

User Guide

# VectorStar™ MS4640A/B 366xX-1 Verification Kits and 2300-579-R Performance Verification Software Application

3669B-1 Verification Kit, V Connectors

3668-1 Verification Kit, K Connectors

3666-1 Verification Kit, SMA/3.5 mm Connectors

3663-1 Verification Kit, Type N Connectors

2300-579-R PVS Application



Anritsu

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# Chapter 1 — Verification Kit Reference

## 1-1 Introduction

This manual supports the VectorStar 366xX-1 Verification Kits and the Anritsu 2300-579-R Performance Verification Software (PVS). This software is provided on a USB Memory Device that is included with the four verification kits described in this chapter. The VectorStar Verification Kits support the following VectorStar models. Beginning with PVS version 2.41 (Oct. 2017), 4-Port system testing is supported for 2.92 mm (K-Type) and 1.85 mm (V-Type) using either Fixed Load or AutoCal.

- MS4642A/B, 10 MHz to 20 GHz, K (m) Connector Test Ports
- MS4644A/B, 10 MHz to 40 GHz, K (m) Connector Test Ports
- MS4645A/B, 10 MHz to 50 GHz, V (m) Connector Test Ports
- MS4647A/B, 10 MHz to 70 GHz, V (m) Connector Test Ports

<b>Note</b>	Anritsu does not support tests or verification processes for wafer probe equipment. Contact the vendor of the wafer probe equipment if such support is desired.
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A quick start guide is available for the verification kits and the PVS software:  
10410-00285F-366xx-1-CalVerKits-2300-579-R-PVS-QSG

## 1-2 Verification Kit Reference Manual

As described in greater detail in [Chapter 2](#), the VNA verification kits allow you to verify the performance of a calibrated VectorStar VNA. 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. Four (4) different verification kits are available to match the VectorStar Port DUT connector requirements:

- **3669B-1** – V Connector Verification Kit
  - Applicable to MS4645A/B or MS4647A/B VNA (with V Connectors).
- **3668-1** – K Connector Verification Kit
  - Applicable to MS4642A/B or MS4644A/B VNA (with K Connectors)
  - Also applicable to MS4645A/B, MS4647A/B VNA (with V Connectors) by using K to V adapters.
- **3666-1** – SMA/3.5 mm Connector Verification Kit.
  - Applicable VNA models depend on the adapters used.
- **3663-1** – Type N Connector Verification Kit
  - Applicable VNA models depend on the adapters used.
  - Also applicable to MS4642A/B, MS4644A/B VNA (with K Connectors), or the MS4645A/B, MS4647A/B with (V Connectors) by using the appropriate adapters.

## 1-3 Verification Kit Standards

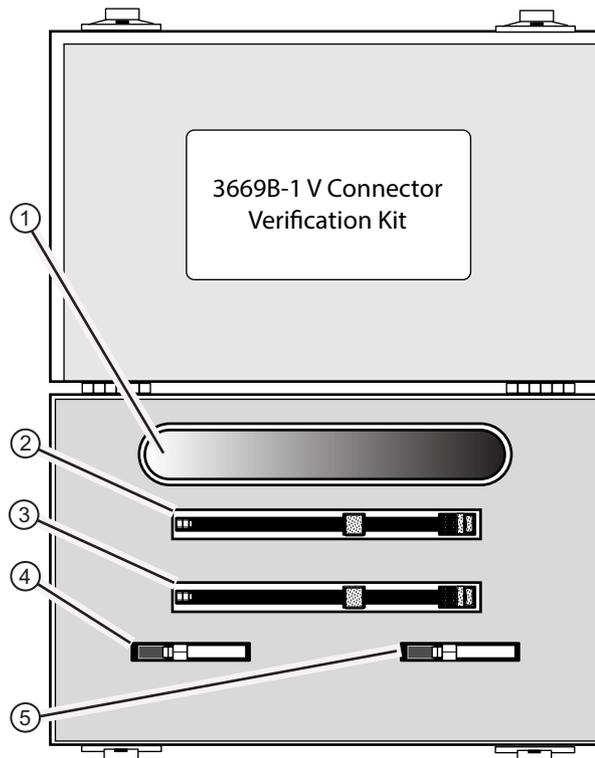
Each verification kit consists of four standards and each are supplied with S-parameter data. Each standard verifies a primary S-parameter with uncertainty windows provided at each data point as follows:

- 20 dB Attenuator –  $S_{21}$ ,  $S_{12}$  Magnitude and Phase
- 50 dB or 40 dB Attenuator –  $S_{21}$ ,  $S_{12}$  Magnitude and Phase
- Beadless Airline –  $S_{21}$ ,  $S_{12}$  Phase
- Beatty Standard –  $S_{11}$ ,  $S_{22}$  Magnitude

**Note** Many of the images in this document are used as typical representations of the product or of the product features. Your instrument and instrument displays may vary slightly from these images.

## 1-4 3669B-1 V Connector Verification Kit

The 3669B-1 V Connector Verification Kit is shown below in [Figure 1-1](#). The kit components are described below the figure.



- |  |   |
|--|---|
| <p>1. USB Memory Device – The memory device contains:</p> <ul style="list-style-type: none"> <li>• 2300-579-R PVS Application Installer</li> <li>• Component Device Characterization Data</li> <li>• Test Definition Files</li> <li>• Factory Calibration Reports for the kit components</li> <li>• Documentation</li> </ul> | <p>2. Airline – 19V50-5</p> <p>3. Beatty Airline – 19V50-5B</p> <p>4. 20 dB Offset (Pad) Attenuator – 42V-20</p> <p>5. 40 dB Offset (Pad) Attenuator – 42V-40</p> |
|--|---|

**Figure 1-1.** 3669B-1 V Connector Verification Kit Contents

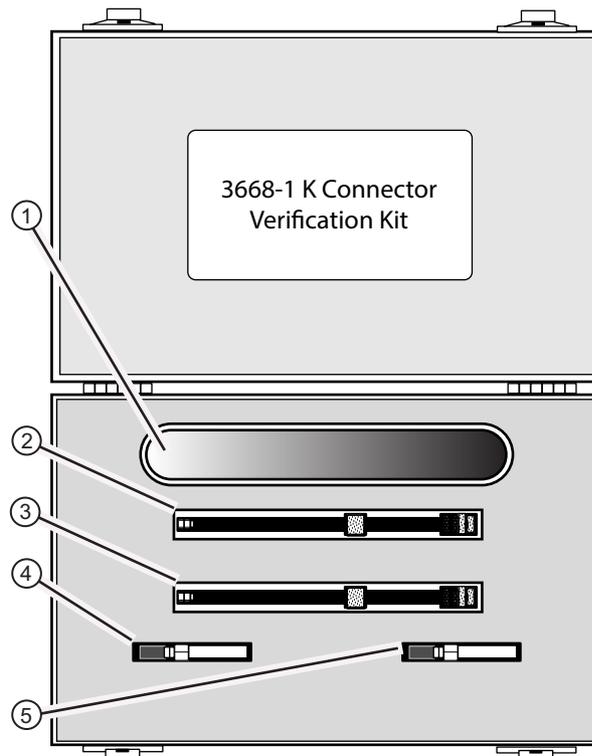
**Note**

The Personal Computer (PC) Controller and the VNA are connected over a GPIB network. The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.

The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later. The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package. Contact NI for additional details.

## 1-5 3668-1 K Connector Verification Kit

The **3668-1 K Connector Verification Kit** is shown below in [Figure 1-2](#). The kit components are described below the figure.



- |  |   |
|--|---|
| <p>1. USB Memory Device – The memory device contains:</p> <ul style="list-style-type: none"> <li>• 2300-579-R PVS Application Installer</li> <li>• Component Device Characterization Data</li> <li>• Test Definition Files</li> <li>• Factory Calibration Reports for the kit components</li> <li>• Documentation</li> </ul> | <p>2. Airline – 19K50-7</p> <p>3. Beatty Airline – 19K50-7B</p> <p>4. 20 dB Offset (Pad) Attenuator – 42K-20</p> <p>5. 50 dB Offset (Pad) Attenuator – 42K-50</p> |
|--|---|

**Figure 1-2.** 3668-1 K Connector Verification Kit Contents

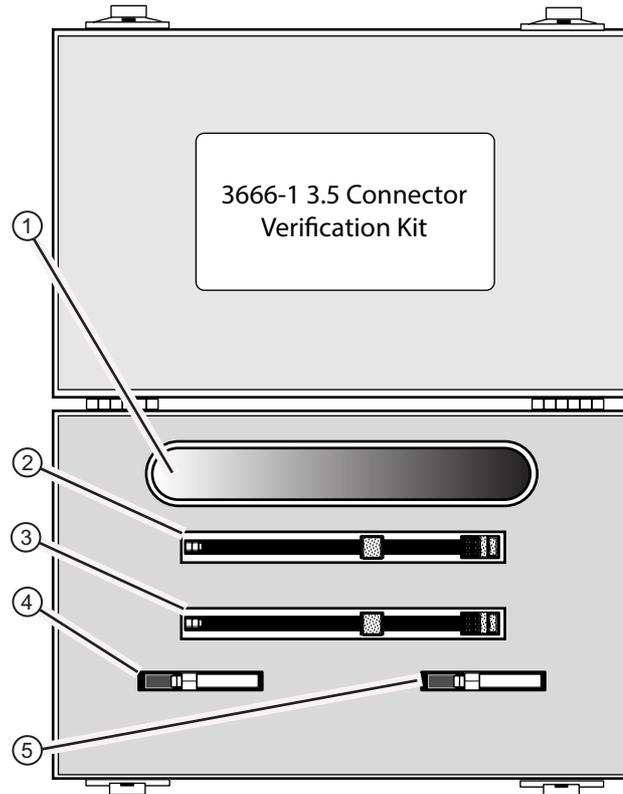
**Note**

The Personal Computer (PC) Controller and the VNA are connected over a GPIB network. The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.

The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later. The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package. Contact NI for additional details.

## 1-6 3666-1 3.5 mm Connector Verification Kit

The **3666-1 3.5 mm Connector Verification Kit** is shown below in [Figure 1-3](#). The kit components are described below the figure.



- |  |   |
|--|---|
| <p>1. USB Memory Device – The memory device contains:</p> <ul style="list-style-type: none"> <li>• 2300-579-R PVS Application Installer</li> <li>• Component Device Characterization Data</li> <li>• Test Definition Files</li> <li>• Factory Calibration Reports for the kit components</li> <li>• Documentation</li> </ul> | <p>2. Airline – 19S50-7</p> <p>3. Beatty Airline – 19S50-7B</p> <p>4. 20 dB Offset (Pad) Attenuator – 42S-20</p> <p>5. 50 dB Offset (Pad) Attenuator – 42S-50</p> |
|--|---|

**Figure 1-3.** 3666-1 3.5 mm Connector Verification Kit Contents

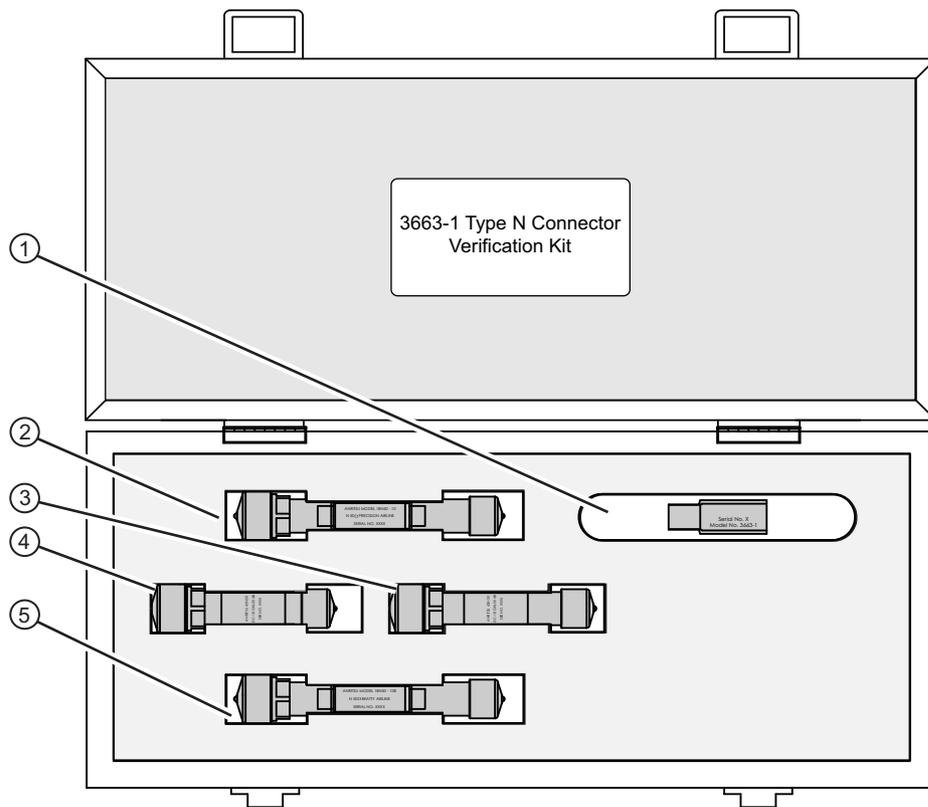
**Note**

The Personal Computer (PC) Controller and the VNA are connected over a GPIB network. The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.

The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later. The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package. Contact NI for additional details.

## 1-7 3663-1 Type N Connector Verification Kit

The **3663-1 Type N Connector Verification Kit** is shown below in [Figure 1-4](#). The kit components are described below the figure.



- |  |   |
|--|---|
| <p>1. USB Memory Device – The memory device contains:</p> <ul style="list-style-type: none"> <li>• 2300-579-R PVS Application Installer</li> <li>• Component Device Characterization Data</li> <li>• Test Definition Files</li> <li>• Factory Calibration Reports for the kit components</li> <li>• Documentation</li> </ul> | <p>2. N (m) to N (f) Precision Airline – 18N50-10</p> <p>3. 50 dB Attenuator – 42N-50</p> <p>4. 20 dB Attenuator – 42N-20</p> <p>5. N (m) to N (f) Beatty Airline – 18N50-10B</p> |
|--|---|

**Figure 1-4.** 3663-1 Type N Connector Verification Kit Contents

**Note**

The Personal Computer (PC) Controller and the VNA are connected over a GPIB network. The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.

The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later. The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package. Contact NI for additional details.

## 1-8 Related Documentation

All the latest product documentation related to the VectorStar and Lightning Series VNA are accessible at Anritsu's Web site at:

<http://www.anritsu.com/en-us/products-solutions/products/ms4640b-series.aspx>

On this web page, you can select various tabs for more information about your instrument. Included is a "Library" tab which contains links to all the latest technical documentation related to this instrument.

### Product Information, Compliance, and Safety

Refer to the VectorStar Product Information, Compliance, and Safety (PICS) – 10100-00063 for applicable product information, compliance statements, and safety information, including links to applicable product web pages.

## 1-9 Contacting Anritsu

To contact Anritsu, please visit:

<http://www.anritsu.com/en-US/contact-us>

From here, you can select the latest sales, service and support contact information in your country or region, provide online feedback, complete a "Talk to Anritsu" form to get your questions answered, or obtain other services offered by Anritsu.

# Chapter 2 — Performance Verification Software (PVS) Process Overview

## 2-1 Introduction

This chapter provides an overview of the VNA's verification process using the Performance Verification Software (PVS).

## 2-2 Verification Process

### Overview

The verification is a straightforward, semi-automatic process intended to show that the vector network analyzer (VNA) is performing to specification. After the system has been powered on for a minimum of one hour, the verification process can usually be accomplished in less than an hour.

It is important to recognize that the process involves seven (7) hardware components:

- VNA
- Calibration kit, either:
  - A manual calibration kit with fixed or sliding loads
  - An automatic calibrator (AutoCal) kit
  - The exact type of calibration kit to use depends on the VNA Test Port Connector type, and any required conversion adapters needed to accommodate the DUT.
- PC controller to run the PVS application
- GPIB cable between the VNA and the PC controller
- Compatible high-quality, phase-stable test port cable
- Verification kit
- Required adapters for the selected VNA and verification kit

Each of these components is described in greater detail in [Chapter 3 — Required Hardware](#).

### Verification Process Procedure

The following summarizes the installation, setup, configuration, calibration, and verification process. Each of these steps is described in greater detail in the following chapters.

1. Gather the required equipment including:
  - VNA
  - PC controller
  - GPIB Cable
  - Verification Kit
  - Calibration Kit, either an AutoCal Module or a Manual Calibration Kit
  - Adapters
  - Through Line

2. Obtain the information about the assembled equipment:
  - VNA Serial Number, Installed Options, and VNA Application Release Version
  - If not a first time verification, previous verification records for the VNA.
  - Verification Kit Part Number and Serial Number
  - Calibration Kit Part Number and Serial Number
3. Connect the **VNA** and the **PC controller** with the **GPIB cable** and make sure both have the correct GPIB addresses.
4. Power up the VNA and make sure it is in a temperature stable environment and has been on for at least 60 minutes.
5. If an **AutoCal Module** is to be used, connect it to AC Power and the signal port on the VNA and allow it to warm up. When at the correct temperature, its Blue LED is lit.
6. Insert the **Calibration Kit USB memory device** containing its characterization data into the VNA.
7. Insert **Verification Kit USB memory device** containing its characterization data into the PC controller.
8. If a first time use of the PVS application, install the software on the PC controller.
9. Start the PVS application.
10. Complete the system description screens and locate the verification coefficients and characterization data.
11. The system default selects the VNA calibration and all eight (8) verification tests. Deselect calibration and verification tests as required.
12. Install the required **Test Port adapters** and the **through line**. The adapters and through line must stay in their initially installed location throughout the calibration and verification tests.
13. Start the calibration process and select either an manual calibration kit or an AutoCal Module calibration kit. Review the kit model number and serial number data as correct.
14. The screens are different for an AutoCal or manual calibration kit. The operation is the same. Follow the on-screen directions for adding and removing modules and calibration kit components. As each test runs, the left side **Current Test** progress bar shows percentage completion. Just below, the **Test Progress** icons shown progress through all the selected tests. The right side **Display** area provides a narrative of test actions, progress, and saved location of the test results for each test.
15. When the calibration process is complete, the system is ready to start the eight default (or selected) verification tests.
16. Each test provides an explanatory dialog box and then a hardware configuration dialog box with a component assembly diagram. Prepare the test components as instructed, and, when ready, start the test.
17. When the test is complete, a status line appears in the right side **Results** matrix area. Later, click the test name line to see the report for that test.
18. Once a test is complete, the next one starts automatically.
19. When the calibration and verification tests are complete, the results report can be read by clicking on the test name in the **Results** matrix, or from the menu bar, selecting either **UTILITIES | Open File For Viewing** or **UTILITIES | Open File (for Print Only)**.

## 2-3 Factors Affecting Verification

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 VNA; failure is more often caused by factors other than the VNA (see next paragraph). Consequently, it is incumbent on the operator to examine these other factors before pronouncing the VNA as “out of specification.”

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

### Cables

A good method for evaluating cable performance is to calibrate a VNA—a simple frequency response transmission calibration will do, or in an uncalibrated system, you can use trace memory to store the response and then select Data/Memory to view it. In either case, when you connect port1 to port 2 using the cable under evaluation, 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 original 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 is 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 likely result in center conductor damage.

<b>Note</b>	Ensure that the slide is in the FORWARD position before attempting to connecting the Sliding Load.
-------------	--



# Chapter 3 — Required Hardware

## 3-1 Introduction

This chapter describes the required hardware needed to support the VectorStar verification process and the Performance Verification Software (PVS). Described are the compatible VNAs, PC Controller and related components, the GPIB cable, compatible manual or automatic calibration kits, through line requirements, and necessary adapters.

## 3-2 Required Equipment Summary

The following equipment is required:

- VectorStar MS4640A/B Series VNA
- Verification Kit
- PC Controller with required processor, RAM, and hard drive free space, and with National Instrument (NI) GPIB Controller PCI Board and NI VISA Library installed on GPIB Board.

<b>Note</b>	<p>The Personal Computer (PC) Controller and the VNA are connected over a GPIB network.</p> <p>The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.</p> <p>The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later.</p> <p>The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package.</p> <p>Contact NI for additional details.</p>
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- GPIB Cable
- Calibration Kit
  - Either a Automatic Calibrator (AutoCal) Calibration Kit or a Manual Calibration Kit
- Connector Adapters as required
- Test Port Through Line

A part number summary of all required equipment is provided in [Table 3-1](#) at the end of this chapter.

## 3-3 VectorStar MS4640A/B Series VNAs

### VectorStar VNA Models

The 2300-579-R PVS application is used for performance verification of the VectorStar MS4640A/B Series Vector Network Analyzers (VNAs) including the:

- MS4642A/B VNA, K connectors, 10 MHz to 20 GHz Standard, 70 kHz to 20 GHz with Option 070
- MS4644A/B VNA, K connectors, 10 MHz to 40 GHz Standard, 70 kHz to 40 GHz with Option 070
- MS4645A/B VNA, V connectors, 10 MHz to 50 GHz Standard, 70 kHz to 50 GHz with Option 070
- MS4647A/B VNA, V connectors, 10 MHz to 70 GHz Standard, 70 kHz to 70 GHz with Option 070

## VectorStar VNA Options

If the lower frequency range of 70 kHz to 10 MHz is required, the VNA must be equipped with the **MS4640A/B-070 70 kHz Low-End Frequency Extension**. The option certifies frequencies to 70 kHz, but allows the instrument to be set to as low as 40 kHz.

All other VectorStar options do not affect the calibration/verification equipment required nor the verification process. For a summary of all options, refer to the VectorStar MS4640A/B Series VNA Technical Data Sheet and Operation Manual at: [www.anritsu.com](http://www.anritsu.com)

## VectorStar VNA Serial Numbers and Installed Options

All Anritsu VectorStar MS4640A/B Series VNA instruments are assigned a six- or seven-digit ID Serial Number, such as Serial Number 0185204. This number appears on a label affixed to the rear panel. Below the serial number is a list of the VNA installed options using the last three digits listed above, such as Options 002, 007, 062, and 070.

## 3-4 VectorStar MS4640A/B Series VNA Verification Kits

The connectors on the selected verification kit usually match those of the VNA to be verified. In all cases, at least two and possibly four additional adapters (described below) are required to complete the Port to Port connections. As described in [Chapter 1](#), the following verification kits are available:

- 3669B-1 V Connector Verification Kit
- 3668-1 K Connector Verification Kit
- 3666-1 SMA/3.5 mm Connector Verification Kit
- 3663-1 Type N Connector Verification Kit

These verification kits are dedicated for the VectorStar MS4640A/B Series VNA. The kits consist of:

- Two attenuators
- One precision airline
- One stepped impedance airline Beatty Standard
- One USB Memory Device with:
  - 2300-579-R Performance Verification Software (PVS)
  - PVS User Guide – 10410-00270 (this document)
  - PVS Quick Start Guide – 10410-00285
  - Device characterization data and test configuration files.

Verification kits include characterized traceable standards that can be used with the provided software and data to verify the calibration and resulting performance of your VNA. The applicable calibrations depend on the type of calibration kit used.

## 3-5 Calibration Kits

The use of a calibration kit, automatic or manual, is required before doing the VNA verification. Working through the PC Controller, the PVS application software controls the settings on the VNA and instructs the user as to which components to connect during the calibration. In general, the connectors on the calibration kit used should match those on the VNA. If 3.5 mm or Type N calibration on either a K- or V-Connector VNA is required, additional adapters, discussed below, are required.

### Automatic Calibrator (AutoCal) Calibration Kits

If an AutoCal calibration kit is to be used, only the following kits are supported:

- **36585V-2MF** – Precision AutoCal Module – V (m) to V (f) – For MS4645A/B and MS4647A/B VNAs used with the 3669B-1 V Connector Verification Kit.
- **36585K-2MF** – Precision AutoCal Module – K (m) to K (f) – For MS4642A/B and MS4644A/B VNAs used with the 3668-1 K Connector Verification Kit.

**Note**

Note that the 3666-1 3.5 mm Verification Kit is not supported with AutoCal modules. Instead, the 3650A-1 SMA/3.5 mm Manual Calibration Kit must be used.

Note that the 3663-1 Type N Connector Verification Kit is not supported with AutoCal modules. Instead, the 3653A Type N Connector Manual Calibration Kit must be used.

### Manual Calibration Kits

If a manual calibration kit is to be used, only the following kits are supported:

- 3654D – V (1.85 mm) Connector Manual Calibration Kit with Fixed Loads
- 3654D-1 – V (1.85 mm) Connector Manual Calibration Kit with Sliding Loads
- 3653A – Type N Connector Calibration Kit with Fixed Loads
- 3652A – K (2.92 mm) Connector Manual Calibration Kit with Fixed Loads
- 3652A-1 – K (2.92 mm) Connector Manual Calibration Kit with Sliding Loads
- 3650A – SMA/3.5 mm Connector Manual Calibration Kit with Fixed Loads
- 3650A-1 – SMA/3.5 mm Connector Manual Calibration Kit with Sliding Loads

The 365xX-1 Manual Calibration Kits and the PVS application support a Short-Open-Load-Through (SOLT) with Sliding Load calibration for most kits, and Fixed Load calibration for all 365xA Manual Calibration Kits.

**Note**

3666-1, 3668-1, and 3669B-1 Verification Kits with serial numbers below 1309001 **will not** have fixed load calibration capabilities unless the kits have been returned to Anritsu for calibration.

## 3-6 Adapters

To complete the verification kit connections, adapters may be required on VNA Port 1 and Port 2 that are not supplied by the verification kits. Note that use of the 3666-1 SMA/3.5 mm Connector Verification Kit, 3663-1 Type N Verification Kit, and 3653A Type N Mechanical Calibration Kit may require multiple adapters.

### V Connector Adapters

- **33VVF50C** – V (f) to V (f) Adapter – On Port 1
- **33VVF50C** – V (m) to V (f) Adapter – On Through Line at Port 2
- One V (f) to V (m) Test Port Cable on VNA Port 2

### K Connector Adapters

- **33KFKF50B** – K (f) to K (f) Adapter – On Port 1
- **33KKF50B** – K (m) to K (f) Adapter – On Through Line at Port 2
- K (f) to K (m) Test Port Cable on VNA Port 2

### 3.5 mm Connector Adapters

The required 3.5 mm adapters depend on the VNA used and can require two or four adapters:

- **MS4645A/B, MS4647A/B** with V Connectors - Four Adapters
  - **Test Port 1 V (m)**
    - **34VFKF50** – V (f) to K (f) Adapter – On Port 1
    - **33SSF50** – 3.5 mm (m) to 3.5 mm (f) Adapter – On the adapter above.
  - **Test Port 2 V (m)**
    - **34VFK50** – V (f) to K (m) – On Port 2
    - **33SSF50** – 3.5 mm (m) to 3.5 mm (f) Adapter – On Through Line at Port 2
    - One K (f) to K (m) Test Port Cable
- **MS4642A/B, MS4644A/B** with K Connectors – Two Adapters
  - **Test Port 1 K (m)**
    - **33SFSF50** – 3.5 mm (f) to 3.5 mm (f) Adapter – On Port 1
  - **Test Port 2 V (m)**
    - **33SSF50** – 3.5 mm (m) to 3.5 mm (f) Adapter – On Through Line at Port 2
    - One K (f) to K (m) Test Port Cable on VNA Port 2

### Type N Connector Adapters

The required Type N adapters listed here assume using an MS4642A/B or MS4644A/B VNA equipped with K Test Port Connectors to provide a fully insertable (M to F) connector measurement reference plane for the DUT.

- **MS4642A/B, MS4644A/B** with K Connectors – Three Adapters
  - **Test Port 1 K (m)**
    - **3671K50-1** – K (f) to K (m) Test Port Cable – On Port 1.
    - **71693-R** – K (f) to N (f) Adapter – On cable above.
  - **Test Port 2 K (m)**
    - **3671K50-1** – K (f) to K (m) Test Port Cable – On Port 2.
    - **71693-R** – K (f) to N (f) Adapter – On cable above.
    - **33NN50B** – N (m) to N (m) Adapter – On the adapter above.

## 3-7 Test Port Through Line Cables

<b>Note</b>	Cable connectors marked with an asterisk "*" such as V* (f) and K* (f) are ruggedized for VNA test ports only and do not fit other standard V (f) or K (f) connectors.
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One (1) Test Port Cable at least 61 cm (24") long is required and must be compatible with the VectorStar VNA Test Port Type and gender. Test port cables less than 61 cm (24") are too short for verification operations. Note that test port cables longer than 61 cm (24") may not be stable enough for verification procedures. Typical compatible Anritsu cables are listed below.

### V Connector Cables

For **MS4645A/B**, **MS4647A/B** VNAs with V connectors:

- **3670V50A-2** – Ruggedized Semi-Rigid Cable – 61 cm (24") V (f) to V (m)
- **3671V50-100** – Test Port Cable – 100 cm (39.4") V\* (f) to V (m)

### K Connector Cables

For **MS4642A/B**, **MS4644A/B** VNAs with K Connectors:

- **3670K50-2** – Ruggedized Semi-Rigid Cable – 61 cm (24") K (f) to K (m)
- **3671K50-100** – Test Port Cable – 100 cm (39.4") K\* (f) to K (m)

### 3.5 mm Connector Cables

The required test port cable depends on the VNA model and its test port connectors:

- If the 3666-1 3.5 mm Verification Kit is used on a V-Connector VNA MS4645A/B, MS4647A/B, the following cable is required:
  - **3670K50-2** – Test Port Cable Ruggedized Semi-Rigid – 61 cm (24") – K (f) to K (m)
- If the 3666-1 3.5 mm Verification Kit is used on a K-Connector VNA (MS4642A/B, MS4644A/B), one of the following cables is required:
  - **3670K50-2** – Ruggedized Semi-Rigid Cable – 61 cm (24") K (f) to K (m)
  - **3671K50-100** – Test Port Cable – 100 cm (39.4") K\* (f) to K (m)

### 3-8 Summary of Required Hardware

The table below summarizes the required support hardware for each verification kit. Only one calibration kit, automatic or manual, is required. Note also that the PC Controller and the connecting GPIB cable are required for all VNAs and all verification kits.

**Table 3-1.** Summary of Required Hardware (1 of 2)

Ver Kit VNAs Adapters	VNA Test Port Required Adapter and/or Through Line	Compatible AutoCal Calibration Kits	Compatible Manual Calibration Kits	Recommended Test Port Cables
<b>3669B-1 V Connector Verification Kit</b>  MS4645A/B MS4647A/B  Two Adapters	<ul style="list-style-type: none"> <li>Test Port 1 V (m)</li> <li>33VVF50C V (f) to V (f) Adapter on Port 1</li> </ul>	36585V-2MF Precision AutoCal Module with V (m) to V (f) Connectors	3654D V (1.85 mm) Mechanical Calibration Kit with Fixed Loads  3654D-1 V (1.85 mm) Mechanical Calibration Kit with Sliding Loads	3670V50A-2 Test Port Cable Ruggedized Semi-Rigid 61 cm (24") – V (f) to V (m)
	<ul style="list-style-type: none"> <li>Test Port 2 V (m)</li> <li>Through Line Cable on Port 2</li> <li>33VVF50C V (m) to V (f) Adapter on cable above</li> </ul>			3671V50-100 Test Port Cable Flexible Phase Stable 100 cm (39.4") – V (f) to V (m)  <i>Note #1</i>
<b>3668-1 K Connector Verification Kit</b>  MS4642A/B MS4644A/B  Two Adapters	<ul style="list-style-type: none"> <li>Test Port 1 K (m)</li> <li>33KFKF50B K (f) to K (f) Adapter on Port 1</li> </ul>	36585K-2MF Precision AutoCal Module with K (m) to K (f) Connectors	3652A K (2.92 mm) Mechanical Calibration Kit with Fixed Loads  3652A-1 K (2.92 mm) Mechanical Calibration Kit with Sliding Loads	3670K50-2 Test Port Cable Ruggedized Semi-Rigid 61 cm (24") – K (f) to K (m)
	<ul style="list-style-type: none"> <li>Test Port 2 K (m)</li> <li>Through Line Cable on Port 2</li> <li>33KFKF50B K (m) to K (f) on cable above</li> </ul>			3671K50-100 Test Port Cable Flexible Phase Stable 100 cm (39.4")- K (f) to K (m)  <i>Note #2</i>
<b>3666-1 3.5 mm Connector Verification Kit</b>  MS4645A/B MS4647A/B  Four Adapters	<ul style="list-style-type: none"> <li>Test Port 1 V (m)</li> <li>34VFKF50 V (f) to K (f) Adapter on Port 1</li> <li>33SSF50 3.5 mm (m) to 3.5 mm (f) Adapter on adapter above</li> </ul> <i>Note #3</i>	<i>AutoCal is not available for 3.5 mm Verification Kits</i>	3650A SMA/3.5 mm Mechanical Calibration Kit with Fixed Loads  3650A-1 SMA/3.5 mm Mechanical Calibration Kit with Sliding Loads	3670K50-2 Test Port Cable Ruggedized Semi-Rigid 61 cm (24") – K (f) to K (m)
	<ul style="list-style-type: none"> <li>Test Port 2 V (m)</li> <li>34VFK50 V (f) to K (m) Adapter on Port 2</li> <li>Through Line Cable on adapter above</li> <li>33SSF50 3.5 mm (m) to 3.5 mm (f) on cable above</li> </ul> <i>Note #3</i>			

Table 3-1. Summary of Required Hardware (2 of 2)

Ver Kit VNAs Adapters	VNA Test Port Required Adapter and/or Through Line	Compatible AutoCal Calibration Kits	Compatible Manual Calibration Kits	Recommended Test Port Cables
<b>3666-1 3.5 mm Connector Verification Kit</b>  MS4642A/B MS4644A/B  Two Adapters	<ul style="list-style-type: none"> <li>• Test Port 1 K (m)</li> <li>• 33SFSF50 3.5 mm (f) to 3.5 mm (f) Adapter on Port 1</li> </ul>	<i>AutoCal is not available for 3.5 mm Verification Kits</i>	3650A SMA/3.5 mm Mechanical Calibration Kit with Fixed Loads  3650A-1 SMA/3.5 mm Mechanical Calibration Kit with Sliding Loads	3670K50-2 Test Port Cable Ruggedized Semi-Rigid 61 cm (24") – K (f) to K (m)
	<ul style="list-style-type: none"> <li>• Test Port 2 K (m)</li> <li>• Through Line Cable on Port 2</li> <li>• 33SSF50 3.5 mm (m) to 3.5 mm (f) Adapter on cable above</li> </ul>			3671KFK50-100 Test Port Cable Flexible Phase Stable 100 cm (39.4") - K (f) to K (m)  <i>Note #2</i>
<b>3663-1 Type N Connector Verification Kit</b>  MS4642A/B MS4644A/B  Three Adapters	<ul style="list-style-type: none"> <li>• Test Port 1 K (m)</li> <li>• Test Port Cable on Port 2</li> <li>• 71693-R K (f) to N (f) Adapter on cable above</li> </ul>	<i>AutoCal is not available for Type N Verification Kits</i>	3653A Type N Mechanical Calibration Kit with Fixed Loads	3671KFK50-60 Test Port Cable Flexible Phase Stable 60 cm (23.6") - K (f) to K (m)  <i>Note #2</i>
	<ul style="list-style-type: none"> <li>• Test Port 2 K (m)</li> <li>• Test Port Cable on Port 2</li> <li>• 71693-R K (f) to N (f) Adapter on cable above</li> <li>• 33NN50B N (m) to N (m) Adapter on adapter above</li> </ul>			3671KFK50-60 Test Port Cable Flexible Phase Stable 60 cm (23.6") - K (f) to K (m)  <i>Note #2</i>

Note #1 – The V (f) connector on this cable is only for VNA test ports. Connector does not fit standard V (m) connectors.

Note #2 – The K (f) connector on this cable is only for VNA test ports. Connector does not fit standard K (m) connectors.

Note #3 – 3.5 mm connectors are mechanically compatible with K connectors.



# Chapter 4 — Hardware Configuration

## 4-1 Introduction

This chapter describes how the various system elements are interconnected and the necessary GPIB addresses established.

**Note**

Many of the images in this document are used as typical representations of the product or of the product features. Your instrument and instrument displays may vary slightly from these images.

## 4-2 Electrostatic Discharge Prevention

All electronic devices, components, and instruments can be damaged by electrostatic discharge. It is important to take preventative measures to protect the instrument and its internal subassemblies from electrostatic discharge.

An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the MS4640A/B Series VNA instruments.

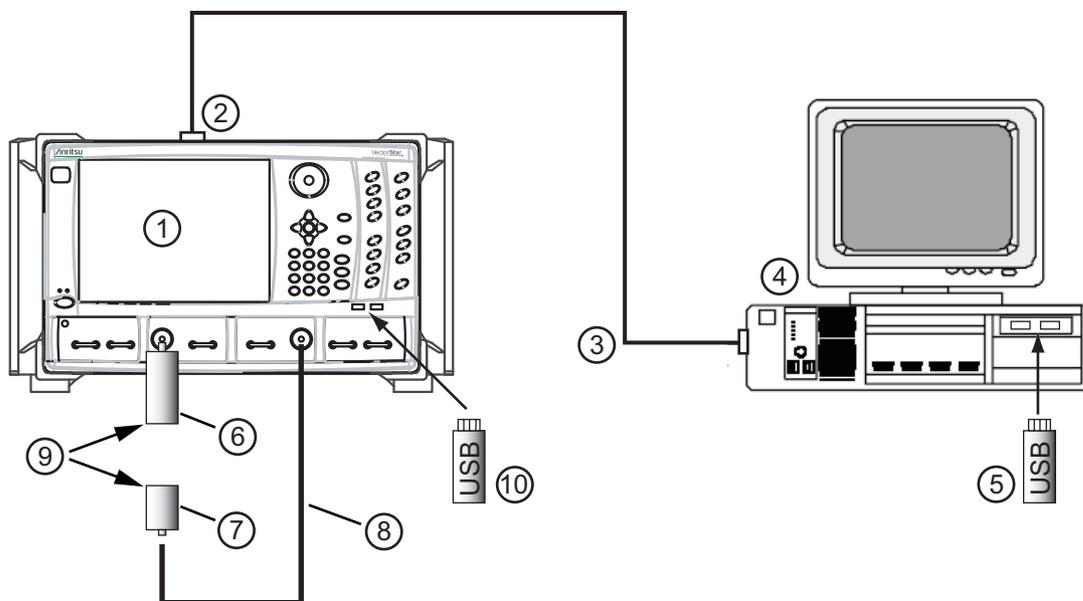
Prior to connecting an extension cable to the VNA test port, take steps to eliminate the static charges built-up on the cable. This can be done by terminating the open-end of the extension cable with the short from the calibration kit and then grounding the outer conductor of the connector on the cable.

## 4-3 VNA and PC Controller Connections

**Note**

Many of the images in this document are used as typical representations of the product or of the product features. Your instrument and instrument displays may vary slightly from these images.

The connections between the VNA and the PC Controller are summarized in the figure below.



- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. VectorStar MS4640A/B Series VNA</li> <li>2. VNA Rear Panel IEEE 488.2 GPIB Port <ul style="list-style-type: none"> <li>• For GPIB talker/listener to PC controller connections.</li> </ul> </li> <li>3. GPIB Cable to PC Controller and National Instruments PCI GPIB Card Port and VISA library installed on the PCI card. <ul style="list-style-type: none"> <li>• See note below for requirements.</li> </ul> </li> <li>4. PC Controller: The 2300-579-R System Performance Verification Software is installed from the USB Memory Device.</li> <li>5. Verification Kit USB Memory Device containing PVS Application installer, Characterization Measurement Data, Test Parameter Definition files, and original factory calibration reports.</li> </ol> | <ol style="list-style-type: none"> <li>6. Port 1 F-F Adapter: <ul style="list-style-type: none"> <li>• 33VVF50C for MS4645A/B, MS4647A/B V connectors</li> <li>• 33KKF50B for MS4642A/B, MS4644A/B K connectors.</li> </ul> </li> <li>7. Port 2 M-F Adapter: <ul style="list-style-type: none"> <li>• 33VVF50C for MS4645A/B, MS4647A/B V connectors</li> <li>• 33KKF50B for MS4642A/B, MS4644A/B K connectors.</li> <li>• See <a href="#">Chapter 3 — Required Hardware</a> for 3.5 mm and Type N Adapters.</li> </ul> </li> <li>8. Through Line Cable <ul style="list-style-type: none"> <li>• High-quality, phase-stable test port through line</li> <li>• V (f) to V (m) for MS4645A/B, MS4647A/B</li> <li>• K (f) to K (m) for MS4642A/B, MS4644A/B.</li> </ul> </li> <li>9. Insert calibration and verification components here.</li> <li>10. Calibration Kit (Manual or Automatic Calibrator) calibration device coefficients data on USB Memory Device.</li> </ol> |
|---|--|

**Figure 4-1.** MS4640A/B VNA and PC Controller Connection Diagram

**Note**

The Personal Computer (PC) Controller and the VNA are connected over a GPIB network. The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.

The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later.

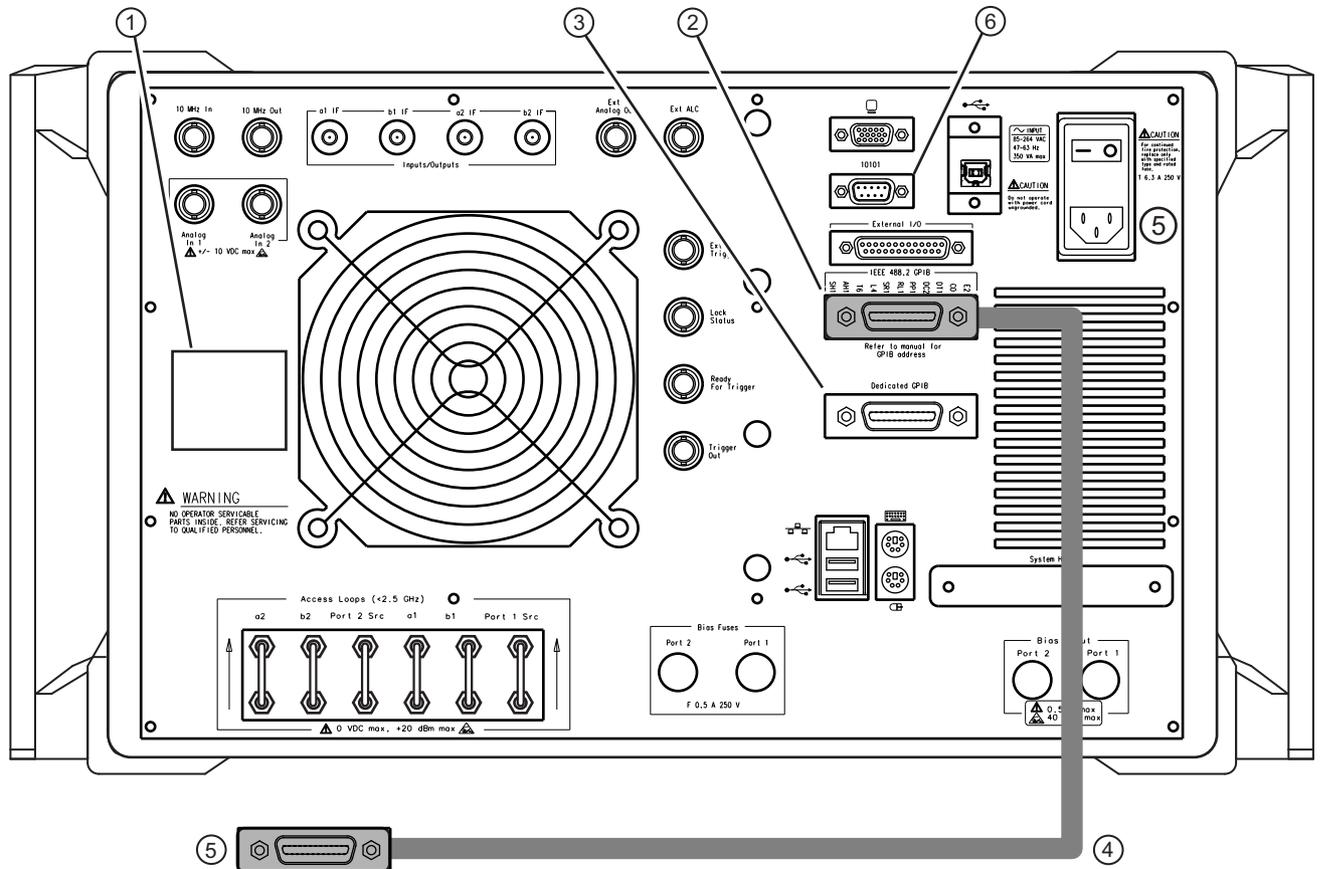
The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package.

Contact NI for additional details.

### 4-4 Connecting PC Controller and VNA

Connect the PC Controller and the VNA via a GPIB cable.

1. Connect the GPIB Cable to the VNA rear panel IEEE 488.2 GPIB Port as shown below. Note that the correct port is the upper GPIB port, (#2 in Figure 4-2), and not the lower Dedicated GPIB port, (#3 in Figure 4-2)
  - The recommended cable is an Anritsu PN: 2100-2-R.



**Figure 4-2.** VNA Rear Panel GPIB Cable connection to the IEEE 488.2 GPIB Port

- |  |   |
|--|---|
| 1. VNA Serial Number Label with model number and installed options.                                      | 4. Standard GPIB Cable  |
| 2. VNA IEEE 488.2 GPIB Port – Upper GPIB Port – For control of the VNA by a remote PC controller.        | 5. GPIB Connector to PC Controller GPIB Port                    |
| 3. VNA Dedicated GPIB Port – Lower GPIB Port – For VNA control of external devices such as Power Meters. | 6. Serial 10101 Port – Used for AutoCal Module described below. |

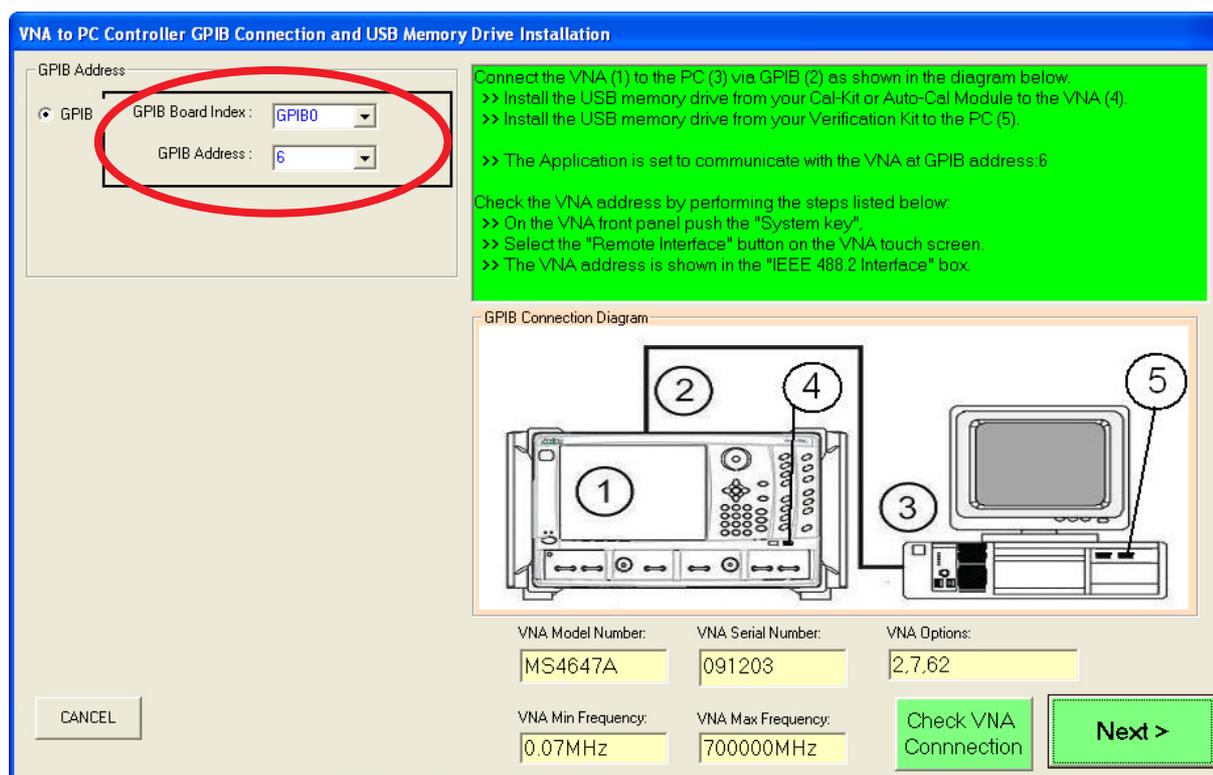
**Figure 4-2.** VNA Rear Panel GPIB Cable connection to the IEEE 488.2 GPIB Port

- While at the rear panel, write down the VNA Serial Number and the list of Installed Options on the Rear Panel Identification Label on the left.
- Route the GPIB cable to the PC Controller and connect to the National Instrument PCI GPIB Card and connect. If using a NI PCMCIA card and a laptop, route the NI-supplied cable between the PCMCIA card and the VNA rear panel.

## 4-5 GPIB Addressing

### PC Controller GPIB Address

The PC Controller must be configured as “GPIB0.” After startup, the Check VNA GPIB Connection screen verifies this setting as shown below.



**Figure 4-3.** Check VNA to PC Controller Connection and USB Memory Device Installation

### Setting VNA GPIB Address from the PVS Application

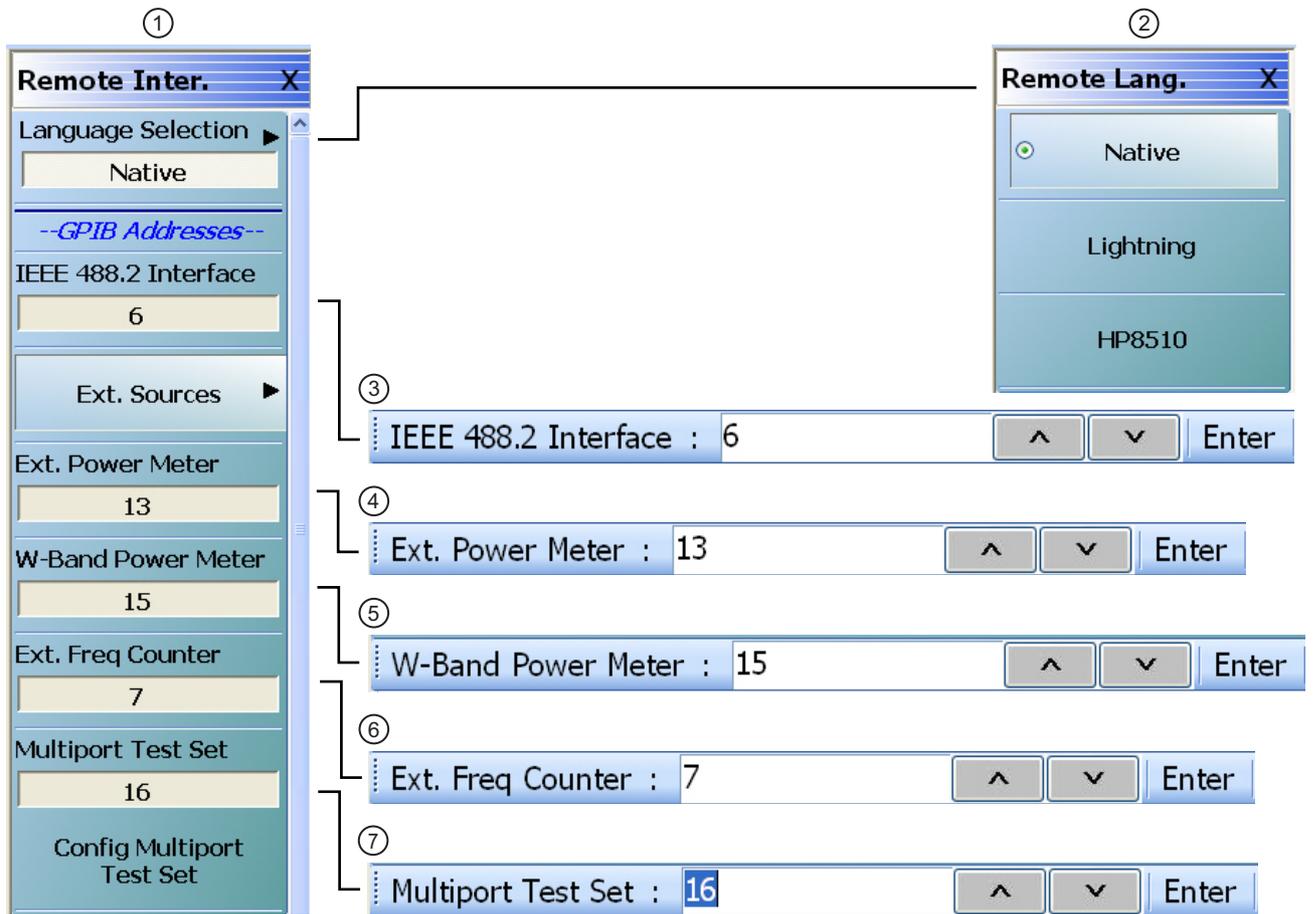
The address setting for the VNA can be set either from the screen above or from the VNA user interface.

If set from the screen above, the default setting is GPIB = 6. If necessary to change, use the down arrow to select another address from the drop-down menu.

### Setting VNA GPIB Address from the VNA

The default GPIB address for the VNA = 6. If it needs to be changed from the VNA user interface, proceed as follows:

1. On the VectorStar MS4640A/B Series VNAs, to change the GPIB Address, navigate to the REMOTE INTER. (REMOTE INTERFACE) menu, a submenu in the SYSTEM menu group.
2. Select MAIN | System | SYSTEM | Remote Interface | REMOTE INTER.
  - The REMOTE INTER. menu appears as shown in [Figure 4-4](#) below.



<ol style="list-style-type: none"> <li>1. REMOTE INTERFACE Menu</li> <li>2. REMOTE LANGUAGE Menu</li> <li>3. IEEE 488.2 Interface GPIB Address Toolbar</li> <li>4. External Power Meter GPIB Address Toolbar</li> </ol>	<ol style="list-style-type: none"> <li>5. W-Band Power Meter GPIB Address Toolbar                     <ul style="list-style-type: none"> <li>• On MS4647A/B VNAs with Option 080/081, the W-Band Power Meter button is present.</li> <li>• On MS4647A/B VNAs without Option 080/081, the button is not present.</li> </ul> </li> <li>6. External Frequency Counter GPIB Address Toolbar</li> <li>7. Multiport Test Set GPIB Address Toolbar</li> </ol>
---	--

**Figure 4-4.** VNA REMOTE INTER. (REMOTE INTERFACE) Menu – GPIB Addresses

3. On the REMOTE INTER. menu, select the IEEE 488.2 Interface button.
4. The factory as-shipped default address for the VectorStar VNA is GPIB address **6** (six).

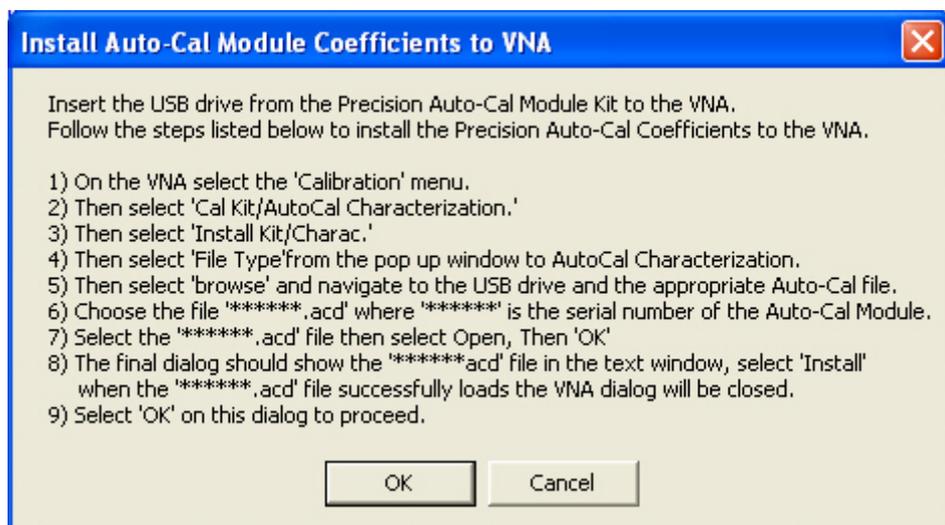
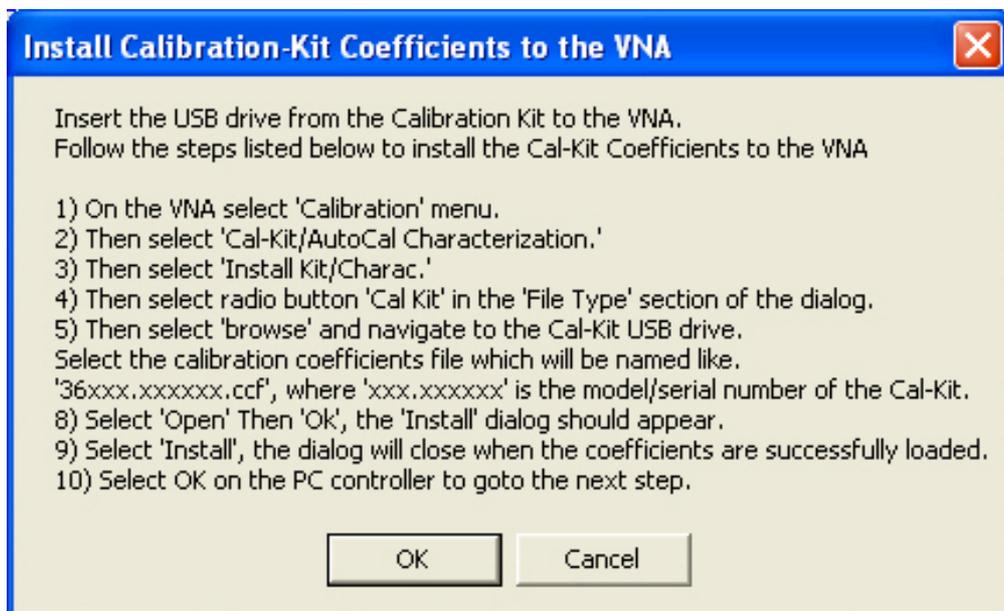
5. Select the IEEE 488.2 Interface button to access the IEEE 488.2 Interface field toolbar and then select any valid address and then click the Enter button on the toolbar (see [Figure 4-4](#) above).

**Note** The GPIB Address settings on the VNA and in the PVS application must match.

6. If the VNA address is changed, a reboot is recommended but not required.

## 4-6 Loading Calibration Kit Coefficients into VNA

Before a calibration kit can be used with the VNA, its calibration coefficients must be loaded into the VNA. A dialog box reminds you to load the coefficients, either for an AutoCal Module Calibration Kit or Manual Calibration Kit. The reminder dialogs are shown below.



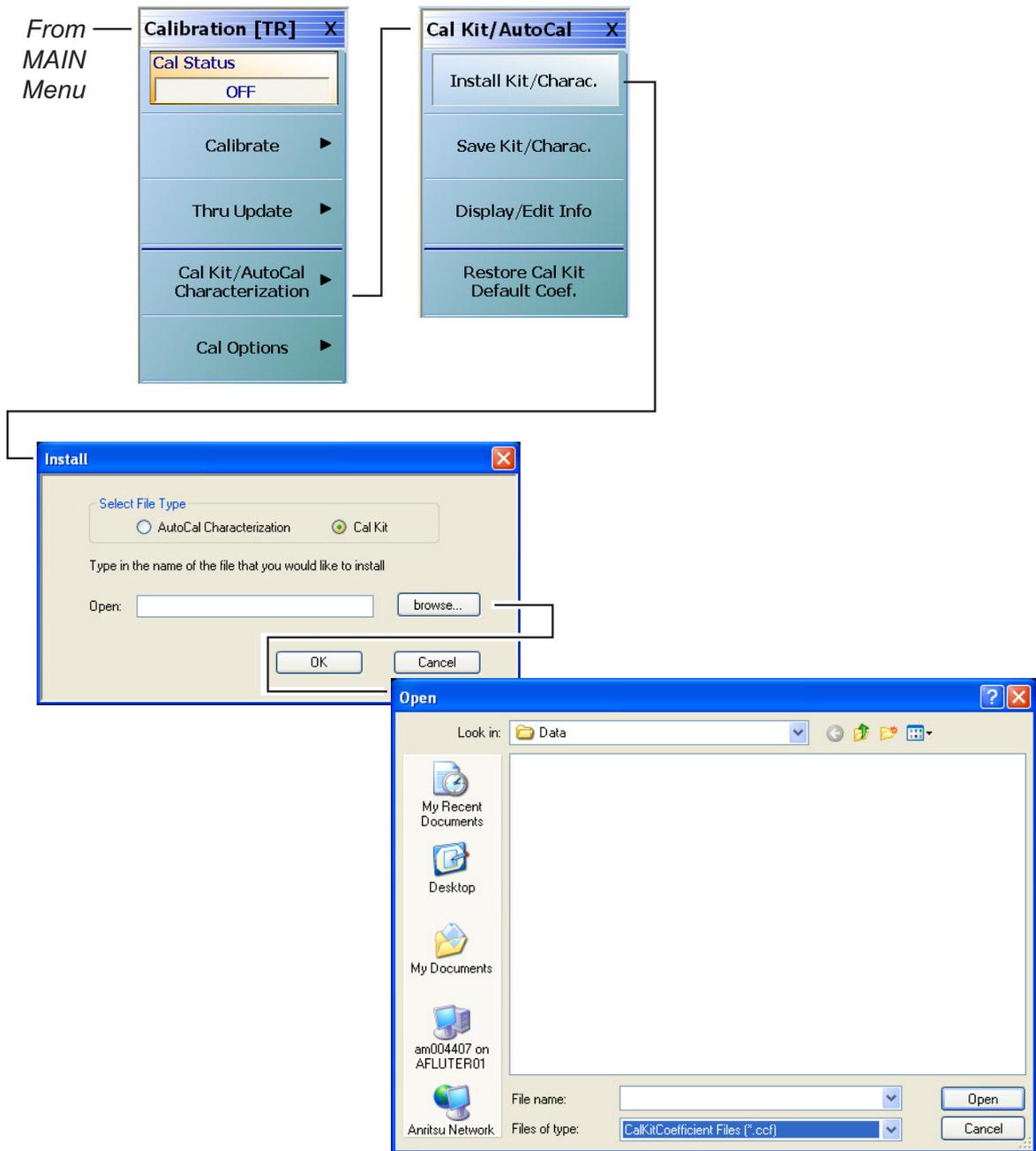
At top, INSTALL CALIBRATION KIT COEFFICIENTS to VNA Dialog Box.

At bottom, INSTALL AUTOCAL MODULE COEFFICIENTS to VNA Dialog Box.

**Figure 4-5.** Instruction Dialog Boxes to Load Calibration Kit Coefficients onto VNA

Best practices recommend loading the coefficients file into the VNA before starting the verification tests as described below.

1. Insert the USB Memory Device for the calibration kit into a VNA USB 2.0 Type A Port.
2. On the VectorStar MS4640A/B Series VNA, navigate to the CAL KIT/AUTOCAL menu, a submenu in the CALIBRATION menu group.
3. Select MAIN | Calibration | CALIBRATION | Cal Kit/AutoCal Characterization  
The CAL KIT/AUTOCAL menu appears as shown below.



**Figure 4-6.** VNA Menus and Dialog Boxes for Loading Calibration Kit Characterization Files

4. Select the Install Kit/Charac. button. The INSTALL dialog box appears.
5. Select button for the type of file to install:

- AutoCal Characterization for AutoCal automatic calibration modules.
  - Cal Kit for manual calibration kits.
6. Select the **Browse** button. The **OPEN** dialog box appears.
  7. In the **Files of Type** area at the bottom of the dialog box:
    - For AutoCal Modules, select either the **AutoCalKitCharacterization Files (\*.acd)** or **All Files** file type.
    - For Manual Calibration Kits, select the **CalKitCoefficient Files (\*.ccf)** file type.
  8. Navigate to the USB Device and select the appropriate calibration kit characterization file.
    - AutoCal Module Characterization files are named `<Serial Number>.acd` using the serial number of the AutoCal Module Calibration Kit.
    - Manual Calibration Kit Characterization files are named `<Serial Number>.ccf` using the serial number of the manual calibration kit.
  9. With the appropriate file selected, select **Open** and then **OK**.
  10. A dialog appears stating that a characterization file was detected. Select **Install**.
  11. A final dialog will acknowledge the installation was successful.

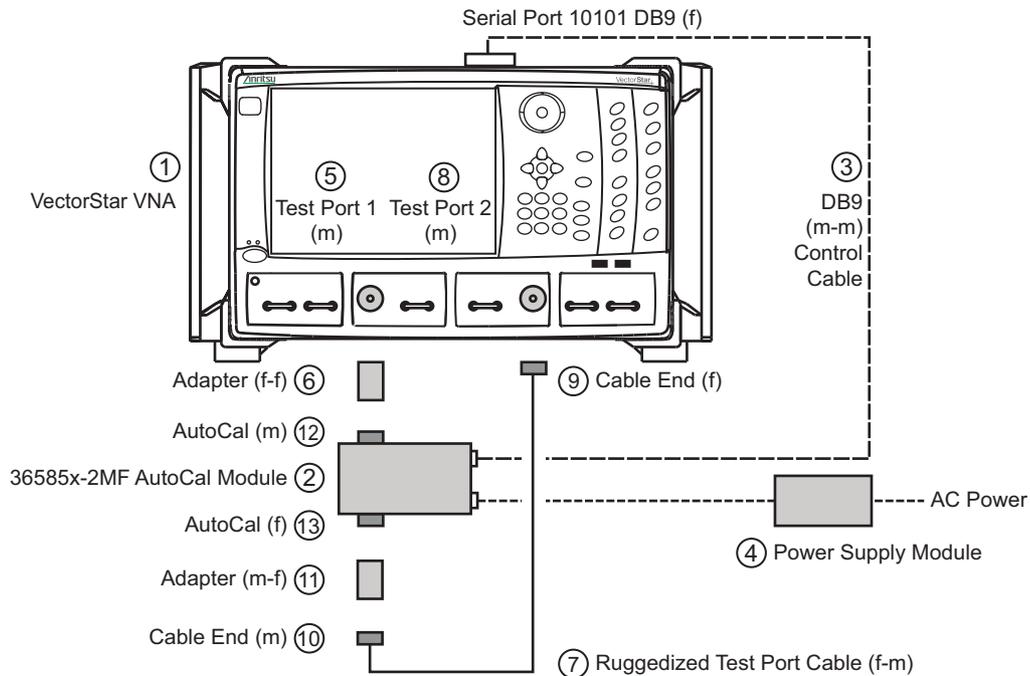
## 4-7 Connecting the Precision AutoCal Module

Use this procedure if you will use the AutoCal Module for your calibration kit.

1. Position the VectorStar MS4640A/B Series VNA for the calibration/verification tests as shown below in [Figure 4-7](#). Only the M-F versions of the Precision AutoCal Modules, 36585K-2MF and 36585V-2MF, are supported by the 2300-579-R PVS application.

**Note** Do not connect the AutoCal Module to the VNA Test Ports until directed to do so by the PVS application.

2. Connect the DB-9 Signal Cable to the DB-9 port on the AutoCal Module.
3. Connect the other end of the DB-9 Signal Cable to the VNA Rear Panel Serial 10101 Port.
4. Connect the AC Power Module to the AC Line and then to the AutoCal Module; the module Green LED illuminates.
5. Allow the module to warm up for a few minutes. When it is at operating temperature, the Blue LED illuminates. The AutoCal Module is ready to use. Do not connect the AutoCal module to the VNA test ports until directed by the PVS application.



**Figure 4-7.** Precision AutoCal Module 36585X-2MF Connections to VNA (1 of 2)

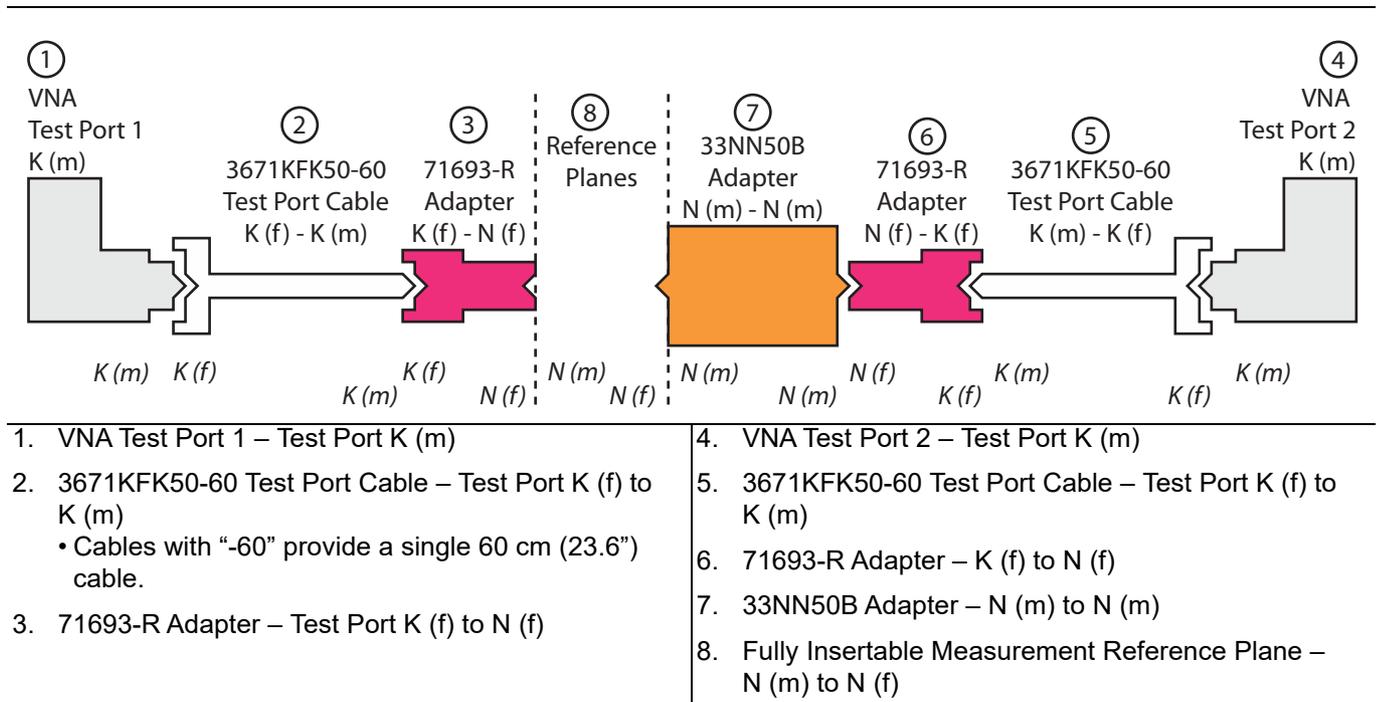
<ol style="list-style-type: none"> <li>1. VectorStar VNA: <ul style="list-style-type: none"> <li>• MS4645A/B, MS4647A/B V-Connector VNA</li> <li>• MS4642A/B, MS4644A/B K-Connector VNA</li> </ul> </li> <li>2. 36585V-2MF or 36585K-2MF Precision AutoCal Module. Other AutoCal Modules are not supported.</li> <li>3. Connect the AutoCal Signal Cable (m-m) to the DB-9 connector on the Module. Connect the other end of the signal cable to the VNA Rear Panel Serial 10101 Port.</li> <li>4. Connect the AC Power Block to the AutoCal Module and then to AC Power. <ul style="list-style-type: none"> <li>• Allow the Module to warm up until its Blue LED is illuminated.</li> <li>• Do not connect the AutoCal Module to the VNA Test Ports until directed by the PVS application.</li> </ul> </li> <li>5. VNA Test Port 1 (m)</li> </ol>	<ol style="list-style-type: none"> <li>6. Install the Adapter (f-f) on Test Port 1: <ul style="list-style-type: none"> <li>• 33VVF50C, V (f) to V (f) Adapter on Port 1</li> <li>• 33KFKF50B, K (f) to K (f) Adapter on Port 1</li> </ul> </li> <li>7. Test Port Cable (m-f): <ul style="list-style-type: none"> <li>• 3670V50A-2 Test Port Cable Ruggedized Semi-Rigid, 61 cm (24") – V (f) to V (m)</li> <li>• 3670K50-2 Test Port Cable Ruggedized Semi-Rigid 61 cm (24") – K (f) to K (m)</li> </ul> </li> <li>8. VNA Test Port 2 (m)</li> <li>9. Install cable end (f) to Port 2</li> <li>10. Install adapter to open end of cable on Port 2</li> <li>11. Adapter (m-f): <ul style="list-style-type: none"> <li>• 33VVF50C V (m) to V (f) Adapter on cable above</li> <li>• 33KFKF50B K (m) to K (f) Adapter on cable above</li> </ul> </li> <li>12. Connect AutoCal male port to adapter on test port 1</li> <li>13. Connect cable end with adapter to female port of AutoCal Module.</li> </ol>
--	--

**Figure 4-7.** Precision AutoCal Module 36585X-2MF Connections to VNA (2 of 2)

### 4-8 Connecting Equipment with Adapters On Test Ports

Use this configuration when there is a requirement to add Type N adapters to a standard K (m) Test Port as equipped on VectorStar MS4642A/B or MS4644A/B VNAs. This configuration requires using a 3653A Type N Connector Calibration Kit with Fixed Loads and a 3663-1 Type N Connector Verification Kit.

For example, if a Type N connector fully insertable N (m) to N (f) reference plane is required, the adapter configuration shown below in [Figure 4-8](#) must be used.



**Figure 4-8.** MS4642A/B, MS4644A/B K VNA configured with Type N Reference Planes



# Chapter 5 — Installation and Operation

## 5-1 Introduction

This chapter describes how to install the Performance Verification Software (PVS) application and how to use the PVS user interface functions.

## 5-2 PVS Application Installation

The software is contained on the USB Memory Device supplied with each Verification Kit.

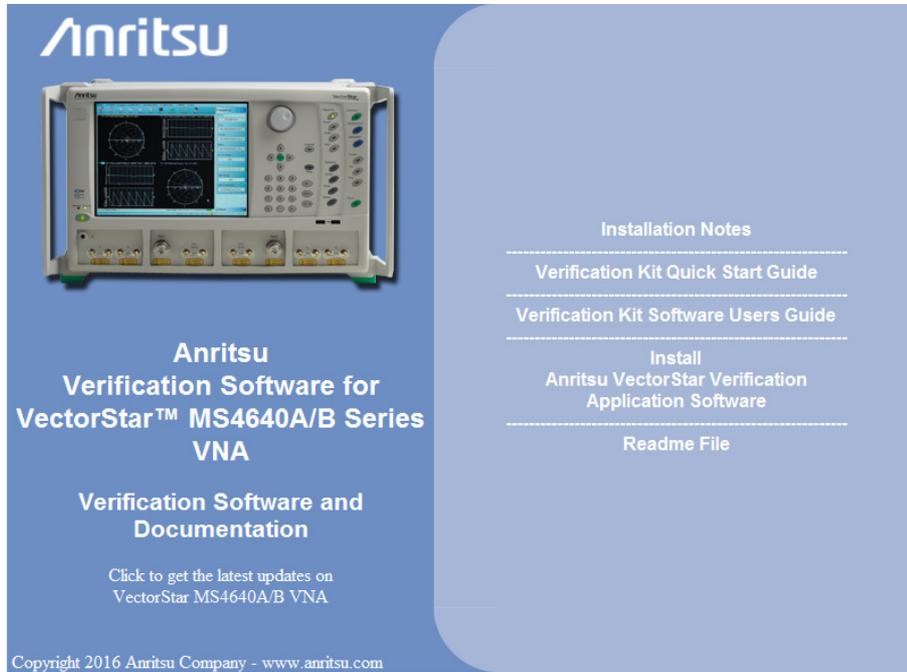
<b>Note</b>	<p>In order to correctly install the PVS application, the logged in user must have Administrative rights on the Windows PC Controller.</p> <p>The PVS application is installed onto the PC Controller on a per-user basis. If the PC is used by multiple users using different logon identifications, separate installations are required for each user. Alternatively, one PVS installation could be installed under a common logon user identification such as “Test Operator.”</p> <p>Consult your PC and network support administrator on how to best proceed.</p>
-------------	--

Prior to installation of the 2300-579-R PVS, the National Instruments GPIB card, its drivers, and the VISA library must be installed in the PC Controller.

<b>Note</b>	<p>The Personal Computer (PC) Controller and the VNA are connected via a GPIB cable.</p> <p>The required GPIB cable, test port adapters, and phase-stable through line are not included in the verification kit. See the chapters below for the required additional components.</p> <p>The PVS application must be run on a PC controller equipped with a National Instruments (NI) PCI GPIB Interface card, and VISA Runtime Version 3.6 or later.</p> <p>The NI VISA Runtime license is available from NI as a stand-alone software package or as part of the NI GPIB Adapter Hardware package.</p> <p>Contact NI for additional details.</p>
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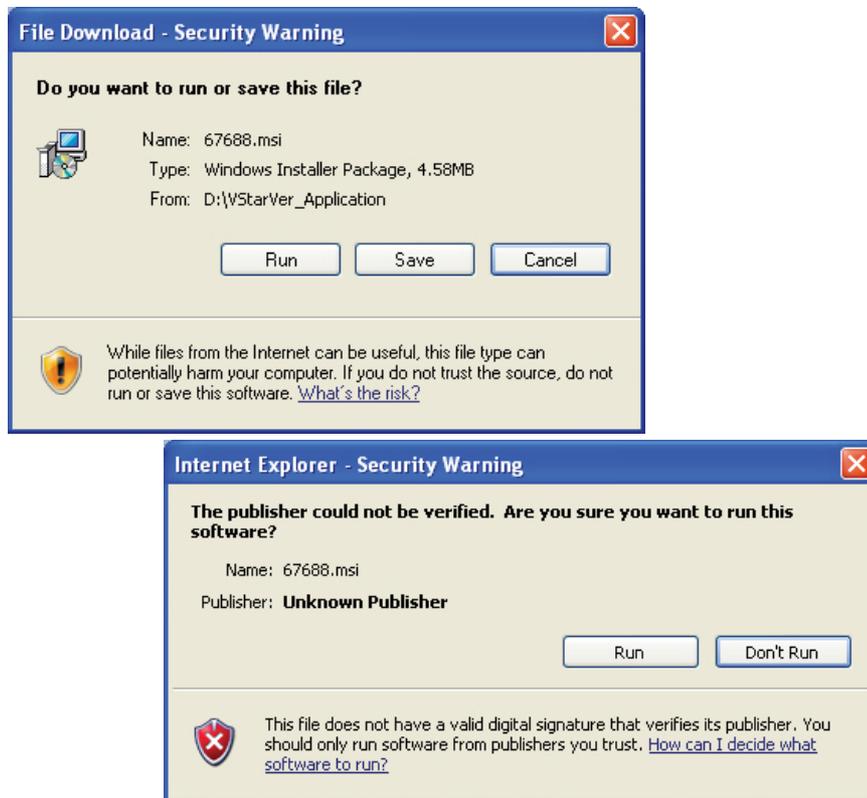
Turn off all other running applications on the PC Controller.

1. Insert the USB Memory Device into the USB slot.
2. Open Windows Explorer, browse to the USB Drive, and double click on Startup.htm.
3. The Verification Software navigation page ([Figure 5-1 on page 5-2](#)) should then appear.



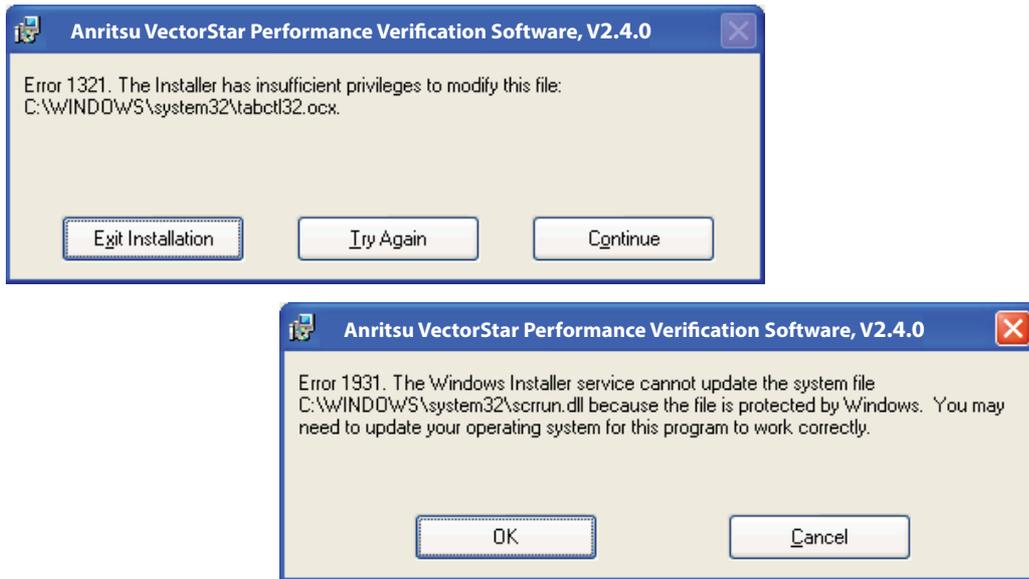
**Figure 5-1.** PVS Installation and Documentation Screen

4. On the navigation page, click the Install Anritsu VectorStar Verification Application Software link.
5. The first of several installation dialog boxes appears.



**Figure 5-2.** Installation Security Dialog Boxes - Click Run on each

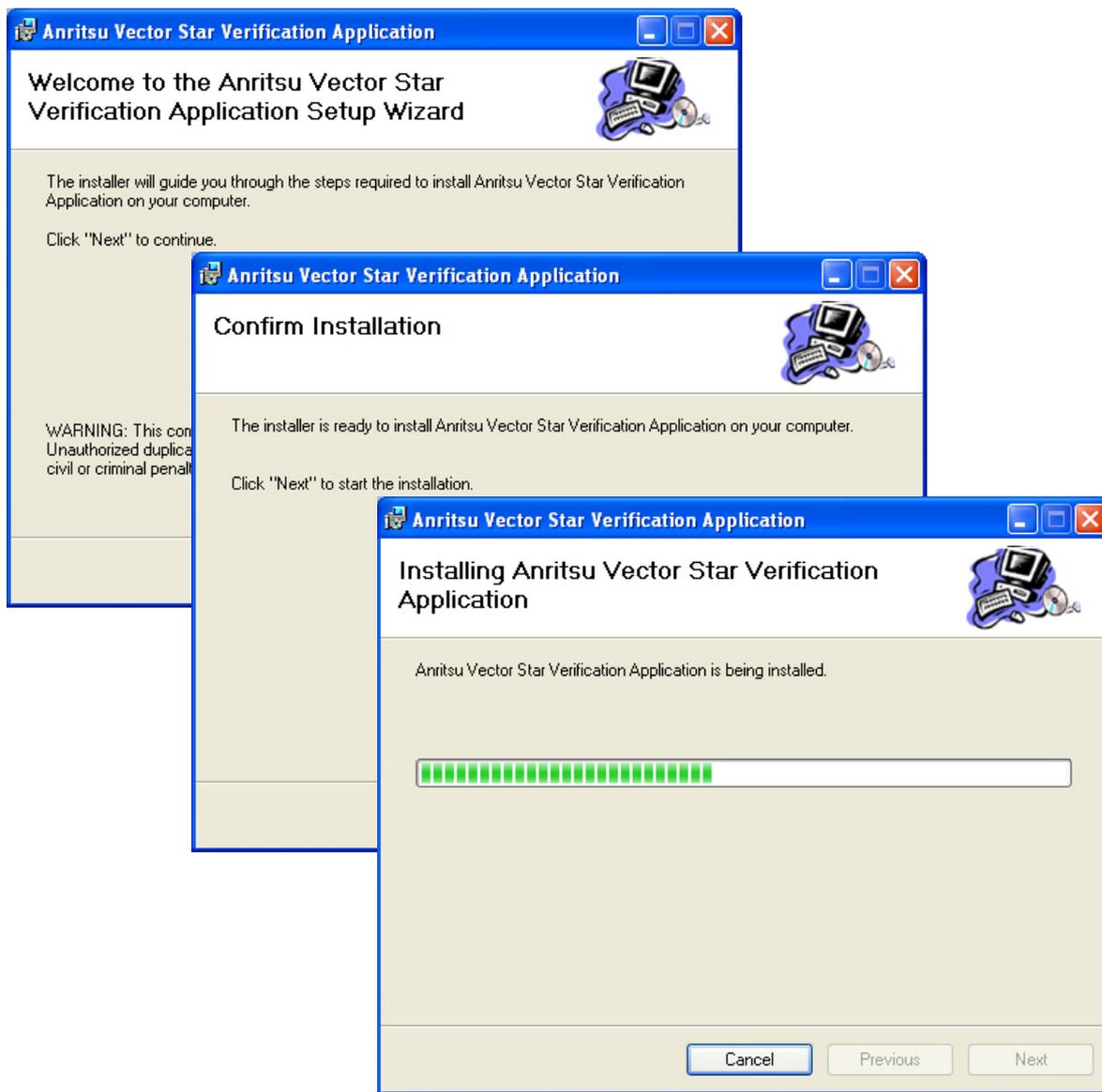
6. Click Run on the two security dialog boxes.
7. If either of the two dialog boxes shown below in [Figure 5-3](#) for Error 1321 or Error 1931 appear, follow the instructions at the bottom of the page.



<p><b>Error 1321</b> For Error 1321 (at top), select Exit Installation and make sure you have Administrator privileges on the PC Controller</p>	<p><b>Error 1931</b> For Error 1931 (at bottom), select OK to bypass the error message and continue the installation</p>
---	--

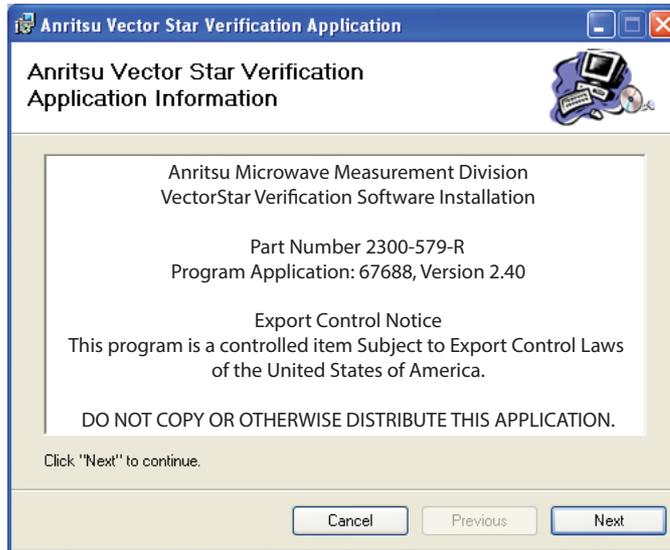
**Figure 5-3.** Installation Error 1321 and Error 1931 Dialog Boxes

- Two preliminary installation wizard setup dialog boxes appear in sequence. Click Next to proceed through each dialog box. The final dialog box shows an installation progress bar.



**Figure 5-4.** Installation Confirmation and Progress Dialog Boxes - Click Next on each

9. When the installation progress bar shows complete, click Next. The final Application Information dialog box appears. Click Next and the Installation Complete dialog box appears.



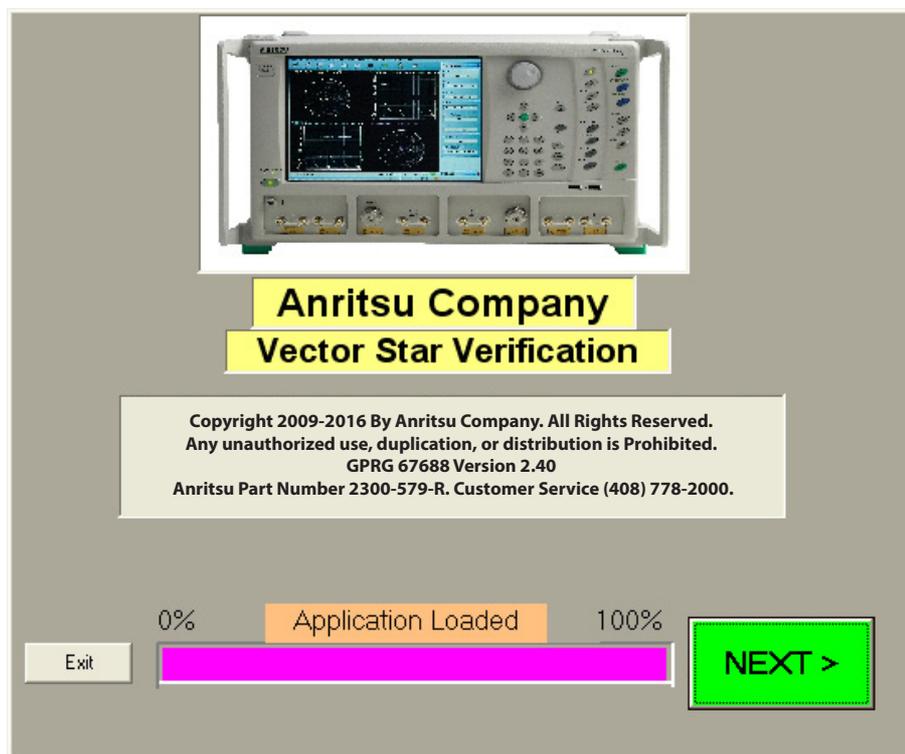
**Figure 5-5.** Final Application Information and Installation Complete Dialog Boxes

10. The installer adds all required files and makes the necessary registry updates on the PC Controller. When done, the navigation page (Figure 5-1) reappears.
11. If desired, open the User Guide (this document) and the Quick Start Guide and save and/or print a copy.
12. The PVS application is available on the Start or Program menu of the PC Controller.

## 5-3 Starting the PVS Application

Make all the necessary connections between the VNA and the PC Controller as described in [Chapter 5](#) before starting the PVS application.

1. Launch the software.
2. Once the software starts, the Startup screen appears

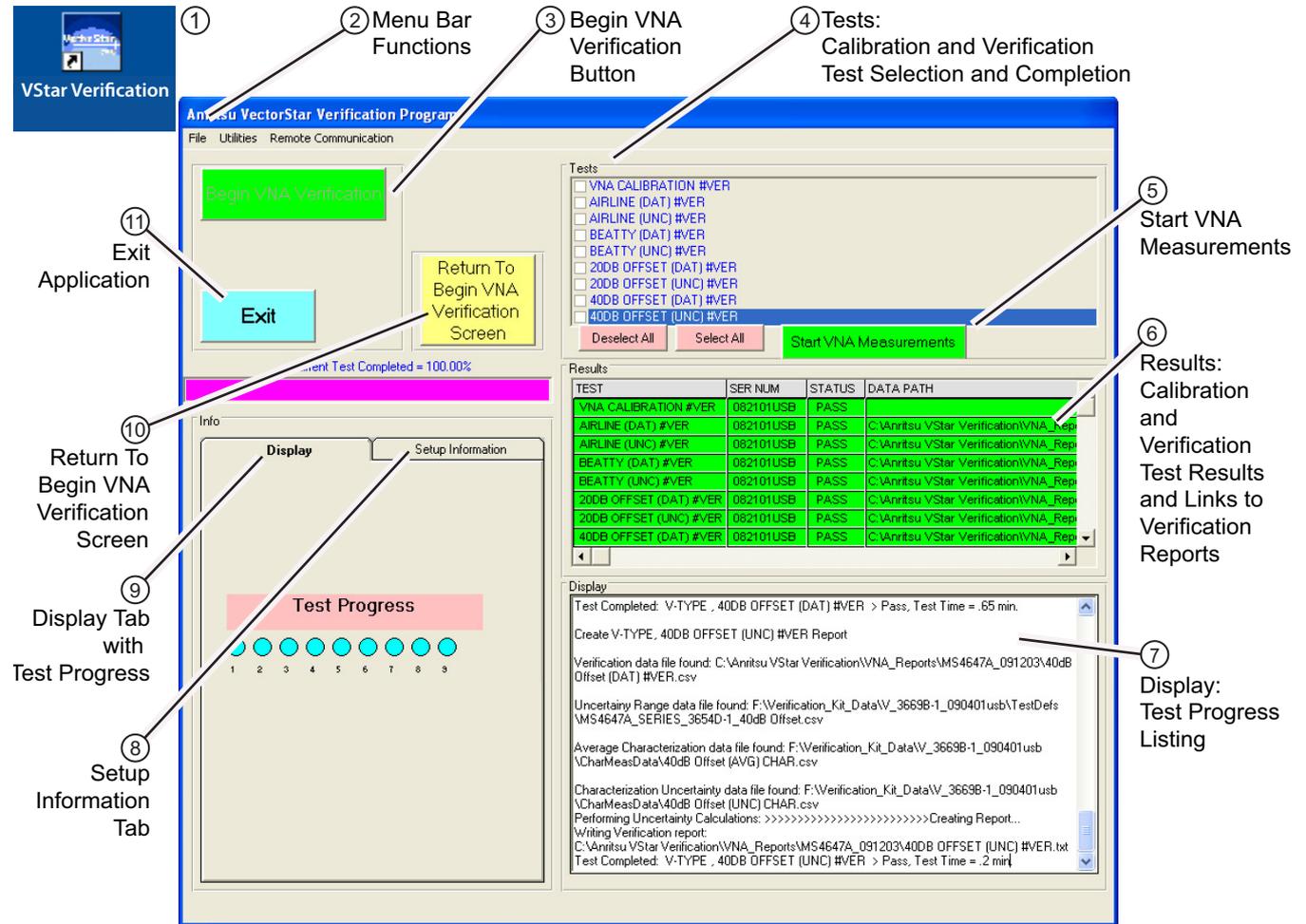


**Figure 5-6.** PVS Application Startup Screen

3. When the software finishes loading, click NEXT >. The Verification Program Main Screen appears with most screen areas blank.
4. For a typical VNA Calibration tests, see [Chapter 6](#).
5. For a typical VNA Verification tests, see [Chapter 7](#).

## 5-4 User Interface Control Areas

The user interface (UI) changes depending on the tests selected and how many have been completed. The general UI areas are shown in the figure below. The example shown is the screen appearance after all calibration and verification tests have been completed. Each area is described in greater detail in the sections following.



- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. PC Controller Icon – Select to launch verification application.</li> <li>2. Menu Bar Functions – Drop-down menus for File, Utilities, Remote Communication, and About</li> <li>3. Begin VNA Verification Button – Starts setup process. When setup is complete, the button is unavailable.</li> <li>4. Tests Area – Allows all or some tests to be selected. As each is completed, the check box is deselected.</li> <li>5. Start VNA Measurements – Once the setup is complete, the button starts the selected tests. If all tests are selected, the VNA Calibration Test starts.</li> </ol> | <ol style="list-style-type: none"> <li>6. Results Area – As each test is completed, a color coded row appears. Clicking the row links to the report.</li> <li>7. Display Area – Lists information about test progress.</li> <li>8. Display Tab – Shows which major test has completed. The Progress Bar above shows individual test completion.</li> <li>9. Setup Tab – Not shown here. Lists all device model information and serial numbers.</li> <li>10. Return to Begin VNA Verification Screen – Restarts the setup procedure.</li> </ol> |
|---|--|

**Figure 5-7.** Verification Program Main Screen – User Interface Areas

## 5-5 Menu Bar Operation

The Menu Bar menus at the top of the screen provide access for general controls.

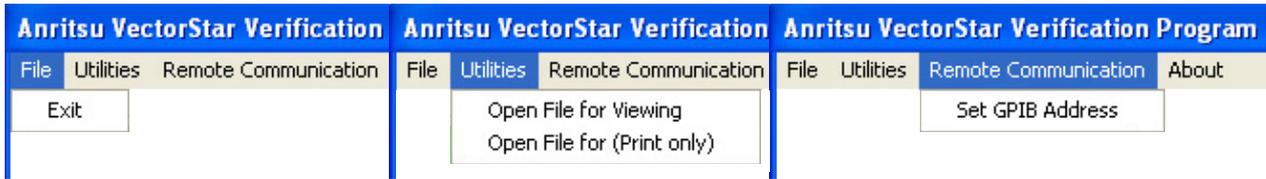


Figure 5-8. Menu Bar Functions

The Menu Bar functions are:

- **File | Exit** – Exits the application.
- **Utilities | Open File for Viewing** – Navigates to test reports and displays the selected report in a text editor. Depending on the PC Controller screen settings, the report may not have line wrapping.
- **Utilities | Open File for Print Only** – Navigates to reports and displays the selected report in a ready to print format with no line wrapping.
- **Remove Communication | Set GPIB Address** – Displays the GPIB Address Screen for setting the PC Controller and VNA addresses.
- **About** – Displays the Startup Screen with PVS version information.

## 5-6 On-Screen Help

Most screens provide both a configuration graphic and specific instructions for the step at hand. Note that with the text content most screens change based on the Connector Type, the Verification Kit, and the VNA used.

On some screens, a More Information button is available. Selecting it displays an explanatory dialog as shown in the figure below.

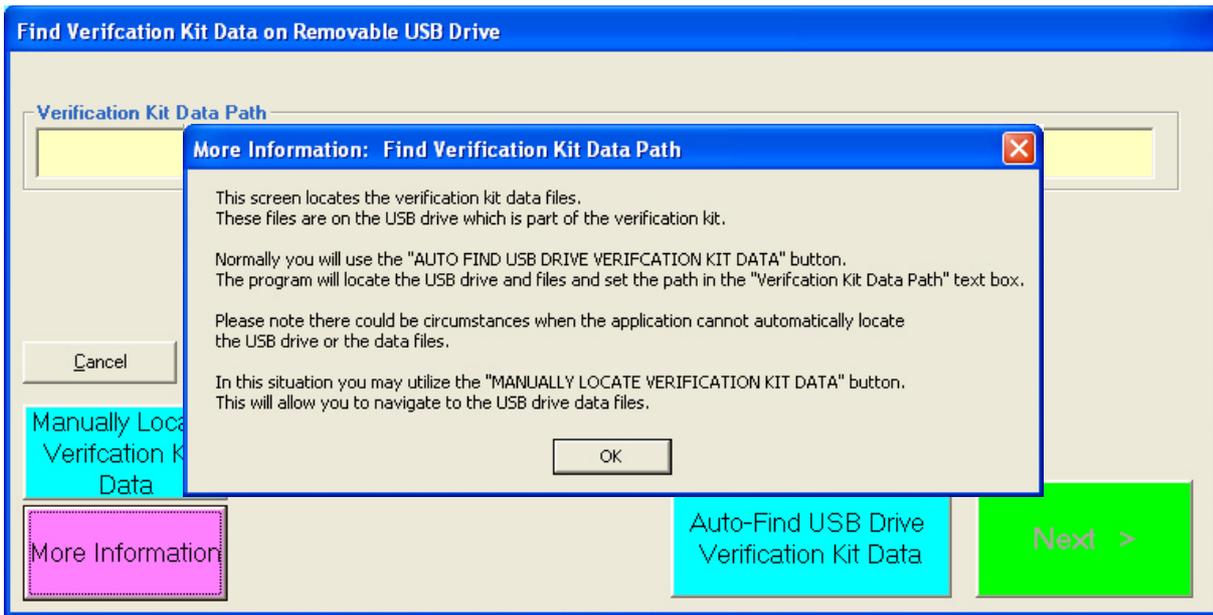
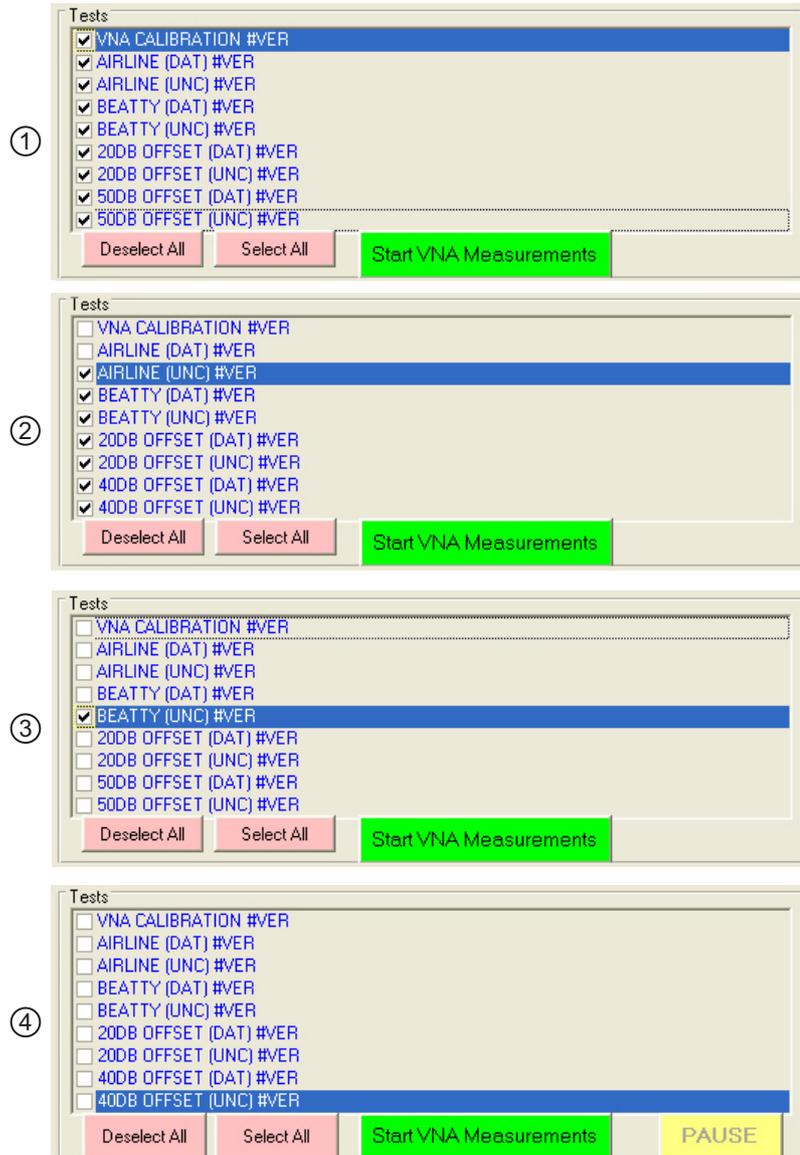


Figure 5-9. More Information Dialog Example

## 5-7 Selecting Tests

On the Verification Program Main Screen, [Figure 5-10](#), the upper right Tests area allows selection of tests to perform and also indicates which tests have been completed. A selected checkbox means the test is yet to run. Any combination of tests can be defined as long as one is selected. Selected tests are always performed in the top to bottom sequence. After the required tests are selected, click Start VNA Measurements to start the tests.



- |  |                            |
|--|----------------------------|
| 1. All tests selected and none are completed.              | 3. Only one test selected. |
| 2. The first two tests are completed with seven remaining. | 4. All tests completed.    |

**Figure 5-10.** Tests Area and Test Selection

**Note**

At least one (1) test must be selected to run the program.  
 Selected tests always run from top to bottom as shown on the user interface.

## 5-8 Test Results Grid

On the Verification Program Main Screen, the right side Results area (shown below) displays the general status of each completed test where:

- **Green** = Test Passed
- **Red** = Test Failed
- **Magenta** = Test Canceled or Aborted, or an unknown error occurred

For the eight verification tests, clicking on the Data Path column displays the test report in the default test editor, usually Windows® Notepad.

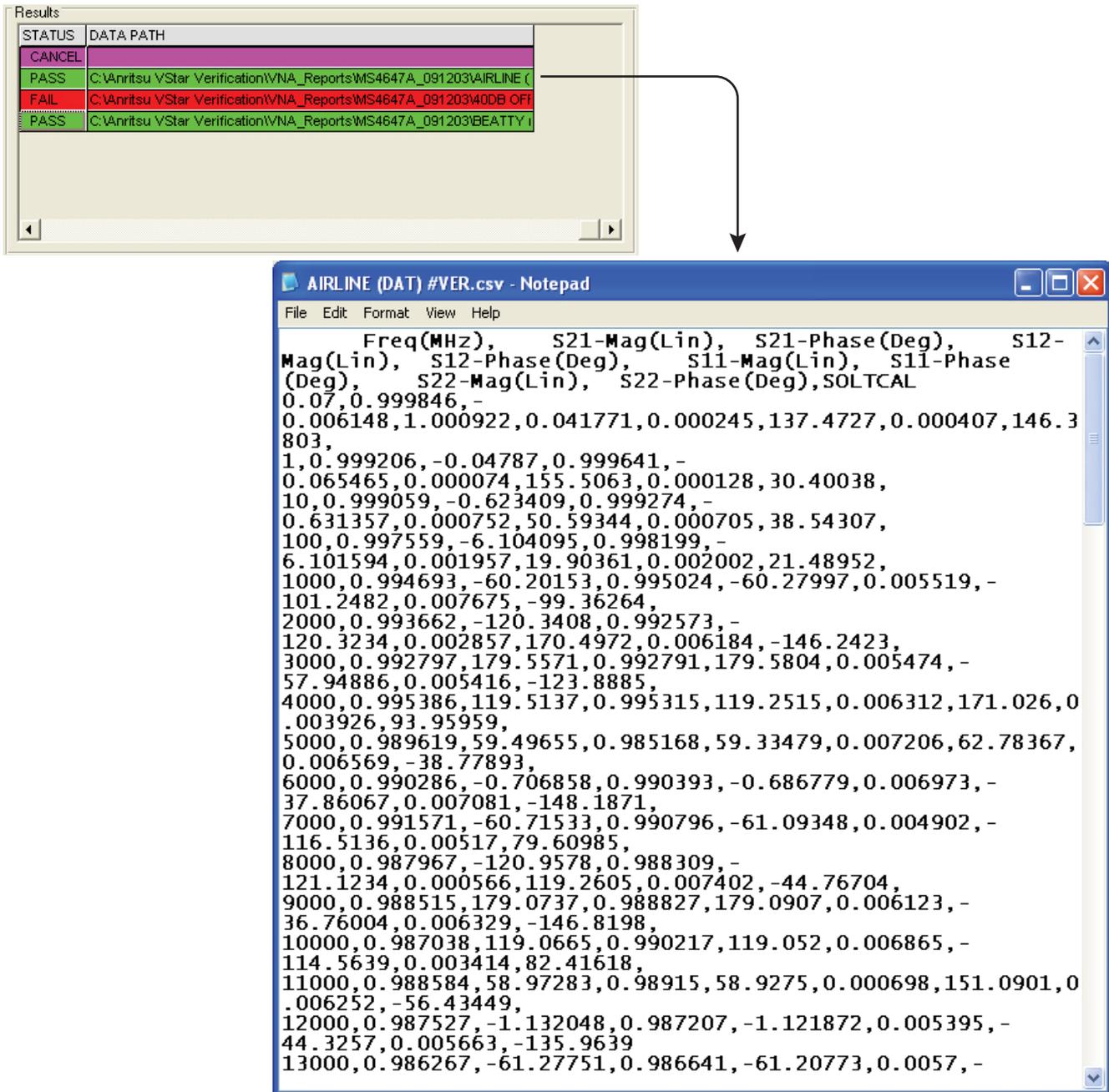


Figure 5-11. Test Results Grid and Related Report

# Chapter 6 — VNA Calibration

## 6-1 Introduction

This chapter provides information about running the verification tests. For each test, configuration information is provided for adapter and through line connections. The use of both 36585X-2MF Series Precision Automatic Calibrator (AutoCal) Calibration Kits and 365X-1 Series Manual Calibration Kits is described.

## 6-2 Prerequisites

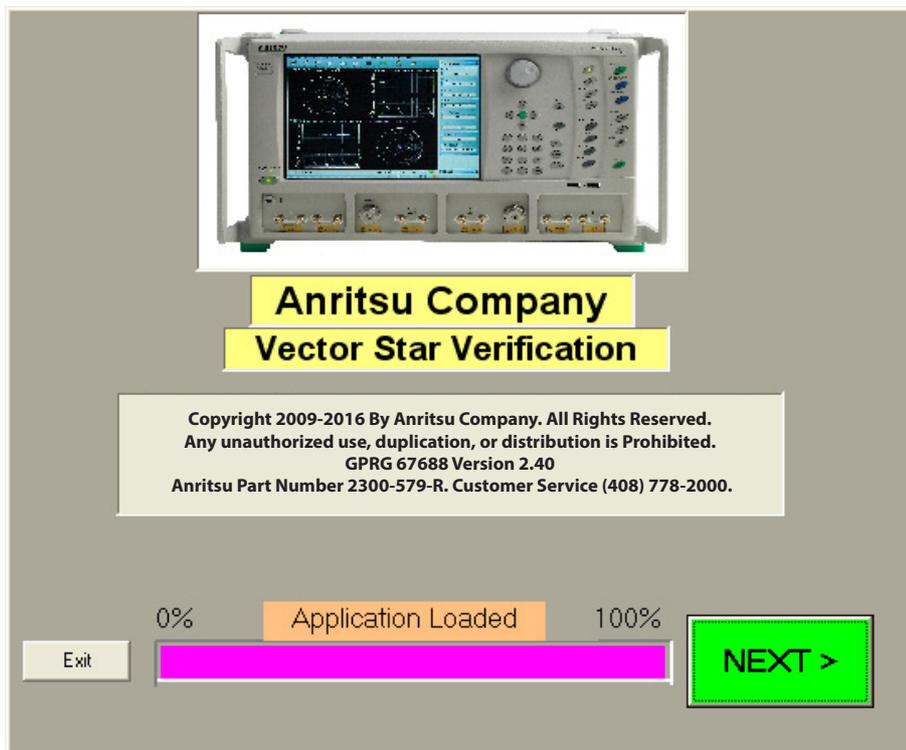
This chapter assumes the following prerequisites have been met:

- The VNA and PC controller are correctly configured and connected via the GPIB cable.
  - See [Chapter 4 — Hardware Configuration](#)
- The PVS application has been installed on the PC Controller.
  - See [Chapter 5 — Installation and Operation](#)
- The appropriate calibration kit has been selected and its characterization USB memory device is inserted into the VNA and that its characterization data has been loaded into the VNA memory.
  - See [Chapter 3 — Required Hardware](#)
  - See [Chapter 4 — Hardware Configuration](#)
- The appropriate verification kit has been selected and its characterization USB memory device is inserted into the PC Controller.
  - See [Chapter 3 — Required Hardware](#)
  - See [Chapter 4 — Hardware Configuration](#)
- The appropriate support adapters and test port cable has been obtained.
  - See [Chapter 3 — Required Hardware](#)
- The appropriate information about all the components gathered and written down
  - See [Chapter 1 — Verification Kit Reference](#)
  - See [Appendix A — VNA Verification Record Form](#)

## 6-3 Start the Application

### Starting the Application

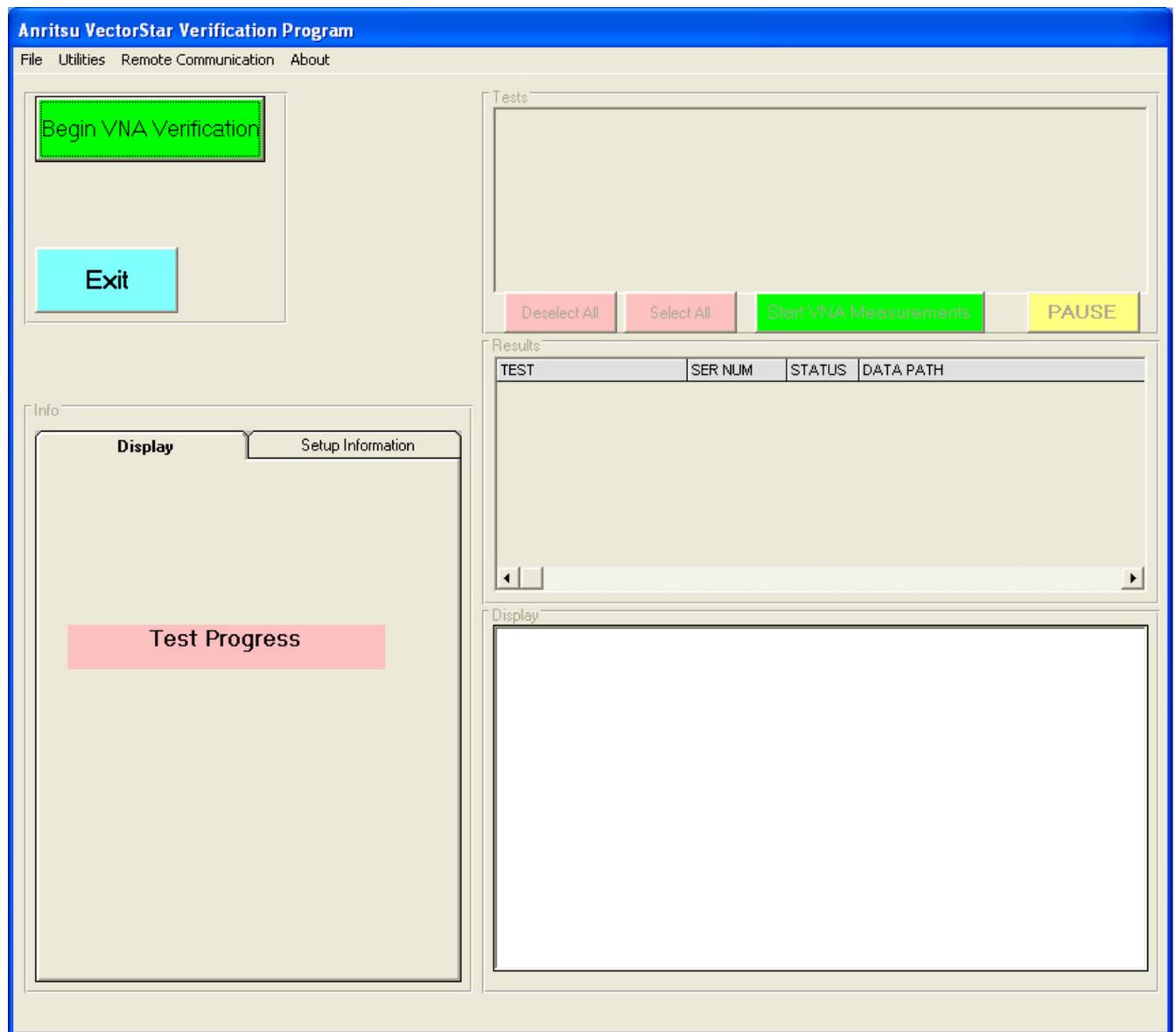
1. From the appropriate desktop icon or the program menu, launch the PVS application.
  - From the PC desktop, select Start | Programs | Anritsu | VectorStar Verification. The startup dialog appears.



**Figure 6-1.** PVS Application Startup Dialog Box

2. When the program finishes loading, click NEXT >.
3. The Verification Program main screen appears.

- For general interface operation, see [Chapter 5, “On-Screen Help”](#) on page 5-8

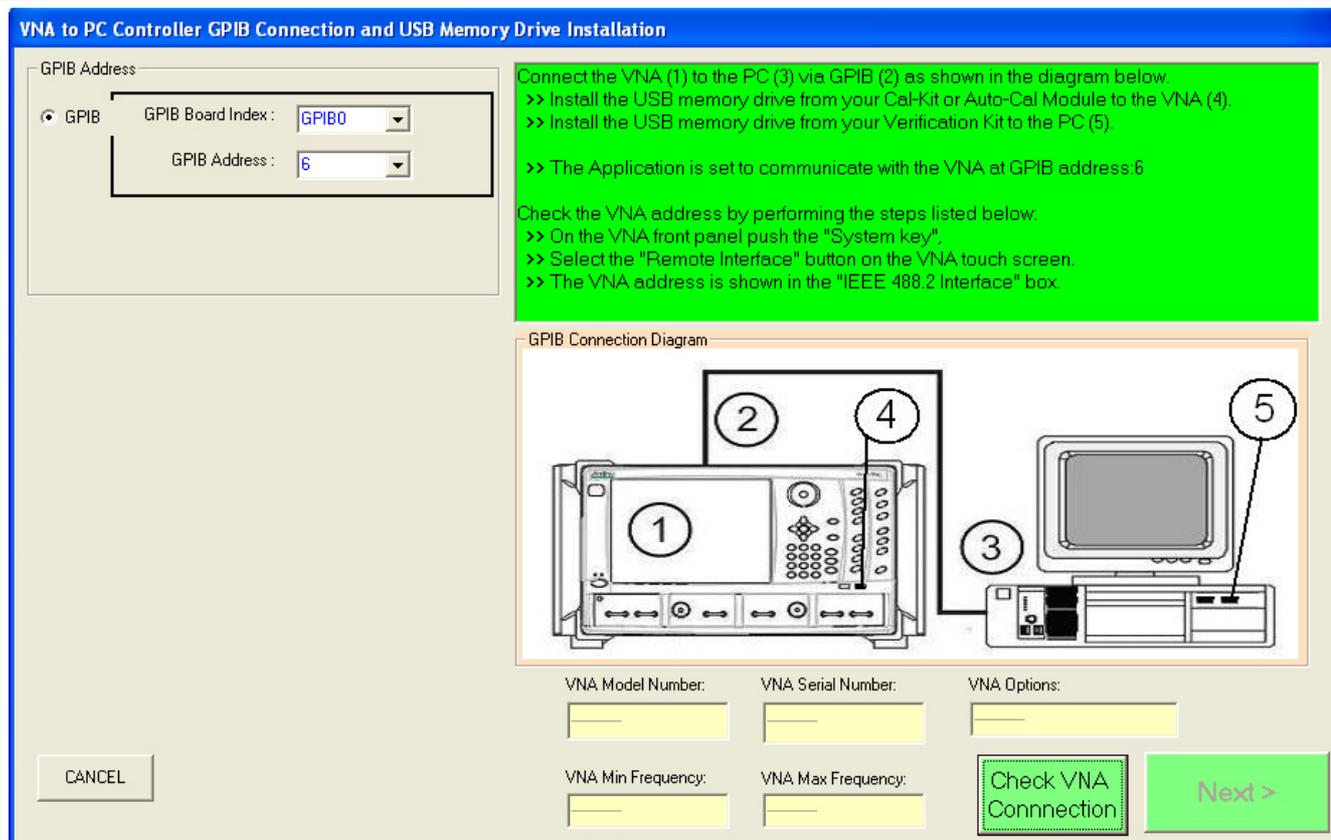


**Figure 6-2.** Verification Program Main Screen

4. To start the VNA verification process, click the green **Begin VNA Verification** button in the upper left corner of the screen.
5. The **Check VNA GPIB Connection** screen appears.

## Setting GPIB Address for the VectorStar VNA

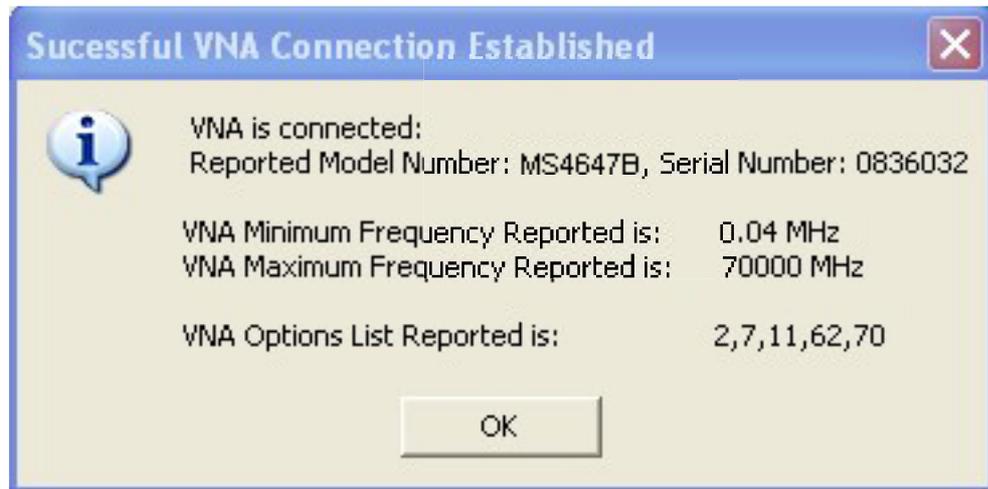
6. When the Begin VNA Verification button is selected, the GPIB Address screen appears.



**Figure 6-3.** Check VNA GPIB Connection Screen - Empty Fields

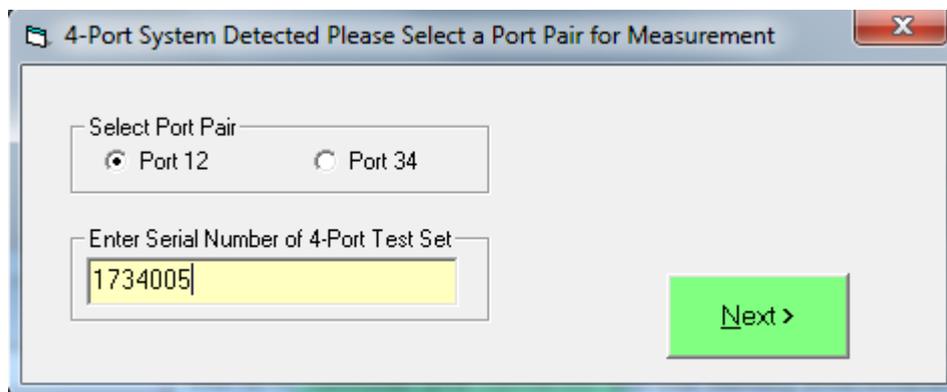
7. If the GPIB addresses on either the card or the VNA must be changed, proceed as follows:
- Use the PVS to Set the PCI-GPIB PC Controller Address:  
The PVS application defaults to “GPIB0” for the PCI-GPIB board index. If your PC GPIB board is configured with a different index number, use the GPIB Board Index drop down arrow to match the PVS application to your PC setting.
  - Use the PVS to Set the VNA GPIB Address:  
The PVS application defaults to a VNA address of “6”. The address setting in the PVS application must match the setting on the VNA. You may either set the PVS address to match the VNA address setting, or you may set the VNA to match the PVS Setting. If the VNA address is already set, select the GPIB Address drop down arrow and choose the address to match the VNA address.
  - Use the VNA to Set It’s GPIB Address:  
For GPIB addressing at the VNA, see [Chapter 4](#) and “[Setting VNA GPIB Address from the VNA](#)” on page 4-5.
8. Assuming the GPIB addresses on both units are correct, and the cable correctly installed, click Check VNA Connection to test the interface.
9. The VNA Connection Verification dialog box appears (see [Figure 6-4](#)) with a configuration summary reporting:
- VNA Model Number
  - VNA Serial Number

- VNA Minimum Frequency
- VNA Maximum Frequency
- VNA Installed Option Numbers
  - For a work form for recording VNA Verification Information, see [Appendix A — VNA Verification Record Form](#).
  - For a listing of VNA option numbers and their definitions, see [Chapter 3](#) and the section “[VectorStar VNA Options](#)” on page 3-2.
  - For a complete listing of all available options, see the VectorStar MS4640A/B Series VNA Technical Data Sheet, available on the Internet at: [www.anritsu.com](http://www.anritsu.com)



**Figure 6-4.** VNA Connection Verification Dialog Box – Example

10. If a 4-Port System is detected, the dialog below ([Figure 6-5](#)) appears after selecting 'OK' in the VNA Connection dialog above.
11. Choose which 'Port-Pair' to perform verification (either Port12 or Port34), then enter the serial number of the 4-Port test set in the SN field.



**Figure 6-5.** 4-Port VNA System Detected – Port Pair Selection Dialog

12. When ready to proceed, click OK. The Check VNA GPIB Connection screen reappears with completed fields.

**VNA to PC Controller GPIB Connection and USB Memory Drive Installation**

GPIB Address

GPIB    GPIB Board Index:     GPIB Address:

Connect the VNA (1) to the PC (3) via GPIB (2) as shown in the diagram below.  
 >> Install the USB memory drive from your Cal-Kit or Auto-Cal Module to the VNA (4).  
 >> Install the USB memory drive from your Verification Kit to the PC (5).  
 >> The Application is set to communicate with the VNA at GPIB address 6

Check the VNA address by performing the steps listed below:  
 >> On the VNA front panel push the "System key".  
 >> Select the "Remote Interface" button on the VNA touch screen.  
 >> The VNA address is shown in the "IEEE 488.2 Interface" box.

GPIB Connection Diagram

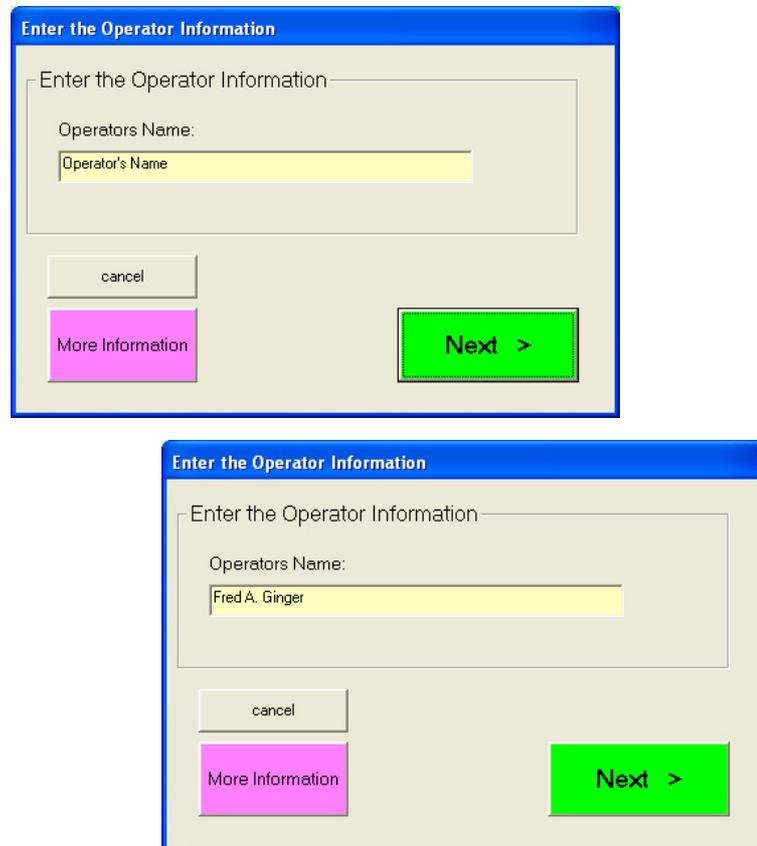
VNA Model Number:     VNA Serial Number:     VNA Options:

VNA Min Frequency:     VNA Max Frequency:

**Figure 6-6.** Check VNA GPIB Connection Screen - Completed Fields

13. If all information is correct, click **Next>** to continue. The Enter Operator Information dialog box appears.

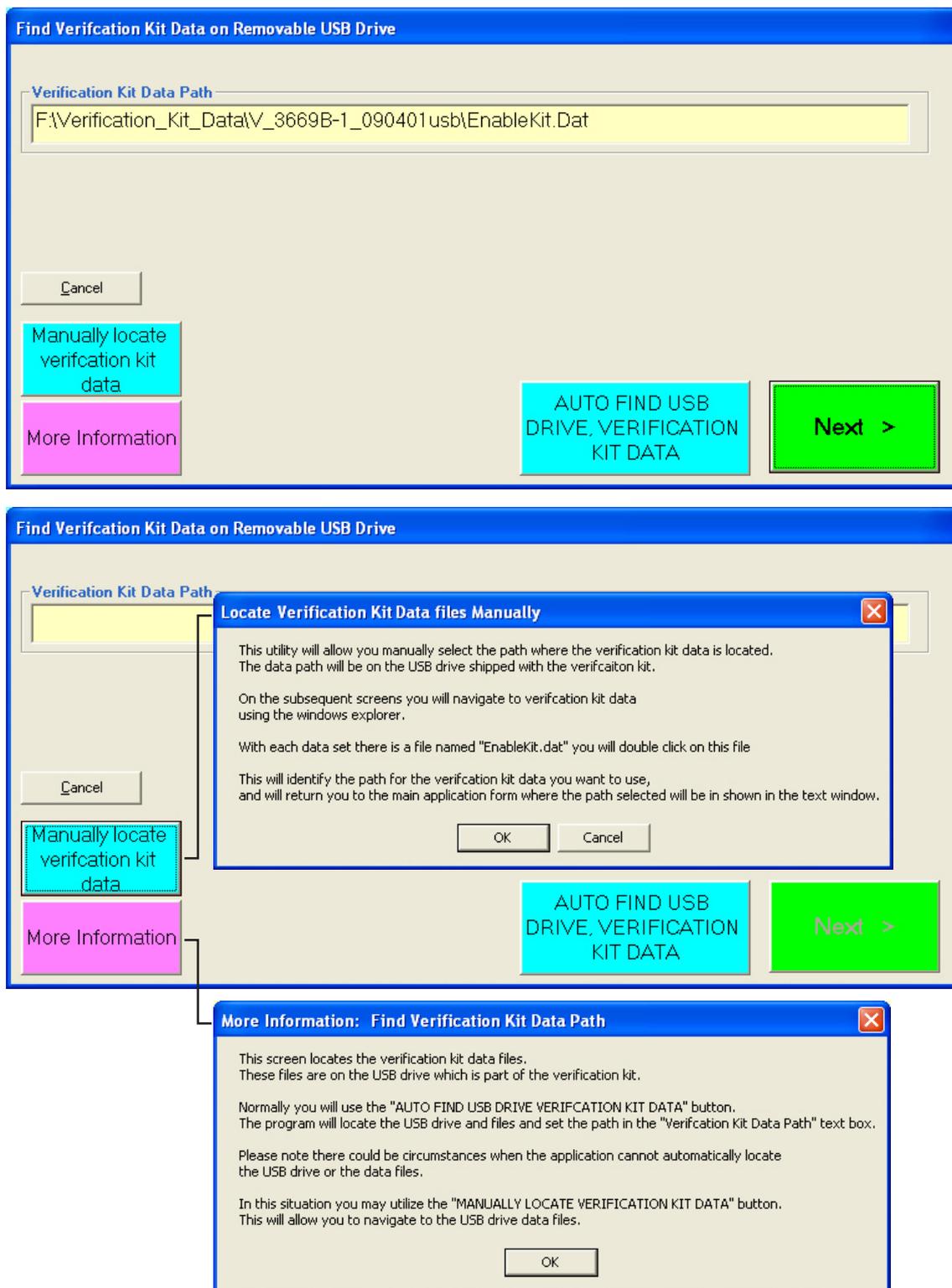


**Figure 6-7.** Enter Operation Information Dialog Box - Default (above) and User Input (below)

14. Enter the name of the operator as required. This name will appear in all the test reports during this test session.

- Alternatives to an operator name could be the name of the test setup, the DUT, the assembly procedure test, the project, or similar identification strings.

15. When ready to proceed, click Next>. The Find Verification Kit Data dialog box appears with an empty path field.



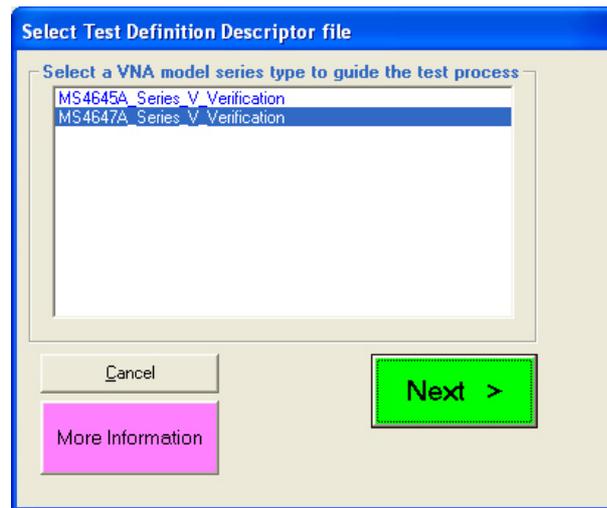
**Figure 6-8.** Find Verification Kit Data Dialog Boxes - Before (above) and After (below)

16. Find the USB device and its verification data by either using the Auto Find or Manual Find process as described below.

17. AUTO FIND USB DEVICE: To have the software find the USB Verification data:
  - a. Click the AUTO FIND USB DRIVE VERIFICATION KIT DATA button.
  - b. The PVS application will search the PC Controller for the USB drive and the verification data EnableKit.Dat file.
  - c. If successful, the Verification Kit Data Path field is filled as shown in [Figure 6-8](#) above and the Next > button becomes available.
  - d. If unsuccessful, an error message appears. In this case, use the step below.
18. MANUALLY LOCATE USB DEVICE: To manually locate verification kit data:
  - a. Click the Manually Locate button. The Open dialog appears.
  - b. Navigate to the location of the verification kit USB memory device searching for the EnableKit.Dat file.
    - Note that the drive letter for the USB device may vary.
  - c. Once the USB device is found, follow the folder path to the EnableKit.Dat file located at:
    - <Drive Letter>:\Verification\_Kit\_Data\<Connector Letter>\_<Verification Kit Model Number>\_<Verification Kit Serial Number>\EnableKit.Dat
  - d. For example, a V-Connector Verification Kit with a serial number of #903001 and connected to the PC as drive E:\ would have the following path:
    - E:\Verification\_Kit\_Data\V\_3669B-1\_903001\EnableKit.Dat
  - e. For help with the location process, click the More Information button.
  - f. When the search is successful, the Next > button becomes available.
19. When ready to proceed, click Next >.

## Selecting the VNA Model Series and Test Definition Descriptors

20. The Test Definition Descriptor Files dialog box appears.



**Figure 6-9.** Select Test Definition Descriptor File Dialog Box

21. Select the entry for your VNA model and verification kit from the listed options. Not all VectorStar VNAs will necessarily be listed. When ready to proceed, click Next >. The Calibration Kit Selection dialog box appears.

22. If a 4-port system is detected (Figure 6-10), the 'Test Definition Descriptors will have '4-Port' included in name (if the Verification Kit was manufactured after October 2017).

If the verification kit does not have the applicable 4-Port descriptors, the message (shown in Figure 6-11) will appear. In this case the 4-Port test descriptors will need to be added to the verification kit to proceed with 4-Port system verification.

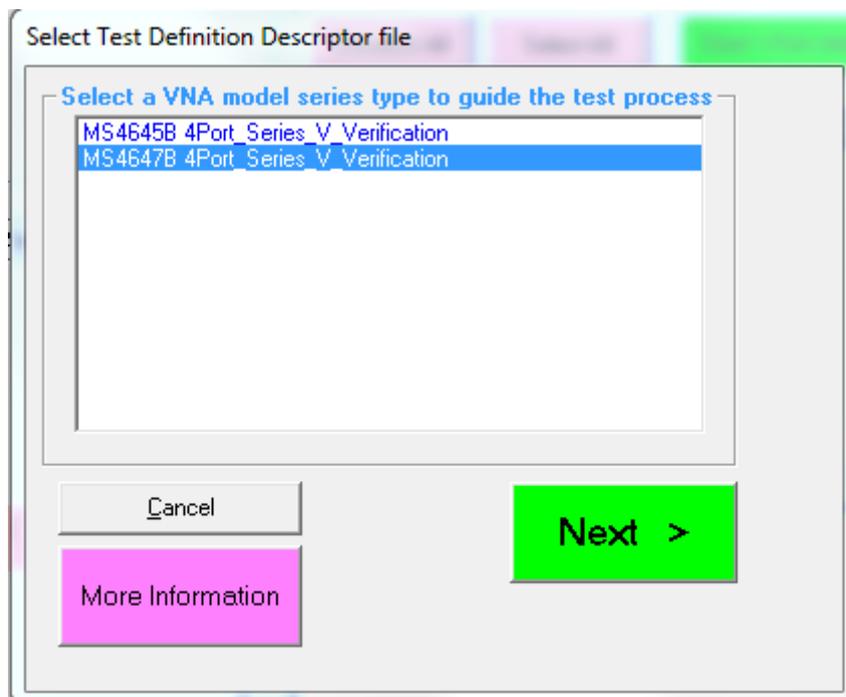


Figure 6-10. Select Test Definition Descriptor File Dialog Box - 4 Port VNA

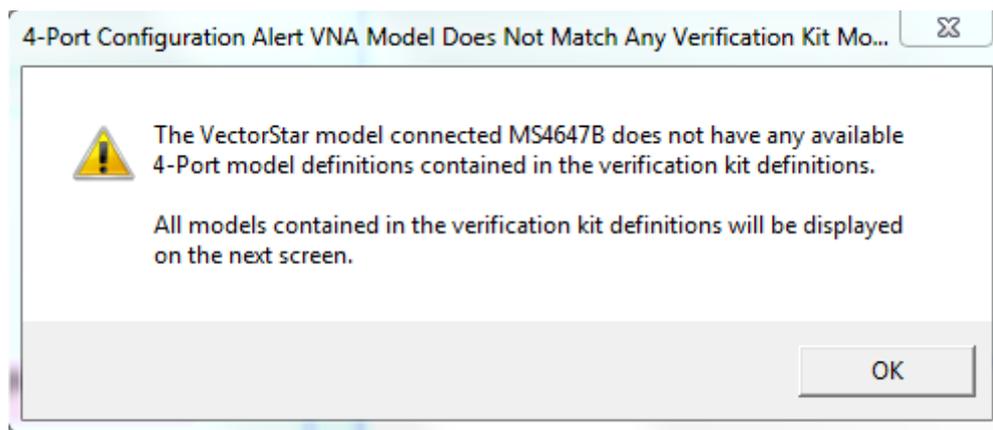


Figure 6-11. Select Test Definition Descriptor File Dialog Box - 4 Port VNA

## Selecting the Calibration Method

At this point in the program execution, you select either a Manual Calibration or an Auto Calibration.

23. Select the selection button for either the Manual Calibration or Auto Calibration. The selected button makes available the appropriate fields for selecting the Connector Type and Model Number from pull down lists, and entering the Kit Serial Number

Manual Calibration Fields (left)

Auto Calibration Fields (right)

**Figure 6-12.** Calibration Kit Type Selection Dialog Box and Fields

24. The next PVS action depends on which calibration method was selected:
  - a. Manual Calibration selected: If the left side Manual Calibration button was selected, proceed below to [Section 6-4 “Manual Calibration Kit Calibration Procedure” on page 6-12.](#)
  - b. Auto Calibration selected: If the right side Auto Calibration button was selected, proceed below to [Section 6-5 “AutoCal Module Calibration Kit Procedure” on page 6-29.](#)

## 6-4 Manual Calibration Kit Calibration Procedure

### Note

The on-screen directions and the part numbers referenced in the PVS application depend on the Verification Kit and its associated connector type (V, K, N, or 3.5 mm) selected in the sections above. The figures in this section are typical examples of required components for a 3669B-1 Verification Kit used with an MS4645A/B or MS4647A/B VNA with V Connectors.

4-Port systems are supported only for 2.92mm (K-Type) and 1.85mm (V-Type) using either 'Fixed-Load' or 'Auto-Cal'. Sliding load calibration is not supported on 4-Port system verifications.

1. On the Select Calibration Kit dialog box, the Manual Calibration button was selected and the information fields for a manual calibration kit appeared.

- Manual calibration kit selected in VNA Calibration Method Area with default entries at left.
- At right, the user has entered a serial number.
- When ready to proceed, click Next >.
- The drop-down arrows and combo boxes may or may not be available depending on the VNA Model and the compatible calibration kits.
- The Serial Number is always available for user input.

**Figure 6-13.** Manual Calibration Type Selected

2. If available, in the Select Connector Type field, use the pull-down menu to select the calibration kit connector type.

### Note

If the fields are not available, then the exact calibration kit and or connector type must be utilized to perform the calibration.

3. If available, in the Select Model Number field, use the pull-down menu to select the calibration kit model number:
  - K connector: use 3652A for fixed load or 3652A-1 for sliding load

- 3.5 mm connector: use 3650A fixed load or 3650A-1 for sliding load
  - V connector: use 3654D fixed load and 3654D-1 sliding load
4. Manually enter the Kit Serial Number. This number will appear on all test reports for this session.
  5. When ready to proceed, click Next >.
  6. The Final Information Check dialog box appears. The contents of the dialog box fields depends on which connector was selected.
    - An example of a Final Information Check dialog box for a 3669B-1 V Connector Verification Kit is shown below in [Figure 6-14](#).

**Final Information Check**

Verification Kit Information

Ver-Kit Model Number	Airline Model Number	Airline Serial Number	20 dB Offset Model Number	20 dB Offset Serial Number
3669B-1	19V50-5	601002	42V-20	501010
Ver-Kit Serial Number	Beatty Model Number	Beatty Serial Number	40 dB Offset Model Number	40 dB Offset Serial Number
903001	19V50-5B	601004	42V-40	601012

Calibration Kit Information

Cal-Kit Model Number	Cal-Kit Serial Number	Cal-Kit Connector Type
3654D-1	ENTER	V-CALKIT

VNA Information

VNA Model Number	VNA Serial Number	VNA Options
MS4647A	091203	2,7,62

Verification Report Path Information

VNA Verification Report File Location More Information

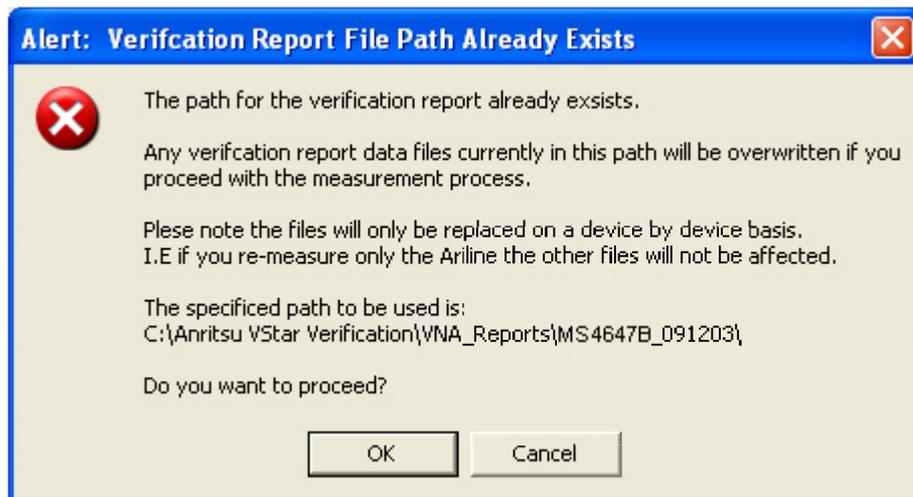
**View Path** C:\Anritsu VStar Verification\VNA\_Reports\MS4647A\_091203

- Example of a final information check for a:
  - 3669B-1 V Verification Kit
  - 3654D-1 V Manual Calibration Kit
  - VectorStar MS4647A/B VNA
- The path shown is the default path to the PC Controller hard drive.
- Path is always C:\Anritsu VStar Verification\VNA\_Reports\- The path name must keep the first portion of the default path as C:\Anritsu VStar Verification\VNA\_Reports\.

**Figure 6-14.** Final Information Check Screen

7. Verify that all fields are correct.
  - If necessary, change the Verification Report Path as required. The recommended destination directory is C:\Anritsu VStar Verification\VNA\_Reports\
8. When ready to proceed, click Next > (Begin Measurements).

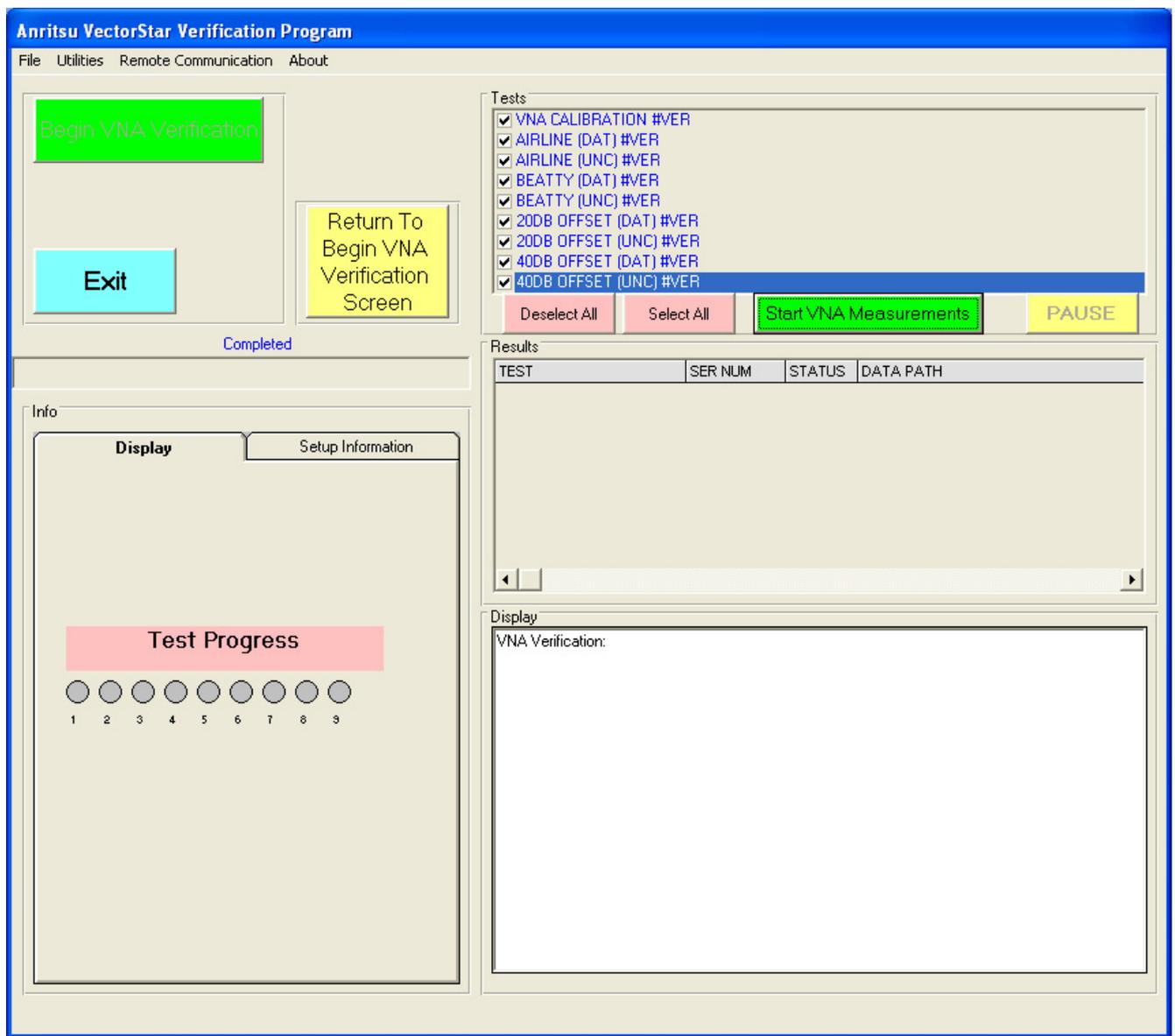
9. If the Alert Verification Report File Path dialog appears, the path has been previously used and proceeding will overwrite any data present in the path directory. If there is no file path conflict, the Alert dialog will not appear.



**Figure 6-15.** Alert Verification Report File Path Dialog Box

10. To stop the test and select another path, click Cancel. The program returns to the Final Information Check screen as shown above in [Figure 6-14](#).
  - a. On the Final Information Check screen, select the View Path button.
  - b. On the associated file dialogs, create and/or select another folder to store the test results.
    - If necessary, change the Verification Report Path as required. The top portion of the file path must be kept as C:\Anritsu VStar Verification\VNA\_Reports\...
    - The recommended destination directory is C:\Anritsu VStar Verification\VNA\_Reports\
  - c. You can also rename the result output files.
  - d. When done, return to the Final Information Check screen and again select the Next > (Begin Measurements) button.
  - e. Proceed with the next step below.

11. To proceed and overwrite previous test data, click OK. The Verification Program Main Screen reappears as shown below.



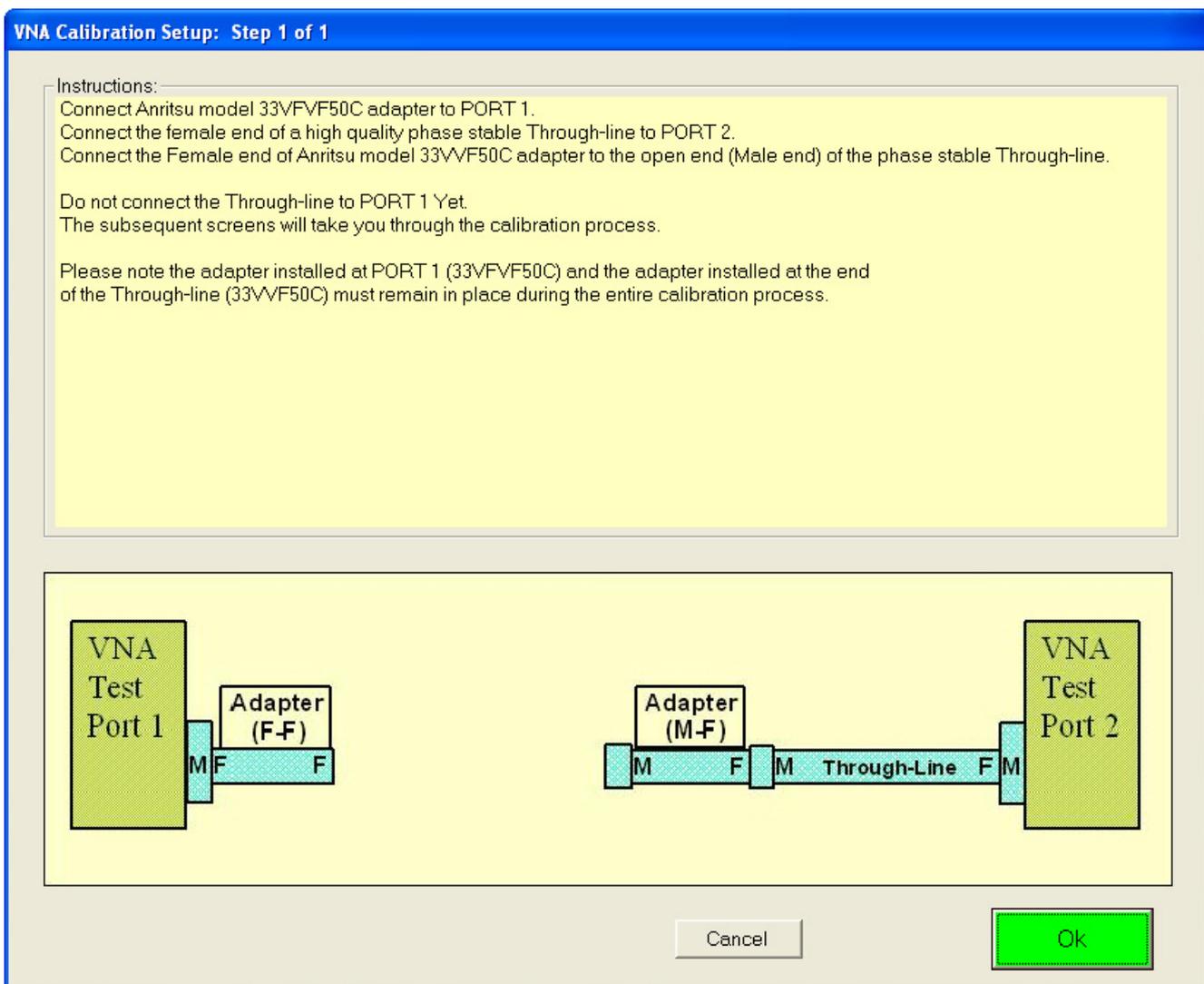
• V Connector Example

**Figure 6-16.** Verification Program Main Screen - Ready to Start Calibration

12. Click the green right side Start VNA Measurements button to start the calibration run.
13. A dialog box appears reminding you to insert the Calibration Kit USB Memory Device into the VNA. Click OK to proceed. See for details in [Section 4-6 “Loading Calibration Kit Coefficients into VNA”](#) on page 4-6.

## VNA Calibration Initial Setup

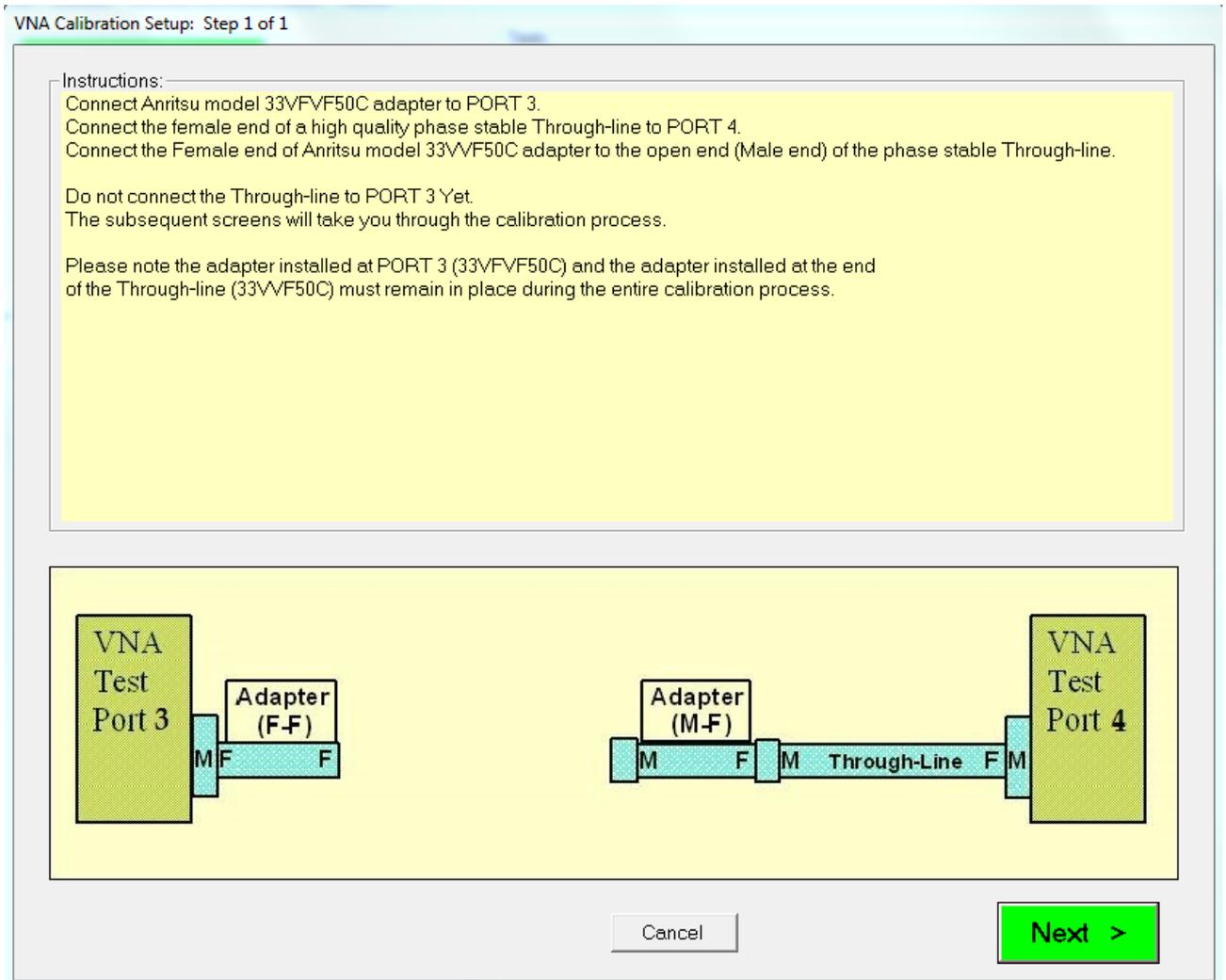
14. The VNA Calibration Setup Step 1 of 1 screen appears as shown in [Figure 6-17](#). With 4-Port System verification, Port 3 and Port 4 will appear in this dialog ([Figure 6-18](#)) if the Port Pair Selection of Port 34 was checked in the Port Selection dialog ([Figure 6-5](#)).



- This screen layout is used throughout the calibration and verification instruction screens.
- The top half of the screen provides specific instructions and component part numbers.
- The bottom half of the screen shows a schematic of the required action.

- Note that the component names and part numbers change depending on the VNA model, calibration method, calibration kit part number, and verification kit part numbers.
- The example screens in this document are for a VectorStar MS4645A/B, MS4647A/B V Connector VNA.

**Figure 6-17.** VNA Calibration Initial Setup – Port 1 and Port 2 (For 2-Port or 4-Port VNA)



- This screen layout is used throughout the calibration and verification instruction screens.
- The top half of the screen provides specific instructions and component part numbers.
- The bottom half of the screen shows a schematic of the required action.
- Note that the component names and part numbers change depending on the VNA model, calibration method, calibration kit part number, and verification kit part numbers.
- The example screens in this document are for a VectorStar MS4645A/B, MS4647A/B V Connector VNA.

**Figure 6-18.** VNA Calibration Initial Setup – Port 3 and Port 4 (For 4-Port VNA)

- At **Port 1 (or Port 3 for 4-Port)**, connect the **F-F Adapter**. Connect the **F-End** of the **F-M Through Line** to **Port 2 (or Port 4 for 4-Port)**, and connect the **M-F Adapter** to the open end of the Through Line.
- Do not connect the **Through Line** to **Port 1**.

**Note** Once connected, the two adapters and the through line must remain in place for the duration of the calibration and verification tests. If they are removed, or the connections re-adjusted in anyway, the calibration and verification process must be repeated.

- When ready to proceed, click **Next**.

## VNA Calibration Setup - Fixed Loads - Step 1 of 4 – Sliding Loads - Step 1 of 10

### Note

The following subsections for VNA Calibration Step 1 of 10 to VNA Calibration Step 10 of 10 describe the steps for a manual calibration using sliding loads.

If the calibration type uses fixed loads, such as those in a Type N Connector Calibration Kit, similar dialogs are presented as VNA Calibration Step 1 of 4 through VNA Calibration Step 4 of 4.

18. The VNA Calibration Setup - Step 1 of 10 screen appears.

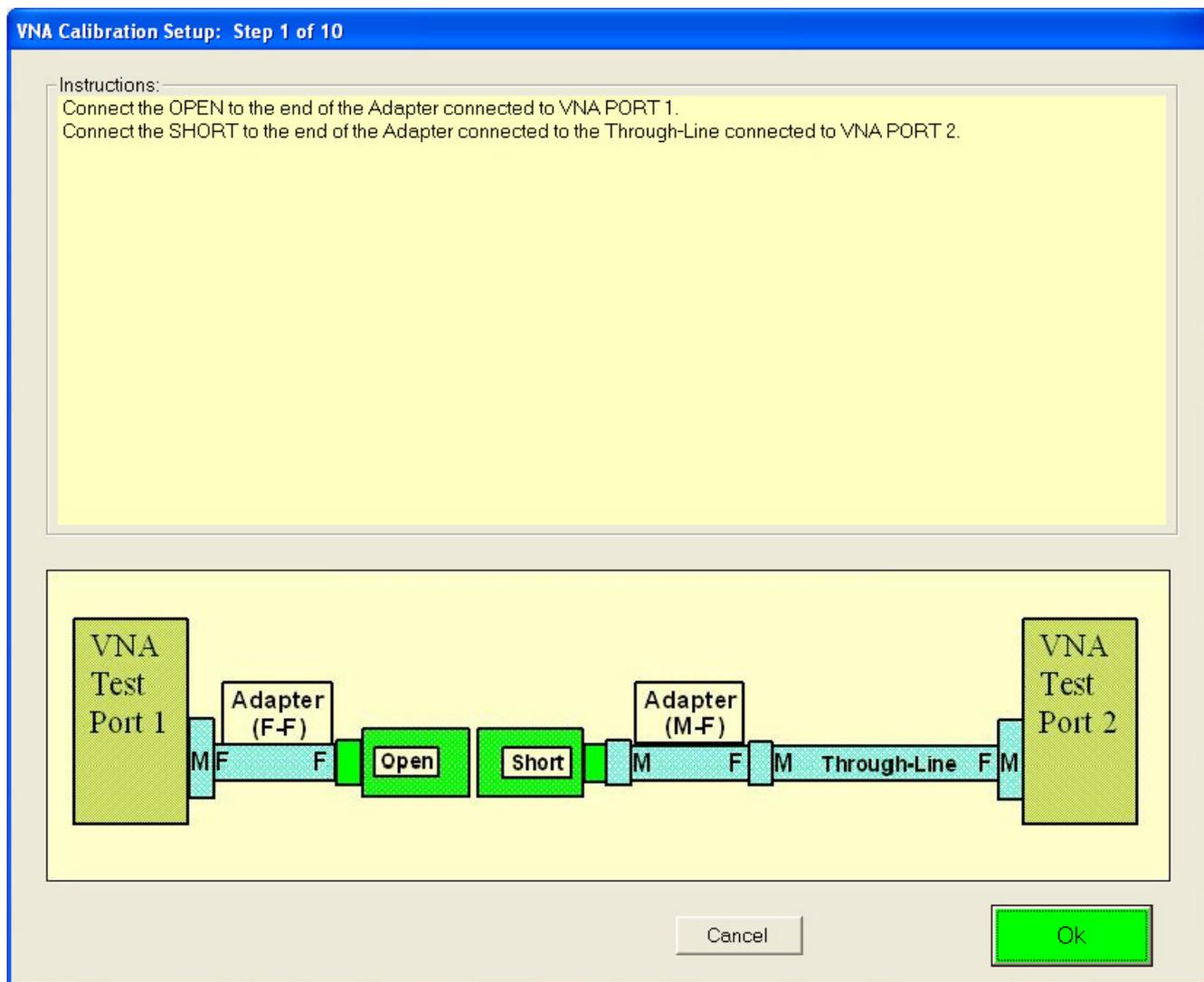
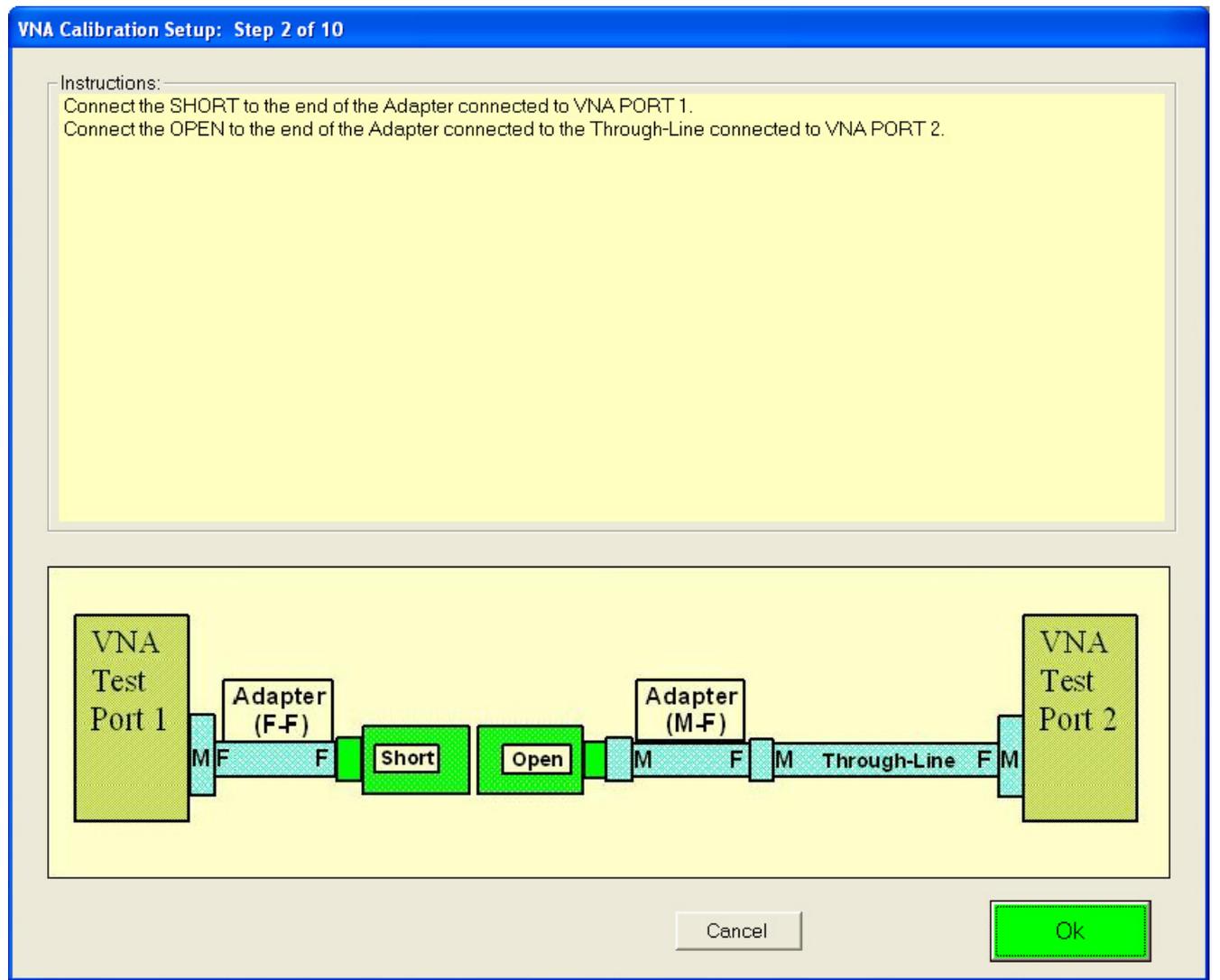


Figure 6-19. VNA Calibration Setup – Fixed Step 1 of 4 – Sliding Step 1 of 10

19. At **Port 1** with the **F-F Adapter**, connect the **M-Open**.
20. At **Port 2** with the **F-M Through Line** and the **F-M Adapter**, connect the **F-Short**.
21. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Fixed Loads - Step 2 of 4 – Sliding Loads - Step 2 of 10

22. The VNA Calibration Setup - Step 2 of 10 screen appears.



**Figure 6-20.** VNA Calibration Setup – Fixed Step 2 of 4 – Sliding Step 2 of 10

23. At **Port 1** and the **F-F Adapter**, connect the **M-Short**.
24. At **Port 2** and the **F-M Through Line** and the **F-M Adapter**, connect the **F-Open**.
25. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Fixed Loads - Step 3 of 4 – Sliding Loads - Step 3 of 10

26. The VNA Calibration Setup - Step 3 of 10 screen appears.

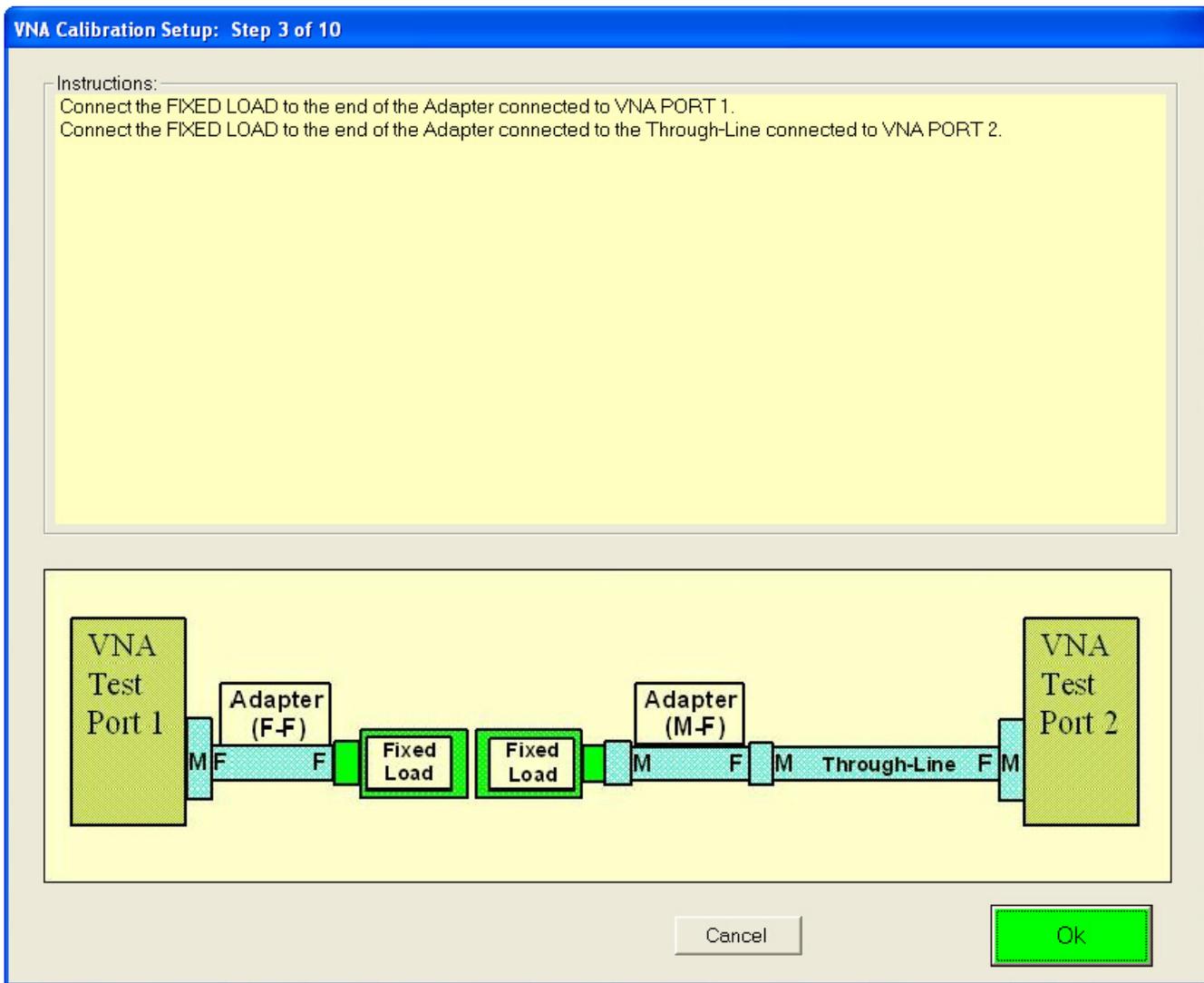


Figure 6-21. VNA Calibration Setup - Step 3 of 10

27. At **Port 1** and the **F-F Adapter**, connect the **M-Fixed Load**.

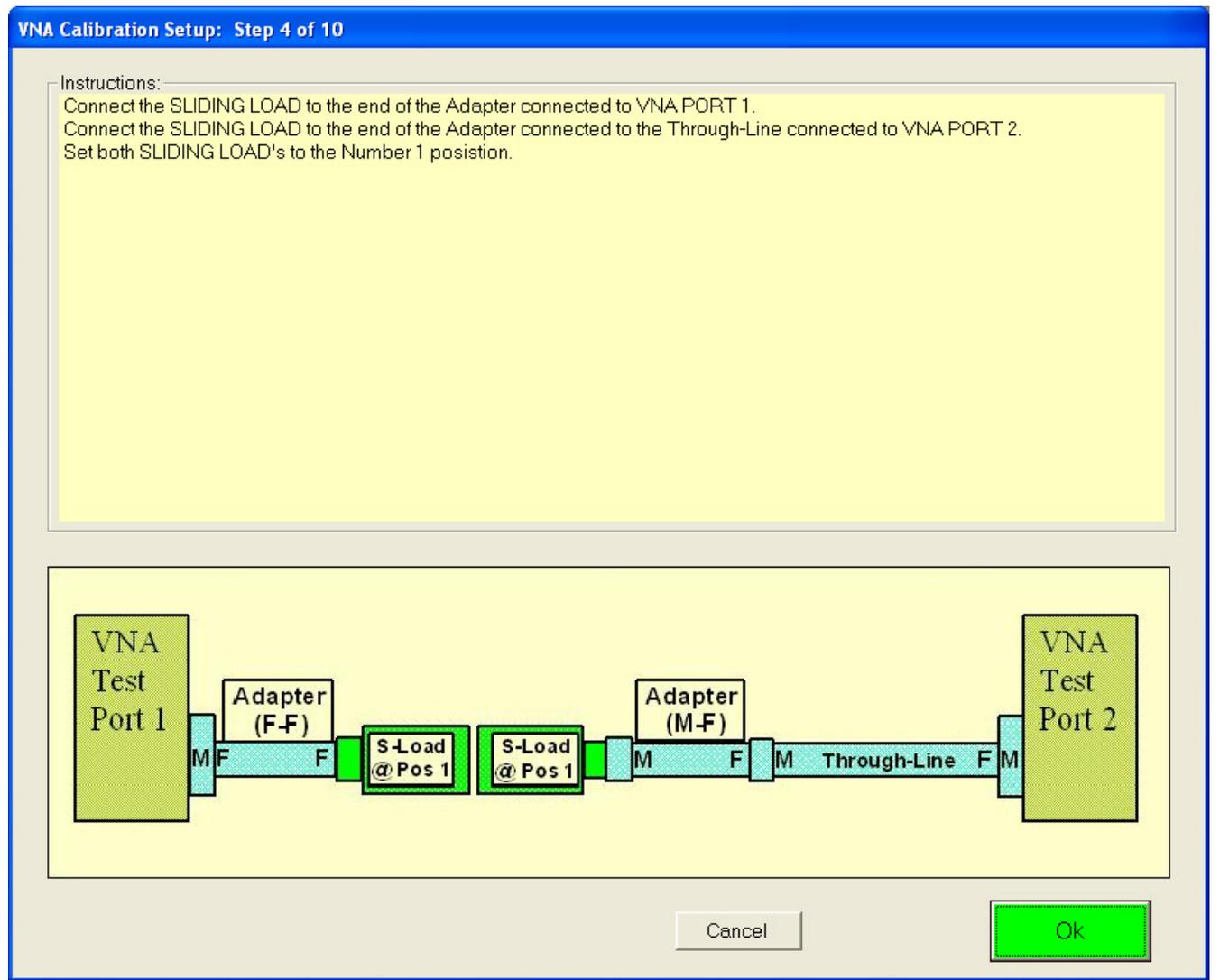
28. At **Port 2** and the **F-M Through Line** and the **F-M Adapter**, connect the **F-Fixed Load**.

29. When ready to proceed, click OK. The calibration procedure starts.

- If the calibration type uses fixed loads, such as those in a Type N Connector Mechanical Calibration Kit, the next calibration procedure step will be the Through Line connection.
- If using a calibration kit with fixed loads, skip ahead to [“VNA Calibration Setup - Fixed Loads - Step 4 of 4 – Sliding Loads - Step 10 of 10”](#) on page 6-27 below.
- If using a calibration kit with sliding loads, continue below with [“VNA Calibration Setup - Sliding Loads - Step 4 of 10”](#) on page 6-21 immediately below.

## VNA Calibration Setup - Sliding Loads - Step 4 of 10

30. The VNA Calibration Setup - Step 4 of 10 screen appears.



**Figure 6-22.** VNA Calibration Setup – Sliding Loads – Step 4 of 10

31. At **Port 1** and the **F-F Adapter**, connect the **M-Sliding Load** and set it to **Position 1**.
32. At **Port 2** and the **F-M Through Line** and the **F-M Adapter**, connect the **F-Sliding Load** and set it to **Position 1**.
33. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Sliding Loads - Step 5 of 10

34. The VNA Calibration Setup - Step 5 of 10 screen appears.

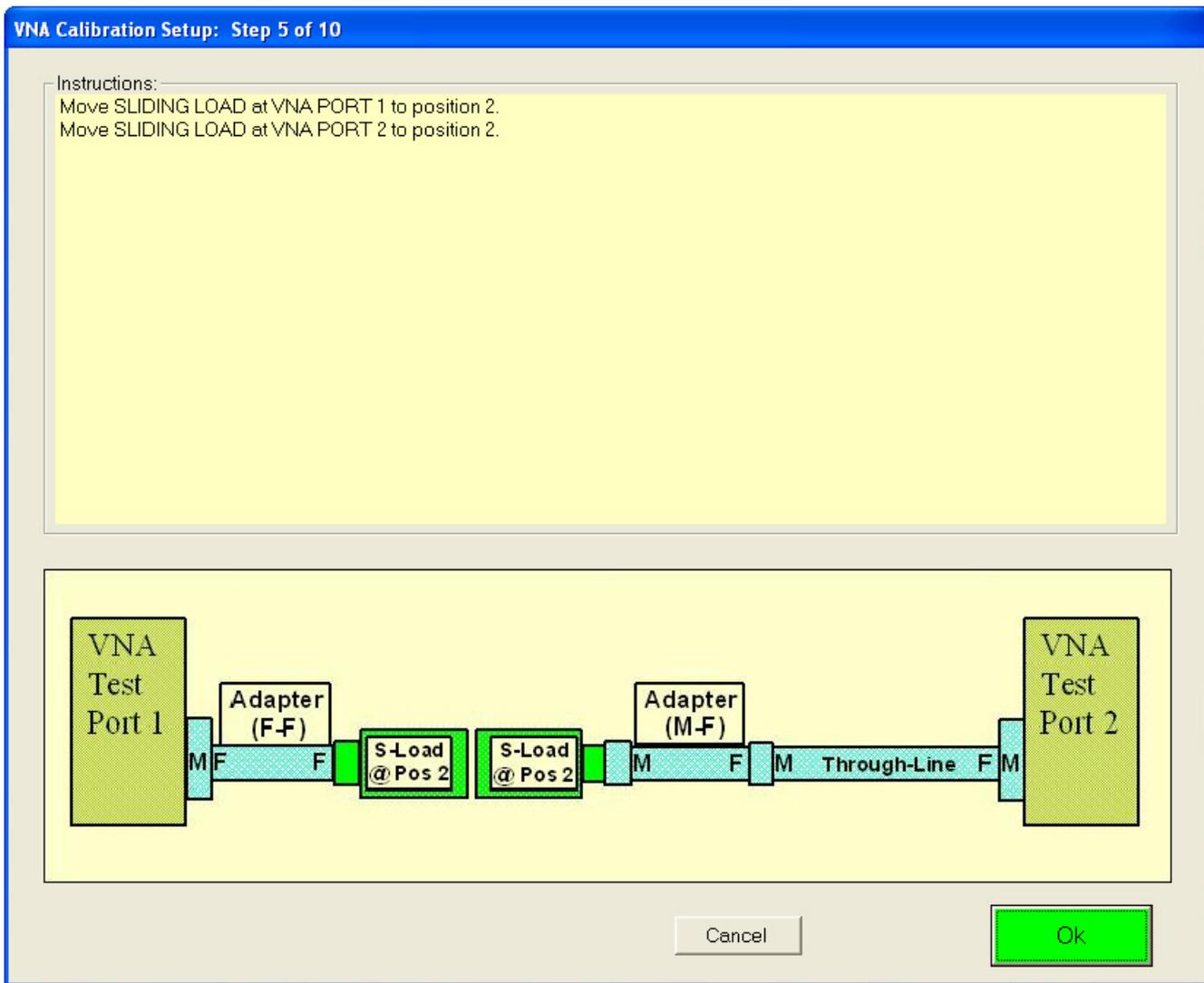
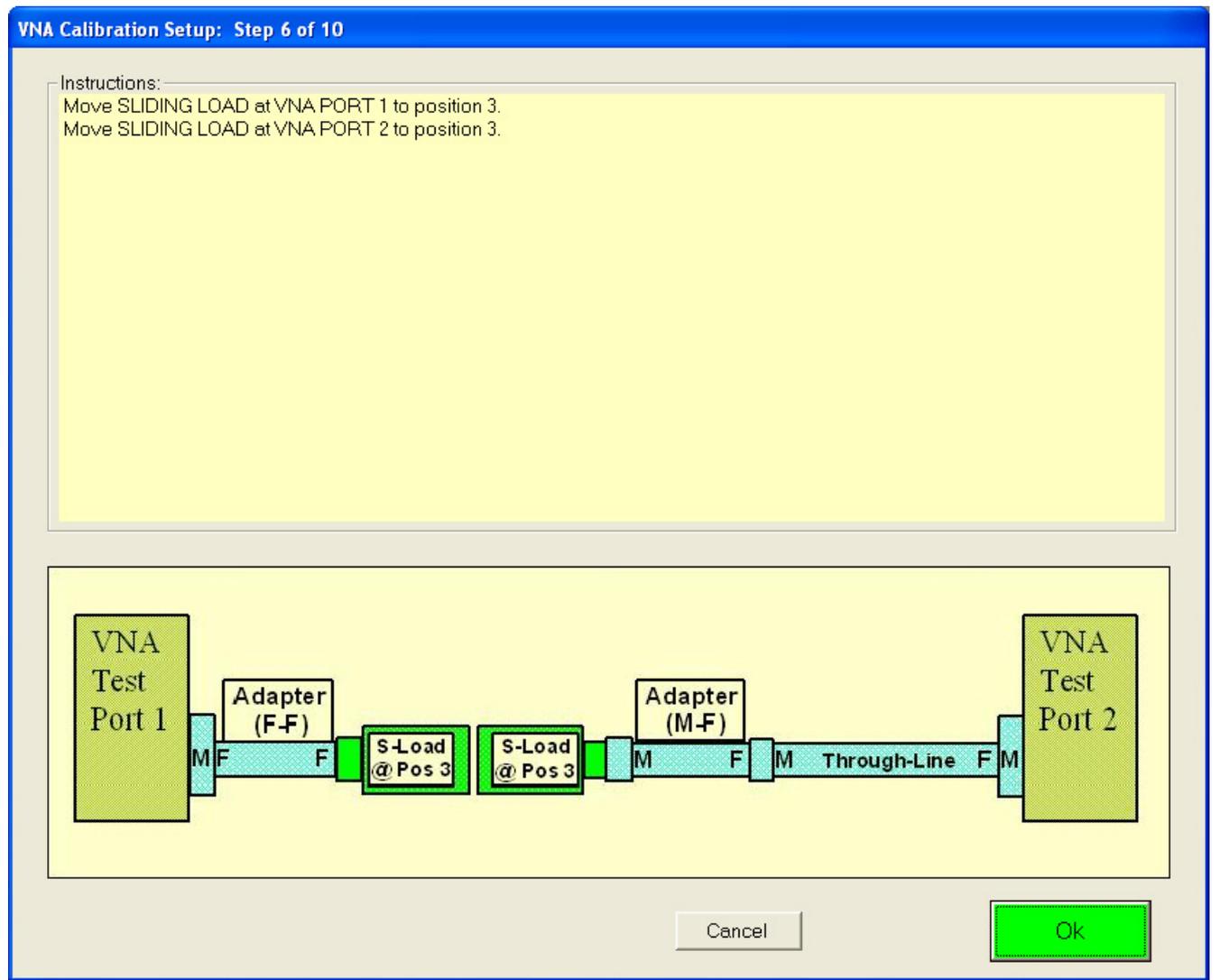


Figure 6-23. VNA Calibration Setup – Sliding Loads – Step 5 of 10

35. At **Port 1** and the **F-F Adapter** with the **M-Sliding Load** still connected, set it to **Position 2**.
36. At **Port 2** and the **F-M Through Line** and the **F-M Adapter**, with the **F-Sliding Load** still connected, set it to **Position 2**.
37. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Sliding Loads - Step 6 of 10

38. The VNA Calibration Setup - Step 6 of 10 screen appears.



**Figure 6-24.** VNA Calibration Setup – Sliding Loads – Step 6 of 10

39. At **Port 1** and the **F-F Adapter**, with the **M-Sliding Load** still connected, set it to **Position 3**.
40. At **Port 2**, the **F-M Through Line**, and the **F-M Adapter**, with the **F-Sliding Load** still connected, set it to **Position 3**.
41. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Sliding Loads - Step 7 of 10

42. The VNA Calibration Setup - Step 7 of 10 screen appears.

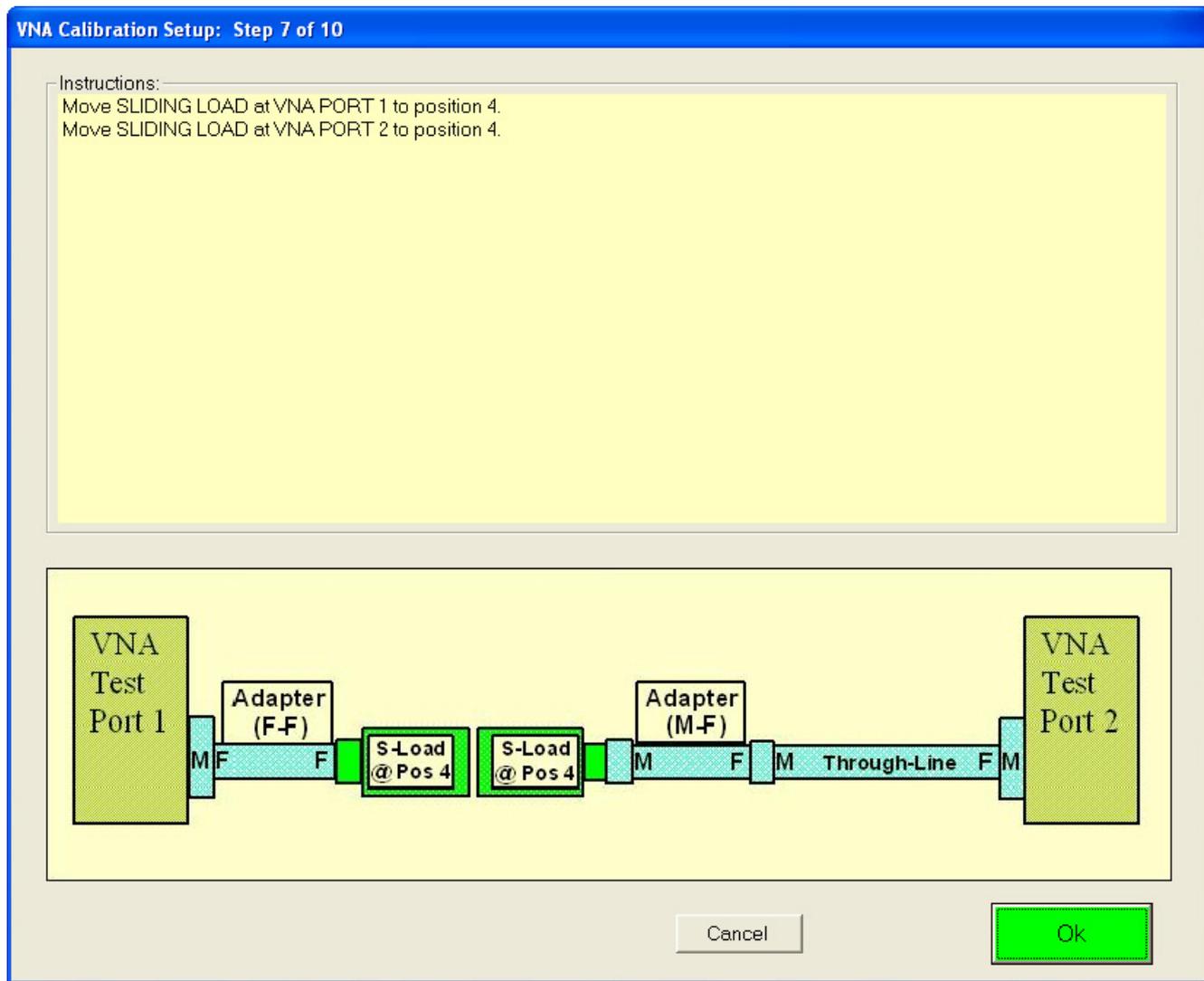


Figure 6-25. VNA Calibration Setup – Sliding Loads – Step 7 of 10

43. At **Port 1** and the **F-F Adapter**, with the **M-Sliding Load** still connected, set it to **Position 4**.
44. At **Port 2**, the **F-M Through Line**, and the **F-M Adapter**, with the **F-Sliding Load** still connected, set it to **Position 4**.
45. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Sliding Loads - Step 8 of 10

46. The VNA Calibration Setup - Step 8 of 10 screen appears.

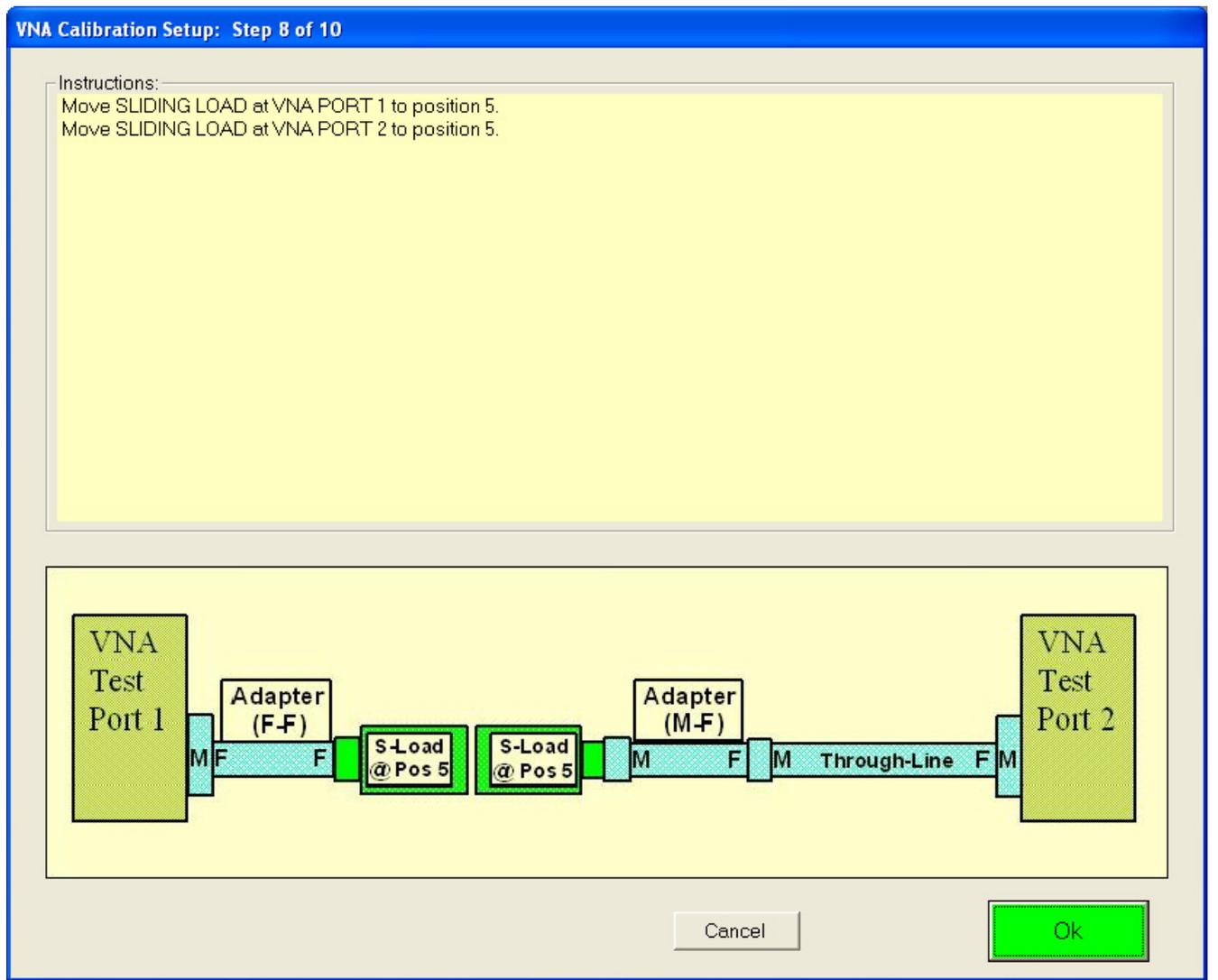


Figure 6-26. VNA Calibration Setup – Sliding Loads – Step 8 of 10

47. At **Port 1** and the **F-F Adapter**, with the **M-Sliding Load** still connected, set it to **Position 5**.
48. At **Port 2** and the **F-M Through Line** and the **F-M Adapter**, with the **F-Sliding Load** still connected, set it to **Position 5**.
49. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Sliding Loads - Step 9 of 10

50. The VNA Calibration Setup - Step 9 of 10 screen appears.

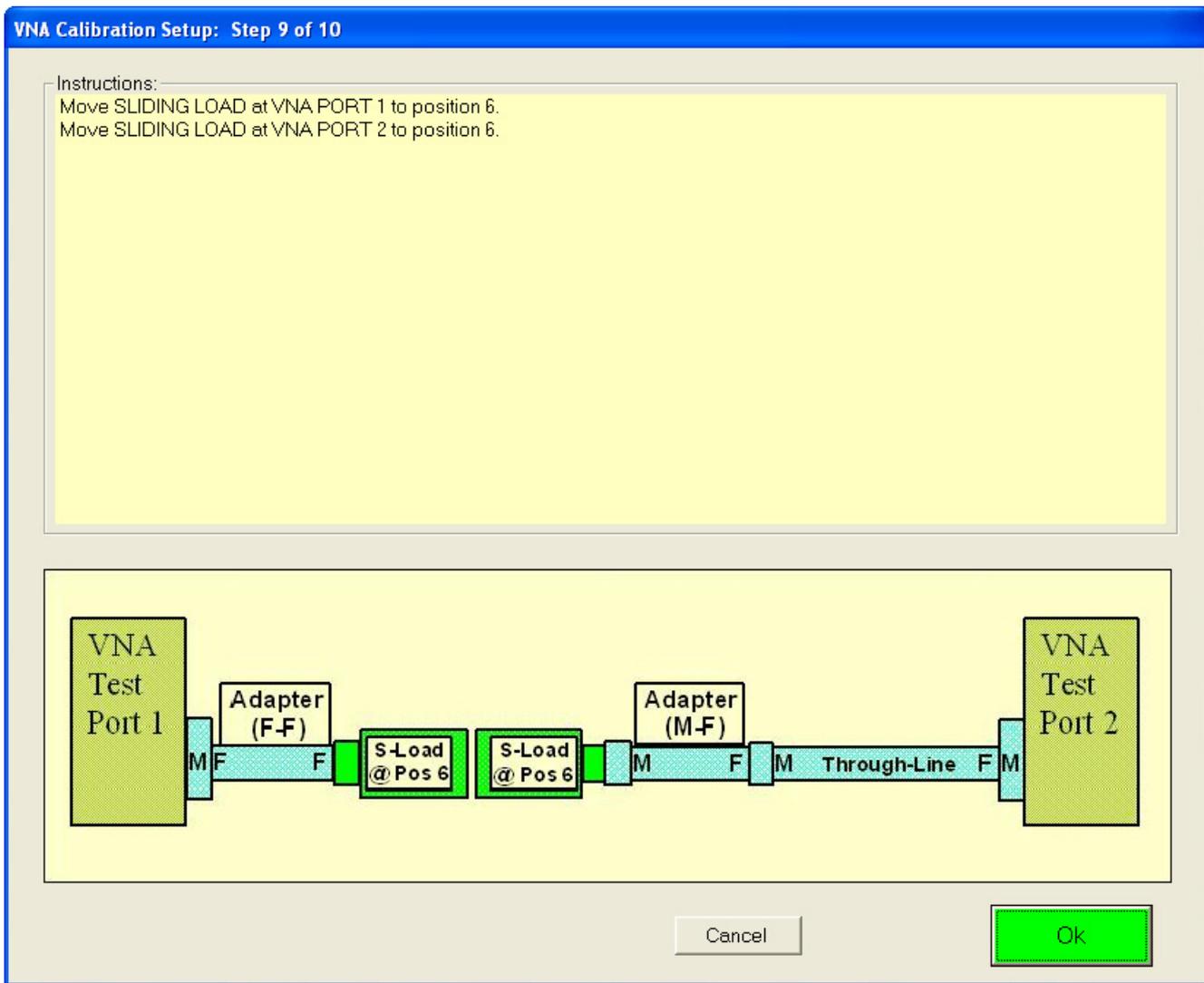
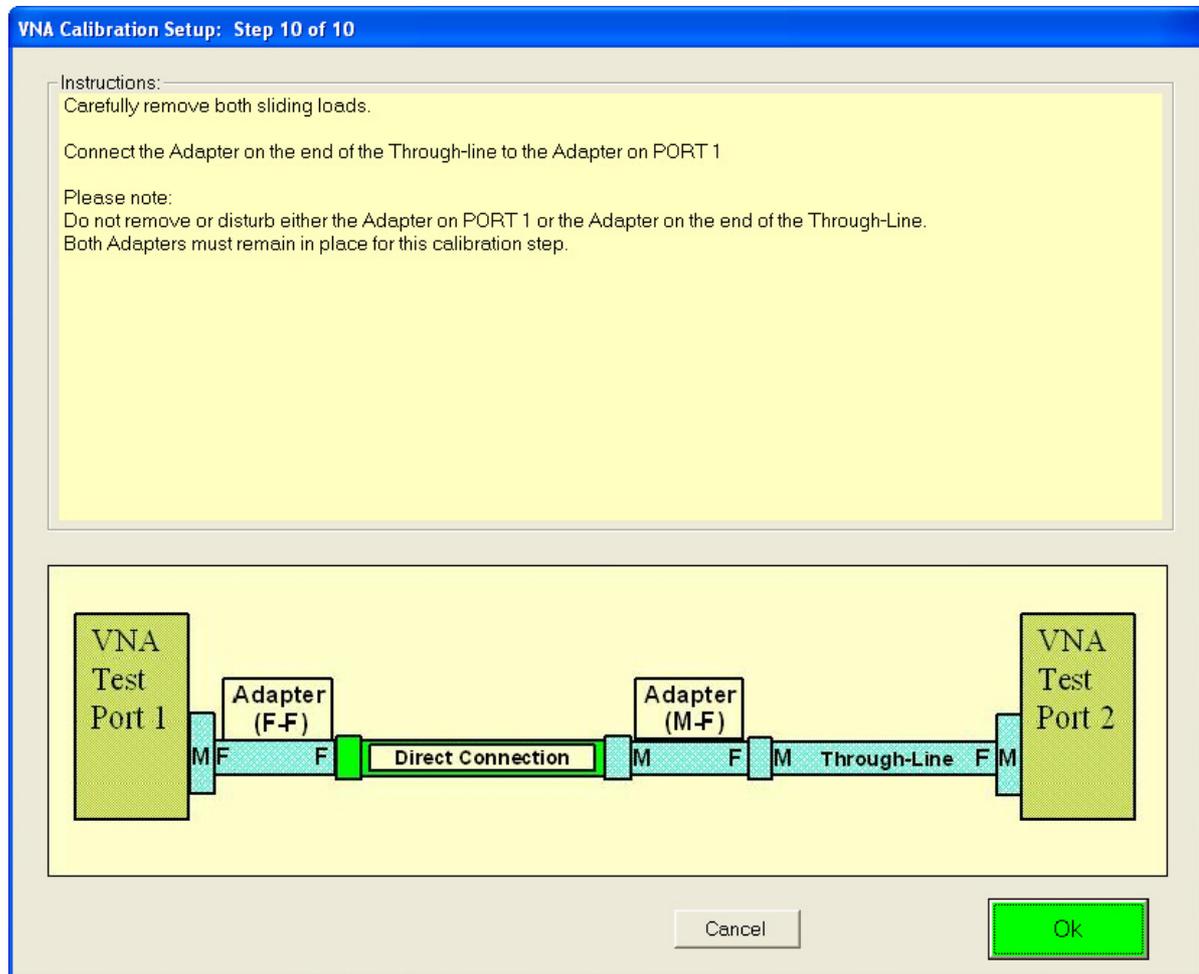


Figure 6-27. VNA Calibration Setup – Sliding Loads – Step 9 of 10

51. At **Port 1** and the **F-F Adapter**, with the **M-Sliding Load** still connected, set it to **Position 6**.
52. At **Port 2**, the **F-M Through Line**, and the **F-M Adapter**, with the **F-Sliding Load** still connected, set it to **Position 6**.
53. When ready to proceed, click OK. The calibration procedure starts.

## VNA Calibration Setup - Fixed Loads - Step 4 of 4 – Sliding Loads - Step 10 of 10

54. The VNA Calibration Setup - Step 10 of 10 screen appears.



**Figure 6-28.** VNA Calibration Setup - Step 10 of 10

**Note**

Both adapters and the through line **MUST** remain in place for this calibration step. If they are disconnected or adjusted, the calibration must be repeated.

55. At Port 1 and the **F-F Adapter**, remove either the **M-Fixed Load** or the **M-Sliding Load**. The calibration kits and their load types are:

- **3654D** – V (1.85 mm) Connector Mechanical Calibration Kit with Fixed Loads
- **3654D-1** – V (1.85 mm) Connector Mechanical Calibration Kit with Sliding Loads
- **3653A** – Type N Connector Mechanical Calibration Kit with Fixed Loads
- **3652A** – K (2.92 mm) Connector Mechanical Calibration Kit with Fixed Loads
- **3652A-1** – K (2.92 mm) Connector Mechanical Calibration Kit with Sliding Loads
- **3650A** – SMA/3.5 mm Connector Mechanical Calibration Kit with Fixed Loads
- **3650A-1** – SMA/3.5 mm Connector Mechanical Calibration Kit with Sliding Loads

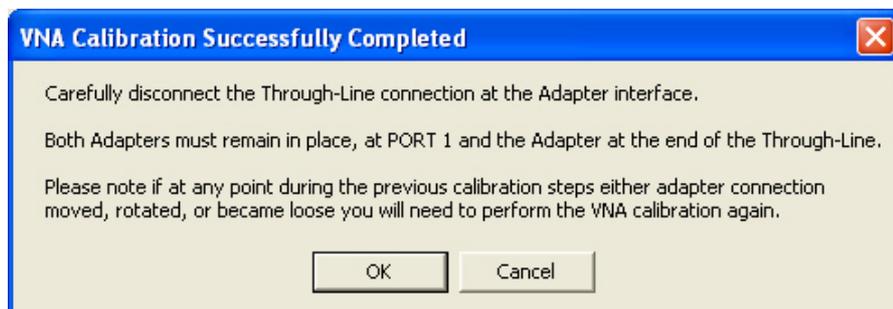
56. At **Port 2**, the **F-M Through Line**, and the **F-M Adapter**, remove the **F-Fixed Load** or the **F-Sliding Load**.

57. Leave both adapters and the through line in place. Connect the two adapters together as shown above in [Figure 6-28](#).

58. When ready to proceed, click **OK**. The calibration procedure starts. When successfully completed, the VNA Calibration Successfully Completed dialog box appears.

## VNA Calibration Completion

59. The VNA Calibration Successfully Completed dialog box appears.



**Figure 6-29.** VNA Calibration Successfully Completed Dialog Box

60. Carefully disconnect the interface joint between the **F-F Adapter** and the **M-F Adapter**.

<b>Note</b>	The <b>F-F Adapter</b> at <b>Port 1</b> and the <b>M-F Adapter</b> at the end of the <b>Through Line</b> on <b>Port 2</b> <b>MUST</b> remain in place. If at any point in this step or any previous steps, an adapter connection is moved, rotated, or becomes loose, you must perform the VNA calibration steps again.
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61. A row labeled VNA CALIBRATION #VER is entered in the Results area of the main menu with columns for Serial Number and Pass/Fail Status.
62. When ready to proceed, click OK. The next program action depends on which tests were selected during the initial setup above.
- a. **ALL VERIFICATION TESTS SELECTED:** If all tests were selected, the AIRLINE (DAT) #VER test is next. The Device Connection: AIRLINE dialog appears as shown in [Chapter 7 — Performance Verification](#) and the section titled “[Airline \(DAT\) Verification Test](#)” on page 7-3. After the last test, the program returns to the Verification Program Main Screen.
  - b. **ONE OR MORE VERIFICATION TESTS NOT SELECTED:** If only some verification tests were selected, the starting dialog box for the first selected test in top to bottom order next appears. The bulleted list below lists the tests in execution sequence. After the last selected test, the program returns to the Verification Program Main Screen. Each of these tests is described in [Chapter 7 — Performance Verification](#) in the following sections:
    - “[Airline \(DAT\) Verification Test](#)” on page 7-3.
    - “[Airline \(UNC\) Verification Test](#)” on page 7-5
    - “[Beatty Airline \(DAT\) Verification Test](#)” on page 7-6
    - “[Beatty Airline \(UNC\) Verification Test](#)” on page 7-8
    - “[20 dB OFFSET \(DAT\) \(Pad\) Test](#)” on page 7-9
    - “[20 dB Offset \(UNC\) \(Pad\) Test](#)” on page 7-11
    - “[40 dB or 50 dB Offset \(DAT\) # Ver Test](#)” on page 7-12
    - “[40 dB or 50 dB Offset \(UNC\) # Ver Test](#)” on page 7-14
  - c. **NO VERIFICATION TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 6-5 AutoCal Module Calibration Kit Procedure

Program execution continues here if Auto Calibration was selected above on the SELECT CALIBRATION KIT AND ENTER SERIAL NUMBER dialog box above in “Selecting the Calibration Method” on page 6-11

If Manual Calibration was selected above, the description of program execution continues above at Section 6-4 “Manual Calibration Kit Calibration Procedure” on page 6-12.

Assuming Auto Calibration was selected, proceed with the following procedure:

1. On the SELECT CALIBRATION KIT dialog box, select the Auto Calibration button.
  - The Precision Auto Calibration area appears with fields for Connector Type, Select AutoCal Model, and Enter Serial Number.

- At left, default entries.
- The drop-down arrows and the drop-down combo boxes may or may not be available depending on the VNA Model and the compatible AutoCal Modules.
- The Serial Number field is always available for user input.
- At right, the user has entered a serial number.
- When ready to proceed, click **Next >**.

**Figure 6-30.** Select Calibration Kit Dialog Box - Auto Calibration Method Selected

- The Final Information Check dialog box appears. The contents of the dialog box fields depends on which connector was selected. An example of a FINAL INFORMATION CHECK dialog box for a **3669B-1 V Connector Verification Kit** is shown below in [Figure 6-14](#).

**Final Information Check**

Verification Kit Information

Ver-Kit Model Number	Airline Model Number	Airline Serial Number	20 dB Offset Model Number	20 dB Offset Serial Number
3669B-1	19V50-5	601002	42V-20	501010
Ver-Kit Serial Number	Beatty Model Number	Beatty Serial Number	40 dB Offset Model Number	40 dB Offset Serial Number
903001	19V50-5B	601004	42V-40	601012

Auto Calibration Module Information

Auto-Cal Model Number	Auto-Cal Serial Number	Auto-Cal Connector
36585V	ENTER	V-ACALKIT

VNA Information

VNA Model Number	VNA Serial Number	VNA Options
MS4647A	091203	2.7.62

Verification Report Path Information

VNA Verification Report File Location More Information

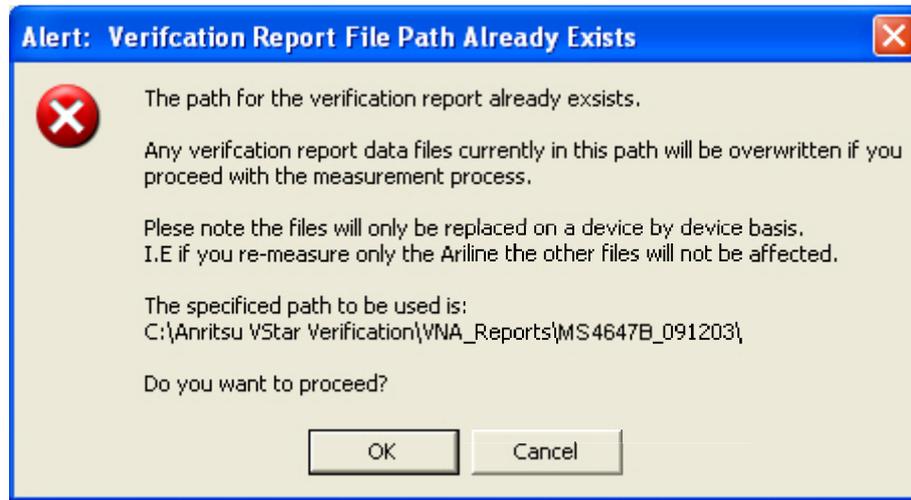
**View Path** C:\Anritsu VStar Verification\VNA\_Reports\MS4647A\_091203

- Example of a final information check for a:
  - 3669B-1 V Verification Kit
  - 36585 V Precision AutoCal M-F Module
  - VectorStar MS4647A VNA.
- The path shown is the default path to the PC Controller hard drive and is always C:\Anritsu VStar Verification\VNA\_Reports\- The path name must keep the first portion of the default path as C:\Anritsu VStar Verification\VNA\_Reports\.

**Figure 6-31.** Final Information Check Screen - Precision AutoCal Module

- Verify that all fields are correct.
  - If necessary, change the Verification Report Path as required. The top portion of the file path must be kept as C:\Anritsu VStar Verification\VNA\_Reports\... .
  - The recommended destination directory is C:\Anritsu VStar Verification\VNA\_Reports\
- When ready to proceed, click Next > (Begin Measurements).

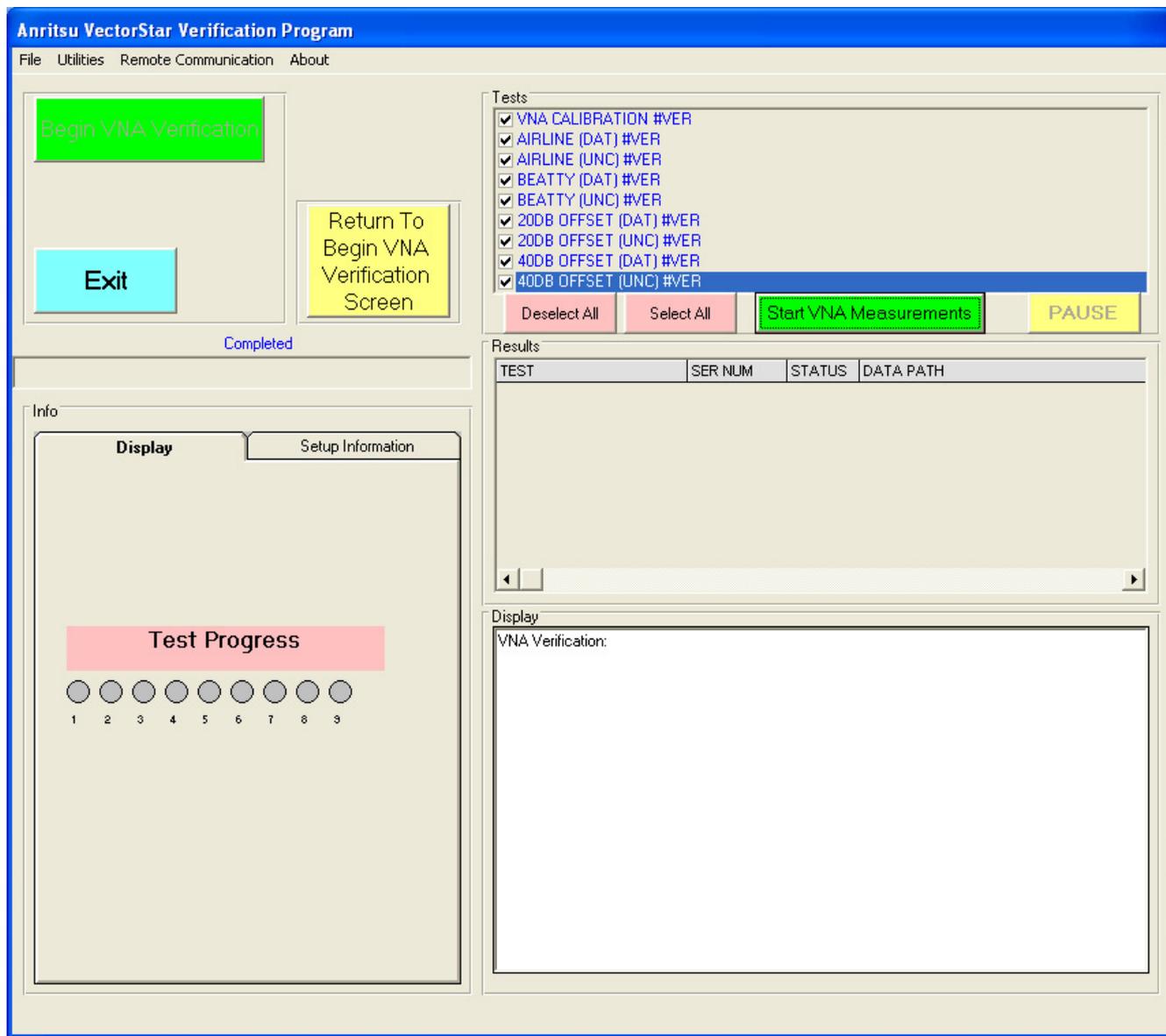
5. If the Alert Verification Report File Path dialog box appears, the path has been previously used and proceeding will overwrite any data present in the path directory. If there is no file path conflict, the Alert dialog will not appear.



**Figure 6-32.** Alert Verification Report File Path Dialog Box

6. To stop the test and select another path, click **Cancel**. The program returns to the Final Information Check screen shown above in [Figure 6-31](#).
  - a. On the Final Information Check screen, select the **View Path** button.
  - b. On the associated file dialogs, create and/or select another folder to store the test results.
  - c. You can also rename the result output files.
  - d. When done, return to the Final Information Check screen and again select the **Next > (Begin Measurements)** button.
  - e. Proceed with the next step below.
7. To proceed and overwrite previous test data, click **OK**.
8. The Verification Program Main Screen reappears as shown below.

- See [Chapter 5](#) and [Section 5-6 “On-Screen Help”](#) on page 5-8 for user interface operation.



- Ready to start VNA calibration
- Use of a 36585A V Precision AutoCal Module with a MS4647A/B VNA shown

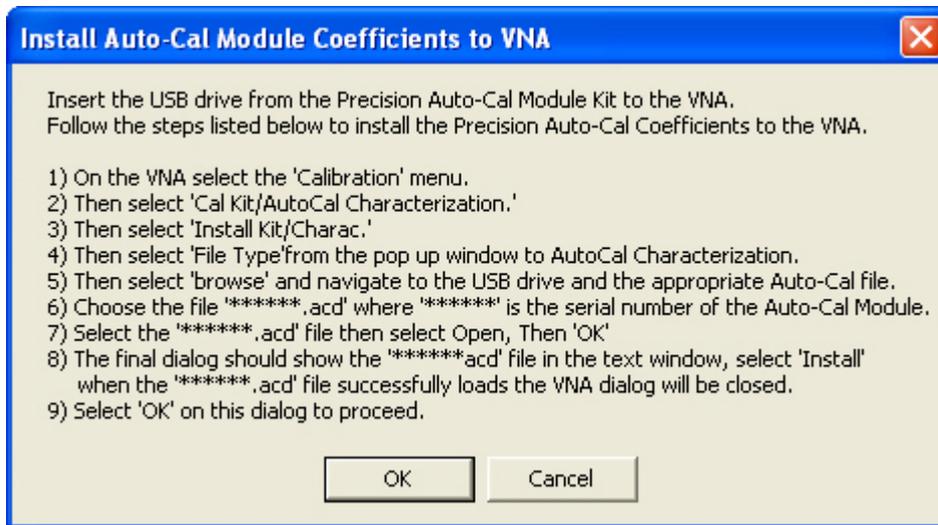
**Figure 6-33.** Verification Program Main Screen - Ready to Start Calibration

9. Click the green right side Start VNA Measurements button to start the calibration run.
10. The Precision AutoCal DC Power and Serial Control dialog box appears, reminding you to connect the AutoCal Module to Power and the VNA Serial Port.
11. If you have not done this step, connect the AutoCal Module to its AC Power Module and to the VNA Rear Panel Serial 10101 Port as described in [Chapter 4, Section 4-7 “Connecting the Precision AutoCal Module”](#) on page 4-9.

**Note**

Allow the AutoCal Module to warm up to operating temperature with the **Blue LED** on before using. Do not connect the AutoCal Module to the **VNA Test Ports** until directed by the PVS application.

12. When ready to proceed, click OK. The Install AutoCal Module Coefficients dialog box appears.



**Figure 6-34.** Install AutoCal Module Coefficients Dialog Box

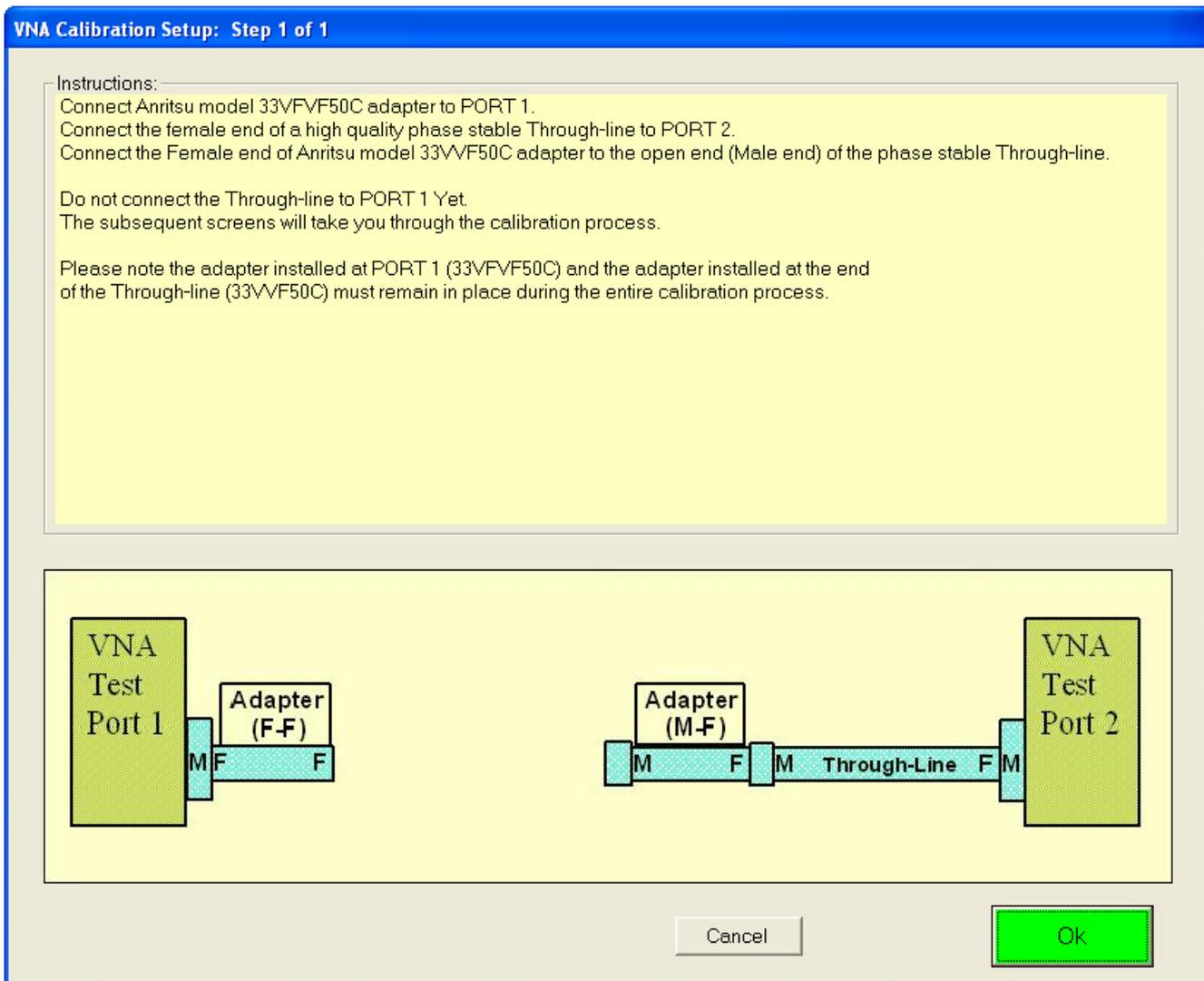
13. If you have not done this step, install the AutoCal Characterization Coefficient Files from their USB Memory Device and load them into the VNA as described in [Chapter 4, Section 4-6 “Loading Calibration Kit Coefficients into VNA”](#) on page 4-6.

**Note** Do not connect the AutoCal Module to the **VNA Test Ports** until directed by the PVS application.

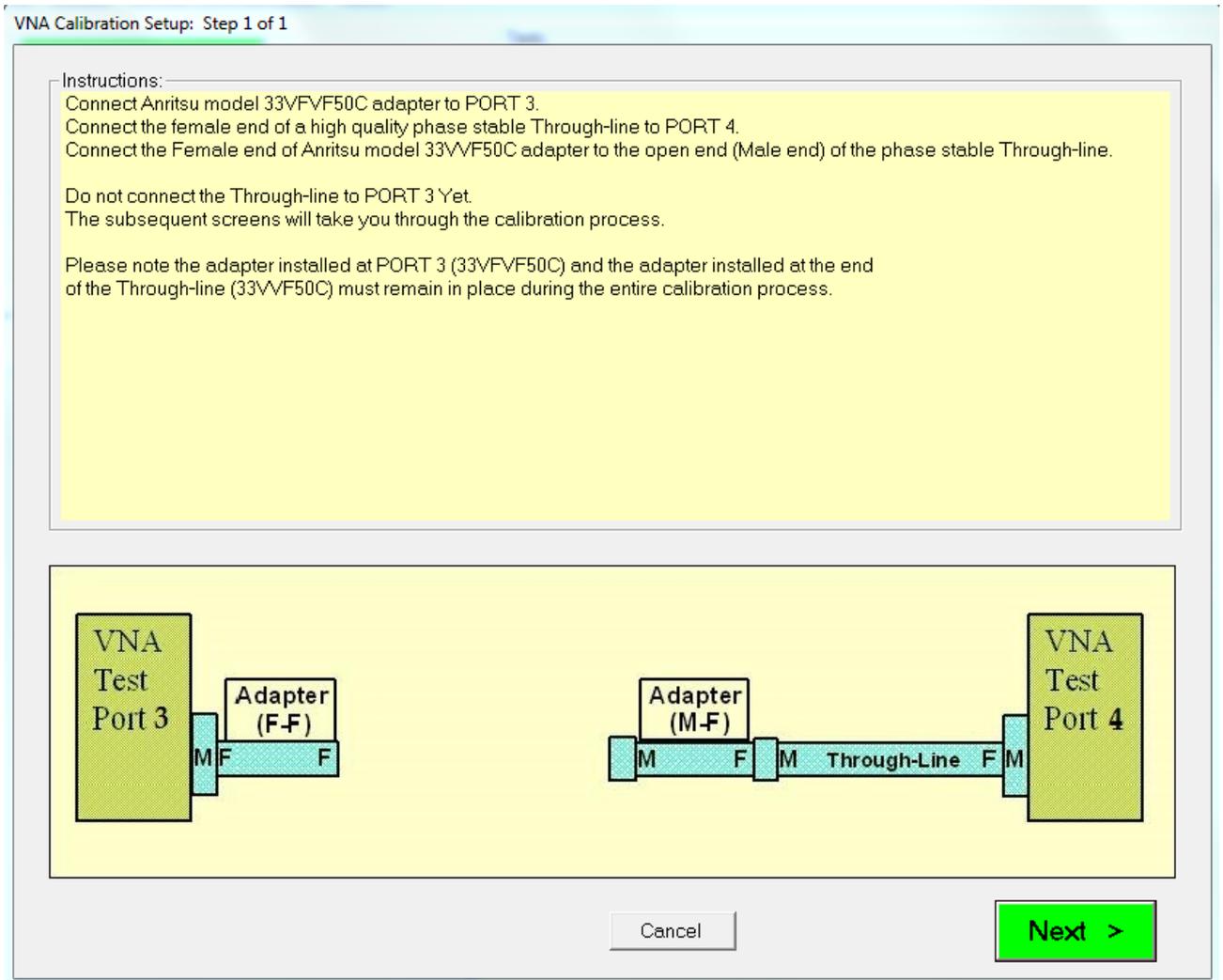
14. When ready to proceed, click OK. The VNA Calibration Step 1 of 1 screen appears.

## VNA Calibration Initial Setup

15. The VNA Calibration Setup Step 1 of 1 screen appears as shown in [Figure 6-35](#). With 4-Port System verification, Port 3 and Port 4 will appear in this dialog ([Figure 6-36](#)) if the Port Pair Selection of Port 34 was checked in the Port Selection dialog ([Figure 6-5](#))



**Figure 6-35.** VNA AutoCal Calibration Setup – Port 1 and Port 2 (For 2-Port or 4-Port VNA)



**Figure 6-36.** VNA AutoCal Calibration Setup – Port 3 and Port 4 (For 4-Port VNA)

**Note**

The on-screen directions and the part numbers referenced depend on the Verification Kit and its associated connector type (V or K connectors) selected in the sections above. The example figures in this section show the required components for 36585V-2MF M-F Precision AutoCal Module used with an MS4645A/B and a MS4647A/B VNA with V Connectors.

16. To **Port 1 (or Port 3 for 4-Port)**, connect an **F-F Adapter**.
17. To **Port 2 (or Port 4 for 4-Port)**, connect the **F-End** of a high quality phase-stable **Through Line**.
18. To the **M-End** of the **Through Line**, connect a **M-F Adapter**.

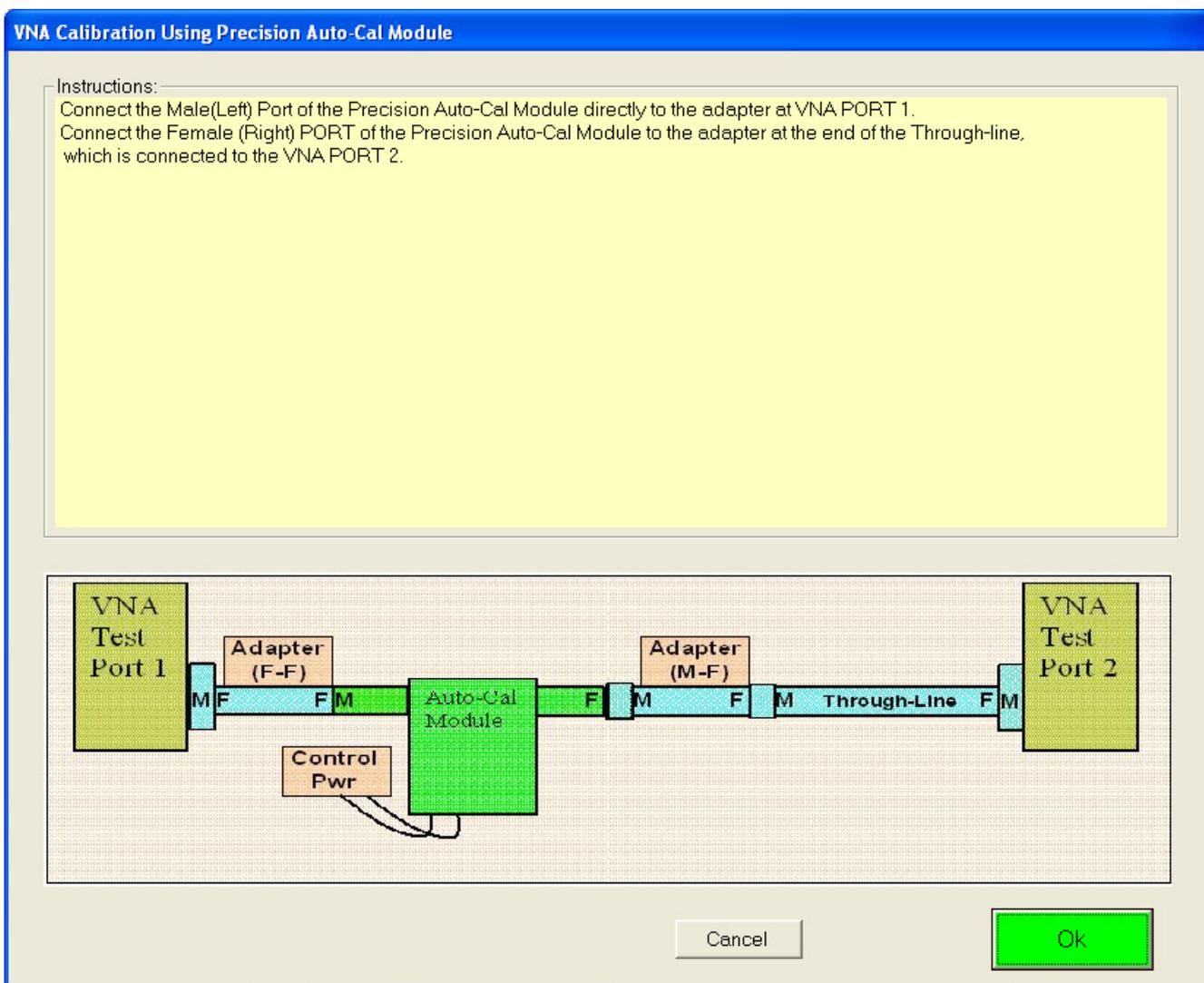
**Note**

The F-F Adapter connected to Port 1 and the M-F Adapter connected to the Through Line must remain in place during the complete automatic calibration process. If they are removed or loosened during the process, the entire automatic calibration process must be repeated.

19. When ready to proceed, click Next. The Verification Program Main Screen momentarily appears listing test status updates and the moving progress bar. When the tests are complete, the VNA Calibration Using AutoCal screen appears.

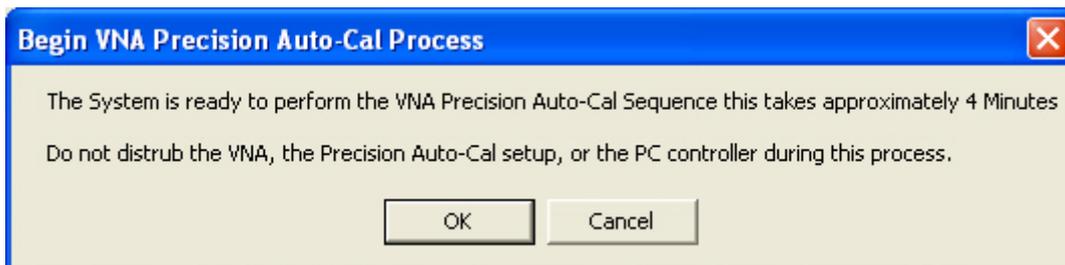
## VNA Calibration Using Precision AutoCal Module

20. The VNA CALIBRATION USING PRECISION AUTOCAL MODULE screen appears.



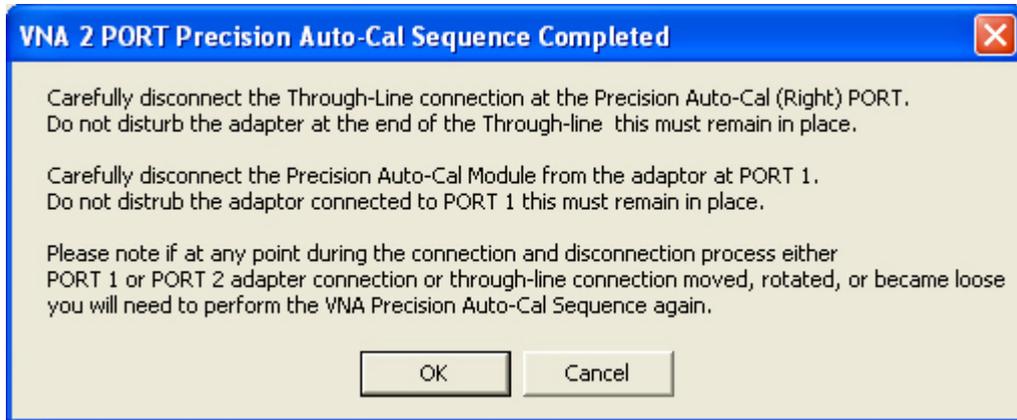
**Figure 6-37.** VNA Calibration Using a Precision AutoCal Module

21. On **Port 1** with the attached **F-F Adapter**, connect the **AutoCal M-Left Connector**.
22. On Port 2 with the attached M-F Though Line and the **M-F Adapter**, connect **AutoCal F-Right Connector**.
23. When ready to proceed, click OK. A alert appears stating that the AutoCal Calibration process takes approximately four (4) minutes. Do not disturb the instrument, components, connectors, or through line during the calibration process.



**Figure 6-38.** Begin VNA AutoCal Calibration Dialog Box

24. When ready to proceed, click OK. The calibration process runs.
25. When complete, the Verification Program Main Screen reappears and displays general status and test progress.
  - The Current Test Completed bar progresses for each test.
  - The Test Progress area only displays Test 1 (Calibration) as active and not completed.
  - The Display area lists individual test progress and status messaged.
26. When all tests are completed, the VNA 2-Port AutoCal Sequence Completed dialog box appears.



**Figure 6-39.** Precision AutoCal Sequence Completed Dialog Box

27. Disconnect the **AutoCal Module F (Right) Connector** from the **M-F Adapter**.
  - Do not disturb the connection between the **M-F Adapter** and the **M-F Though Line**.
28. Disconnect the **AutoCal Module M (Left) Connector** from the **F-F Adapter**.
  - Do not disturb the **F-F Adapter** connection to the **Port 1**.
  - Do not disconnect the **AutoCal Module** from the VNA Rear Panel **Serial 10101 Port** nor from the **AC Power Module** and the AC Line.
29. When ready to proceed, click OK to start the verification tests.
30. The next program action depends on which tests were selected:
  - a. **ALL VERIFICATION TESTS SELECTED:** If all tests were selected, the AIRLINE (DAT) #VER test is next. The Device Connection: AIRLINE dialog appears as shown in [Chapter 7 — Performance Verification, “Airline \(DAT\) Verification Test” on page 7-3](#).
  - b. **SOME VERIFICATION TESTS SELECTED:** If only some verification tests were selected, the selected tests will execute in their top to bottom display order. The first selected verification test then displays its starting dialog box as described in the various sections of [Chapter 7 — Performance Verification](#) below:
    - [“Airline \(DAT\) Verification Test” on page 7-3](#)
    - [“Airline \(UNC\) Verification Test” on page 7-5](#)
    - [“Beatty Airline \(DAT\) Verification Test” on page 7-6](#)
    - [“Beatty Airline \(UNC\) Verification Test” on page 7-8](#)
    - [“20 dB OFFSET \(DAT\) \(Pad\) Test” on page 7-9](#)
    - [“20 dB Offset \(UNC\) \(Pad\) Test” on page 7-11](#)
    - [“40 dB or 50 dB Offset \(DAT\) # Ver Test” on page 7-12](#)
    - [“40 dB or 50 dB Offset \(UNC\) # Ver Test” on page 7-14](#)
  - c. **NO VERIFICATION TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.



# Chapter 7 — Performance Verification

## 7-1 Introduction

This chapter provides information about running the verification tests. For each test, configuration information is provided for adapter and through line connections.

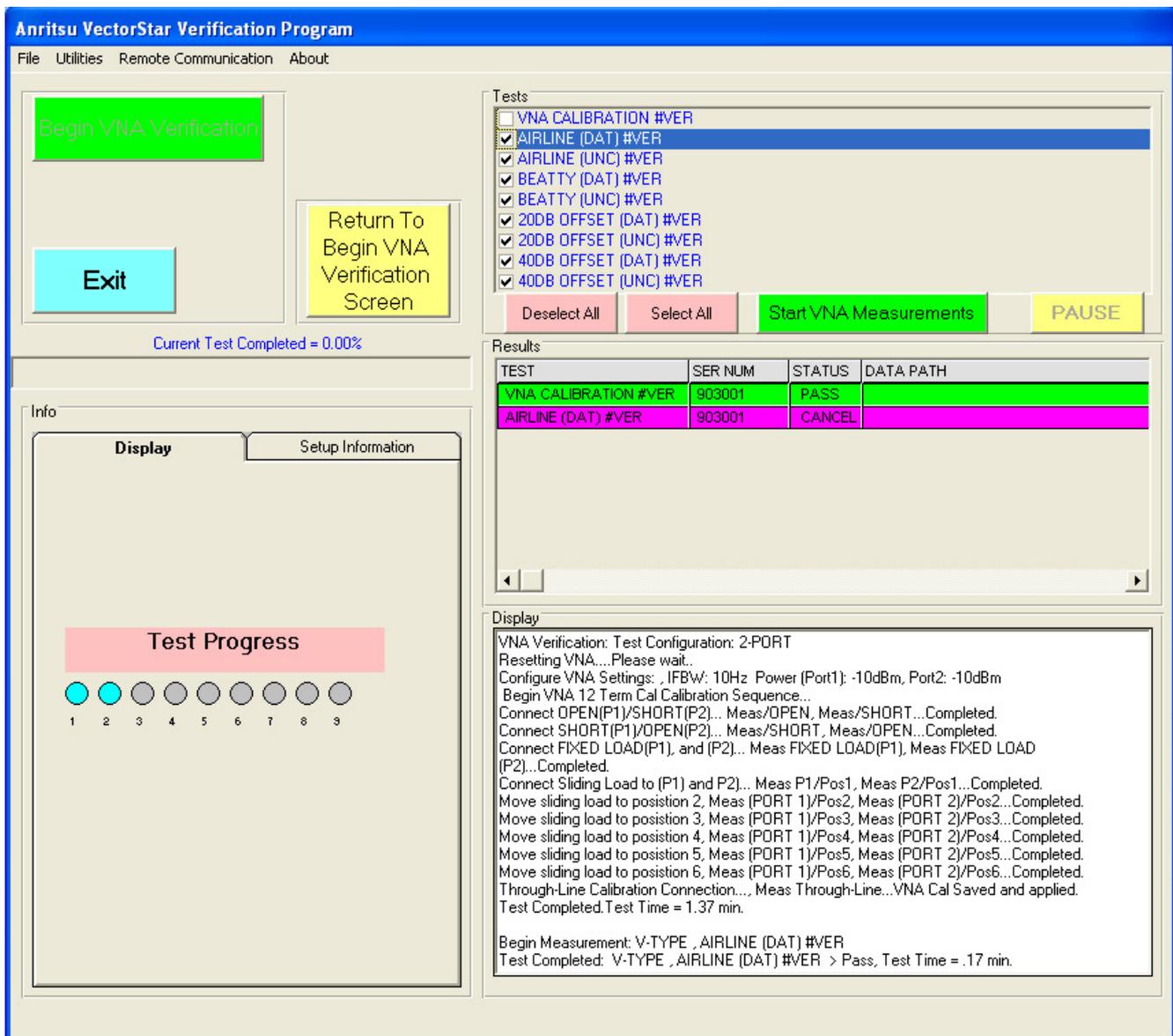
## 7-2 Prerequisites

This chapter assumes the following prerequisites have been met:

- The VNA and PC controller are correctly configured and connected via the GPIB cable.
  - See [Chapter 4 — Hardware Configuration](#)
- The PVS application has been installed on the PC Controller.
  - See [Chapter 5 — Installation and Operation](#)
- The appropriate calibration kit has been selected and its characterization USB memory device is inserted into the VNA and that its characterization data has been loaded into the VNA memory.
  - See [Chapter 3 — Required Hardware](#)
  - See [Chapter 4 — Hardware Configuration](#)
- The appropriate verification kit has been selected and its characterization USB memory device is inserted into the PC Controller.
  - See [Chapter 3 — Required Hardware](#)
  - See [Chapter 4 — Hardware Configuration](#)
- The appropriate support adapters and test port cable has been obtained.
  - See [Chapter 3 — Required Hardware](#)
- The appropriate information about all the components gathered and written down
  - See [Chapter 1 — Verification Kit Reference](#)
  - See [Appendix A — VNA Verification Record Form](#)
- A successful calibration using either an AutoCal Module or a manual calibration kit has been completed.
  - See [Chapter 6 — VNA Calibration](#)
  - See [Section 6-4 “Manual Calibration Kit Calibration Procedure” on page 6-12](#)
  - See [Section 6-5 “AutoCal Module Calibration Kit Procedure” on page 6-29](#)

## 7-3 Verification Program Main Screen

Figure 7-1 below displays the verification testing that has been selected.



**Figure 7-1.** Verification Program Main Screen - Calibration Complete - Ready for Verification

The display above assumes that all verification tests will be performed as noted by the selected checkboxes for the eight (8) tests. If the calibration and verification tests are being done in one pass, the next screen will automatically appear.

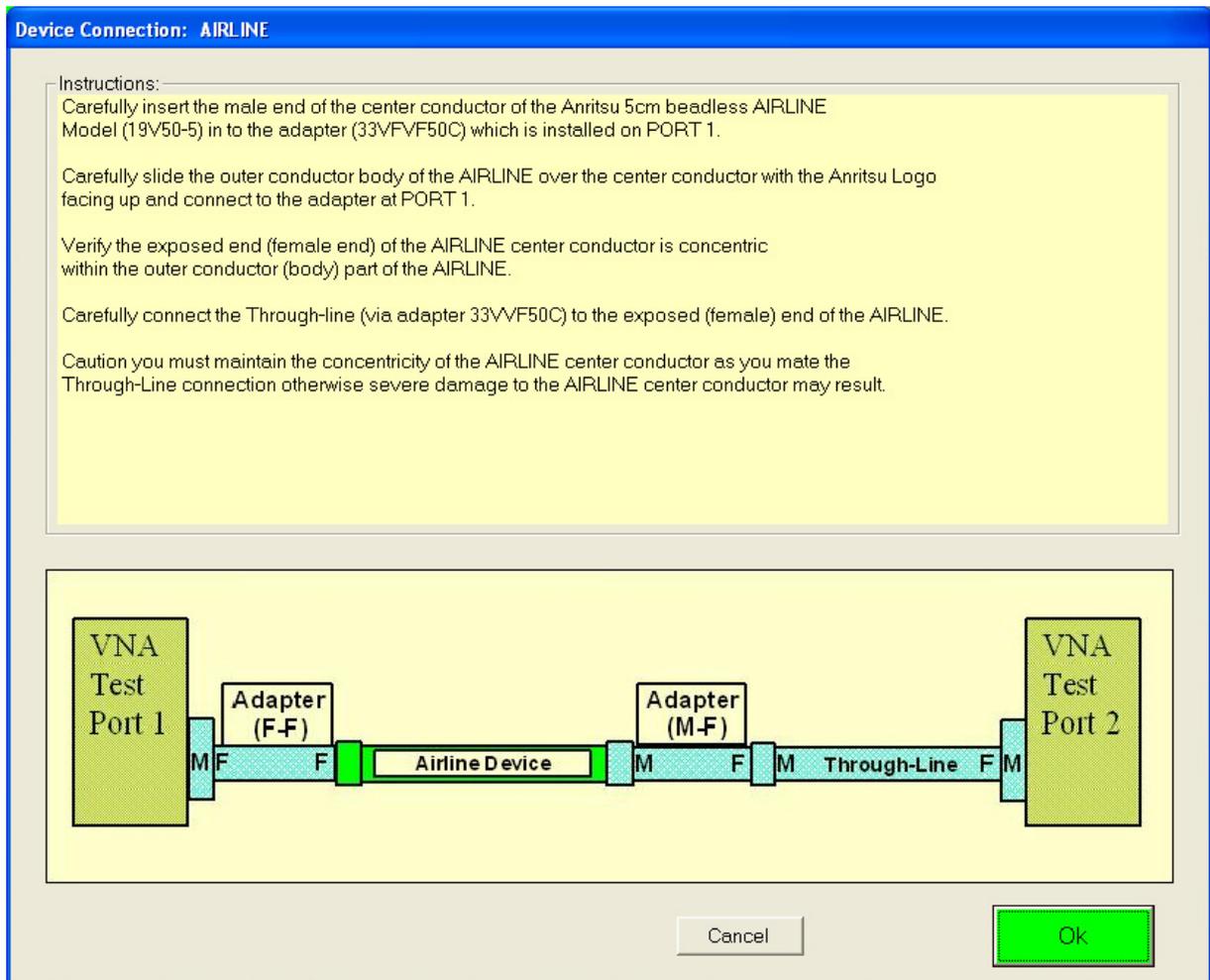
**Note** At least one test must be selected to operate the PVS application.

## 7-4 Airline (DAT) Verification Test

In this section, the software performs the Airline (DAT) test and the Airline (UNC) test.

**Note** The screen and dialog examples in this chapter show connectors and adapters for a 3669B-1 V-Connector Verification Kit working with a VectorStar MS4545A/B or MS4647A/B VNA. The actual screen instructions will describe the proper connector and adapters for the Verification Kit in use.

1. If all tests were selected, the prior calibration test was either the “[Manual Calibration Kit Calibration Procedure](#)” on page 6-12 or the “[AutoCal Module Calibration Kit Procedure](#)” on page 6-29.
2. The Device Connection - AIRLINE screen appears as shown below.

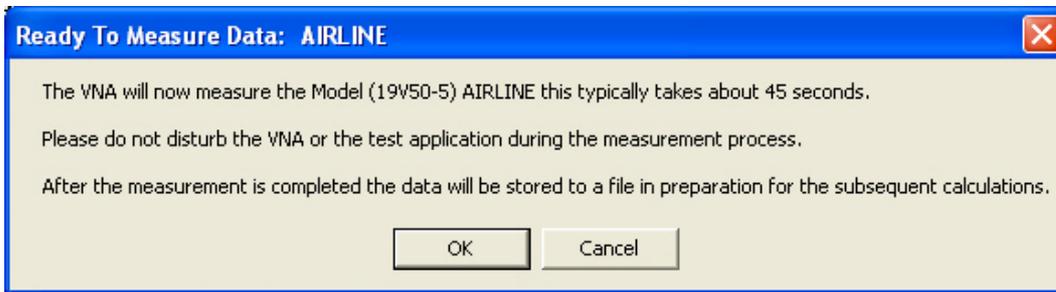


**Figure 7-2.** Device Connection - AIRLINE - DAT and UNC Tests

3. Carefully slide the outer connector body part of the beadless Airline over the center conductor part and connect the outer connector to the **F-F Adapter** on **Port 1**.
4. Verify that the exposed **Female End** of the **Airline Center Conductor** is centered within the **Outer Conductor Body** of the **Airline**.
5. Carefully connect the other end of the Airline to **M-F Adapter** on the **Port 2 Through Line**.

**Caution** You must maintain the concentricity of the **Airline Center Conductor** as you mate the **Through Line** connection. If misaligned, severe damage to the **Airline Center Conductor** may result.

6. When ready to proceed, click OK. The Ready To Measure Data - AIRLINE dialog appears as shown below.



**Figure 7-3.** Ready to Measure Data - Airline - DAT Test

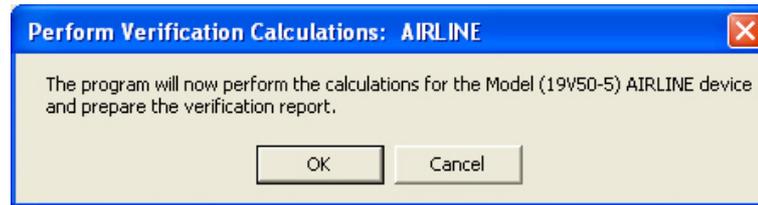
7. When ready to proceed, click OK. The verification test proceeds and the progress bar shows the test percentage completed.
8. When the test is complete, a row labeled AIRLINE (DAT) #VER is entered in the Results area of the main menu with columns for Serial Number and Pass/Fail Status. After all tests are complete, double-click on the row to see the results in a text editor.
9. The next PVS action depends on which tests were selected:
- a. **ALL TESTS SELECTED:** If all tests were selected, the Perform Verification Calculations - AIRLINE dialog box appears as shown in the next section titled [“Airline \(UNC\) Verification Test”](#) on page 7-5.
  - b. **SOME TESTS SELECTED:** If the AIRLINE (UNC) #VER test was not selected, but another test was selected, its starting dialog appears:
    - [“Airline \(UNC\) Verification Test”](#) on page 7-5
    - [“Beatty Airline \(DAT\) Verification Test”](#) on page 7-6
    - [“Beatty Airline \(UNC\) Verification Test”](#) on page 7-8
    - [“20 dB OFFSET \(DAT\) \(Pad\) Test”](#) on page 7-9
    - [“20 dB Offset \(UNC\) \(Pad\) Test”](#) on page 7-11
    - [“40 dB or 50 dB Offset \(DAT\) # Ver Test”](#) on page 7-12
    - [“40 dB or 50 dB Offset \(UNC\) # Ver Test”](#) on page 7-14
  - c. **NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

<b>Note</b> At least one test must be selected to operate the PVS application.
--

## 7-5 Airline (UNC) Verification Test

In this section, the software performs the Airline (UNC) test.

1. If all tests were selected, the prior verification test was the “[Airline \(DAT\) Verification Test](#)” on page 7-3.
2. The Prepare Verification Calculations: AIRLINE dialog appears as shown below



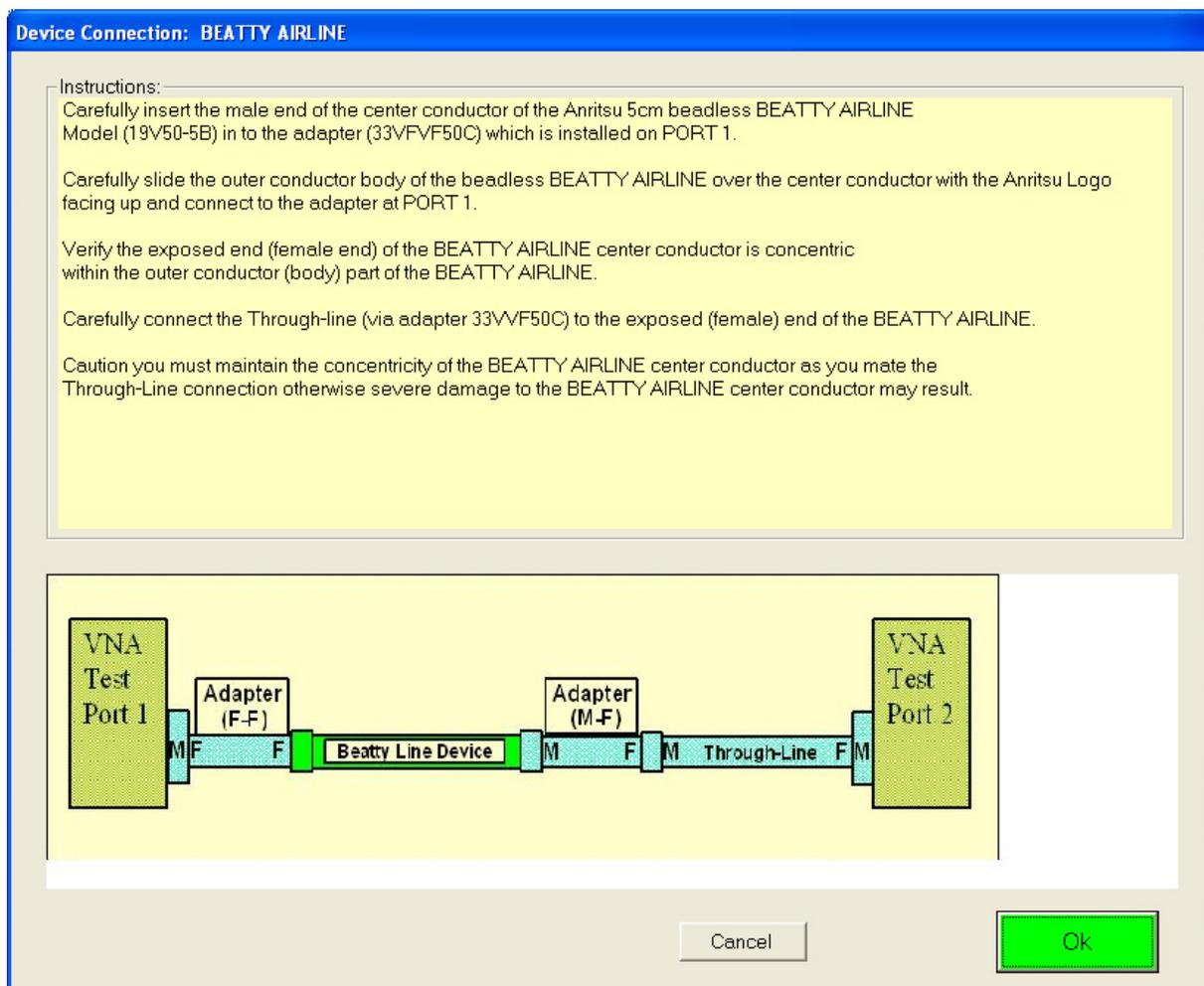
**Figure 7-4.** Perform Verification Calculations - AIRLINE - UNC Test

3. When ready to proceed, click OK. The verification test proceeds and the progress bar shows the test percentage completed.
4. When the test is complete, a row labeled AIRLINE (UNC) #VER is entered in the Results area of the main menu with columns for Serial Number and Pass/Fail Status. After all tests are complete, double-click on the row to see the results in a text editor.
5. The next PVS action depends on which tests were selected:
  - a. **ALL TESTS SELECTED:** If all tests were selected, the Device Connection - BEATTY AIRLINE screen appears as shown in the next section titled “[Beatty Airline \(DAT\) Verification Test](#)” on page 7-6.
  - b. **SOME TESTS SELECTED:** If the BEATTY (DAT) #VER test was not selected, but another test was selected, its starting dialog appears:
    - “[Beatty Airline \(DAT\) Verification Test](#)” on page 7-6
    - “[Beatty Airline \(UNC\) Verification Test](#)” on page 7-8
    - “[20 dB OFFSET \(DAT\) \(Pad\) Test](#)” on page 7-9
    - “[20 dB Offset \(UNC\) \(Pad\) Test](#)” on page 7-11
    - “[40 dB or 50 dB Offset \(DAT\) # Ver Test](#)” on page 7-12
    - “[40 dB or 50 dB Offset \(UNC\) # Ver Test](#)” on page 7-14
  - c. **NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 7-6 Beatty Airline (DAT) Verification Test

In this section, the software performs the Beatty Airline (DAT) test.

1. If all tests were selected, the prior test was the “[Airline \(UNC\) Verification Test](#)” on page 7-5.
2. The Device Connection: BEATTY AIRLINE screen appears as shown below.

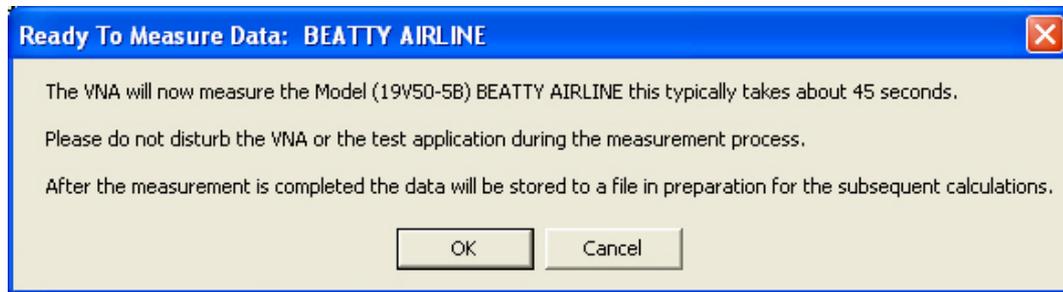


**Figure 7-5.** Device Connection - BEATTY AIRLINE - DAT and UNC Tests

3. Carefully connect the **Beatty Airline M-End** to the **F-F Adapter** installed on **Port 1**.
4. Carefully slide the outer conductor body part of the **Beatty Airline** over the center conductor part and connect the outer conductor to the **F-F Adapter** in **Port 1**.
5. Verify that the exposed F-End of the **Beatty Airline Center Conductor** is centered within the **Outer Conductor Body** of the Beatty Airline.
6. Carefully connect the **M-End** of the attached **M-F Adapter** to the exposed **F-End** of the **Beatty Airline**. The M-F Adapter is attached to the Through Line on Port 1.

**Caution** You must maintain the concentricity of the **Beatty Airline Center Conductor** as you mate the **Through Line** connection. If misaligned, severe damage to the **Beatty Airline Center Conductor** may result.

7. When ready to proceed, click OK. The Ready To Measure Data - BEATTY AIRLINE dialog appears.



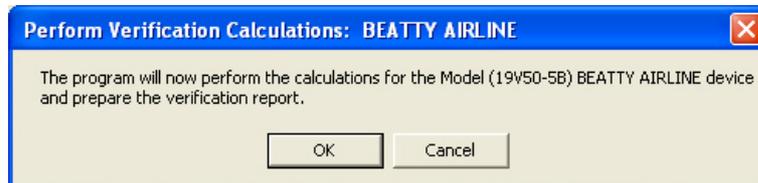
**Figure 7-6.** Ready to Measure Data - BEATTY AIRLINE - DAT Test

8. When ready to proceed, click OK. The verification test proceeds and the progress bar shows the test percentage completed.
9. When the test is complete, a row labeled BEATTY (DAT) #VER is entered in the Results area of the main screen with columns for Serial Number and Pass/Fail Status. After all tests are complete, double-click on the row to see the results in a text editor.
10. The next PVS action depends on which tests were selected:
  - a. **ALL TESTS SELECTED:** If all tests were selected, the Perform Verification Calculations - BEATTY AIRLINE dialog box appears as shown in the next section titled “[Beatty Airline \(UNC\) Verification Test](#)” on page 7-8.
  - b. **SOME TESTS SELECTED:** If the BEATTY (UNC) #VER test was not selected, but another test was selected, its starting dialog appears:
    - “[Beatty Airline \(UNC\) Verification Test](#)” on page 7-8
    - “[20 dB OFFSET \(DAT\) \(Pad\) Test](#)” on page 7-9
    - “[20 dB Offset \(UNC\) \(Pad\) Test](#)” on page 7-11
    - “[40 dB or 50 dB Offset \(DAT\) # Ver Test](#)” on page 7-12
    - “[40 dB or 50 dB Offset \(UNC\) # Ver Test](#)” on page 7-14
  - c. **NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 7-7 Beatty Airline (UNC) Verification Test

In this section, the software performs the Beatty Airline (UNC) Verification test.

1. If all tests were selected, the prior test was the “[Beatty Airline \(DAT\) Verification Test](#)” on page 7-6.
2. The Prepare Verification Report - BEATTY AIRLINE dialog provides general information about the test as shown below.



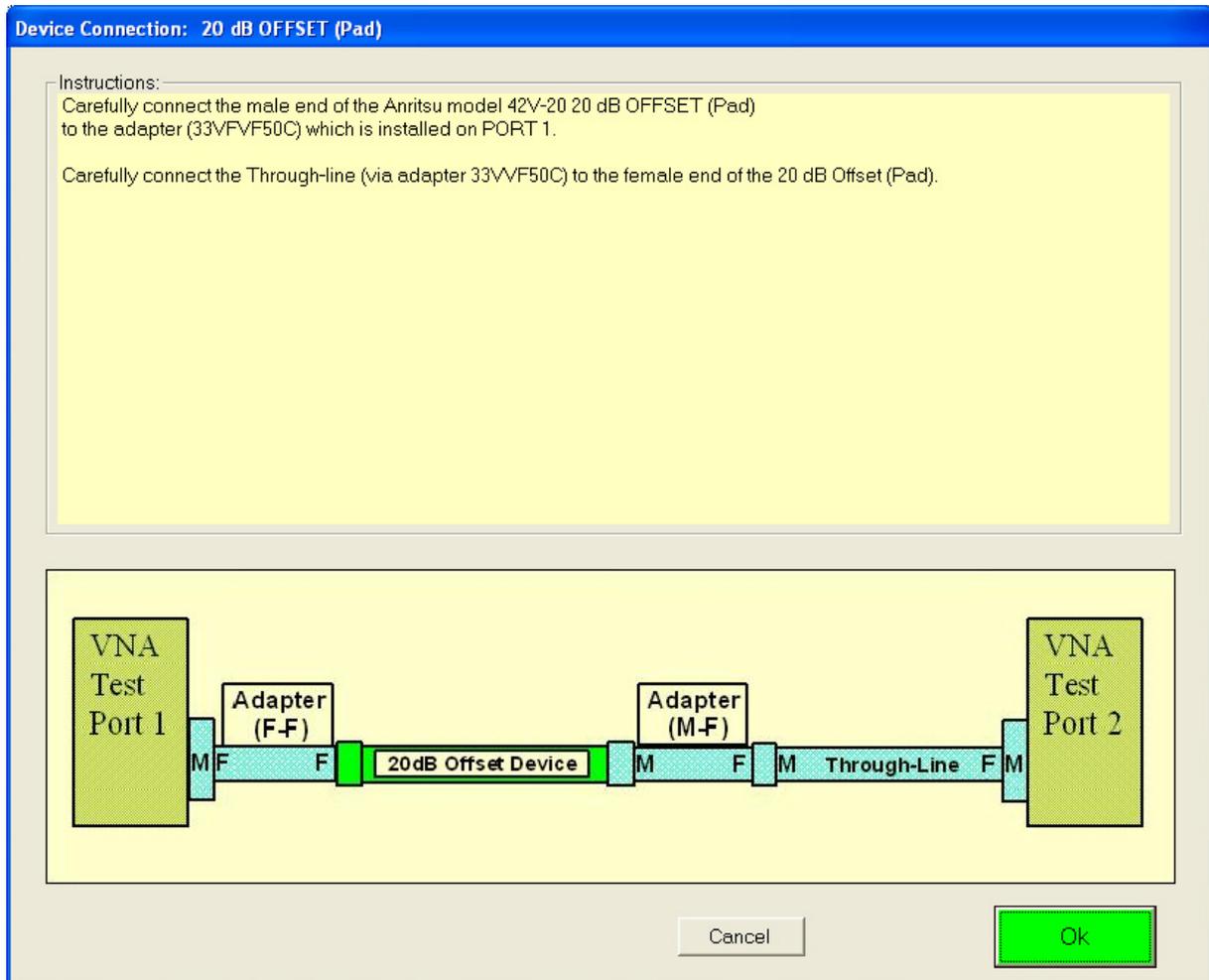
**Figure 7-7.** Perform Verification Calculations: BEATTY AIRLINE - UNC Test

3. When ready to proceed, click OK.
4. The BEATTY (UNC) #VER test starts and the progress bar shows the percentage completed.
5. A row labeled BEATTY (UNC) #VER is entered in the Results area of the main menu with columns for Serial Number and Pass/Fail Status. Double click on the row to see the results in a text editor.
6. When the BEATTY (UNC) #VER test is complete, the next action depends on which tests were selected.
  - a. **ALL TESTS SELECTED:** If all tests were selected, the Device Connection - 20DB OFFSET (Pad) screen appears as shown in the next section titled “[20 dB OFFSET \(DAT\) \(Pad\) Test](#)” on page 7-9.
  - b. **SOME TESTS SELECTED:** If the 20DB OFFSET (DAT) #VER test was not selected, but another test was selected, its starting dialog appears:
    - “[20 dB OFFSET \(DAT\) \(Pad\) Test](#)” on page 7-9
    - “[20 dB Offset \(UNC\) \(Pad\) Test](#)” on page 7-11
    - “[40 dB or 50 dB Offset \(DAT\) # Ver Test](#)” on page 7-12
    - “[40 dB or 50 dB Offset \(UNC\) # Ver Test](#)” on page 7-14
  - c. **NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 7-8 20 dB OFFSET (DAT) (Pad) Test

In this section, the software performs the 20 dB Offset (DAT) (Pad) test.

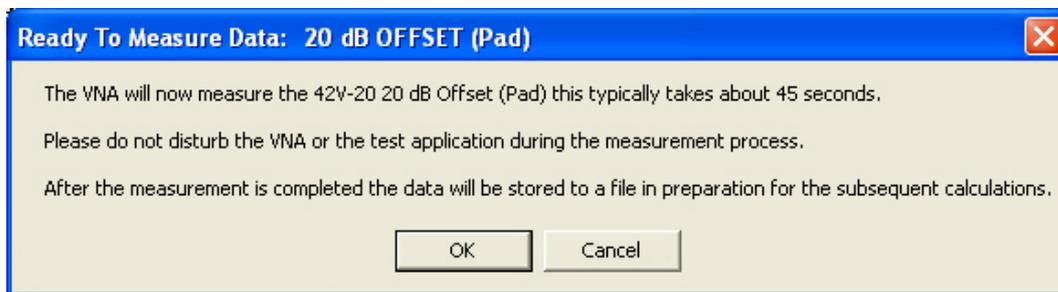
1. If all tests were selected, the prior test was the “Beatty Airline (UNC) Verification Test” on page 7-8.
2. The 20DB OFFSET (UNC) #VER test starts with the Device Connection - 20 dB OFFSET (Pad) screen shown below.



**Figure 7-8.** Device Connection - 20 dB OFFSET (Pad) - DAT and UNC Tests

3. Carefully connect the **M-End** of the **20 dB Offset (Pad)** to the **F-F Adapter** installed in **Port 1**.
4. Carefully connect the **M-End** of the **M-F Adapter** on the Through Line to the F-End of the **20 dB Offset (Pad)**. The Through Line is attached on Port 2.
5. When ready to proceed, click **OK**. To return to the main menu, click **Cancel**.

- The Ready To Measure Data 20 dB Offset (Pad) dialog box appears as shown below.



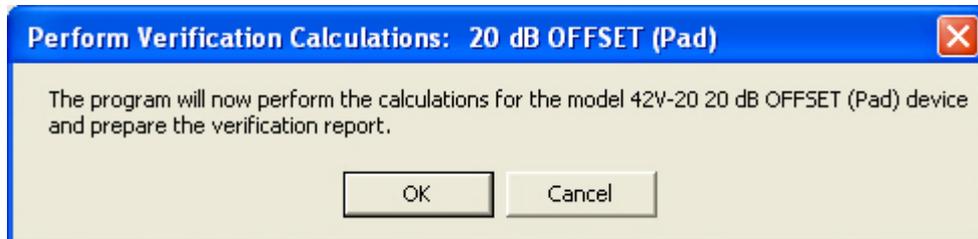
**Figure 7-9.** Ready to Measure Data - 20 dB OFFSET (PAD) - DAT Test

- Note that the contents of the dialog vary depending on the connector set selected.
- When ready to proceed, click OK.
- The 20DB OFFSET (DAT) #VER test runs and the progress bar shows percentage completed.
- A row labeled 20DB OFFSET (DAT) #VER is entered in the Results area of the main menu with columns for Serial Number and Pass/Fail Status. Double click on the row to see the results in a text editor.
- When the 20DB OFFSET (DAT) #VER test is complete, the next action depends on which tests were selected.
  - ALL TESTS SELECTED:** If all tests were selected, the Perform Verification Calculations 20dB OFFSET (Pad) dialog box appears as shown in the next section titled “20 dB Offset (UNC) (Pad) Test” on page 7-11.
  - SOME TESTS SELECTED:** If the 20DB OFFSET (UNC) #VER test was not selected, but another test was selected, its starting dialog appears:
    - “40 dB or 50 dB Offset (DAT) # Ver Test” on page 7-12
    - “40 dB or 50 dB Offset (UNC) # Ver Test” on page 7-14
  - NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 7-9 20 dB Offset (UNC) (Pad) Test

In this section, the software performs the 20 dB Offset (UNC) (Pad) test.

1. If all tests were selected, the prior test was the “20 dB Offset (UNC) (Pad) Test” on page 7-11.
2. The 20DB OFFSET (UNC) #VER test starts with the Perform Verification Calculations 20 dB OFFSET (Pad) dialog box as shown below. Note that the contents of the dialog vary depending on the connector set selected.



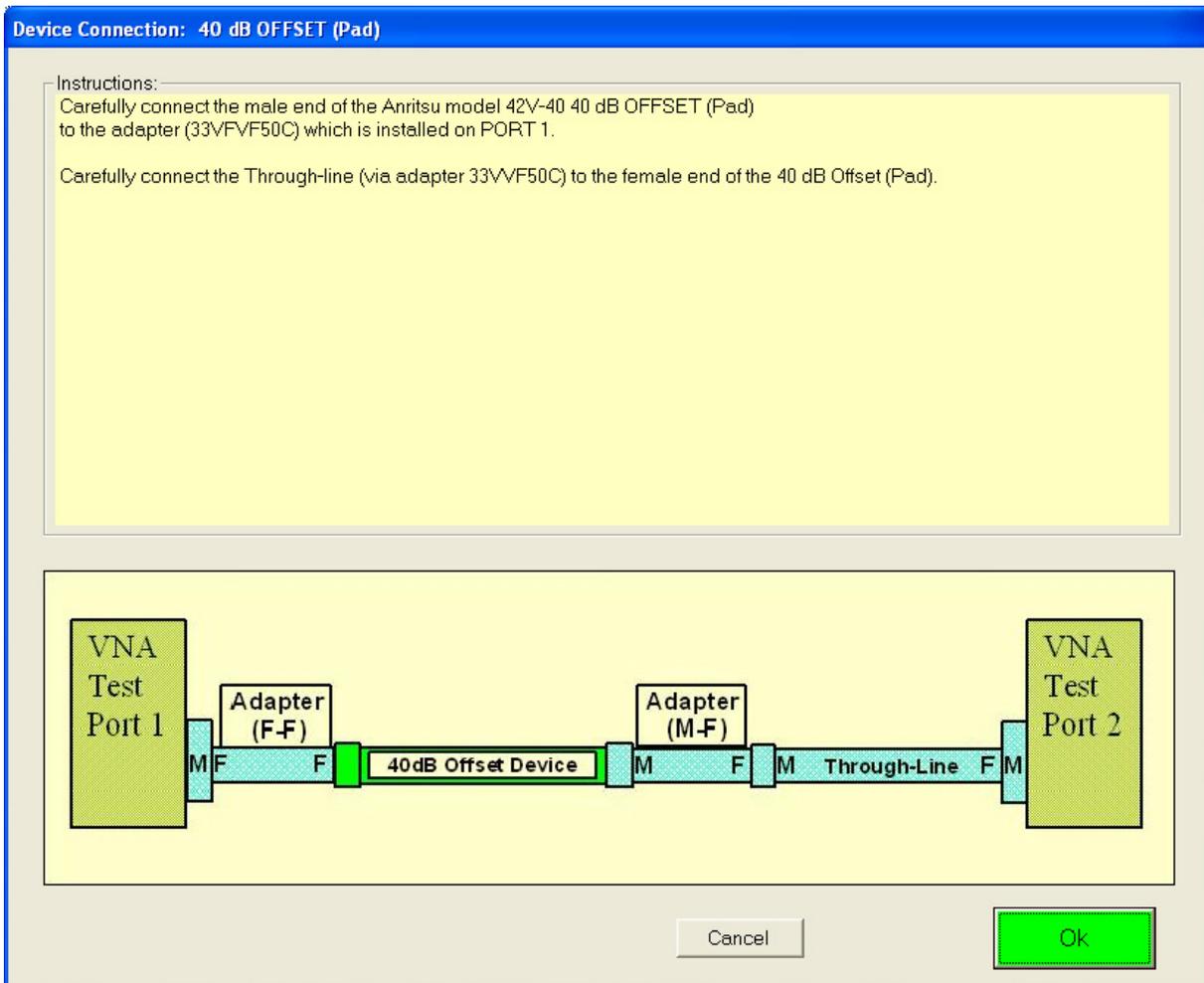
**Figure 7-10.** Perform Verification Calculations - 20 dB OFFSET (Pad) - UNC Test

3. When ready to proceed, click OK.
4. The test runs and the progress bar shows test progress.
5. A row labeled 20DB OFFSET (UNC) #VER is entered in the Results area of the main menu. Double click on the row to see the results in a text editor.
6. When the 20DB OFFSET (DAT) #VER test is complete, the next action depends on which tests were selected.
  - a. **ALL TESTS SELECTED:** If all tests were selected, the Perform Verification Calculations 20dB OFFSET (Pad) dialog box appears as shown in the next section titled “40 dB or 50 dB Offset (DAT) # Ver Test” on page 7-12.
  - b. **SOME TESTS SELECTED:** If the 40 dB or 50 dB Offset (DAT) was not selected, but another test was selected, its starting dialog appears:
    - “40 dB or 50 dB Offset (UNC) # Ver Test” on page 7-14
  - c. **NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 7-10 40 dB or 50 dB Offset (DAT) # Ver Test

This test represents a testing a very lossy device. For V connectors, the 40 dB Test is used. For K, 3.5 mm, or Type N connectors, the 50 dB test is used. The program automatically switches to one of the two tests depending on the initial connector selection.

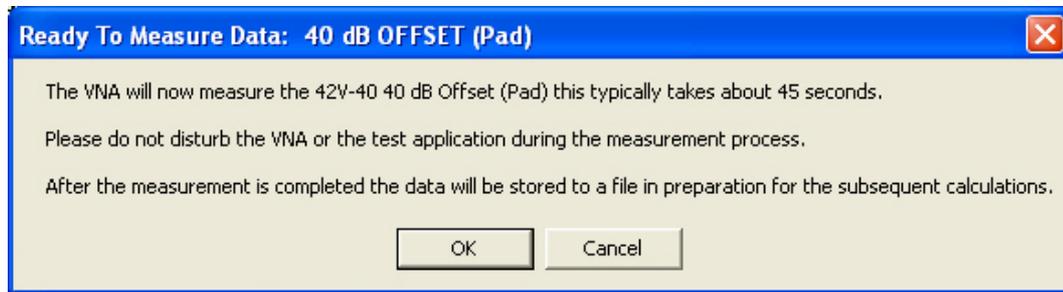
1. If all tests were selected, the prior test was the “20 dB OFFSET (DAT) (Pad) Test” on page 7-9.
2. The 40DB OFFSET (DAT) #VER or 50DB OFFSET (DAT) #VER test starts with the Device Connection 40 dB or 50 dB OFFSET (Pad) screen as shown below. Note that the contents of the dialog vary depending on the connector set selected.



**Figure 7-11.** Device Connections - 40 dB or 50 dB OFFSET (Pad) - DAT and UNC Tests

3. Carefully connect the M-End of the **40/50 dB Attenuation Offset Pad** to the **F-F Adapter** on **Port 1**.
4. Carefully connect the F-End of the **40/50 dB Attenuation Offset Pad** to the **M-F Adapter** on the Through Line on **Port 2**.
5. When ready to proceed, click OK.

- The Ready to Measure: 40 dB OFFSET (Pad) or 50 dB OFFSET (Pad) dialog box appears as shown below.



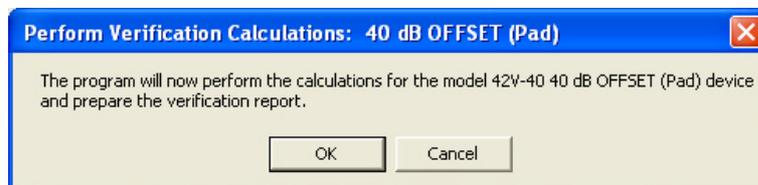
**Figure 7-12.** Ready to Measure Data - 40 dB or 50 dB OFFSET (Pad) - DAT Test

- When ready to proceed, click OK to continue.
- The test runs and the progress bar shows test progress.
- When the test is complete, a row labeled 40 DB OFFSET (DAT) #VER or 50DB OFFSET (DAT) #VER is entered in the Results area of the main men. Double click on the row to see the results in a text editor.
- When the 40/50DB OFFSET (DAT) #VER test is complete, the next action depends on which tests were selected.
  - ALL TESTS SELECTED:** If all tests were selected, the Perform Verification Calculations 40 dB/50 dB OFFSET (UNC) (Pad) dialog box appears as shown in the next section titled “40 dB or 50 dB Offset (UNC) # Ver Test” on page 7-14.
  - NO OTHER TESTS SELECTED:** If no other test was selected, the program returns to the Verification Program Main Screen.

## 7-11 40 dB or 50 dB Offset (UNC) # Ver Test

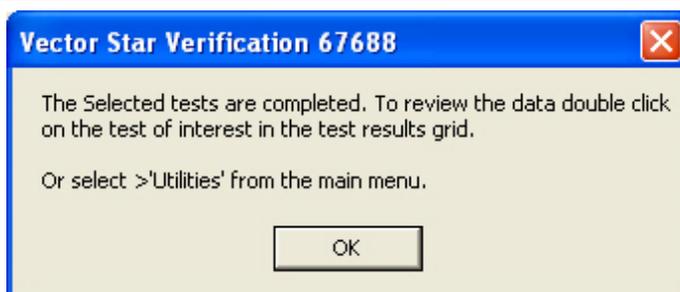
This test represents a testing very lossy device. For V connectors, the 40 dB Test is used. For K, 3.5 mm, or Type N connectors, the 50 dB test is used. The program automatically switches to one of the two tests depending on the initial connector selection.

1. If all tests were selected, the prior test was the “40 dB or 50 dB Offset (DAT) # Ver Test” on page 7-12.
2. The 40DB OFFSET (UNC) #VER or 50DB OFFSET (UNC) #VER test starts with the Perform Verification Calculations: 40/50 dB OFFSET (Pad) dialog box as shown below.



**Figure 7-13.** Perform Verification Calculations: 40 dB or 50 dB OFFSET (Pad) - UNC Test

3. When ready to proceed, click OK. Click Cancel to return to the main menu.
4. While the test runs, the progress bar shows percentage completion results.
5. A row labeled 40DB OFFSET (UNC) #VER or 40DB OFFSET (UNC) #VER is entered in the Results area of the main menu. Double-click on the row to see the results in a text editor.
6. When the test is complete, the completion dialog box appears.



**Figure 7-14.** Verification Complete Dialog Box

7. Click OK to return to the Verification Program Main Screen.
8. View reports as required by:
  - Clicking on the row of interest in the Results area
  - At the Menu Bar select Utilities | Open File for Viewing for unformatted reports.
  - At the Menu Bar, select Utilities | Open File for Print Only for formatted reports.

# Chapter 8 — Reports and Files

## 8-1 Introduction

This chapter provides detailed information about the PVS output reports and data files. The software provides both printable reports and delimited files for import into a spreadsheet or other analysis application. The output location of the reports and files is user configurable allowing a calibration and verification history of each VNA to be built up and stored for reference and certification. This chapter provides information for test results and output reports. Each verification test generated a CSV DAT and TXT UNC reports. The CSV DAT reports are the current measured data for the user's devices. The TXT UNC reports are the calculated uncertainty based on the measured data in the DAT reports and the verification kit certification data.

## 8-2 Prerequisites

In general, to view the completed reports for a calibration and verification process, the following are required:

- The program is running
  - From the PC desktop, select Start | Programs | Anritsu | VectorStar Verification. The startup dialog appears
  - A successful calibration has been completed
  - A successful verification has been completed.

Beginning with PVS Application release version 2.4, the report format has been updated to be compliant with ILAC P14:01/2013 with regard to two significant figures for measurement uncertainty, and least significant digits for measured results.

**Note**

For completeness, this document shows a typical sample of both this updated report format and that of the previous (Historic) format. Most users will be satisfied with the updated format.

- An example Historic format report is shown in [Figure 8-4 on page 8-6](#).
- An example ILAC P14:01/2013 compliant report is shown in [Figure 8-5 on page 8-8](#).

For previous users who may prefer the Historic format, the PVS Application software will support generation of this previous format. To change the report format, refer to [Appendix D](#).

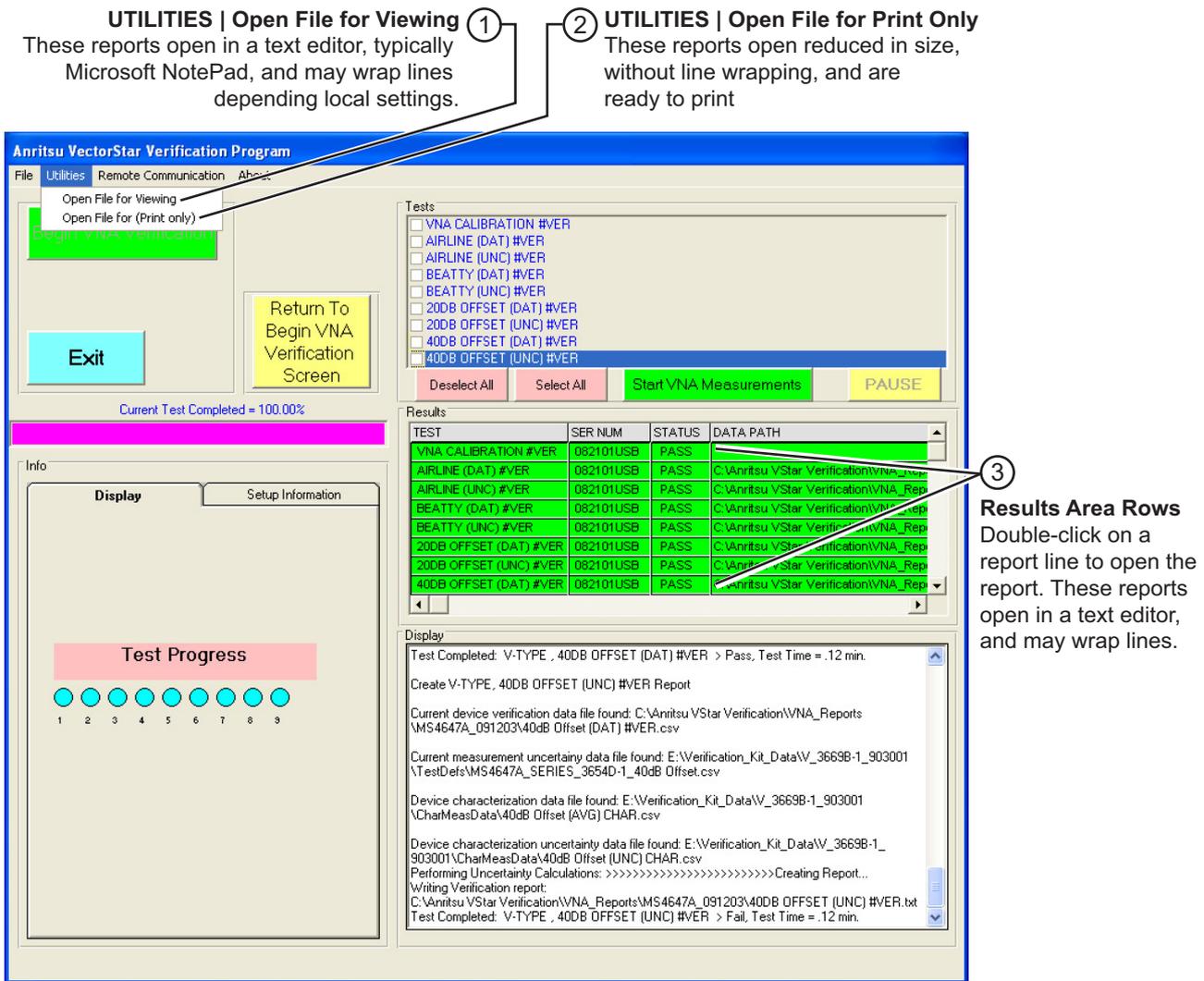
## 8-3 Report Options

### Selecting Reports

As shown in below (Figure 8-1), reports can be selected from the Menu Bar | UTILITIES at the top of the screen or by clicking on the report of interest in the Results Grid.

In the Results Grid, the row color indicates the test conclusion:

- **Green** = Test concluded successfully.
- **Red** = Test failed
- **Magenta** = Test canceled by user or aborted



1. In the top-of-screen Menu Bar, select **UTILITIES | Open file for Viewing**. These reports typically open in Microsoft® Notepad and may have line wraps depending on local settings.

2. **UTILITIES | Open File for Print Only** opens the file in a reduced size without wrapping, ready to print.

3. The same reports as from #1 can be accessed by double-clicking on the test row name in the Results Grid.

**Figure 8-1.** Selection Verification Reports for Viewing or Printing

## Available Test Results and Reports

The following reports are available from the software assuming that all tests were run. Each report is described in greater detail in the sections below with a figure showing a typical output and a listing of the output data fields. The available reports are:

- “[Typical \(DAT\) #VER Report - CSV Format](#)” on page 8-5
- “[Typical \(UNC\) #VER Report - TXT Format \(Historic Format\)](#)” on page 8-6
- “[Typical \(UNC\) #VERX Report - TXT Format \(2 Significant Figures\)](#)” on page 8-8

## Navigating to Reports - Open File For Viewing

All reports can be opened from the program menu bar.

1. From the menu bar, select UTILITIES | Open File for Viewing.
2. Navigate to Anritsu VStar Verification | VNA\_Reports.
3. In the Open dialog box, select the VectorStar model number and serial number of interest. For example, if you are using a VectorStar MS4647A VNA with a serial number of 091203, navigate to MS4647A\_091203.
4. Select the report of interest, and click Open.
5. Depending on your PC settings, most reports open in a text editor such as Notepad.

## Printing Reports

An alternative method of viewing and printing report also uses a menu bar function.

1. From the menu bar, select UTILITIES | Open File for Print Only.
2. As above, navigate to Anritsu VStar Verification | VNA\_Reports.
3. Select the VectorStar model number and serial number of interest.
4. Select the report of interest, and click Open.
5. The report opens in the Data Ready to Print dialog box with Print and Exit buttons in the top frame as shown below in [Figure 8-2 on page 8-4](#).

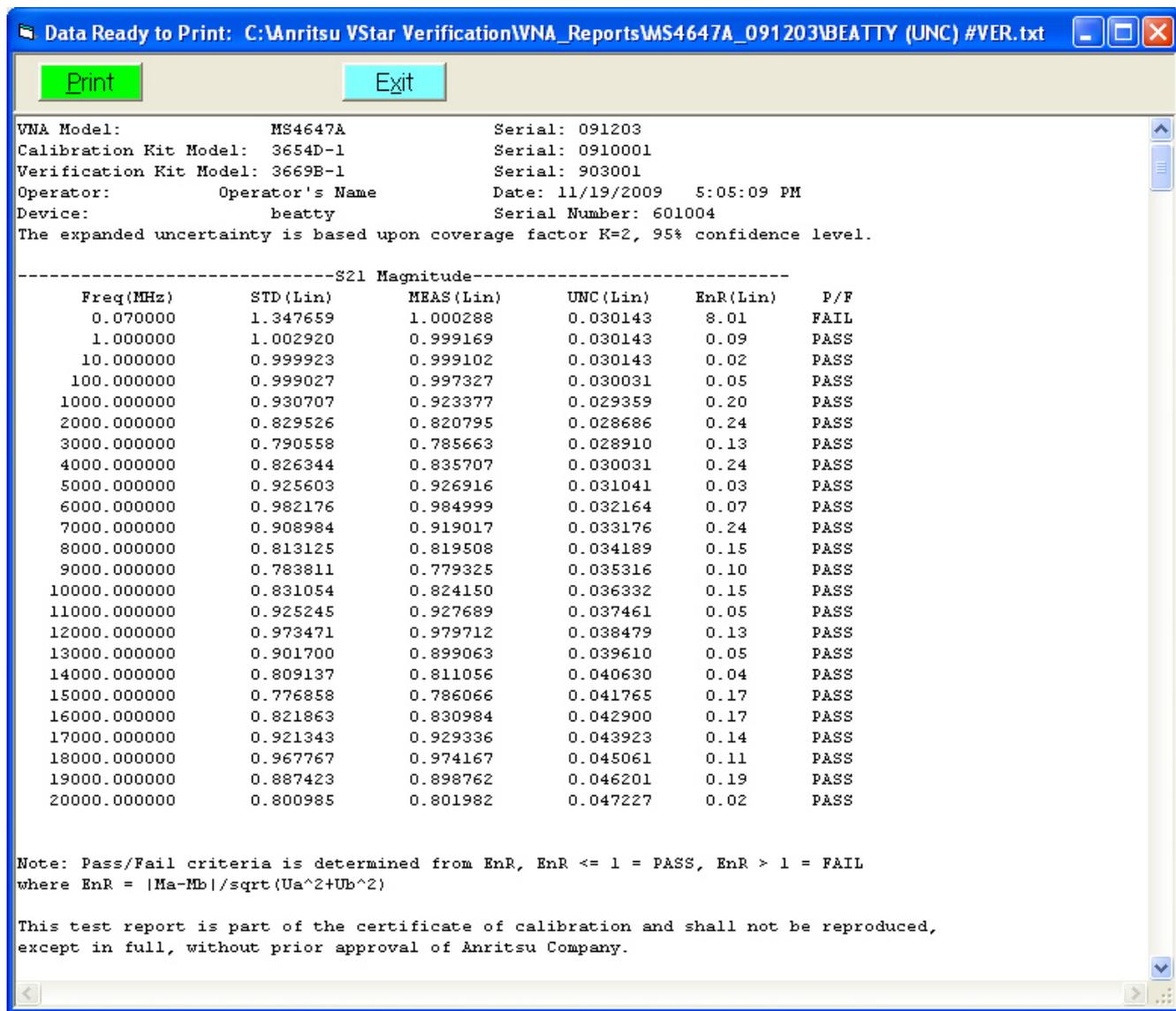


Figure 8-2. Data Ready To Print Dialog Box (Beatty device shown for reference)

6. Click Print to send to the default printer. Click Exit to return to the main menu.

## 8-4 Typical (DAT) #VER Report - CSV Format

This report is available from all VectorStar Verification Kits and will be created for each of the four devices, Airline, Beatty, 20 db Offset (pad), and 40–50 dB Offset (Pad).

Freq(MHz),	S11-Mag(Lin),	S11-Phase(Deg),	S21-Mag(Lin),	S21-Phase(Deg),	S22-Mag(Lin),	S22-Phase(Deg),	S12-Mag(Lin),	S12-Phase(Deg),
0.070000,	0.999846,	0.041771,	0.000245,	137.472700,	0.000407,	146.380300,	1.000922,	0.000000,
1.000000,	0.999206,	-0.065465,	0.000074,	155.506300,	-0.047870,	0.999641,	0.999274,	-0.631357,
10.000000,	0.999059,	-0.631357,	0.000752,	50.593440,	0.000705,	38.543070,	0.999274,	-0.631357,
100.000000,	0.997559,	-6.101594,	0.001957,	19.903610,	-6.104095,	0.998199,	0.995024,	-6.101594,
1000.000000,	0.994693,	-60.279970,	0.005519,	-101.248200,	0.002002,	21.489520,	0.995024,	-60.279970,
2000.000000,	0.993662,	-120.323400,	0.002857,	170.497200,	-120.340800,	0.992573,	0.992573,	-120.323400,
3000.000000,	0.992797,	179.580400,	0.005474,	-57.948860,	0.006184,	-146.242300,	0.992791,	179.580400,
4000.000000,	0.995386,	119.251500,	0.006312,	171.026000,	179.557100,	0.992791,	0.995315,	119.251500,
5000.000000,	0.989619,	59.334790,	0.007206,	62.783670,	0.005416,	-123.888500,	0.995315,	119.251500,
6000.000000,	0.990286,	-0.686779,	0.006973,	-37.860670,	0.003926,	93.959590,	0.985168,	59.334790,
7000.000000,	0.991571,	-61.093480,	0.004902,	-116.513600,	0.006329,	-38.778930,	0.990393,	-0.686779,
8000.000000,	0.987967,	-121.123400,	0.005566,	119.260500,	0.007081,	-148.187100,	0.990393,	-0.686779,
9000.000000,	0.988515,	179.090700,	0.006123,	-36.760040,	-60.715330,	0.990796,	0.990796,	-61.093480,
10000.000000,	0.987038,	119.052000,	0.006865,	-114.563900,	0.005170,	79.609850,	0.988309,	-121.123400,
11000.000000,	0.988584,	58.927500,	0.00698,	151.090100,	0.007402,	-44.767040,	0.988309,	-121.123400,
12000.000000,	0.987527,	-1.121872,	0.005395,	-44.325700,	179.073700,	0.988827,	0.988827,	179.090700,
13000.000000,	0.986267,	-61.207730,	0.005700,	-95.766110,	0.006329,	-146.819800,	0.988827,	179.090700,
14000.000000,	0.985918,	-121.271200,	0.001998,	-113.480100,	119.066500,	0.990217,	0.990217,	119.052000,
15000.000000,	0.985575,	178.665900,	0.005445,	-57.957240,	0.003414,	82.416180,	0.990217,	119.052000,
16000.000000,	0.987572,	118.631600,	0.005853,	-118.536300,	58.972830,	0.989150,	0.989150,	58.927500,
17000.000000,	0.984199,	58.511200,	0.005982,	-165.847500,	0.006252,	-56.434490,	0.987207,	-1.121872,
18000.000000,	0.984486,	-1.475032,	0.004714,	-42.233070,	-1.132048,	0.987207,	0.987207,	-1.121872,
19000.000000,	0.984269,	-61.370740,	0.007645,	-93.163470,	0.005663,	-135.963900,	0.986641,	-61.207730,
20000.000000,	0.984471,	-121.369600,			-61.277510,	0.986641,	0.986641,	-61.207730,
					0.000752,	40.224320,	0.986641,	-61.207730,
					-121.271100,	0.984874,	0.984874,	-121.271200,
					0.005954,	-84.991670,	0.985867,	178.665900,
					178.648700,	0.985867,	0.985867,	178.665900,
					0.005155,	-123.176800,	0.985867,	178.665900,
					118.587100,	0.987915,	0.987915,	118.631600,
					0.008020,	-132.427800,	0.987915,	118.631600,
					58.441390,	0.986557,	0.986557,	58.511200,
					0.010573,	-149.203700,	0.986557,	58.511200,
					-1.539120,	0.984700,	0.984700,	-1.475032,
					0.004650,	-137.097800,	0.984700,	-1.475032,
					-61.584180,	0.983930,	0.983930,	-61.370740,
					0.009246,	-162.027000,	0.983930,	-61.370740,
					-121.660400,	0.986302,	0.986302,	-121.369600,

Figure 8-3. Airline (DAT) CSV Format Report (Shown for reference)

### Report Data Fields

**Note** Report data fields are identical for all devices.

- Frequency (MHz)
- S21 Mag (Lin)
- S21 Phase (Deg)
- S12 Mag (Lin)
- S12 Phase (Deg)
- S11 Mag (Lin)
- S11 Phase (Deg)
- S22 Mag (Lin)
- S22 Phase (Deg)

## 8-5 Typical (UNC) #VER Report - TXT Format (Historic Format)

This report is available for all VectorStar Verification Kits, and will be created for each of the four devices, Airline, Beatty, 20 db Offset (pad), and 40-50 dB Offset (Pad)

Historic format has fixed 6 digits beyond the decimal point for all entries excepting EnR which has 2 digits beyond the decimal point.

```

20DB OFFSET (UNC) #VER.txt - Notepad
File Edit Format View Help
Anritsu Verification Report, Application Program: 67688 Version 2.40
VNA Model: MS4647A Serial: 091854
Calibration Kit Model: 3654D-1 Serial: 0910001
Verification Kit Model: 3669B-1 Serial: 903001
Operator: Silvia Chu Date: 11/17/2009 4:17:12 PM
Device: 20dB Offset Serial Number: 501010
The expanded uncertainty is based upon coverage factor K=2, 95% confidence level.

-----S21 Magnitude-----
Freq(MHz) STD(Lin) MEAS(Lin) UNC(Lin) EnR(Lin) P/F
0.070000 0.096982 0.097075 0.001883 0.03 P
1.000000 0.096608 0.096593 0.001742 0.01 P
10.000000 0.096695 0.096697 0.001742 0.00 P
100.000000 0.096605 0.096642 0.001742 0.02 P
1000.000000 0.096209 0.096219 0.001777 0.00 P
2000.000000 0.096013 0.096069 0.001812 0.02 P
3000.000000 0.095913 0.095942 0.001883 0.01 P
4000.000000 0.095730 0.095734 0.001988 0.00 P
5000.000000 0.095790 0.095733 0.002094 0.02 P
6000.000000 0.095807 0.095767 0.002188 0.01 P
7000.000000 0.095771 0.095707 0.002294 0.02 P
8000.000000 0.095789 0.095713 0.002400 0.02 P
9000.000000 0.095805 0.095781 0.002506 0.01 P
10000.000000 0.095847 0.095801 0.002612 0.01 P
11000.000000 0.095924 0.095879 0.002719 0.01 P
12000.000000 0.096008 0.096015 0.002825 0.00 P
13000.000000 0.096142 0.096124 0.002920 0.00 P
14000.000000 0.096259 0.096251 0.003027 0.00 P
15000.000000 0.096388 0.096383 0.003134 0.00 P
16000.000000 0.096450 0.096470 0.003240 0.00 P
17000.000000 0.096566 0.096497 0.003348 0.01 P
18000.000000 0.096698 0.096632 0.003455 0.01 P
19000.000000 0.096834 0.096799 0.003562 0.01 P
20000.000000 0.096941 0.096900 0.003669 0.01 P
21000.000000 0.097171 0.097107 0.003777 0.01 P
22000.000000 0.097343 0.097241 0.003896 0.02 P
23000.000000 0.097530 0.097459 0.004004 0.01 P
24000.000000 0.097671 0.097562 0.004124 0.02 P
25000.000000 0.097768 0.097721 0.004232 0.01 P
26000.000000 0.097789 0.097764 0.004352 0.00 P
27000.000000 0.097782 0.097743 0.004472 0.01 P
28000.000000 0.097752 0.097668 0.004580 0.01 P
29000.000000 0.097874 0.097814 0.004701 0.01 P
30000.000000 0.098101 0.098087 0.004821 0.00 P
31000.000000 0.098300 0.098217 0.004942 0.01 P
32000.000000 0.098532 0.098497 0.005051 0.00 P
33000.000000 0.098796 0.098794 0.005172 0.00 P

```

Figure 8-4. Typical (UNC) #VER Report - TXT Format (Historic Format) – Shown for Reference

**Report Data Fields**

- Program number
- Program version
- VNA model number
- VNA serial number
- Calibration kit model number
- Calibration kit serial number
- Verification kit model number
- Verification kit serial number
- Operator name
- Date and time of test
- Device type (airline, Beatty, 20dB Offset, 40 or 50dB Offset)
- Device serial number (SN of device)
- Coverage factor K value
- Confidence level percentage
- For each measured S Parameter:
  - Frequency (MHz)
  - STD (Lin)
  - MEAS (Lin)
  - UNC (Lin)
  - EnR (Lin)
  - P/F state (Pass/Fail)

## 8-6 Typical (UNC) #VERX Report - TXT Format (2 Significant Figures)

A typical example of ILAC P14:01/2013-compliant report format is shown in [Figure 8-5](#)

This report is available for all VectorStar Verification Kits.

① Example of S21 Magnitude measurand in ILAC P14:01/2013 compliant report format

```
File Edit Format View Help
Anritsu Verification Report, Application Program: 67688 Version: 2.40
VNA Model: MS464xB Serial: xxxxxx
Calibration Kit Model: 365xA-1 Serial: xxxxxx
Verification Kit Model: 366x-1 Serial: xxxxxx
Operator: Date: 8/4/2016 9:13:35 AM
Verification Device: Airline 19K50-7 Serial: xxxxxx
The expanded uncertainty is based upon coverage factor k=2, 95% confidence level.
```

---

```
-----S21 Magnitude-----
Freq(MHz)   STD(Lin)   MEAS(Lin)   UNC(Lin)   EnR(Lin)   P/F
0.070000   0.999      1.000       0.011      0.06       PASS
1.000000   1.000      1.000       0.011      0.00       PASS
10.000000  0.999      0.999       0.011      0.00       PASS
100.000000 0.998      0.998       0.011      0.00       PASS
1000.000000 0.997      0.995       0.011      0.13       PASS
2000.000000 0.994      0.995       0.010      0.07       PASS
3000.000000 0.994      0.994       0.011      0.00       PASS
```

② The displayed precision of the measured results STD(Lin) and Meas(Lin) is matched to that of the least significant digit; in this case, the 1/1000 position 0.001

③ The uncertainty value UNC(Lin) is formatted at two-significant figures

④ Example of S21 Phase measurand in ILAC P14:01/2013 compliant report format

```
Anritsu Verification Report, Application Program: 67688 Version: 2.40
VNA Model: MS464xB Serial: xxxxxx
Calibration Kit Model: 365xA-1 Serial: xxxxxx
Verification Kit Model: 366x-1 Serial: xxxxxx
Operator: Date: 8/4/2016 9:13:35 AM
Verification Device: Airline 19K50-7 Serial: xxxxxx
The expanded uncertainty is based upon coverage factor k=2, 95% confidence level.
```

---

```
-----S21 Phase-----
Freq(MHz)   STD(Lin)   MEAS(Lin)   UNC(Lin)   EnR(Lin)   P/F
0.070000   0.32       -0.02       0.65       0.37       PASS
1.000000   -0.11      -0.10       0.65       0.01       PASS
10.000000  -0.94      -0.92       0.65       0.02       PASS
100.000000 -9.11      -9.06       0.67       0.05       PASS
1000.000000 -90.48     -90.29      0.84       0.16       PASS
2000.000000 179.2      179.5       1.0        0.21       PASS
3000.000000 89.1       89.3        1.3        0.11       PASS
```

⑤ Again note UNC(Lin) is set to two significant figures and the displayed precision of the STD(Lin) and Meas(Lin) is matched to that of the UNC(Lin)

⑥ Note: The format for resultant EnR(Lin) is fixed at two digits following decimal point regardless of the value of UNC(Lin)

**Figure 8-5.** Typical ILAC P14:01/2013-Compliant Report – (UNC) #VERX Report – TXT Format – 2 Significant Figures (1 of 2)

<ol style="list-style-type: none"> <li>1. Example of S21 Magnitude measurand in ILAC P14:01/2013 compliant report format</li> <li>2. The displayed precision of the measured results STD(Lin) and Meas(Lin) is matched to that of the least significant digit; in this case, the 1/1000 position 0.00<u>1</u></li> <li>3. The uncertainty value UNC(Lin) is formatted at two-significant figures</li> </ol>	<ol style="list-style-type: none"> <li>4. Example of S21 Phase measurand in ILAC P14:01/2013 compliant report format</li> <li>5. Again note UNC(Lin) is set to two significant figures and the displayed precision of the STD(Lin) and Meas(Lin) is matched to that of the UNC(Lin).</li> <li>6. Note: The format for resultant EnR(Lin) is fixed at two digits following decimal point regardless of the value of UNC(Lin)</li> </ol>
---	--

**Figure 8-5.** Typical ILAC P14:01/2013-Compliant Report – (UNC) #VERX Report – TXT Format – 2 Significant Figures (2 of 2)

**Report Data Fields**

- Program number
- Program version
- VNA model number
- VNA serial number
- Calibration kit model number
- Calibration kit serial number
- Verification kit model number
- Verification kit serial number
- Operator name
- Date and time of test
- Device type (airline)
- Device serial number (airline)
- Coverage factor K value
- Confidence level percentage
- For each measured S Parameter:
  - Frequency (MHz)
  - STD (Lin)
  - MEAS (Lin)
  - UNC (Lin)
  - EnR (Lin)
  - P/F state (Pass/Fail)



# Chapter 9 — Troubleshooting

## 9-1 Introduction

This chapter provides information for troubleshooting program and verification problems.

## 9-2 Difficulty Running the Program

If you have difficulty getting the program to run properly, check the following:

1. Check your GPIB interconnection cables and addresses.
2. Check to see that the Windows GPIB is present on the boot drive, that it is properly configured, and that it passes the National Instruments hardware and software tests.
3. This version of the verification software must be installed with the install program on the USB Memory Device. The program will not run if it is just copied from the USB Memory Device to the hard disk.
4. Ensure that, after starting-up the performance verification software, the verification kit USB memory device is connected and recognized as a removable drive by the Windows operating system. See [Appendix C](#) for a listing of the USB and installed files.
5. If, after checking the above, you are still having difficulty, contact your Anritsu customer service center and ask for the Vector Network Analyzer support engineer for further assistance.

## 9-3 Difficulty Meeting System Specifications

If the verification software appears to run properly but the results are not within the measurement limits associated with the verification kit:

1. Check both the verification kit and calibration kit devices for signs of physical damage. Make sure that the connectors are clean.
2. Ensure that the serial number of the verification kit data USB memory device matches that shown on the verification kit.
3. Assure the active systems have been operating for at least one hour before calibrations
4. Repeat the process with a fresh calibration. Save the results of both measurements as an aid in troubleshooting, in case you require factory assistance.
5. When installing calibration devices, and when measuring verification devices, pay particular attention to proper connector alignment and torque. Torque the connector using the torque wrench supplied with the calibration kit.
6. If you still have difficulty after following the above steps, please contact Anritsu Customer Service at: [www.anritsu.com](http://www.anritsu.com).



# Appendix A — VNA Verification Record Form

## A-1 Introduction

Use this form to record model and serial numbers for the calibration and verification process.

## A-2 Summary Information

Parameter	Record Data
Operator	
Name	
Department	
Project	
Date	
VNA Model Number	
VNA Serial Number	
Installed Options	
Software Revision	
Other Information	

**A-3 Hardware Information**

Parameter	Record Data
<b>VNA Information</b>	
VNA Model Number	
VNA Test Port Connector Type	
VNA Serial Number	
VNA Installed Option Numbers	
VNA Application Version Number	
<b>Calibration Kit Information</b>	
Manual Calibration or Automatic Calibration	
Calibration Kit Model Number	
Calibration Kit Serial Number	
Calibration Kit Last Characterization Date	
<b>Verification Kit Information</b>	
Verification Kit Type	
Verification Kit Model Number	
Verification Kit Serial Number	
<b>System Performance Verification Software</b>	
Software Model Number (e.g. 2300-579-R)	
Software Part Number (e.g. 67688)	
Software Version Number	
<b>Adapter Types Used - Start and End Gender</b>	
Adapters Type - Gender	
Adapters	
Adapters	
Adapters	
<b>Through Lines Used - Start and End Gender</b>	
Through Lines	
Through Lines	
Through Lines	

# Appendix B — GPIB Settings

## B-1 Introduction

The following sections are the recommended GPIB Card and GPIB Instrument Settings. Additional GPIB instrument references are also provided.

## B-2 GPIB Board and PC Settings

Use these settings for your GPIB controller board.

**Table B-1.** GPIB Board Settings

Parameter	Setting
Primary Address	0
Secondary Address	NONE or 0
Time-out Setting	800 seconds
Terminate Read on EOS	NO or unchecked
Set EOI with EOS on Writes	YES or checked
Type of compare on EOS	8-bit
EOS Byte	0Ah or decimal 10
Send EOI at End of Write	YES or checked
System Controller	YES or checked
Assert REN When SC	YES or checked
Enable Auto Serial Polling	NO or unchecked
Enable CIC Protocol	NO or unchecked
Bus Timing	2 _seconds
Parallel Poll Duration	Default

**The following settings may vary depending on the selected GPIB Card type and Operating System.**

Use this GPIB Interface	YES or checked
Board Type	Your board type such as PCI or PCMCIA
Base I/O Address	Consult the GPIB card manual
DMA Channel	Consult the GPIB card manual
Interrupt Level	Consult the GPIB card manual

## B-3 MS4640A/B VNA Instrument Settings

**Table B-2.** Instrument Setting

Parameter	Setting
Primary GPIB Address	6
Secondary GPIB Address	NONE
Time-out Setting	10 seconds
Serial Poll Time-out	1 second
Terminate Read on EOS	NO or unchecked
Set EOI with EOS on Writes	YES or checked
Type of compare on EOS	8-bit
EOS Byte	0Ah or decimal 10
Send EOI at End of Write	YES or checked
Enable Repeat Addressing	NO or unchecked

## B-4 Instrument Default GPIB Addresses

The factory as-shipped default GPIB addresses for the VectorStar MS4640A/B VNA are in the table below.

**Table B-3.** VNA Default GPIB Addresses

Parameter	Setting	Address Options
External Source #1	4	Range for all devices is from 1 to 32 Address must be unique Address cannot be duplicated
External Source #2	5	
External Source #3	2	
External Source #4	3	
Power Meter	13	
Frequency Counter	7	
MS4640A/B Series VNA	6	Range from 0 to 32 Address must be unique Address cannot be duplicated

# Appendix C — USB and Installed Files

## C-1 Introduction

This appendix describes the files located on the Verification Kit USB Memory Device and the files that are installed on the PC Controller.

## C-2 Verification Kit USB Memory Device PVS File Contents

The USB Memory Device that comes with each verification kit contains:

- Device Characterization Measurement Data
- Calibration reports from the factory calibration of the Verification Kit components
- Test Definition Files that are used to control the VNA during its calibration and verification tests. The definition files specify frequency settings, power levels, IF bandwidth, and similar parameters for each test. The PVS application running on the PC Controller uses the parameters to control the VNA.

Directories are in `plain text`. Files are in **bold face text**. The USB device file contents are:

```
Removable Disk E:\  
  Verification_Kit_Data  
    v_3669B-1_903001
```

The name of this directory is <Connector Type>\_<Verification Kit Model Number>\_<Serial Number> and will change for each Verification Kit.

**EnableKit.Dat**

**VerKitInfo.ini**

TestDefs

**MS4645B\_Series\_V\_Verification.ini**  
**MS4647B\_Series\_V\_Verification.ini**  
MS4645B\_Series\_3654D\_20dB\_Offset.csv  
MS4645B\_Series\_3654D\_40dB\_Offset.csv  
MS4645B\_Series\_3654D\_Airline.csv  
MS4645B\_Series\_3654D\_Beatty.csv  
**MS4645B\_Series\_3654D-1\_20dB\_Offset.csv**  
**MS4645B\_Series\_3654D-1\_40dB\_Offset.csv**  
**MS4645B\_Series\_3654D-1\_Airline.csv**  
**MS4645B\_Series\_3654D-1\_Beatty.csv**  
**MS4645B\_Series\_36585V\_20dB\_Offset.csv**  
**MS4645B\_Series\_36585V\_40dB\_Offset.csv**  
**MS4645B\_Series\_36585V\_Airline.csv**  
**MS4645B\_Series\_36585V\_Beatty.csv**  
MS4647B\_Series\_3654D\_20dB\_Offset.csv  
MS4647B\_Series\_3654D\_40dB\_Offset.csv  
MS4647B\_Series\_3654D\_Airline.csv  
MS4647B\_Series\_3654D\_Beatty.csv  
**MS4647B\_Series\_36585V\_20dB\_Offset.csv**  
**MS4647B\_Series\_36585V\_40dB\_Offset.csv**  
**MS4647B\_Series\_36585V\_Airline.csv**  
**MS4647B\_Series\_36585V\_Beatty.csv**

Reports

**20dB\_Offset\_UncReport.txt**  
**40dB\_Offset\_UncReport.txt**

For the 3668-1 K, 3666-1 Type N, and 3666-1 3.5 mm Verification Kits, the 40 dB file is replaced with the 50dB Offset UncReport.txt file.

**Airline\_UncReport.txt**  
**Beatty\_UncReport.txt**

CharMeasData

These files are the factory calibration reports for each verification kit component.

**20DB\_OFFSET (AVG) CHAR.csv**  
**20DB\_OFFSET (UNC) CHAR.csv**

For the 3668-1 K, 3666-1 Type N, and 3666-1 3.5 mm Verification Kits, the 40 dB files below are replaced with 50DB OFFSET (AVG) CHAR.csv and 50DB OFFSET (UNC) CHAR.csv files.

**40DB OFFSET (AVG) CHAR.csv**

**40DB OFFSET (UNC) CHAR.csv**

**AIRLINE (AVG) CHAR.csv**

**AIRLINE (UNC) CHAR.csv**

**BEATTY (AVG) CHAR.csv**

**BEATTY (UNC) CHAR.csv**

## C-3 PVS Directory on C:\ Drive

When the installation is complete, the following directories and files are installed on the PC Controller. Directories are in plain text. Files are in bold face text:

Local Disk C:\

Anritsu VStar Verification

**InterfaceSettings.ini**

**Verify\_Main.ini**

Application

**67688\_FilePathVectors.ini**

**Vecstar.ico**

**VStar Verification.exe**

Figures

**2PortACalConn\_A.jpg**

**2PortBasic\_A.jpg**

**GPIB\_ConnConfig.JPG**

**MS4640A\_700x435.bmp**

**OSLCalStep1.JPG**

**OSLCalStep10.JPG**

**OSLCalStep2.JPG**

**OSLCalStep3.JPG**

**OSLCalStep4.JPG**

**OSLCalStep5.JPG**

**OSLCalStep6.JPG**

**OSLCalStep7.JPG**

**OSLCalStep8.JPG**

**OSLCalStep9.JPG**

**VerDev20Offset.JPG**

**VerDev40Offset.JPG**

**VerDev50Offset.JPG**

**VerDevAirline.JPG**

**VerDevBeatty.JPG**

VNA\_Reports

This directory stores verification reports in these subdirectories during the initial steps of the calibration/verification setup process unless the user configuration saves them to another location. The top level default directory is <VNA Model>\_<VNA Serial Number>. If multiple VNAs are verified with the Verification Kit, multiple directories will be present. A sample report directory is shown below.

MS4647A\_091203

20DB OFFSET (DAT) #VER.csv

20DB OFFSET (UNC) #VER.txt

40DB OFFSET (DAT) #VER.csv

40DB OFFSET (UNC) #VER.txt

AIRLINE (DAT) #VER.csv

AIRLINE (UNC) #VER.txt

BEATTY (DAT) #VER.csv

BEATTY (UNC) #VER.txt



# Appendix D — Changing Report Format

## D-1 Introduction

This appendix provides instructions on how to change report format.

**Note** These instructions are applicable to version 2.40 or greater. Previous versions have only the *Historic* format type which cannot be altered.

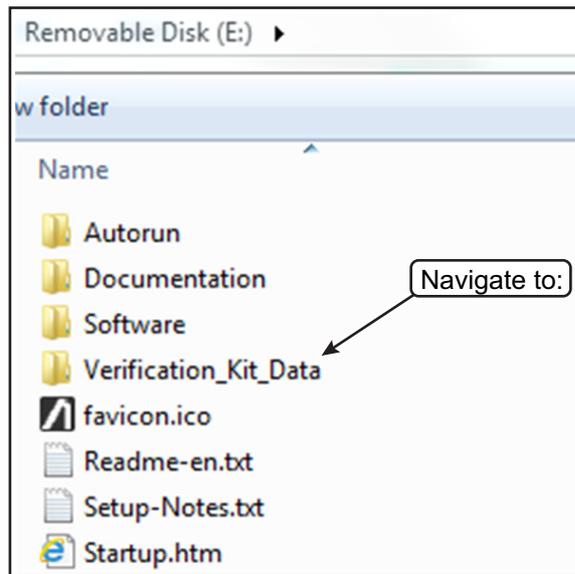
When shipped from the factory the report format for versions 2.40 or greater is set by default to ILAC 2-significant figures.

## D-2 Change Report Format to Historic

**Note** If the PVS Verification application is running, exit the application prior to performing the steps listed below.

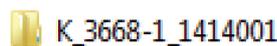
To change the report format to Historic:

1. Install the USB Memory Device provided with you verification kit to the windows PC
2. Navigate to the folder titled: Verification Kit Data.



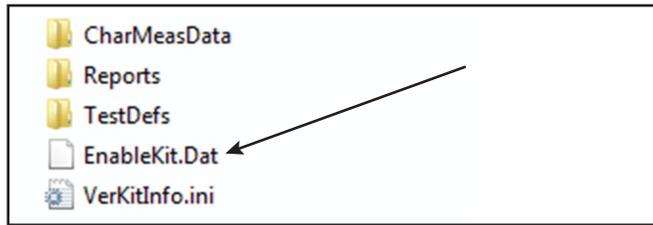
3. Open the Verification Kit Data folder.

Within this folder will be a folder named specifically to the Model and Serial Number of your Verification Kit. In This example we are showing a K-Type 3668-1 Kit with Serial Number 1414001.

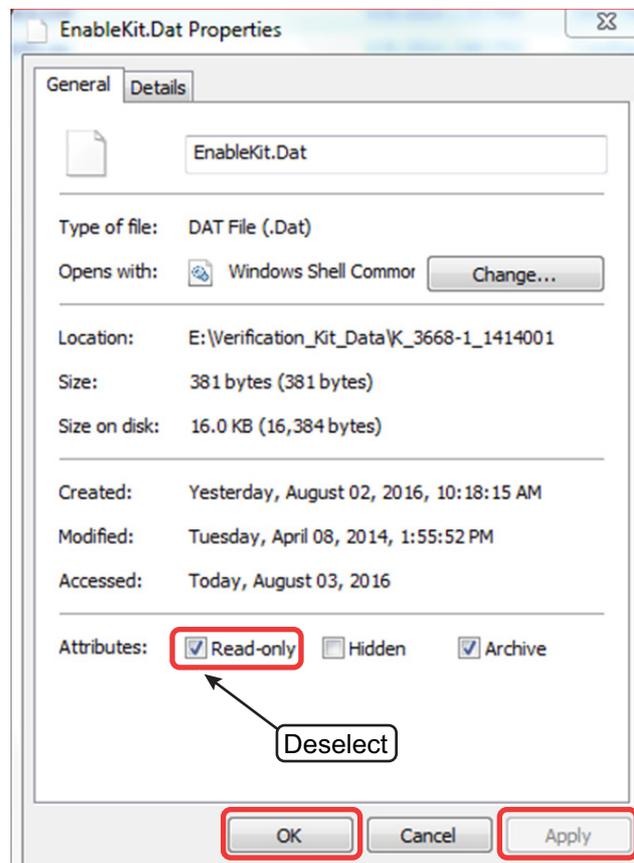


4. Open this folder which is named for your Verification Kit.

Within this folder is a file named “EnableKit.Dat. You will create an entry in this file to instruct the PVS Application to generate the report in Historic format.



5. Prior to opening EnableKit.Dat you will need to unset write protection.
  - a. Right click on EnableKit.Dat with the mouse to bring up the Properties dialog
  - b. Deselect the Read-Only box
  - c. Click “Apply”
  - d. Click “OK”.







# Appendix E — Maintenance

## E-1 Introduction

This appendix provides instructions for the maintenance and proper connection and torquing of the RF connectors on your Anritsu instrument, and components you connect to the instrument, including the calibration kit components described in this manual. Following the recommendations in this document prevents shortened connector life and less equipment downtime due to connector-related failures. The topics covered in this chapter are:

- Inspection and cleaning
- Connection techniques
- Torque specifications and tools

<b>Note</b>	The components in these kits are of the highest quality and accuracy. All components are NIST (National Institute of Standards Technology) traceable. Mechanical shock can damage them. Handle with care.
-------------	---

## Common Causes of Connector Failure

Following are common causes of connector-related instrument failures and effects on measurement accuracy and repeatability.

- Connectors contaminated with material such as metal debris and dust particles will increase the risk of damaging connector. A dusty connector affects the measurement accuracy due to lack of repeatability.
- Worn or damaged threads can damage mating connectors.
- Over torquing connectors will introduce excessive stress to connector interface. Under torquing will increase repeatability uncertainty.
- Improper pin depth of the center conductor can permanently damage the mating connector.
- ESD – A connector is a perfect conductor for electrostatic discharge (ESD). Excessive charge accumulation will damage expensive and sensitive electronic devices residing in the instrument.

## Coaxial Connector Care

Most coax connectors are assembled into a system and forgotten, but some, especially on test equipment interfaces are used almost continuously. The care and cleaning of these connectors is critical to maintain accurate and reliable performance. Good connector performance can be achieved with the following:

- Periodic visual inspection
- Routine cleaning
- Proper connection and disconnection techniques using a torque wrench
- Connector pin depth gauging – Instructions for measuring pin depth are located in the reference manual: 10410-00278, 365xx-x, Mechanical Calibration Kits Reference Manual. This document can be found on the Anritsu web site, <http://www.anritsu.com>.

## E-2 Visual Inspection

Connectors contaminated with material such as metal debris and dust particles will increase the risk of damaging the connector. A dusty connector affects the measurement accuracy due to lack of repeatability. Careful visual inspection with a magnification aid and lighting should be performed at least once per day before connecting. A “good” connector may get damaged if it is mated with a “bad” one.

Any connector with the following defects should be repaired or discarded:

- Plating concerns that include bubbles, blisters, and deep scratches showing bare metal on the mating plane.
- Center conductors with bent, broken or damaged contacts.

### Magnification

Use a device with a magnification range of 2X to 10X depending on the connector type.

Connector Type	Minimum Magnification for Inspection
Type N 3.5 mm	2X
K (2.92 mm) V (1.85 mm)	7X

**Figure E-1.** Magnification for Connector Inspection

### Outer Conductor and Thread Inspection

When connector threads are clean and free from defects, coupling nuts should move freely. Inspect for defects such as:

- Dirt, dust, metal particles and oil
- Damaged threads (distorted, dented, or crushed)
- Dents or raised edges on the mating plane

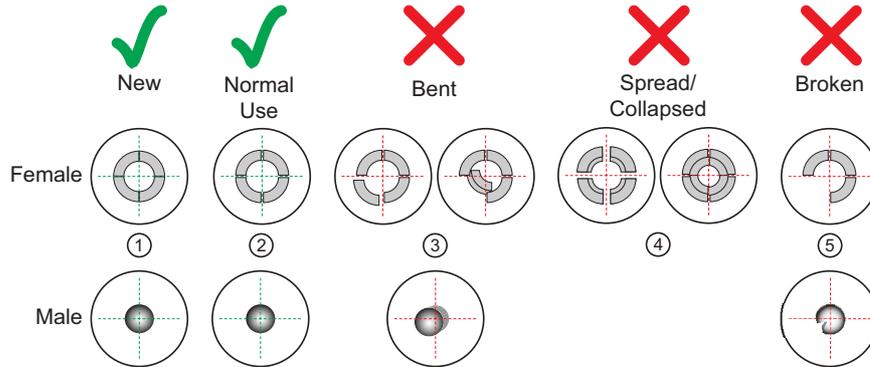
#### Note

Connectors may lose some gloss over time due to normal usage. Light scratches, marks, and other cosmetic imperfections found on the mating plane surfaces are signs of normal wear and should not be considered cause for replacement.

Regular cleaning and proper connection techniques will minimize wear on the plating due to abrasion from debris.

### Center Conductor Inspection

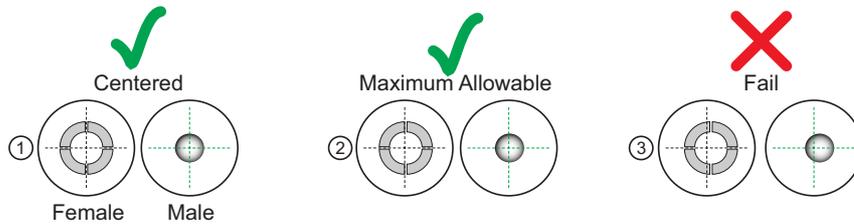
Inspect for bent, broken, or damaged center conductors:



Index	Description
1	New condition
2	Normal use – Slight gap
3	Bent pin section - Discard connector
4	Fingers spread or collapsed - Discard connector
5	Broken pin or pin section - Discard connector

Figure E-2. Example Connector Damage States

Inspect for center pin concentricity:



Index	Description
1	Centered
2	Maximum allowable off-center
3	Fail - off center - Discard connector

Figure E-3. Example Connector Concentricity

## E-3 Connector Cleaning

With repeated connections and disconnections, the threads and outer conductor mating interface builds up a layer of dirt and metal chips which can severely degrade connector electrical and mechanical performance. This debris can also increase the coupling torque required for a good connection which can then damage the mating interfaces. Cleaning of connectors is essential for maintaining good electrical performance. Therefore, connectors should be checked for cleanliness before making any measurements (or calibration).

**Caution** Use the correct sized cotton swabs that are made specifically for cleaning small areas. Oversized cotton swabs can put lateral pressure on the center pin and damage it. Inspect after cleaning to be sure that no cotton strands get caught in the connector.

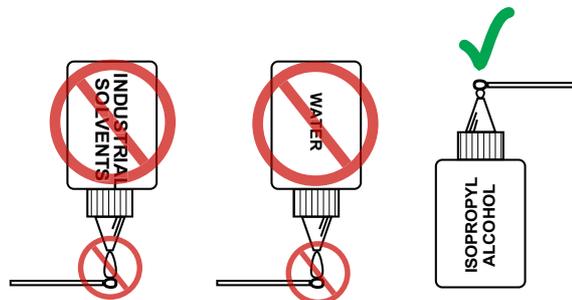
### Required Cleaning Items

- Low-pressure dry, compressed air (oil free, solvent free), maximum pressure: 40 PSI
- Lint-free cotton swabs
- Isopropyl alcohol (IPA), 90 %
- Microscope Cleaning Procedure

**Teflon Tuning Washers:** The center conductor on some 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. Be careful not to disturb it with a cotton swab or compressed air and don't apply alcohol to it.

**Caution Compressed Air:** Do not use compressed air on power sensors. Some power sensors have components internally located near the connector that can be damaged from excessive air pressure.

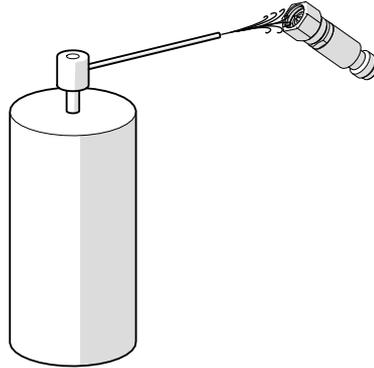
**Solvents:** Do not use industrial solvents or water to clean the connector. Use 90 % Isopropyl Alcohol (IPA) only. Do not spray alcohol directly onto connector surfaces. Do not saturate the swab with alcohol. Instead, lightly dampen it by touching the tip onto a bead of alcohol formed at the bottle tip as shown in [Figure E-4](#).



**Figure E-4.** Isopropyl Alcohol Only

## Procedure

1. Remove loose particles on the mating surfaces, threads, and similar surfaces using low-pressure clean (oil free, solvent free) compressed air (40 PSI max) applied at a shallow angle so foreign particles are not forced down into the connector.



**Figure E-5.** Low Pressure Compressed Air Cleaning

2. Clean the threads of the connector with a lint-free cotton swab dampened with IPA.

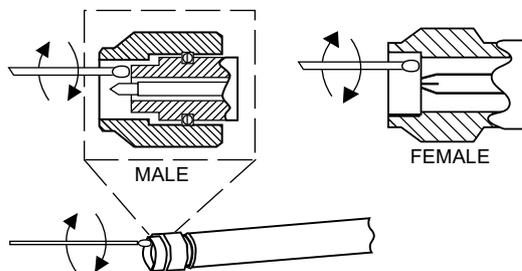
**Caution** Do not insert cotton swabs at an angle or use a swab that is too large (Figure E-6). Doing so can damage the center pin.



**Figure E-6.** Avoid Angled or Large Swab

3. Clean the mating surfaces and connector threads by gently moving the cotton swab around the center pin. Avoid applying pressure to the center pin.

When the connector is clean, you should be able to hand tighten the connector to within approximately one half turn of the specified torque.



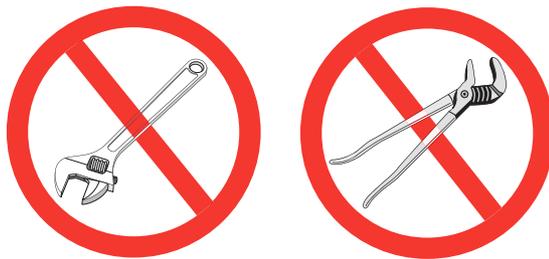
**Figure E-7.** Cleaning Connector with Cotton Swabs

4. After cleaning with swabs, again use low-pressure compressed air to remove any remaining small particles and dry the connector surfaces.
5. Using magnification and adequate lighting, inspect the connectors for damage or debris.

## E-4 Making a Connection

This section provides connection and torquing instructions for making a repeatable connection and avoiding damage to the connector.

<b>Caution</b>	Connectors should never be forced together when making a connection since forcing often indicates incorrectness and incompatibility.
	Use a torque wrench with the correct setting to tighten the connector. Over torquing connectors may damage the connector center pin.
	Never use pliers or adjustable wrenches to tighten connectors.



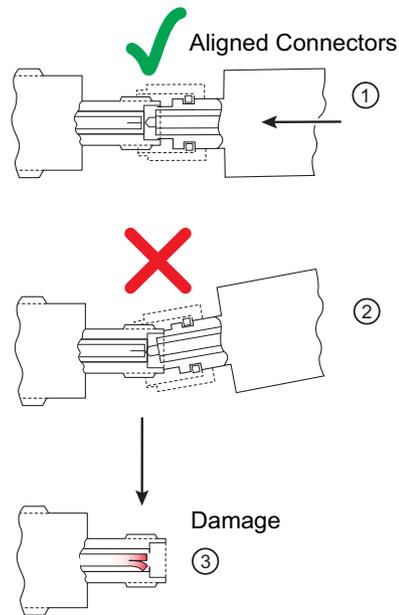
**Figure E-8.** Do Not Use Pliers or Adjustable Wrenches

### Before Connection

1. Verify the power and voltage levels of the device you are connecting to and the input limits of your test equipment.
2. Visually inspect the connectors for damage, cleanliness, and center pin concentricity as described in [Section E-2](#)  
The coupling nut should move freely. If necessary, clean the connectors
3. Before touching instrument connectors, make sure you have grounded yourself and eliminated all static charge by following proper ESD handling procedures that conform to ANSI/ESD S20.20-2007.

### Initial Connection

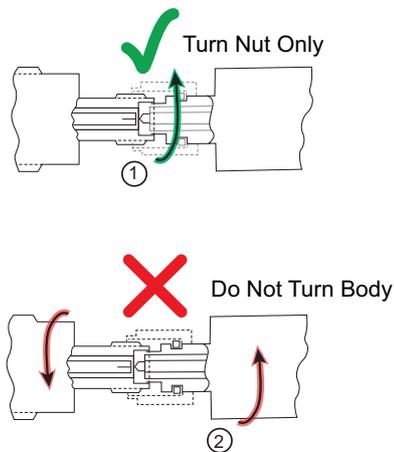
1. Carefully align the connectors as shown in [Figure E-9 on page E-7](#).  
The male connector center pin must slip concentrically into the contact fingers of the female connector. Never apply excessive force when making a connection.
2. Push the connectors straight together.
3. Do not twist while pushing them together and do not turn the connector body. As the center conductors mate, there is usually a slight resistance. Finger-tighten the connection first by turning the connector nut.
4. Back off the connection by turning the connector nut counter clockwise 1/4 turn. The final tightening is done using the appropriate torque wrench from the kit and as described in [Table E-1](#)



Index	Description
1	Aligned connectors
2	Misalignment can cause pin damage
3	Damaged pin

**Figure E-9.** Avoid Pin Damage Due to Misalignment

**Caution** Do not turn the connector body. Major damage to the center conductor and the outer conductor can occur if the connector body is twisted.



Index	Description
1	Turn nut only
2	Do not turn body

**Figure E-10.** Tightening the Connector Nut

## Torquing the Connection

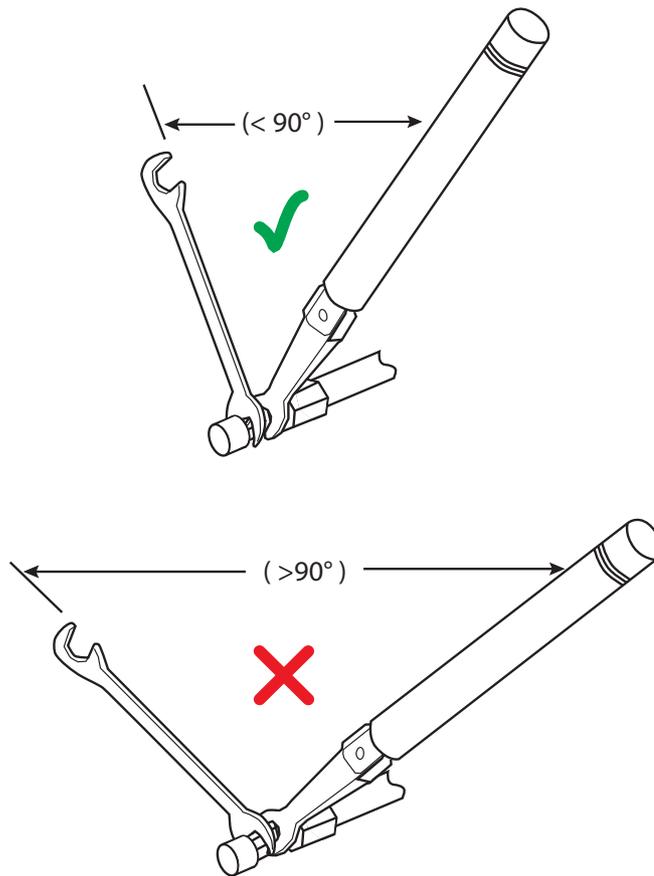
Connectors must be correctly torqued to their required settings to make sure the connector is tight enough to ensure an accurate RF measurement but not so tight as to damage the connector or the instrument. Use the correct torque wrench for the connector type. Applying proper torque will improve connection repeatability and reproducibility. Over torquing connectors is destructive as it may damage the connector center pin. Never use pliers to tighten connectors.

1. Select a torque wrench of proper size and rating for the connector and an open end wrench. The open end wrench is used to prevent the body of the connector from turning. Refer to [Table E-1](#) for torque specifications.
2. Place the two wrenches at an angle of less than 90° as shown in [Figure E-11](#).

### Caution

Using two wrenches with an angle greater than 90° causes the devices to lift up, which tends to misalign and stress the connectors. This becomes more of a problem when multiple devices are connected together.

Breaking the handle fully can cause the wrench to kick back which may loosen the connection.

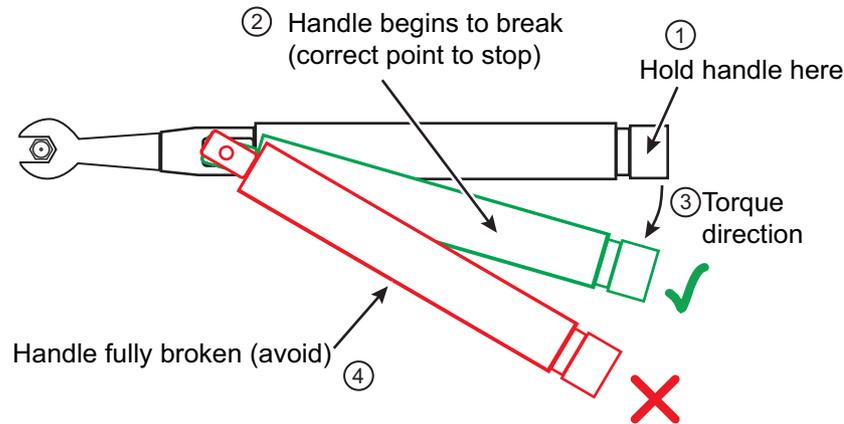


**Figure E-11.** Using Wrenches at Proper Angle

3. Hold the torque wrench at the end as shown in [Figure E-12 on page E-9](#).

### Caution

Holding the torque wrench anywhere but at the end applies an unknown amount of torque and can damage contacts and/or connectors.



Index	Description
1	Hold handle here
2	Handle begins to break - Stop torquing
3	Torque direction
4	Handle fully broken - Avoid torquing this far

**Figure E-12.** Using a Torque Wrench

- Before torquing, make sure long or heavy devices or cables are supported so there is no lateral pressure on the connection
- Rotate *only* the connector nut when tightening the connection. Apply torque to the fitting until the handle begins to break as shown in [Figure E-12](#).

## Torque Specifications and Tools

Torque values are listed below for connectors used with the 365xx-x mechanical calibration kits. If you are not sure which connector types are available on your instrument, consult the instrument Technical Data Sheet available on the web at [www.anritsu.com](http://www.anritsu.com).

**Table E-1.** Connector Torque Settings and Recommended Tools

Connector Type/Size	Wrench Size	Torque Setting	Recommended Tools
3.5 mm <sup>a b</sup>	8 mm 5/16 in	0.9 N·m 8 lbf·in	01-201 5/16 in Torque End Wrench 01-204 5/16 in or 8 mm Open End Wrench
GPC-7	19 mm 3/4 in	12 lbf·in 1.36 N·m	01-200 3/4 in Torque End Wrench
K (2.92 mm)	8 mm 5/16 in	0.9 N·m 8 lbf·in	01-201 5/16 in. Torque End Wrench 01-204 5/16 in. or 8 mm Open End Wrench
V (1.85 mm)	8 mm 5/16 in	0.9 N·m 8 lbf·in	01-201 5/16 in. Torque End Wrench 01-204 5/16 in. or 8 mm Open End Wrench

a. 3.5 mm, 2.92 mm and K connectors are electrically compatible with SMA and have the same connector nut size (8 mm) and torque requirement. Refer to [Table E-2](#) for connector compatibility information.

b. Although the 2.4 mm, 1.85 mm, and V connectors have the same connector nut size (8 mm) and torque requirement, they are not mechanically compatible with 3.5 mm. Refer to [Table E-2](#) for connector compatibility information.

## Disconnection

To properly separate an RF connection:

1. Use the same wrench usage technique as shown in [Figure E-11](#).
2. Use one to prevent the connector body from turning. Use the other to loosen the connector nut.
3. Complete the disconnection by hand, turning *only* the connector nut.
4. Pull the connectors straight apart without twisting or bending.

## Connector Types and Cross-Mating Compatibility

The following table lists RF connector characteristics and cross-mating compatibilities.

**Table E-2.** RF Connector Characteristics

Connector Type/ Parameter	7/16 DIN	20 GHz Type N	Type N	7 mm	SMA	3.5 mm	K (2.92 mm)	2.4 mm	V (1.85 mm)	W1 (1 mm)
<b>Upper Frequency Limit (GHz)</b>	7.5	20	18	18	18	26.5	40	50	67	110
<b>Mating Type</b>	M/F	M/F	M/F	Sexless	M/F	M/F	M/F	M/F	M/F	M/F
<b>Cross-mating Compatibility</b>	7/16 DIN only	Type N	20 GHz Type N	7 mm only	3.5 mm, K, SMA,	K, SMA,	3.5 mm, SMA,	V	2.4 mm	W (1 mm) only
<b>Dielectric</b>	Air	Air	Air	Air	Teflon	Air	Air	Air	Air	Air
<b>Thread</b>	M29 x 1.5	5/8–24	5/8–24	0.6785-24	1/4–36	1/4–36	1/4–36	M7 x 0.75	M7 x 0.75	M4 x 0.7
<b>Outer Conductor (mm)</b>	16	7	7	7	4.2	3.5	2.92	2.4	1.85	1

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# Anritsu



10410-00270



H



Anritsu utilizes recycled paper and environmentally conscious inks and toner.

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