive.

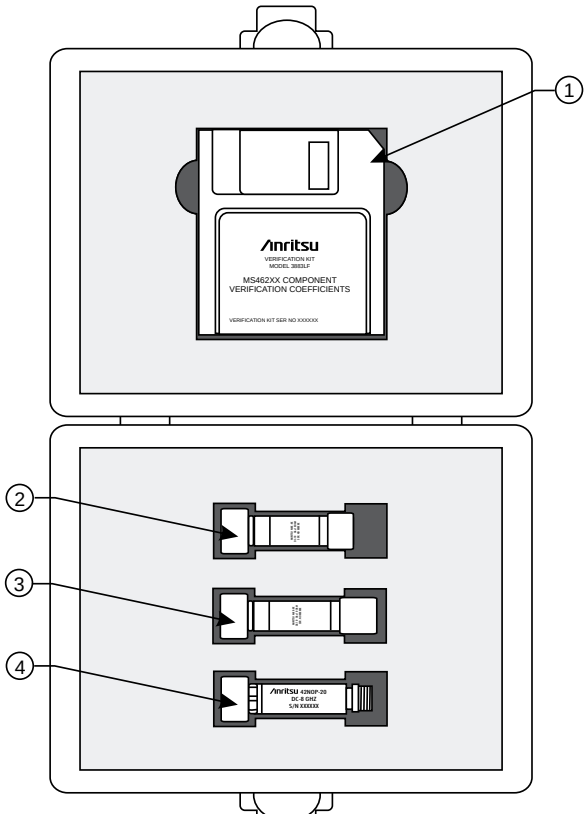


Figure 1-1. *Model 3663LF (Type N) Verification Kit Components*

Model 3666LF (3.5 mm) Verification Kit

This kit (Figure 1-2) includes the following items:

Index 1 Verification Kit disks

Index 2 42L-50, 20 dB Attenuator

Index 3 42L-20, 50 dB Attenuator

Index 4 42LOP-20, 3.5 mm Mismatch Attenuator

CAUTION

The disk included in the Verification Kit is for use by ANRITSU service personnel. It contains component data used during the automated verification procedure that is accomplished with an external PC. It is NOT INTENDED TO BE USED WITH WITRON MS462XX internal floppy disk drive.

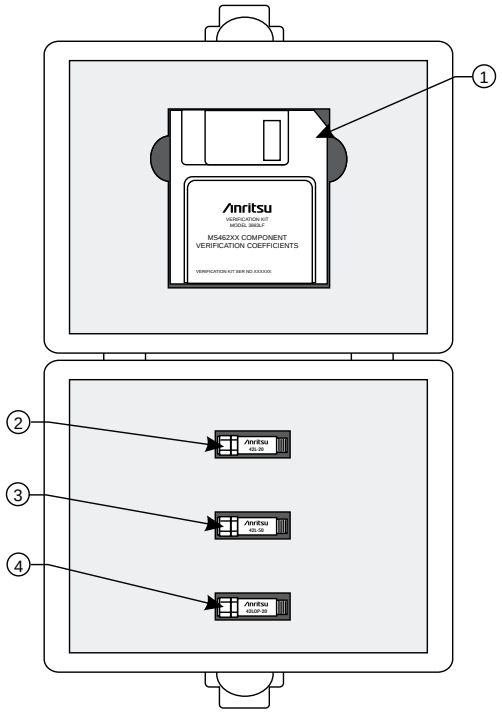


Figure 1-2. *Model 3666LF (SMA/3.5) Verification Kit Components*

Model 3667LF (GPC-7) Verification Kit

This kit (Figure 1-3) includes in the following items:

Index 1 Verification Kit disks

Index 2 42A-50, 50 dB Attenuator

Index 3 42A-20, 20 dB Attenuator

Index 4 42AOP-20, GPC-7 Mismatch Attenuator

CAUTION

The disk included in the Verification Kit is for use by ANRITSU service personnel. It contains component data used during the automated verification procedure that is accomplished with an external PC. It is NOT INTENDED TO BE USED WITH ANRITSU MS462XX internal floppy disk drive.

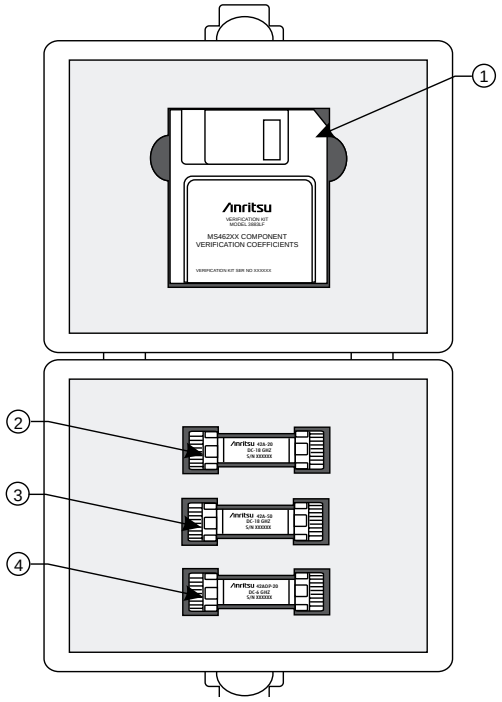


Figure 1-3. *Model 3667LF (GPC 7) Verification Kit Components*

1-5 OPERATION

Each verification kit consists of three standards, each are supplied with S-parameter data. Each standard verifies a primary S-parameter, as follows:

- 20 dB Attenuator — S_{21}, S_{12} Magnitude and Phase
- 50 dB Attenuator — S_{21}, S_{12} Magnitude and Phase
- Mismatch Attenuator — S_{11}, S_{22} Magnitude

Uncertainty windows are provided at each data point. The uncertainty associated with the primary S-parameter for each device is small. Conversely, the uncertainty window can be large for some of the other S-parameter data.

Chapter 2
Performance Verification

2-1 GENERAL

Verifying the performance of the Verification Kit components is automated. The procedure is provided on floppy disk. The program is titled ANRITSU 2300-354 Vector Network Measurerment System Performance Verification, and is provided with a User's Guide, Anritsu Part Number 10410-00216. This User's Guide and its program diskette are included at the end of this manual. In performing the verification procedure, you will be asked to extend the test ports using test cables. This is shown in Figure 2-1.

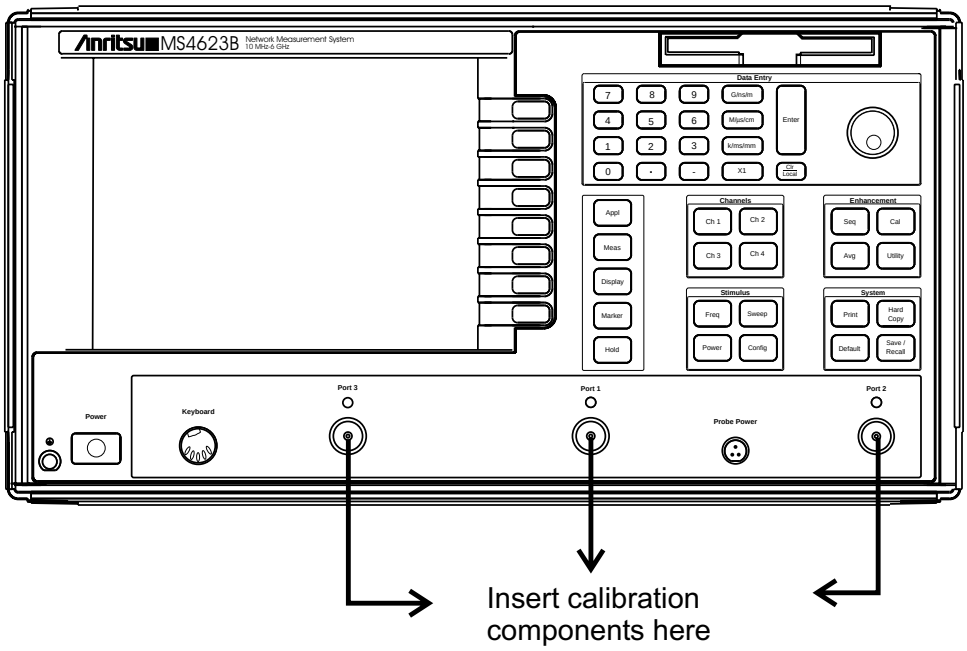


Figure 2-1. *Extending Port 2 for Ease of Connection*

2-2 VERIFICATION PROCESS

Verification is a straightforward process intended to show that a vector network measurement system (VNMS) is performing to specification. It can usually be accomplished in less than an hour, after waiting out the typical one-hour warm-up period. It is important to recognize that the process involves four hardware components:

- VNMS
- Calibration kit
- Cable(s)
- Verification kit

To have a successful verification process, all of the above items must be in good condition and properly connected.

While the primary purpose of the verification process is to validate performance of the VNMS; failure is more often caused by factors other than the VNMS (see next paragraph). Consequently, it is incumbent on the operator to examine these other factors before pronouncing the VNMS as "out of specification."

2-3 FACTORS AFFECTING VERIFICATION PERFORMANCE

The following paragraph discuss factors that can cause verification failure in a VNMS.

Cables

A good method for evaluating cable performance is to calibrate a VNMS—a simple frequence response calibration will do, or in an uncalibration system you can use trace memory to store the response and then select Data/Memory to view it. In either case, you should see a straight line on the display. Select a 1 dB/Div scale and observe the display as you move the cables slightly up and down or left and right. Small variations are acceptable and they should be minimized when the cable is returned to its orginal position. Any erratic changes, such as spikes in the display, would indicate a defective cable. The cable should be replaced before the verification process is begun.

Sliding Loads

Most calibrations require a sliding load. Sliding loads must be handled carefully. When the slide in in the forward position, the center conductor should be centered (or reasonably so). When centered, it is easy to connect the sliding load to the test port. If, however, the slide is positioned toward the back end of the sliding load, the center conductor is not well supported and it will be off center. Attempting to connect the test port in this circumstance will like result in center conductor damage. Consequently, ENSURE THAT THE SLIDE IS IN THE FORWARD POSITION BEFORE ATTEMPTING TO CONNECT THE SLIDING LOAD.

Preview the Display

When running the verification software, there is a step that requires the VNMS to be calibrated. This step places the VNMS in LOCAL (Manual) control and the program waits for the operator to press the Enter key. Pressing Enter tells the program that the calibration is complete and returns the VNMS to REMOTE control.

Prior to pressing the Enter key, connect the 20 dB attenuator included in the verification kit. When this attenuator is connected, the observed response should be smooth and free of "glitches" (Figure 2-1). It should be possible to firmly tap the test device's input and output connections without seeing any significant distortion. Figure 2-2 is typical of the display if a connection is not properly tightened or is defective.

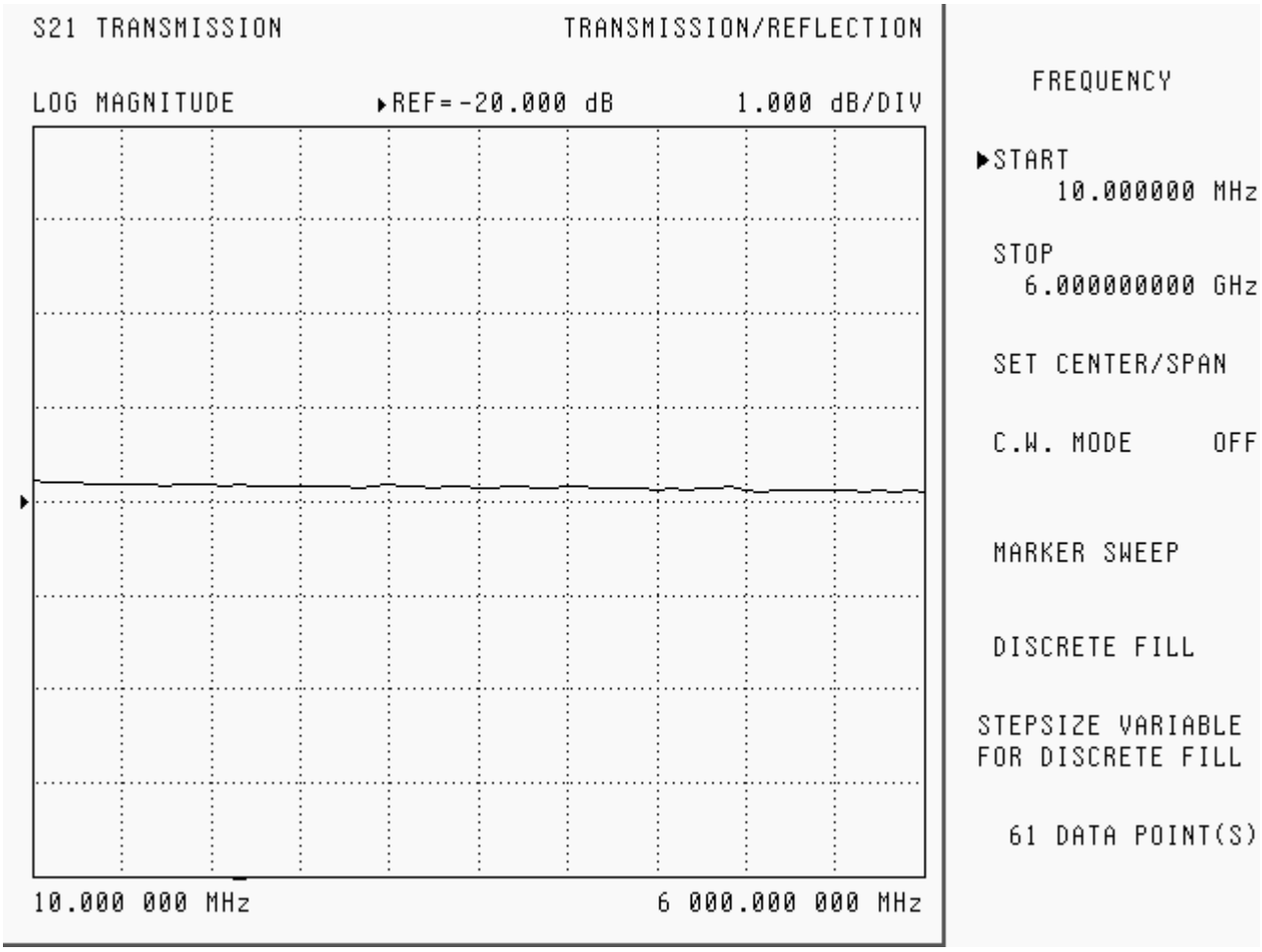


Figure 2-2. *Example of a good display response*

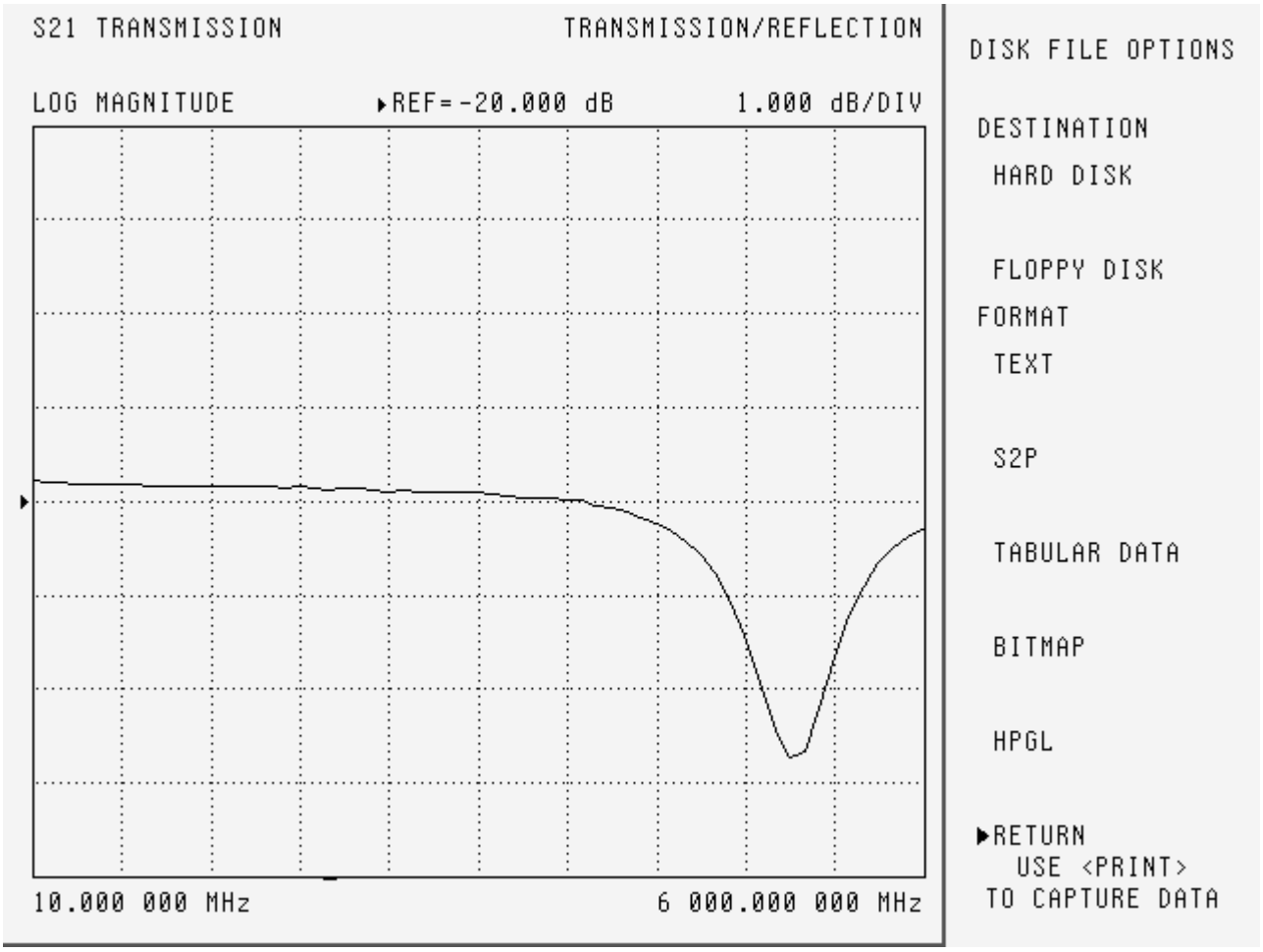


Figure 2-3. *Example of a bad display response*

Chapter 3
Maintenance Instructions

3-1 INTRODUCTION

This chapter provides instructions and discussion on the care and use of precision connectors.

3-2 PRECAUTIONS FOR USING CONNECTORS

The following are precautionary notes related to the use of connectors. For specific information on setting pin depths on sliding terminations, refer to the MS462X Operation Manual, Chapter7.

Pin Depth

Before mating, measure the pin depth (Figure 3-1) of the device that will mate with the RF component, using a ANRITSU Pin Depth Gauge or equivalent (Figure 3-2). Based on RF components returned for repair, destructive pin depth of mating connectors is the major cause of failure in the field. When an RF component is mated with a connector having a destructive pin depth, damage will likely occur to the RF component connector. (A destructive pin depth has a center pin that is too long in respect to the connector's reference plane.)

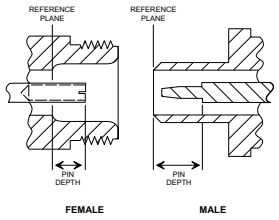


Figure 3-1. *N Connector Pin Depth*

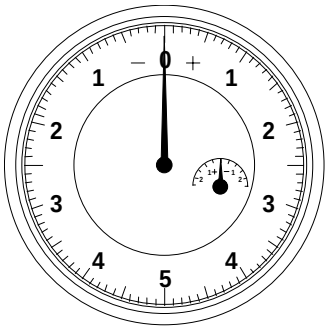


Figure 3-2. *Pin Depth Gauge*

Pin Depth Tolerance

The center pin of RF component connectors has a precision tolerance measured in mils (1/1000 inch). Connectors on test devices that mate with RF components may not be precision types and may not have the proper depth. They must be measured before mating to ensure suitability. When gauging pin depth, if the test device connector measures out of tolerance (Table 3-1) in the "+" region of the gauge (Figure 3-2), the center pin is too long. Mating under this condition will likely damage the termination connector. On the other hand, 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 consequent degradation in performance.

Table 3-1. *Pin Dept Tolerances*

Port/Connector Type	Pin Depth (mils)	ANRITSU Gauge Setting
GPC 7	+0.000 –0.0015	Same as pin depth
N Male	0.207 +0.001 –0.000	0.207 +0.000 –0.001
N Female	0.207 +0.000 –0.001	Same as pin depth
3.5 mm Male 3.5 mm Female	0.000 –0.0015	Same as pin depth
K Male K Female	+0.000 –0.0015	Same as pin depth
V Male V Female	+0.0000 –0.0005	Same as pin depth

Over Torquing Connectors Over torquing connectors is destructive; it may damage the connector center pin. Finger-tight is usually sufficient, especially on Type N connectors. *Never* use pliers to tighten connectors.

Teflon Tuning Washers The center conductor on most RF components contains a small teflon tuning washer located near the point of mating (interface). This washer compensates for minor impedance discontinuities at the interface. The washer's location is critical to the RF component's performance. *Do not disturb it.*

Mechanical Shock RF components are designed to withstand years of normal bench handling. However, do not drop or otherwise treat them roughly. They are laboratory-quality devices, and like other such devices, they require careful handling.

3-3 CLEANING INSTRUCTIONS

Connector interfaces, especially the outer conductors on the GPC 7 and SMA connectors, should be kept clean and free of dirt and other debris. Denatured alcohol is the recommended applicator. Figure 3-3 illustrates cleaning male and female connectors.

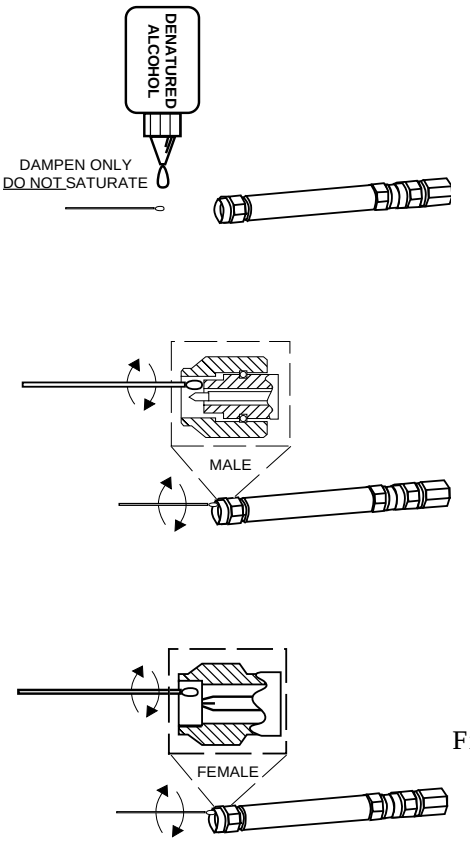


Figure 3-3. *Cleaning Male and Female Connectors*

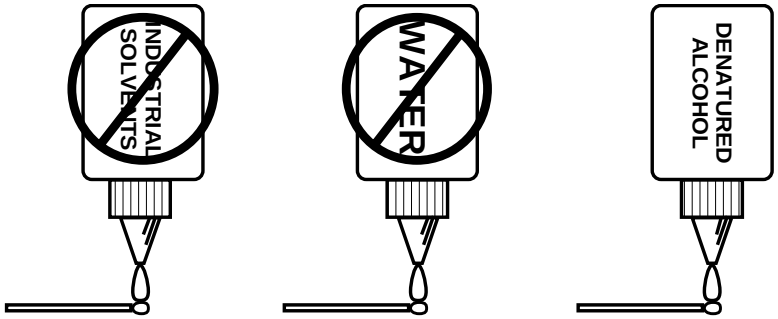
NOTE

Most cotton swabs are too large to fit in the smaller connector types. It is necessary to peal off most of the cotton and then twist the remaining cotton tight. Be sure that the remaining cotton does not get stuck in the connector.

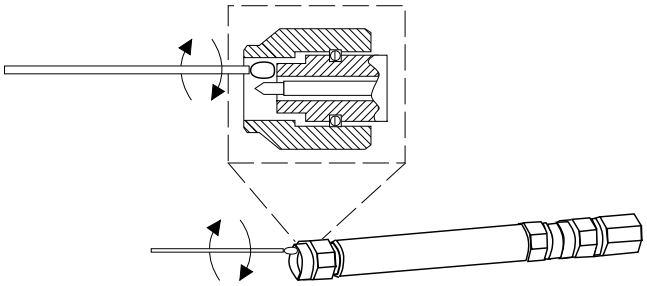
The following are some important tips on cleaning connectors:

- Use only denatured alcohol as a solvent.
- Always use an appropriate size of cotton swab.
- Gently move the cotton swab around the center conductor.
- Never put lateral pressure on the connector's center pin.
- Verify that no cotton or other foreign material remains in the connector after cleaning.
- Only dampen the cotton swab. Do NOT saturate it.
- Compressed air can be used to remove foreign particles and to dry the connector.
- Verify that the center pin has not been bent or damaged.

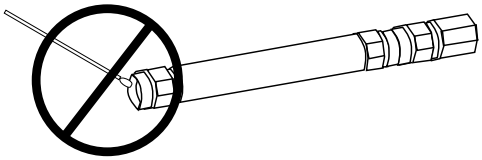
Figure 3-4 illustrates how to clean connectors.



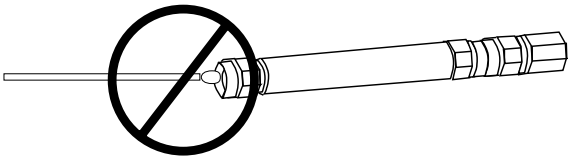
Do NOT use Industrial Solvents or Water on connector. Use only Denatured Alcohol.



Use only denatured alcohol and the proper size of cotton swab. Gently rotate the swab around the center pin being careful not to stress or bend the pin or you will damage the connector.



Do NOT put cotton swabs in at an angle, or you will damage the connectors.



Do NOT use too large of cotton swab, or you will damage the connectors.

Figure 3-4. *How to Clean a Connector*

Subject Index