User Guide

VectorStar™ MS4640A/B 366xX-1 Verification Kits and 2300-527 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
2300-527 PVS Application

Anritsu

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

Part Number: 10410-00270
Revision: D
Published: August 2013

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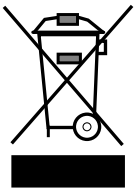

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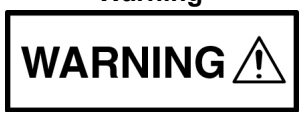
This indicates a risk from a very dangerous condition or procedure that could result in serious injury or death and possible loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

Warning



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

Caution

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

Safety Symbols Used on Equipment and in Manuals

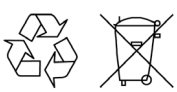
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all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

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

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

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

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



These indicate that the marked part should be recycled.

For Safety

Warning

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

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

Warning

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

Caution

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

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

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Chapter 1 — Verification Kit Reference

1-1 Introduction

This manual supports the VectorStar 366xX-1 Verification Kits and the Anritsu 2300-527 Performance Verification Software (PVS). This software is provided on a CD that is included with the four verification kits described in this chapter. The VectorStar Verification Kits support the following VectorStar models:

- 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

Note	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.

A quick start guide is available for the verification kits and the PVS software:

- VectorStar MS4640A/B Series VNA 366xX-1 Verification Kits and 2300-527 Performance Verification Software Quick Start Guide – 10410-00285.

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 for MS4645A/B or MS4647A/B VNA.
- 3668-1 can be used on either the MS4642A/B, MS4644A/B K Connector VNAs or the MS4645A/B, 3668-1 K Connector Verification Kit for MS4642A/B or MS4644A/B VNAs. Also can be used with MS4645A/B, MS4647A/B Connector VNAs as long as adapters are used.
    - MS4647A/B V Connector VNAs
- 3666-1 SMA/3.5 mm Verification Kit.
    - The applicable VNA models depend on the adapters used.
- 3663-1 Type N Connector Verification Kit
    - The applicable VNA models depend on the adapters used.
    - 3663-1 can be used on the MS4642A/B, MS4644A/B K Connector VNAs or the MS4645A/B, MS4647A/B V Connector VNA

1-3 Verification Kit Standards

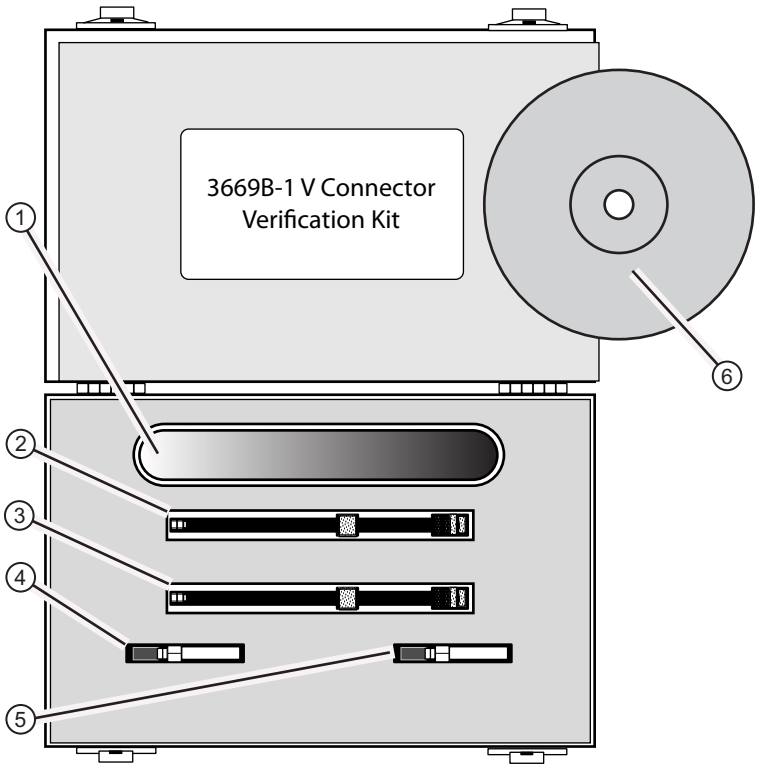
Each verification kit consists of four standards and each are supplied with S-parameter data. Each standard verifies a primary S-parameter with uncertainty windows provided at each data point as follows:

- 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.



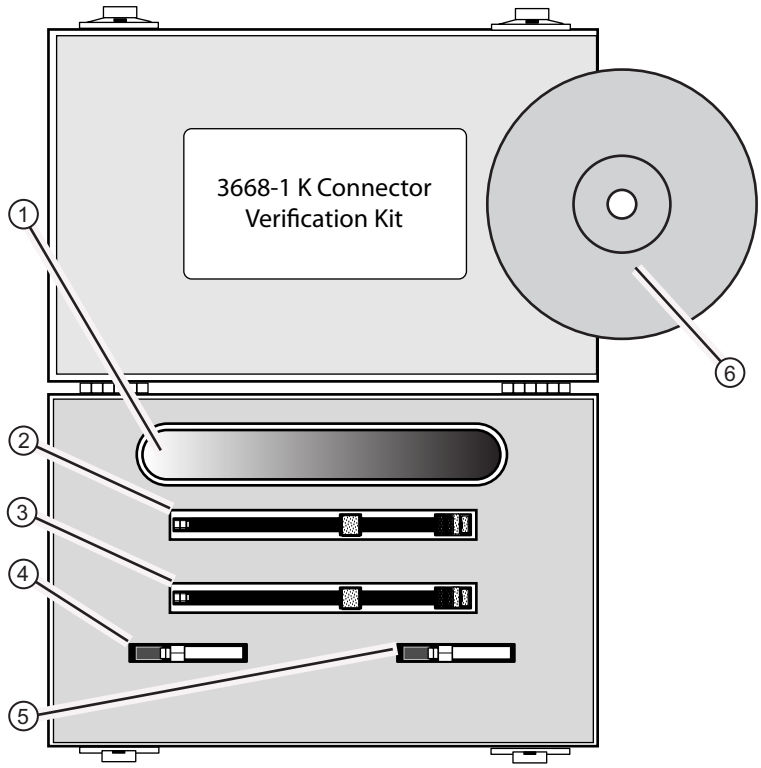
1. USB Memory Device – The memory device contains: • Component Device Characterization Data • Test Definition Files • Factory Calibration Reports for the kit components. 2. Airline – 19V50-5	3. Beatty Airline – 19V50-5B 4. 20 dB Offset (Pad) Attenuator – 42V-20 5. 40 dB Offset (Pad) Attenuator – 42V-40 6. Software and Documentation Disc

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.



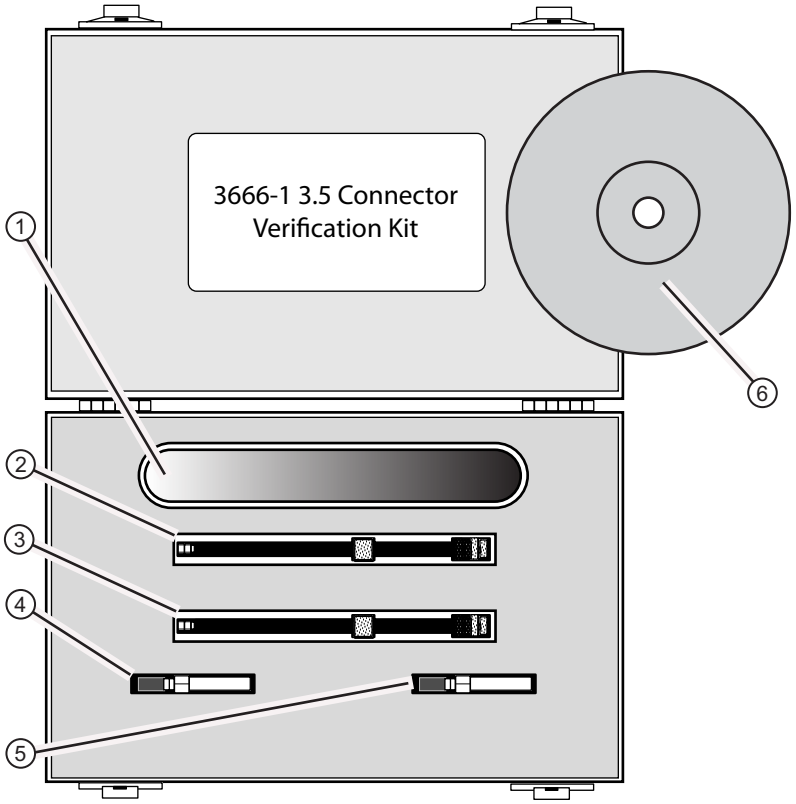
1. USB Memory Device – The memory device contains: • Component Device Characterization Data • Test Definition Files • Factory Calibration Reports for the kit components.	3. Beatty Airline – 19K50-7B
2. Airline – 19K50-7	4. 20 dB Offset (Pad) Attenuator – 42K-20
	5. 50 dB Offset (Pad) Attenuator – 42K-50
	6. Software and Documentation Disc

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

	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.
Note	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.



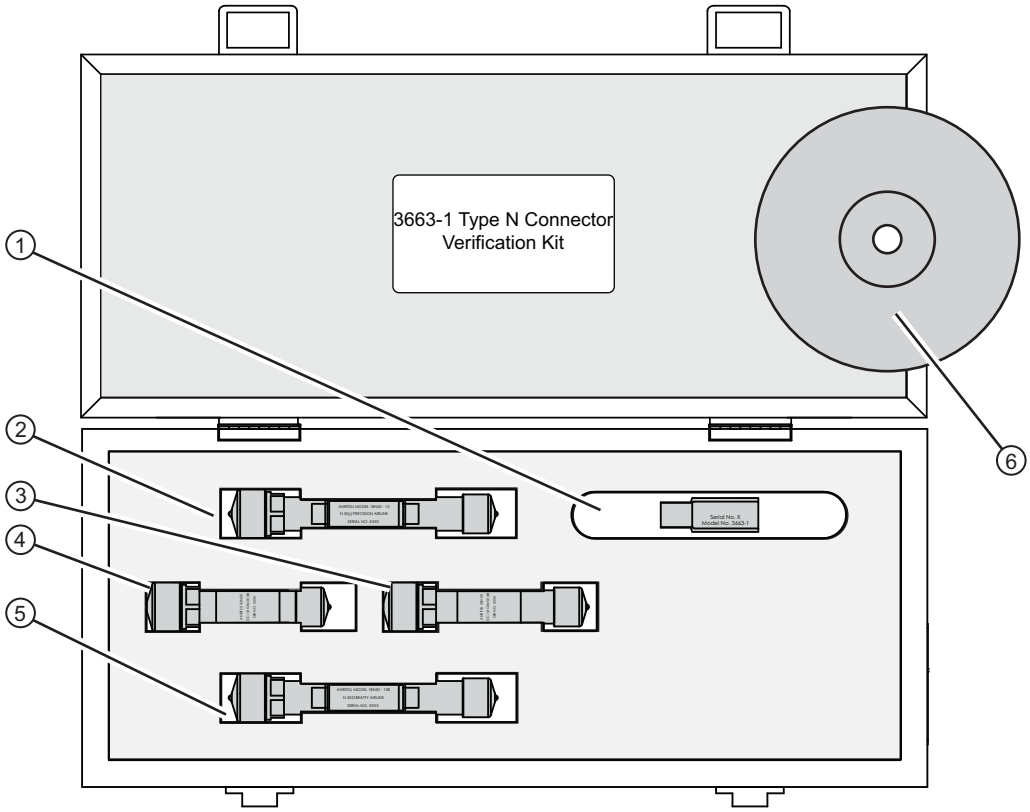
1. USB Memory Device – The memory device contains: • Component Device Characterization Data • Test Definition Files • Factory Calibration Reports for the kit components.	3. Beatty Airline – 19S50-7B
2. Airline – 19S50-7	4. 20 dB Offset (Pad) Attenuator – 42S-20
	5. 50 dB Offset (Pad) Attenuator – 42S-50
	6. Software and Documentation Disc

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.



1. USB Memory Device – The memory device contains: • Component Device Characterization Data • Test Definition Files • Factory Calibration Reports for the kit components.	3. 50 dB Attenuator – 42N-50
2. N (m) to N (f) Precision Airline – 18N50-10	4. 20 dB Attenuator – 42N-20
	5. N (m) to N (f) Beatty Airline – 18N50-10B
	6. Software and Documentation Disc

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 Other VectorStar Documentation

For more information on VNA systems, calibration/verification kits, and other supporting accessories, refer to the Anritsu web site: http://www.anritsu.com.

This and most other VectorStar manuals are available for download as an Adobe Acrobat Portable Document Format (.pdf) file.

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.

Note	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.

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.

- 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 2300-527 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

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 the device characterization data and test configuration files.
- Compact Disc (CD) with:
    - 2300-527 Performance Verification Software (PVS), the PVS User Guide – 10410-00270 (this document), and the PVS Quick Start Guide – 10410-00285.

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

- **33VFVF50C –** 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

Note	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.

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)
- **3671VFV50-100** – 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)
- **3671KFK50-100** – 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)
  - **3671KFK50-100** – 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
3669B-1 V Connector Verification Kit MS4645A/B MS4647A/B Two Adapters	• Test Port 1 V (m) • 33VFVF50C V (f) to V (f) Adapter on Port 1	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)
	• Test Port 2 V (m) • Through Line Cable on Port 2 • 33VVF50C V (m) to V (f) Adapter on cable above			3671VFV50-100 Test Port Cable Flexible Phase Stable 100 cm (39.4") – V (f) to V (m) *Note #1*
3668-1 K Connector Verification Kit MS4642A/B MS4644A/B Two Adapters	• Test Port 1 K (m) • 33KFKF50B K (f) to K (f) Adapter on Port 1	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)
	• Test Port 2 K (m) • Through Line Cable on Port 2 • 33KKF50B K (m) to K (f) on cable above			3671KFK50-100 Test Port Cable Flexible Phase Stable 100 cm (39.4")- K (f) to K (m) *Note #2*
3666-1 3.5 mm Connector Verification Kit MS4645A/B MS4647A/B 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 adapter above *Note #3*	*AutoCal is not available for 3.5 mm Verification Kits*	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)
	• Test Port 2 V (m) • 34VFK50 V (f) to K (m) Adapter on Port 2 • Through Line Cable on adapter above • 33SSF50 3.5 mm (m) to 3.5 mm (f) on cable above *Note #3*			

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
3666-1 3.5 mm Connector Verification Kit MS4642A/B MS4644A/B Two Adapters	• Test Port 1 K (m) • 33SFSF50 3.5 mm (f) to 3.5 mm (f) Adapter on Port 1	*AutoCal is not available for 3.5 mm Verification Kits*	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)
	• Test Port 2 K (m) • Through Line Cable on Port 2 • 33SSF50 3.5 mm (m) to 3.5 mm (f) Adapter on cable above			3671KFK50-100 Test Port Cable Flexible Phase Stable 100 cm (39.4") - K (f) to K (m) *Note #2*
3663-1 Type N Connector Verification Kit MS4642A/B MS4644A/B Three Adapters	• Test Port 1 K (m) • Test Port Cable on Port 2 • 71693-R K (f) to N (f) Adapter on cable above	*AutoCal is not available for Type N Verification Kits*	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) *Note #2*
	• Test Port 2 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 adapter above			3671KFK50-60 Test Port Cable Flexible Phase Stable 60 cm (23.6") - K (f) to K (m) *Note #2*

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.

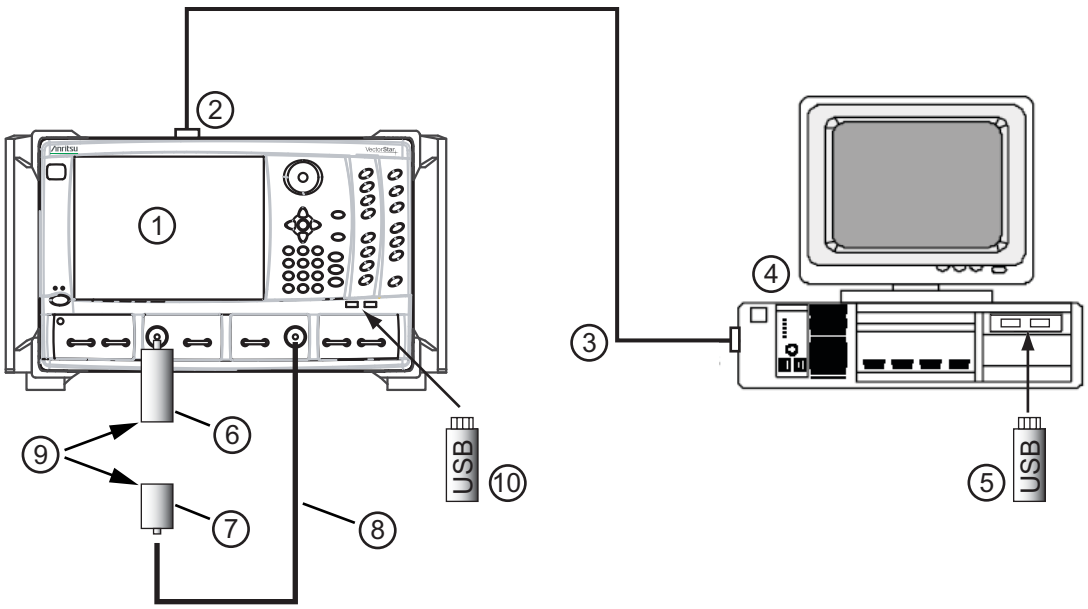
An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the MS4640A/B Series VNA instruments.

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.



1. VectorStar MS4640A/B Series VNA
2. VNA Rear Panel IEEE 488.2 GPIB Port
   • For GPIB talker/listener to PC controller connections.
3. GPIB Cable to PC Controller and National Instruments PCI GPIB Card Port and VISA library installed on the PCI card.
   • See note below for requirements.
4. PC Controller: The 2300-527 System Performance Verification Software is installed from the Verification Kit CD (not shown).
5. Verification Kit USB Memory Device containing Characterization Measurement Data, Test Parameter Definition files, and original factory calibration reports.
6. Port 1 F-F Adapter:
   • 33VFVF50C for MS4645A/B, MS4647A/B V connectors
   • 33KFKF50B for MS4642A/B, MS4644A/B K connectors.
7. Port 2 M-F Adapter:
   • 33VVF50C for MS4645A/B, MS4647A/B V connectors
   • 33KKF50B for MS4642A/B, MS4644A/B K connectors.
   • See Chapter 3 — Required Hardware for 3.5 mm and Type N Adapters.
8. Through Line Cable
   • High-quality, phase-stable test port though line
   • V (f) to V (m) for MS4645A/B, MS4647A/B
   • K (f) to K (m) for MS4642A/B, MS4644A/B.
9. Insert calibration and verification components here.
10. Calibration Kit (Manual or Automatic Calibrator) calibration device coefficients data on USB Memory Device.

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.

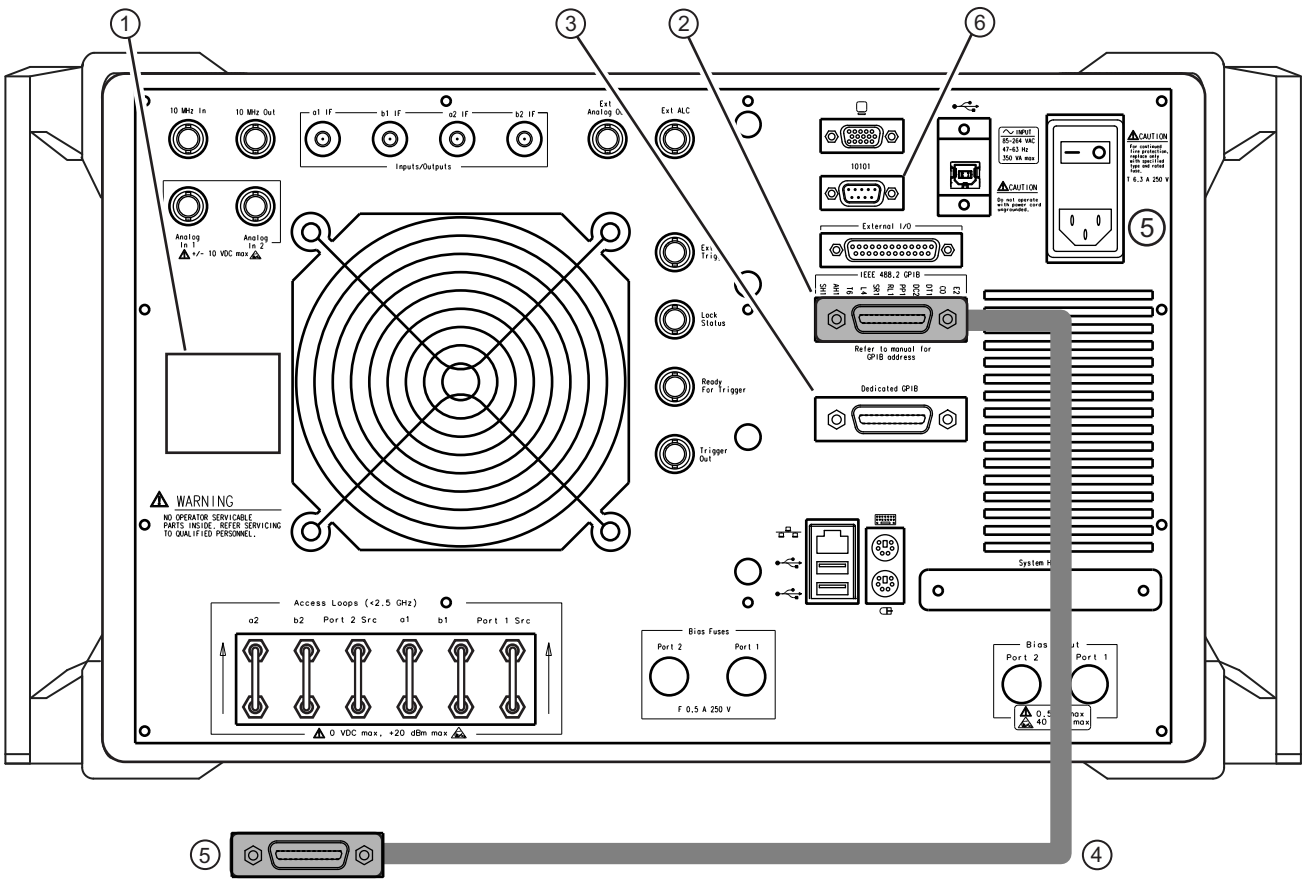


Figure 4-2. VNA Rear Panel GPIB Cable connection to the IEEE 488.2 GPIB Port

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

2. 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.

3. 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.

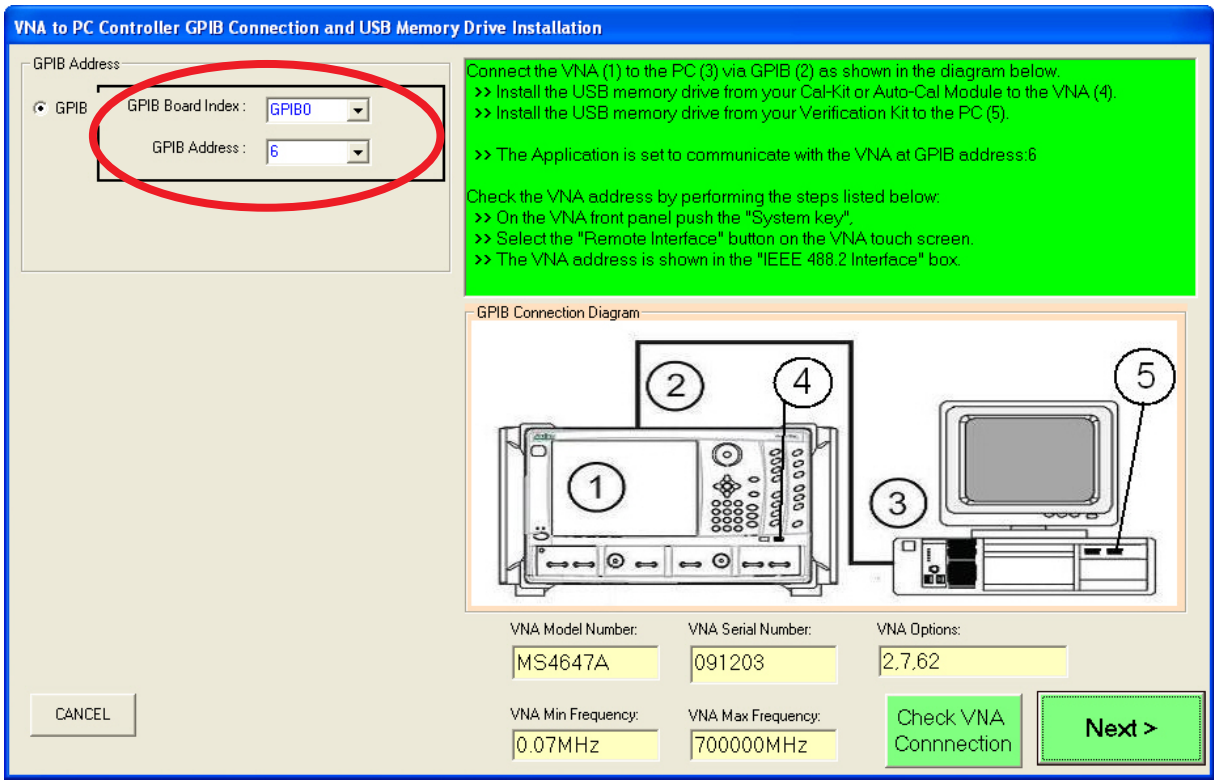


Figure 4-3. Check VNA to PC Controller Connection and USB Memory Device Installation

Setting VNA GPIB Address from the PVS Application

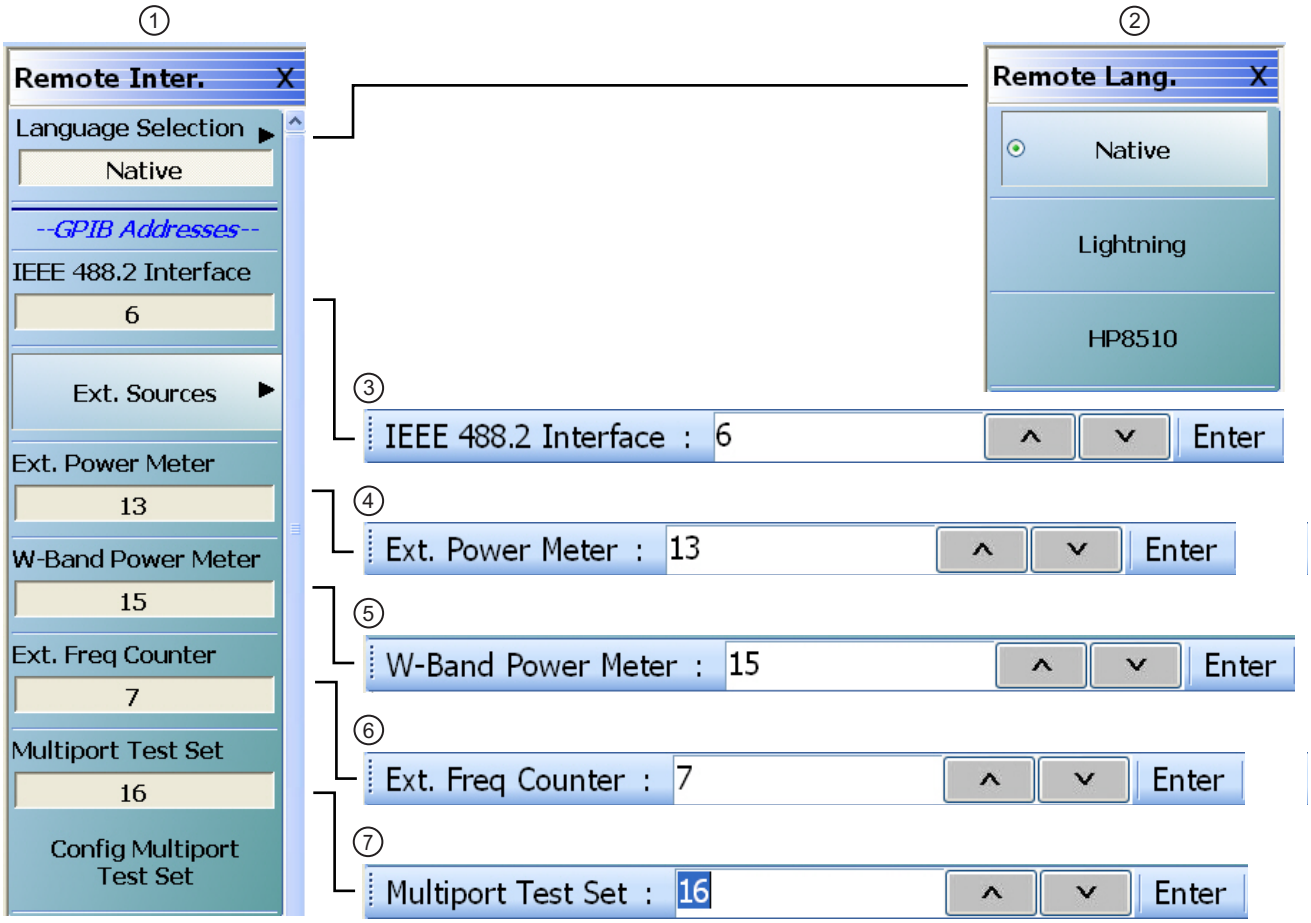
The address setting for the VNA can be set either from the screen above or from the VNA user interface.

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.



1. REMOTE INTERFACE Menu
2. REMOTE LANGUAGE Menu
3. IEEE 488.2 Interface GPIB Address Toolbar
4. External Power Meter GPIB Address Toolbar
5. W-Band Power Meter GPIB Address Toolbar
   - On MS4647A/B VNAs with Option 080/081, the W-Band Power Meter button is present.
   - On MS4647A/B VNAs without Option 080/081, the button is not present.
6. External Frequency Counter GPIB Address Toolbar
7. Multiport Test Set GPIB Address Toolbar

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).

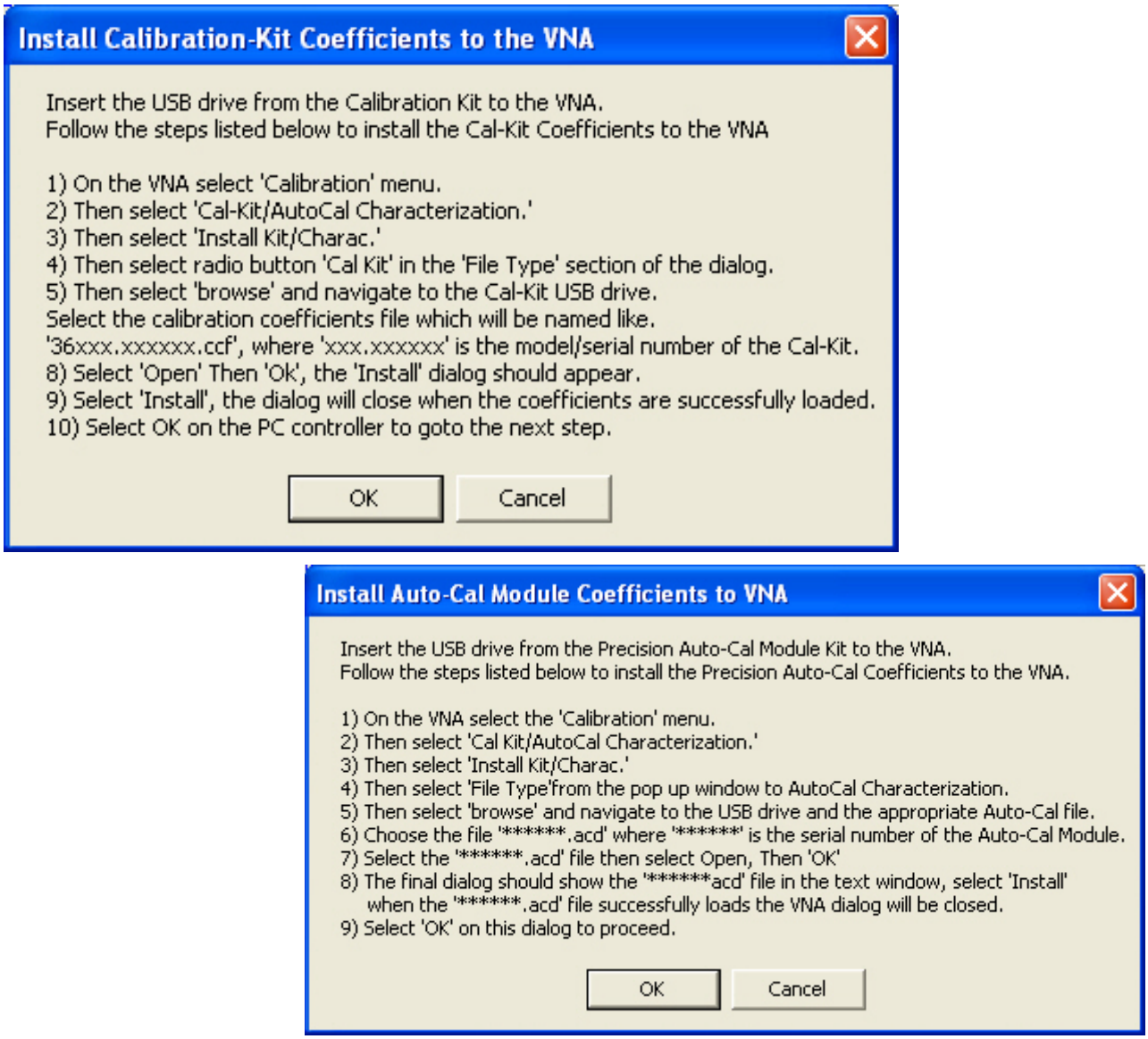
5. Select the IEEE 488.2 Interface button to access the IEEE 488.2 Interface field toolbar and then select any valid address and then click the Enter button on the toolbar (see Figure 4-4 above).

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 CharacterizationThe CAL KIT/AUTOCAL menu appears as shown below.

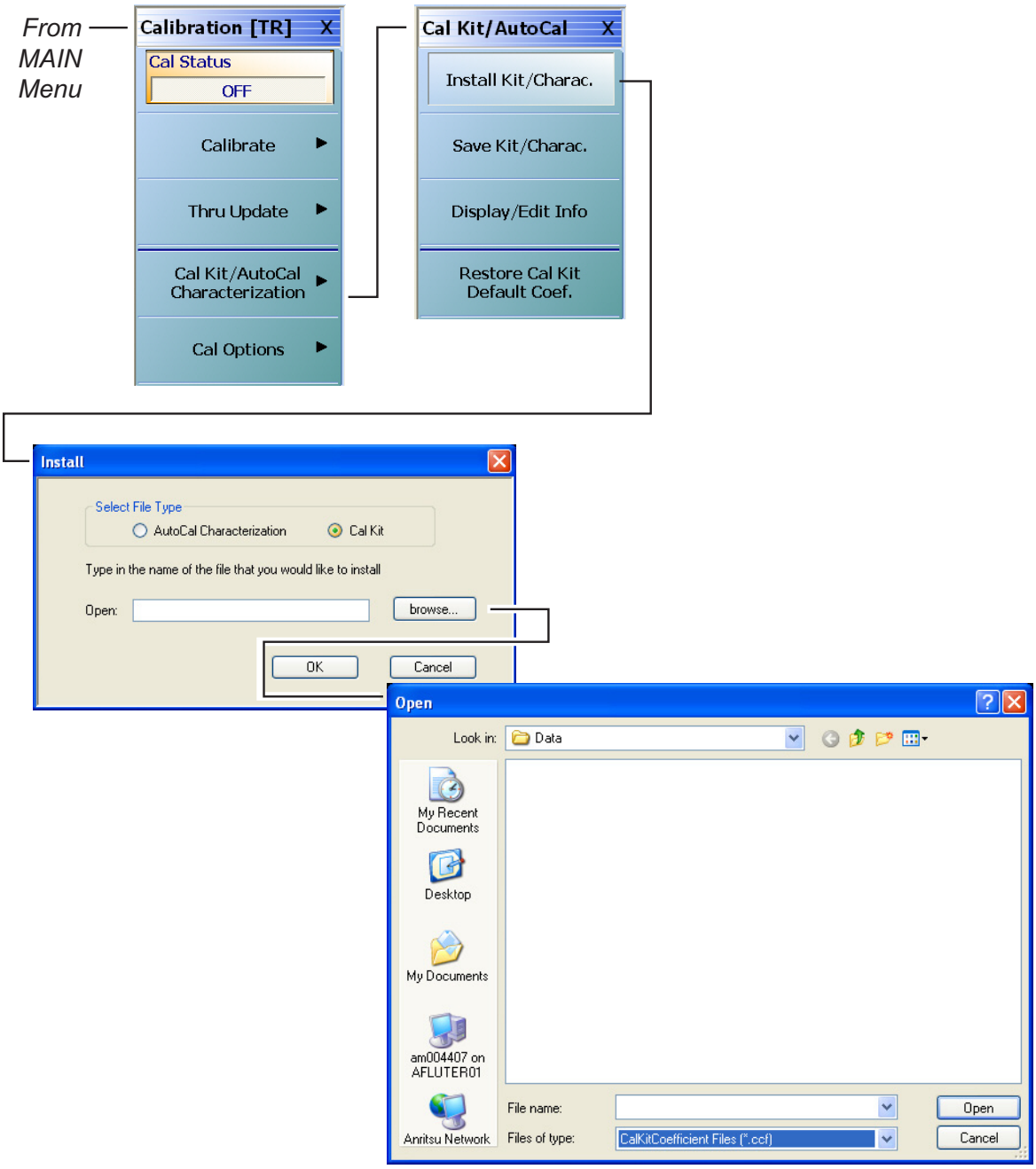


Figure 4-6. VNA Menus and Dialog Boxes for Loading Calibration Kit Characterization Files

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 acknowledges 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 2300-527 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.

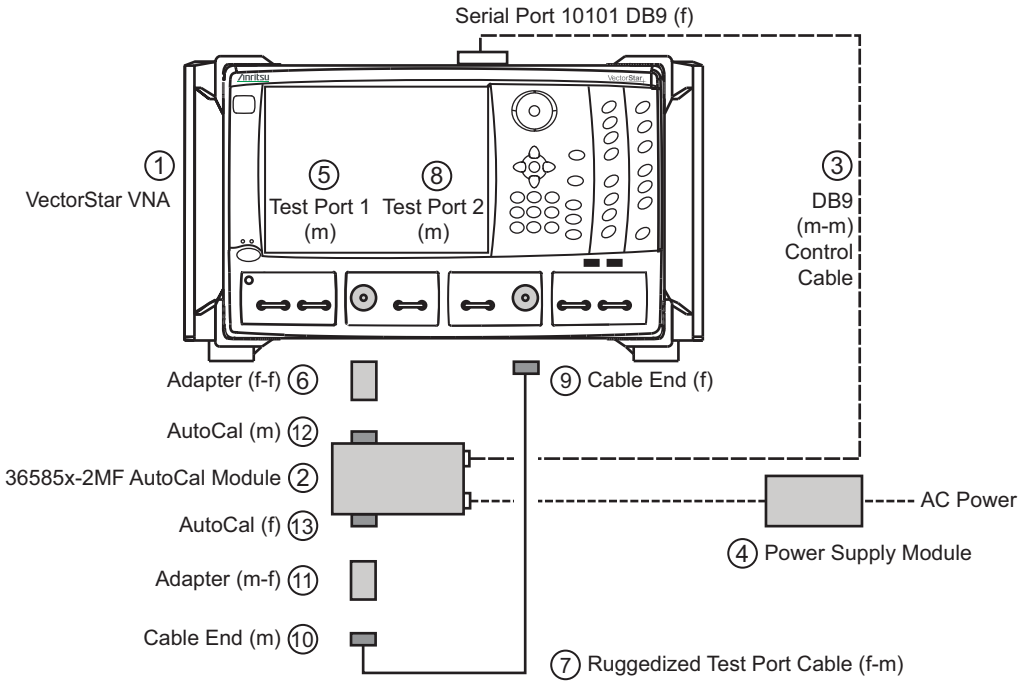


Figure 4-7. Precision AutoCal Module 36585X-2MF Connections to VNA (1 of 2)

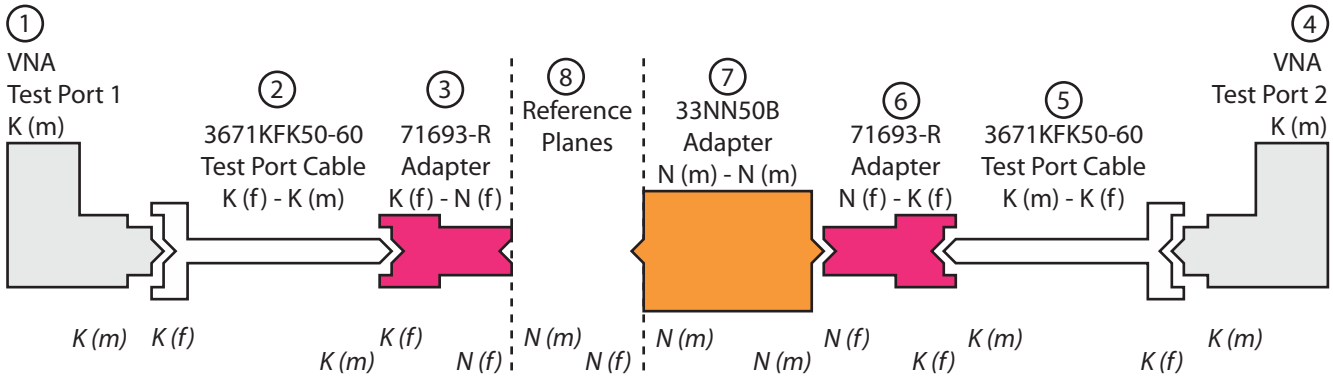
1. VectorStar VNA:
   - MS4645A/B, MS4647A/B V-Connector VNA
   - MS4642A/B, MS4644A/B K-Connector VNA
2. 36585V-2MF or 36585K-2MF Precision AutoCal Module. Other AutoCal Modules are not supported.
3. Connect the AutoCal Signal Cable (m-m) to the DB-9 connector on the Module. Connect the other end of the signal cable to the VNA Rear Panel Serial 10101 Port.
4. Connect the AC Power Block to the AutoCal Module and then to AC Power.
   - Allow the Module to warm up until its Blue LED is illuminated.
   - Do not connect the AutoCal Module to the VNA Test Ports until directed by the PVS application.
5. VNA Test Port 1 (m)
6. Install the Adapter (f-f) on Test Port 1:
   - 33VFVF50C, V (f) to V (f) Adapter on Port 1
   - 33KFKF50B, K (f) to K (f) Adapter on Port 1
7. Test Port Cable (m-f):
   - 3670V50A-2 Test Port Cable Ruggedized Semi-Rigid, 61 cm (24”) – V (f) to V (m)
   - 3670K50-2 Test Port Cable Ruggedized Semi-Rigid 61 cm (24”) – K (f) to K (m)
8. VNA Test Port 2 (m)
9. Install cable end (f) to Port 2
10. Install adapter to open end of cable on Port 2
11. Adapter (m-f):
    - 33VVF50C V (m) to V (f) Adapter on cable above
    - 33KKF50B K (m) to K (f) Adapter on cable above
12. Connect AutoCal male port to adapter on test port 1
13. Connect cable end with adapter to female port of AutoCal Module.

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.



1. VNA Test Port 1 – Test Port K (m)
2. 3671KFK50-60 Test Port Cable – Test Port K (f) to K (m)
   - Cables with “-60” provide a single 60 cm (23.6”) cable.
3. 71693-R Adapter – Test Port K (f) to N (f)
4. VNA Test Port 2 – Test Port K (m)
5. 3671KFK50-60 Test Port Cable – Test Port K (f) to K (m)
6. 71693-R Adapter – K (f) to N (f)
7. 33NN50B Adapter – N (m) to N (m)
8. Fully Insertable Measurement Reference Plane – N (m) to N (f)

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

This only needs to be done once per PC Controller. The software is contained on the CD Disc supplied with each Verification Kit.

Note	In order to correctly install the PVS application, the logged in user must have Administrative rights on the Windows PC Controller. 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.” Consult your PC and network support administrator on how to best proceed.

Prior to installation of the 2300-527 PVS, the National Instruments GPIB card, its drivers, and the VISA library must be installed in the PC Controller.

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.

Turn off all other running applications on the PC Controller.

1. Insert the CD into the PC Controller CD Drive.

2. The Verification Software navigation page should automatically appear using the AutoRun function.

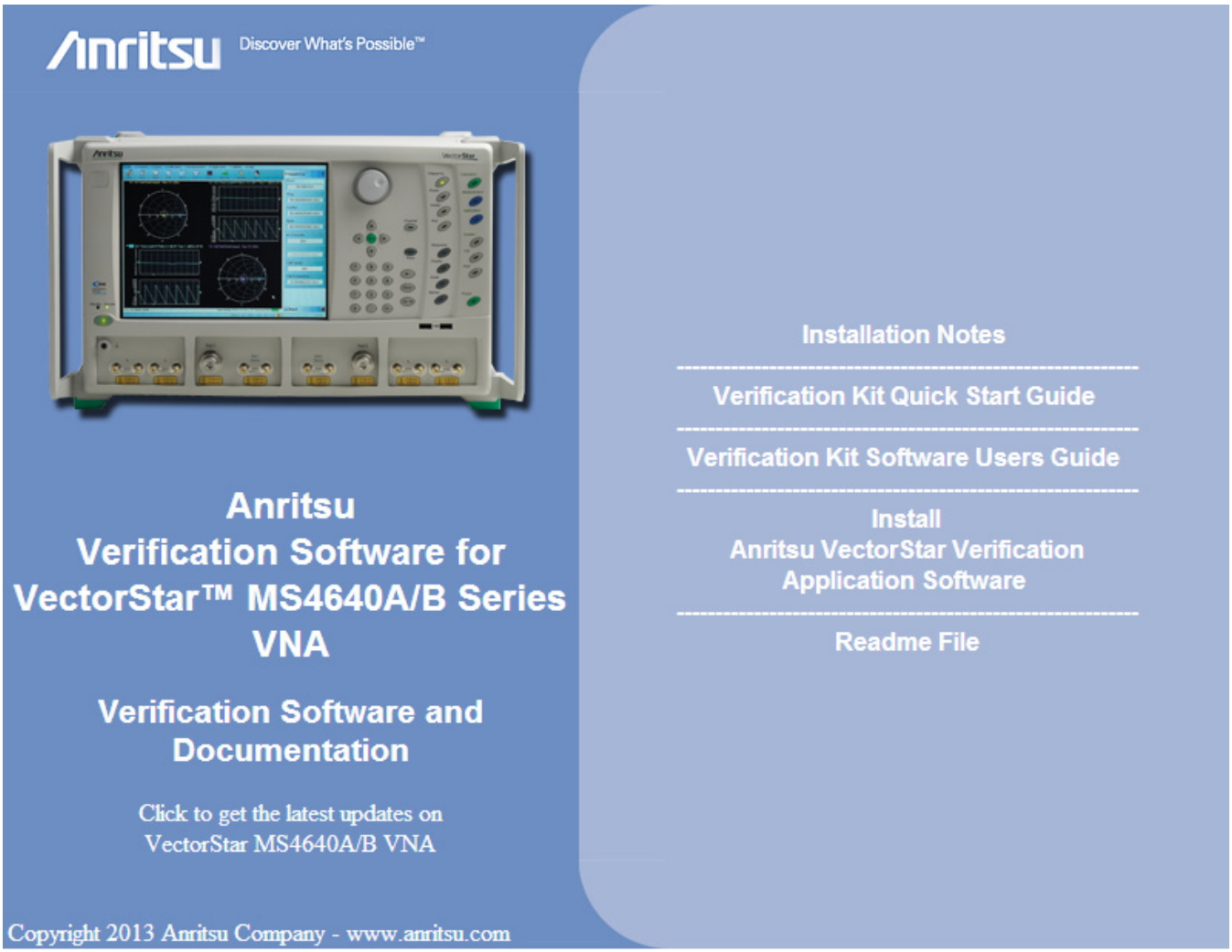


Figure 5-1. PVS Installation and Documentation Screen

3. If the screen above does not appear, navigate to the drive and double click Startup.htm.

4. On the navigation page, click the Install Anritsu VectorStar Verification Application Software link.

5. The first of several installation dialog boxes appears.

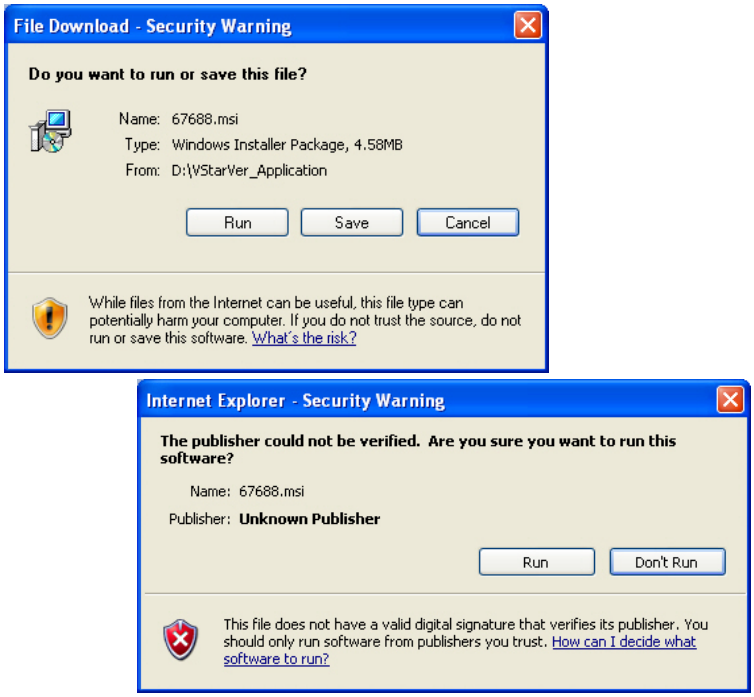
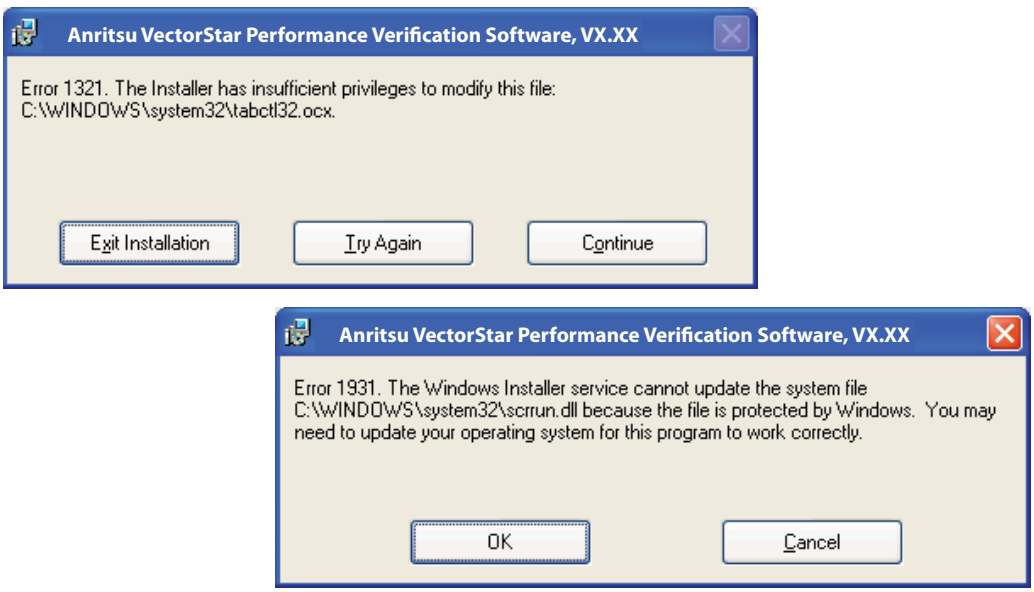


Figure 5-2. Installation Security Dialog Boxes - Click Run on each

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.



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

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

8. 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.

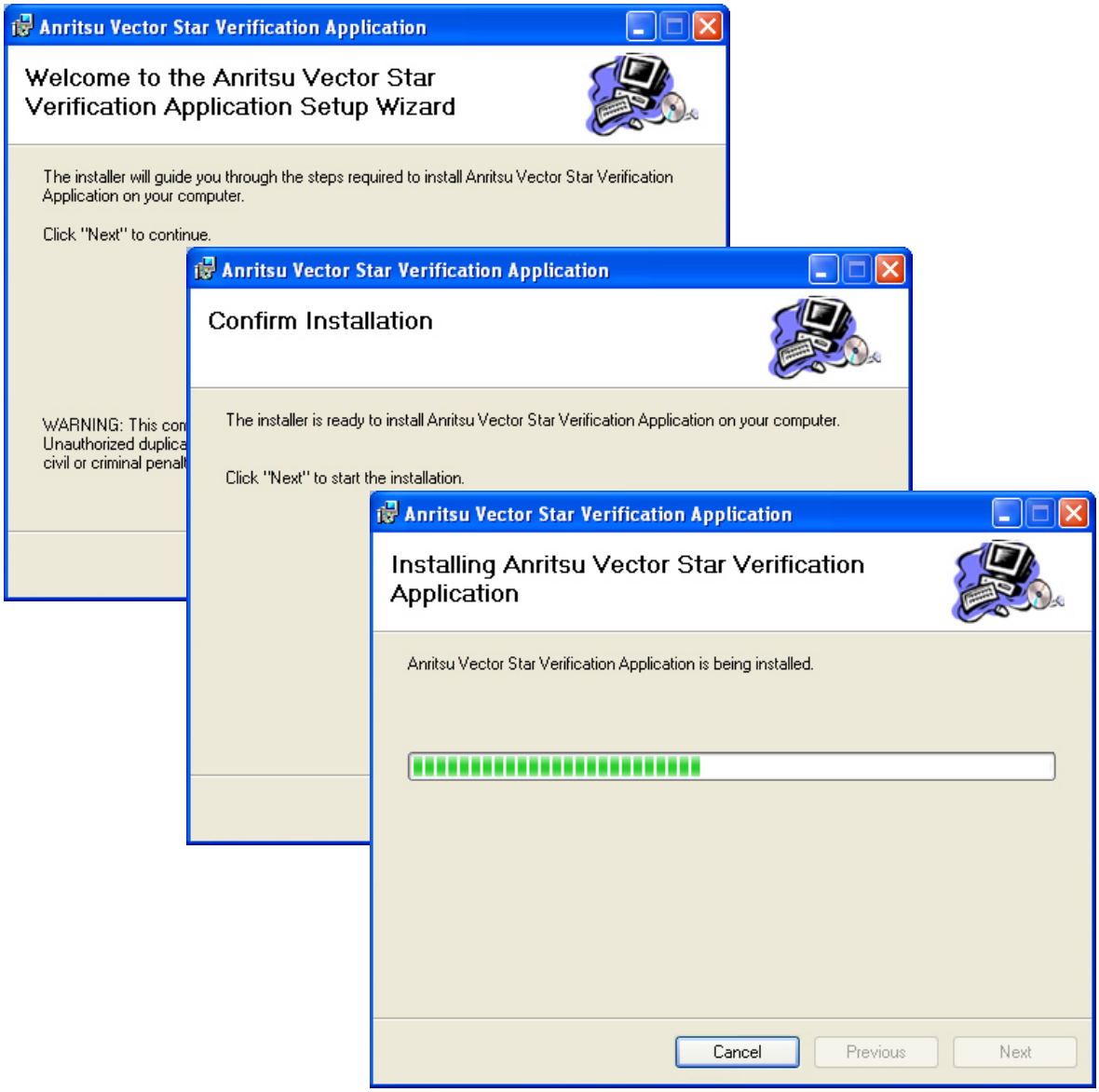


Figure 5-4. Installation Confirmation and Progress Dialog Boxes - Click Next on each

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.

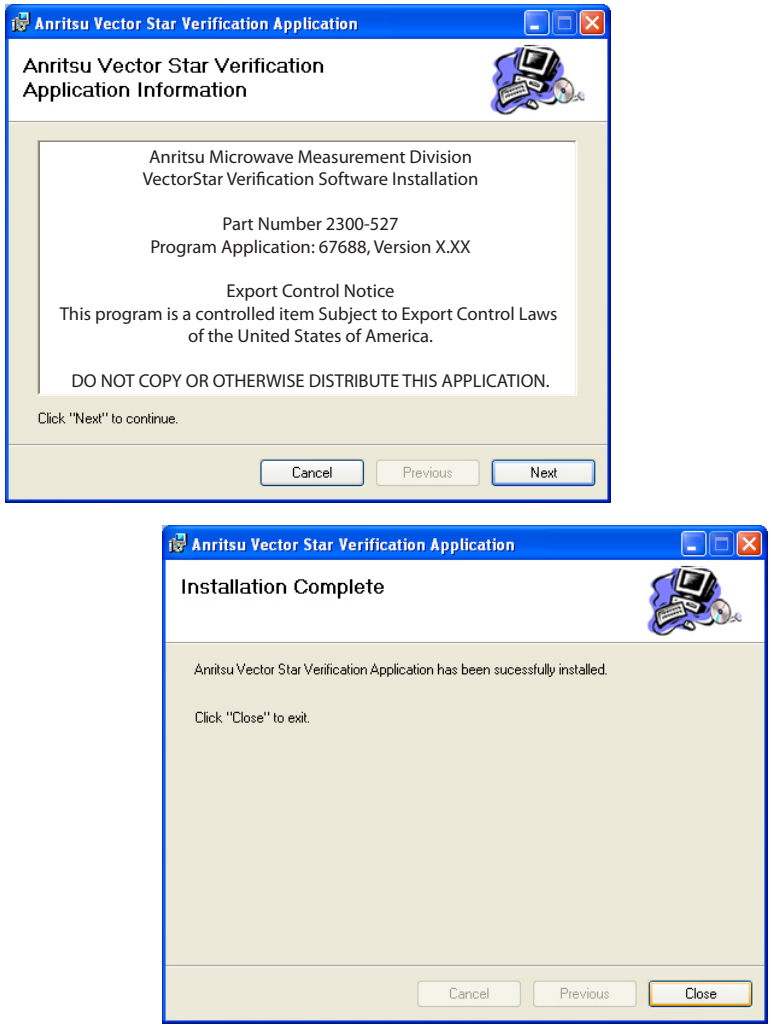


Figure 5-5. Final Application Information and Installation Complete Dialog Boxes

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. When done, eject the CD and return it to the Verification Kit.

13. 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

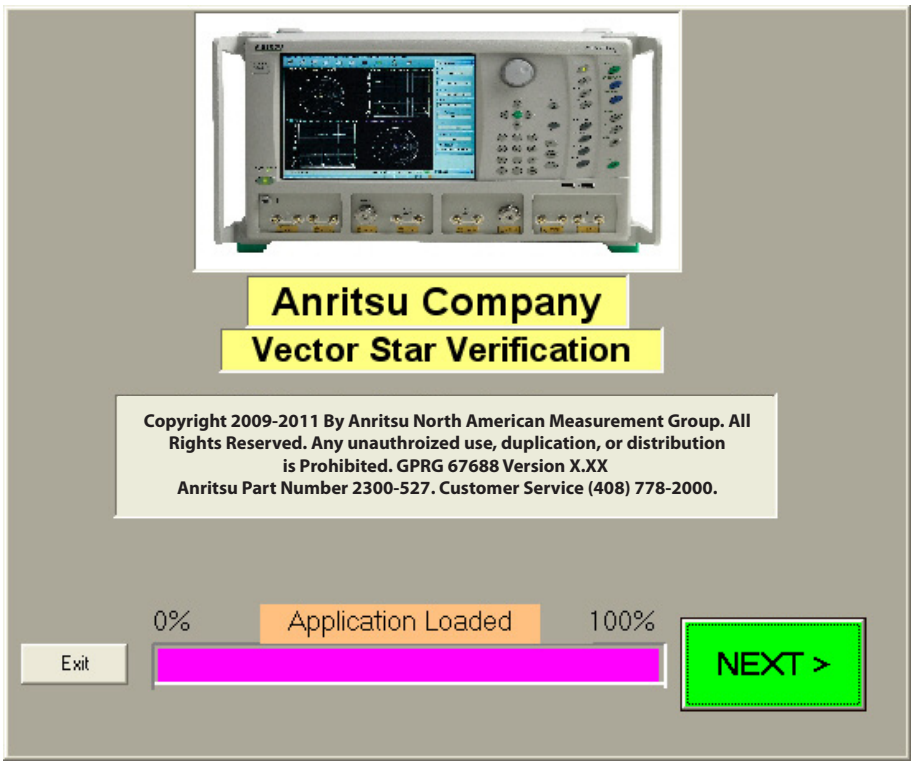
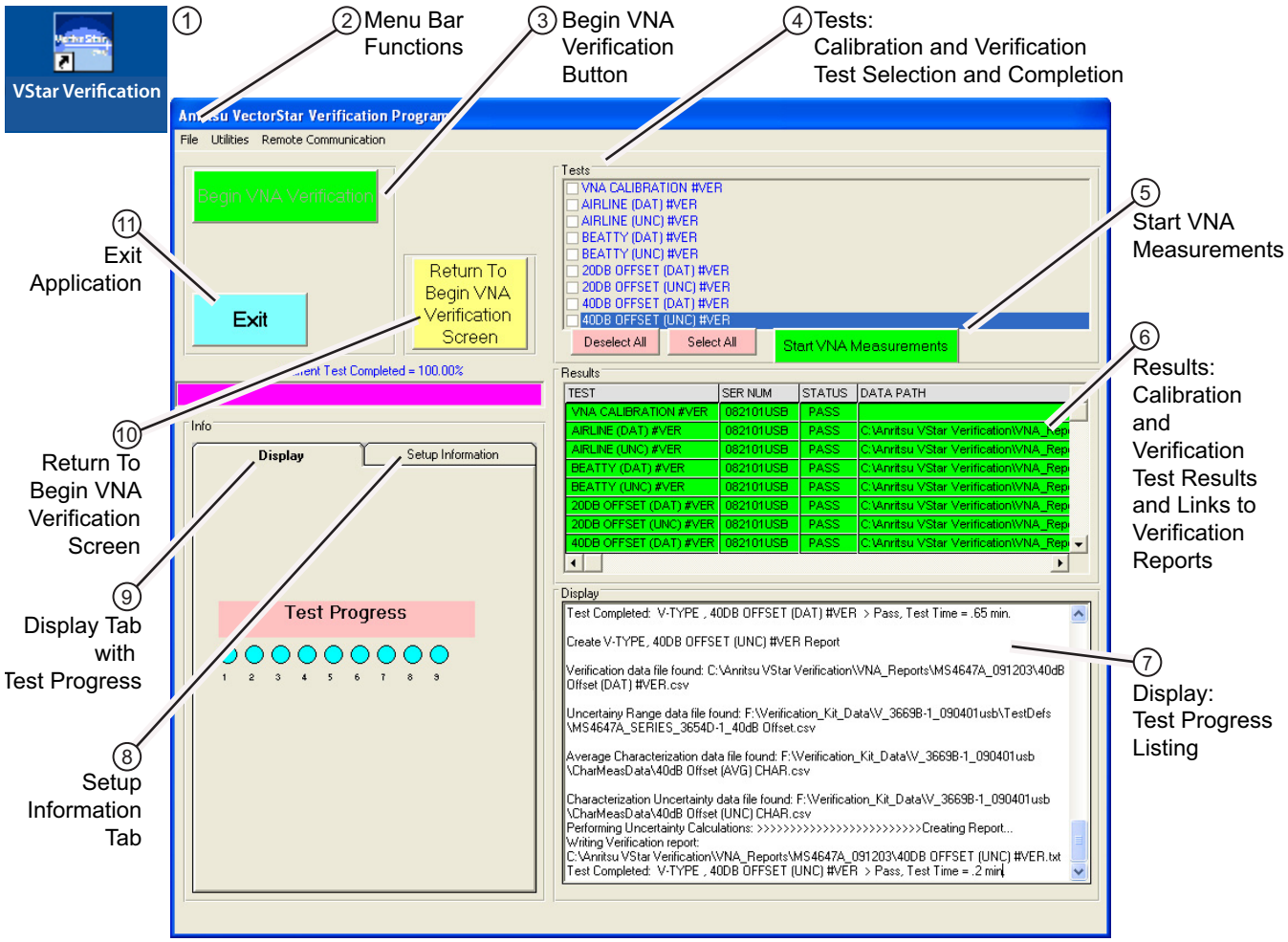


Figure 5-6. PVS Application Startup Screen

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.



1. PC Controller Icon – Select to launch verification application.
2. Menu Bar Functions – Drop-down menus for File, Utilities, Remote Communication, and About
3. Begin VNA Verification Button – Starts setup process. When setup is complete, the button is unavailable.
4. Tests Area – Allows all or some tests to be selected. As each is completed, the check box is deselected.
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.
6. Results Area – As each test is completed, a color coded row appears. Clicking the row links to the report.
7. Display Area – Lists information about test progress.
8. Display Tab – Shows which major test has completed. The Progress Bar above shows individual test completion.
9. Setup Tab – Not shown here. Lists all device model information and serial numbers.
10. Return to Begin VNA Verification Screen – Restarts the setup procedure.

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.

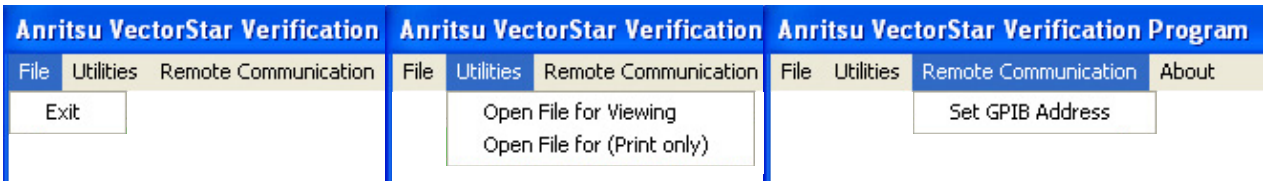


Figure 5-8. Menu Bar Functions

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.

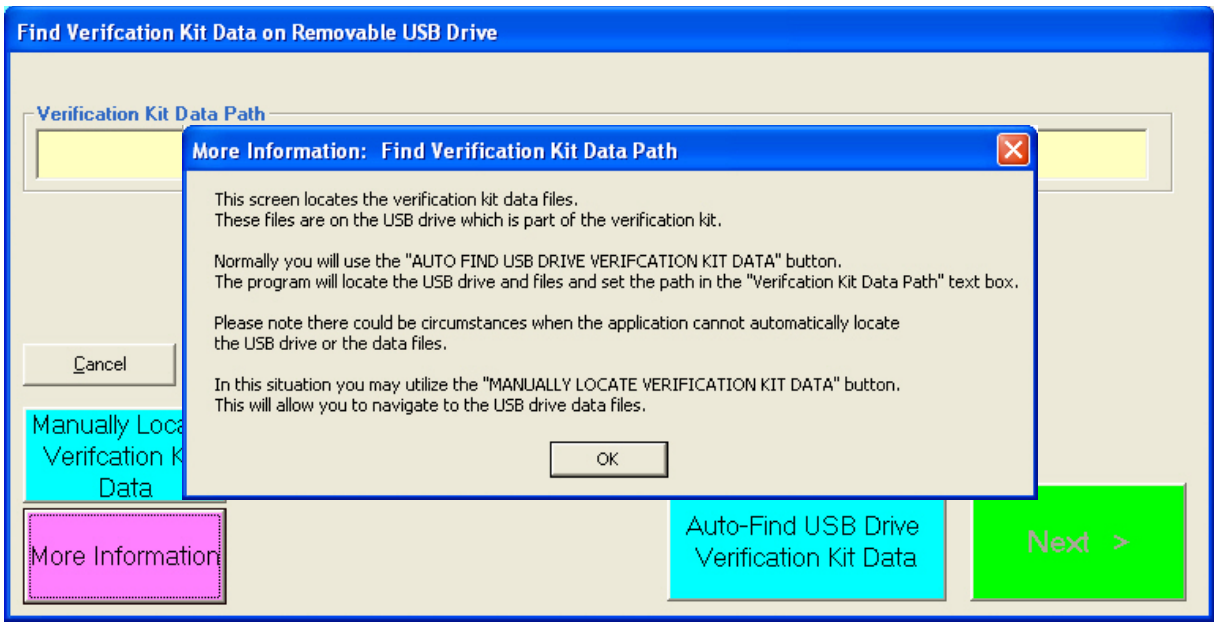
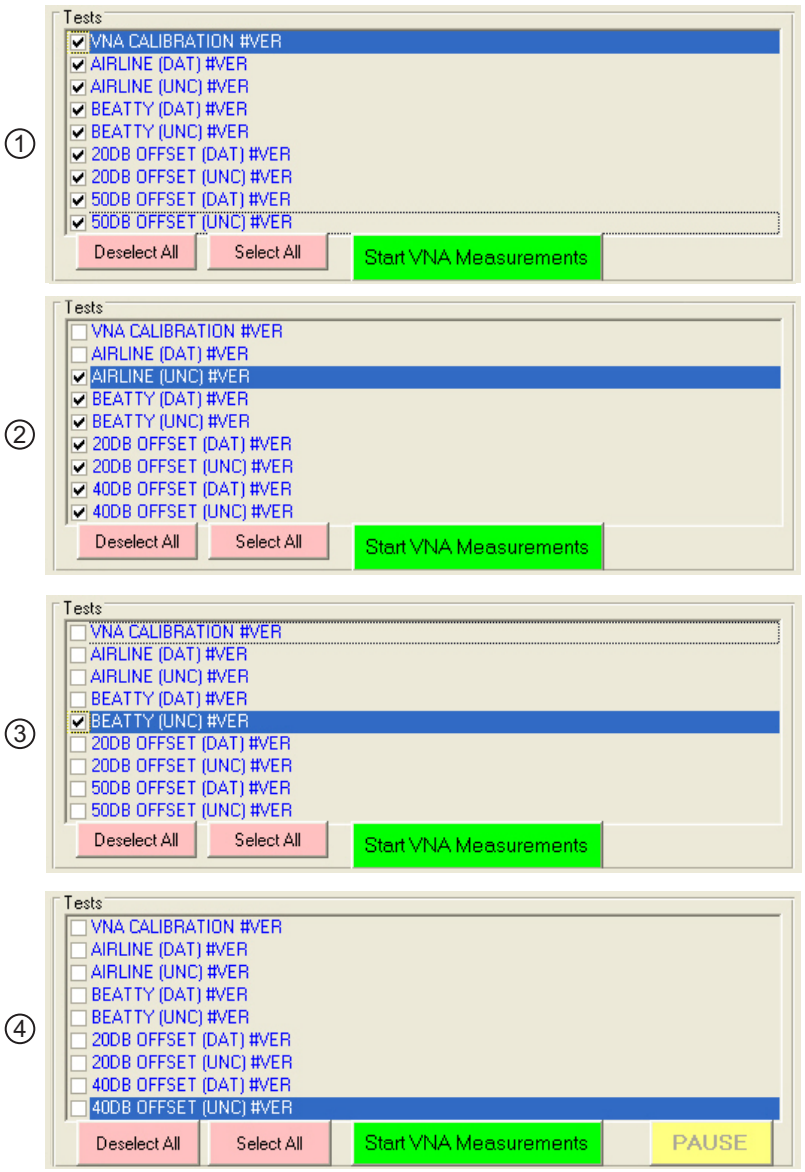


Figure 5-9. More Information Dialog Example

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. elected 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.
2. The first two tests are completed with seven remaining.
3. Only one test selected.
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

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

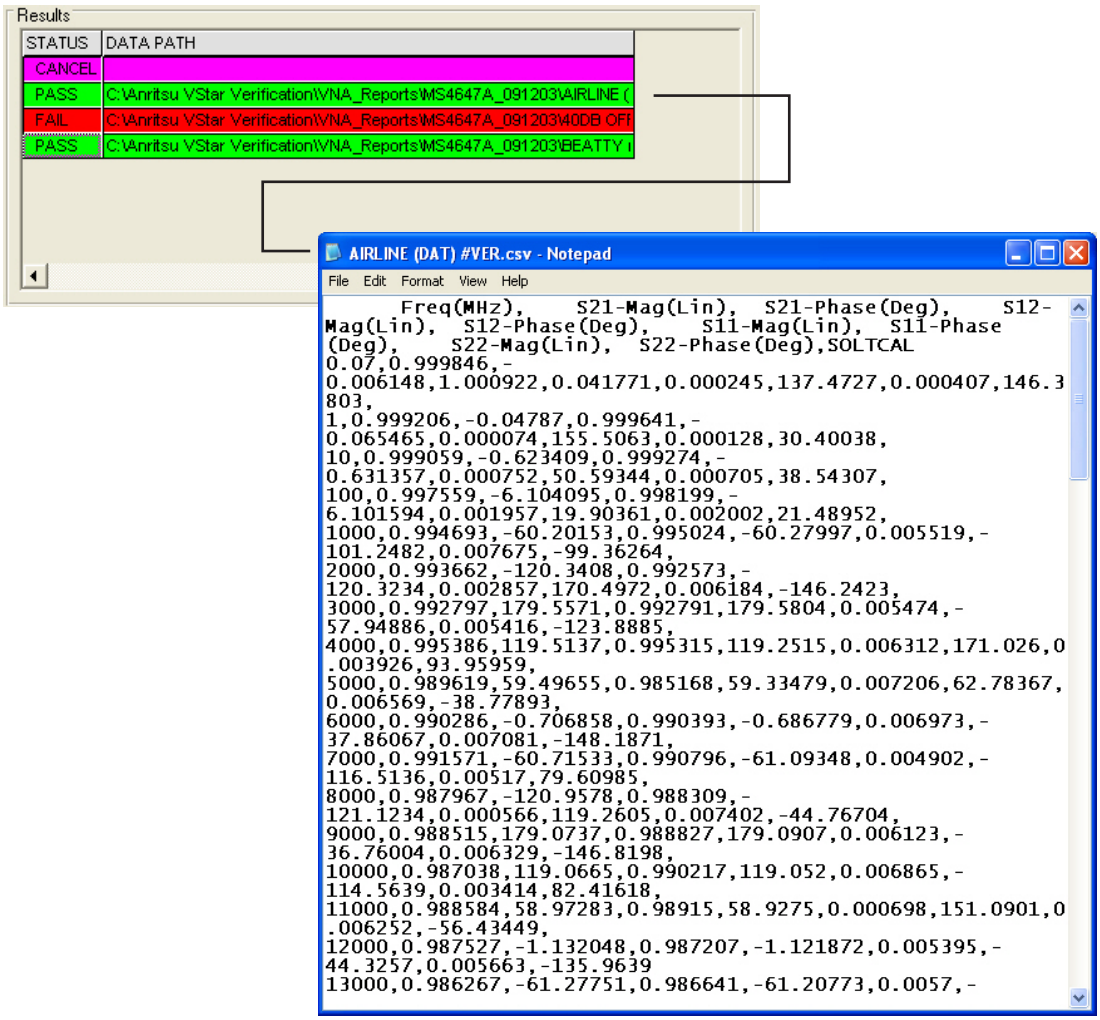


Figure 5-11. Test Results Grid and Related Report

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.

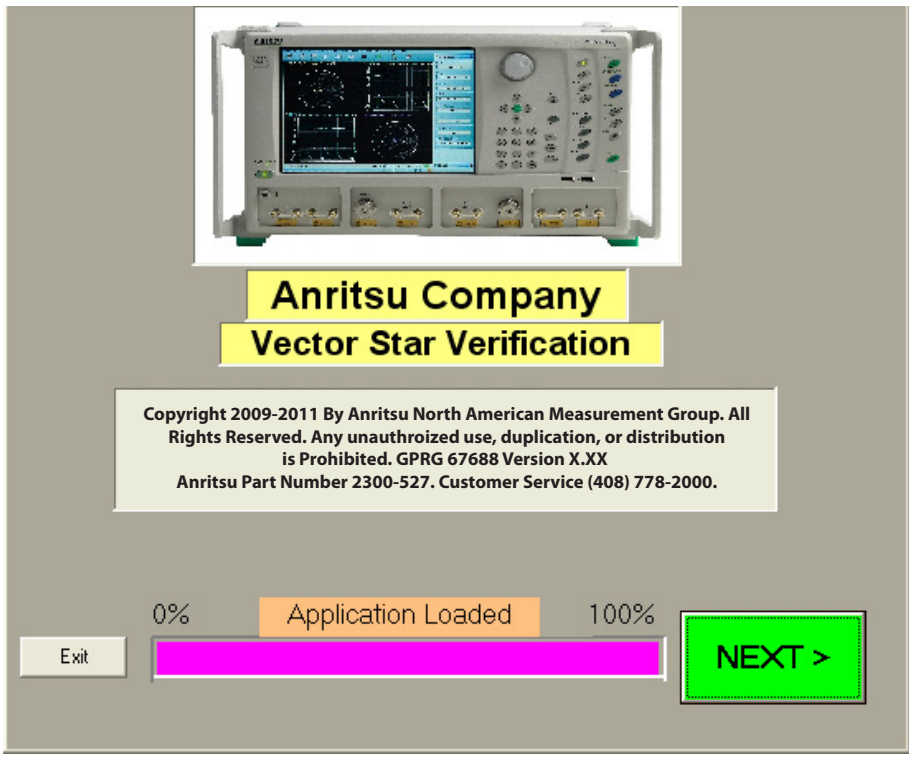


Figure 6-1. PVS Application Startup Dialog Box

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

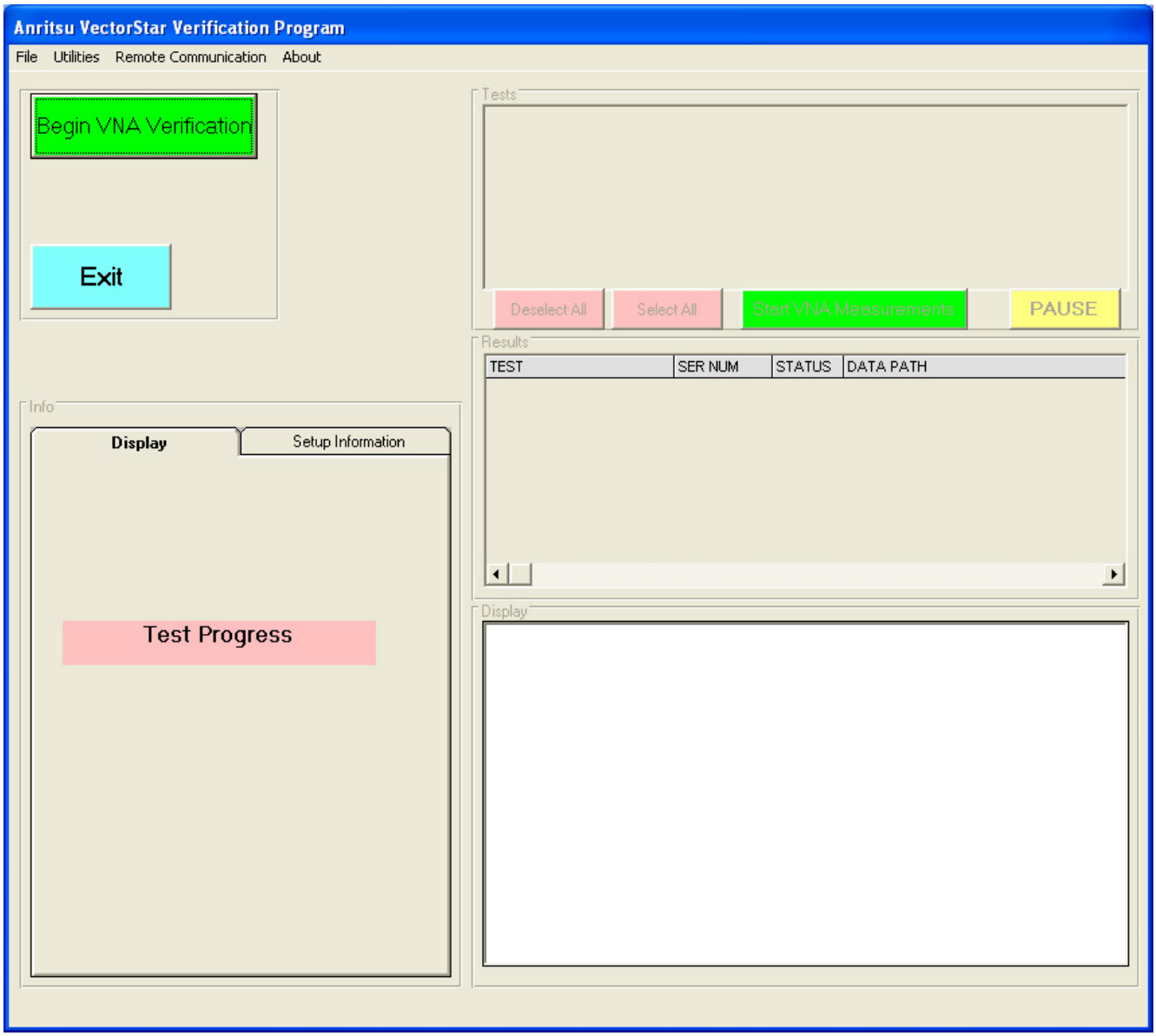


Figure 6-2. Verification Program Main Screen

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.

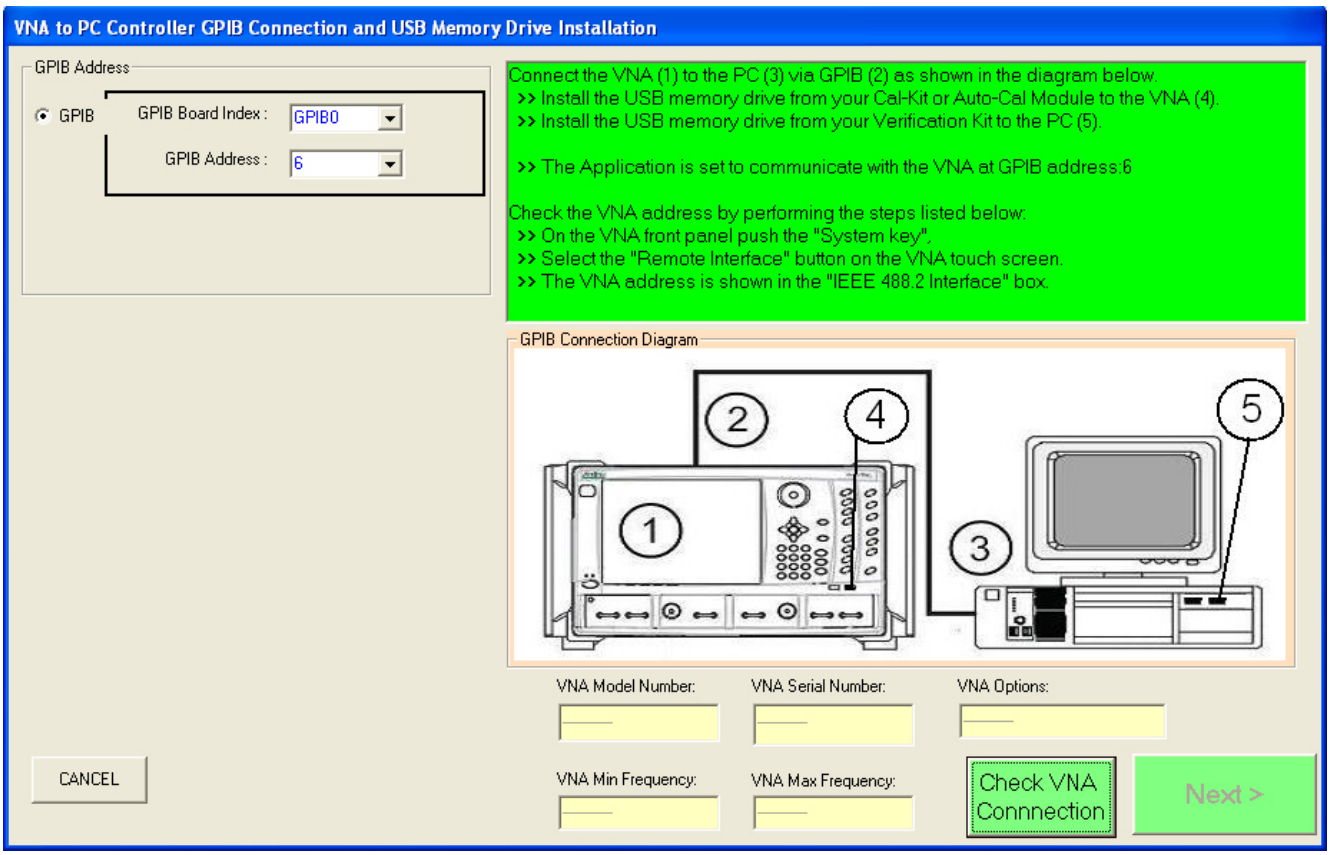


Figure 6-3. Check VNA GPIB Connection Screen - Empty Fields

7. If the GPIB addresses on either the card or the VNA must be changed, proceed as follows:

a. 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.

b. 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.

c. 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 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

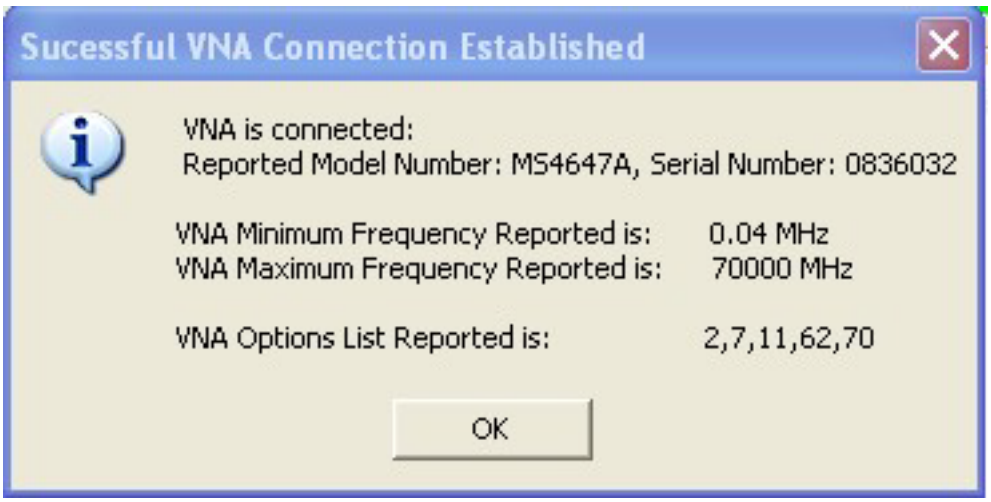


Figure 6-4. VNA Connection Verification Dialog Box – Example

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

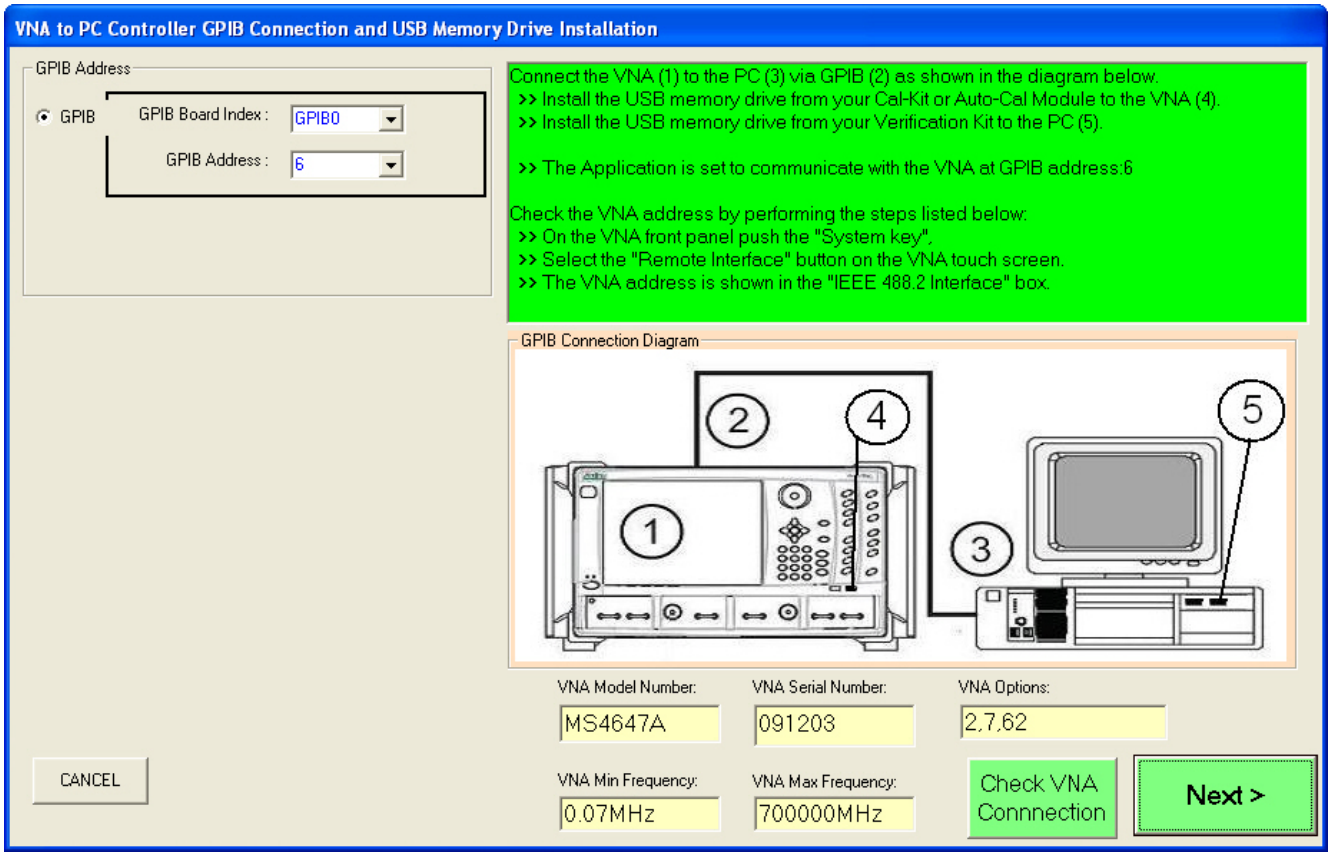


Figure 6-5. Check VNA GPIB Connection Screen - Completed Fields

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

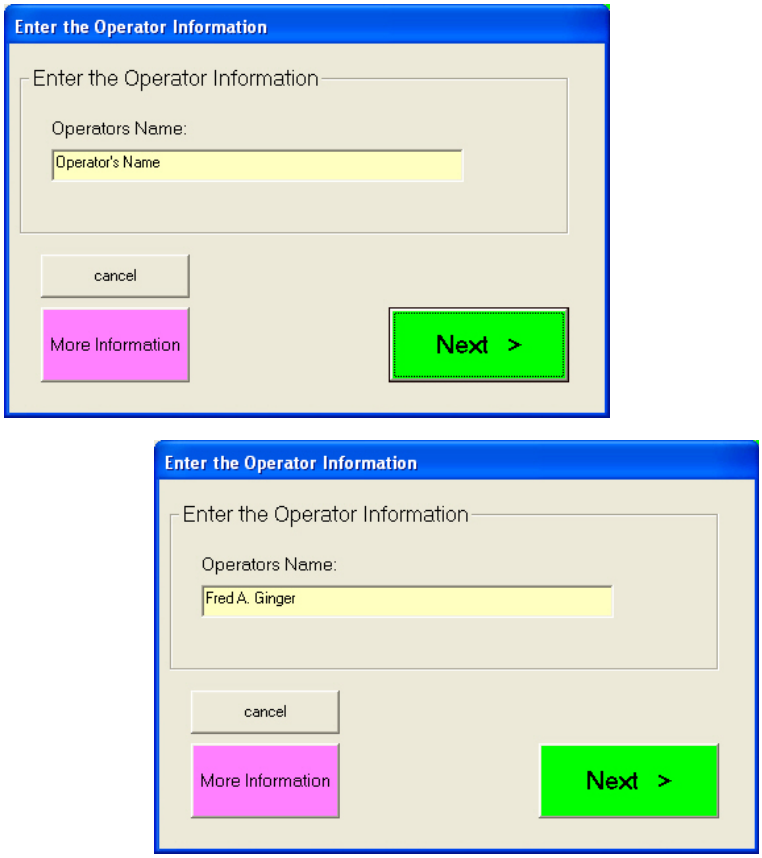


Figure 6-6. Enter Operation Information Dialog Box - Default (above) and User Input (below)

12. 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.

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

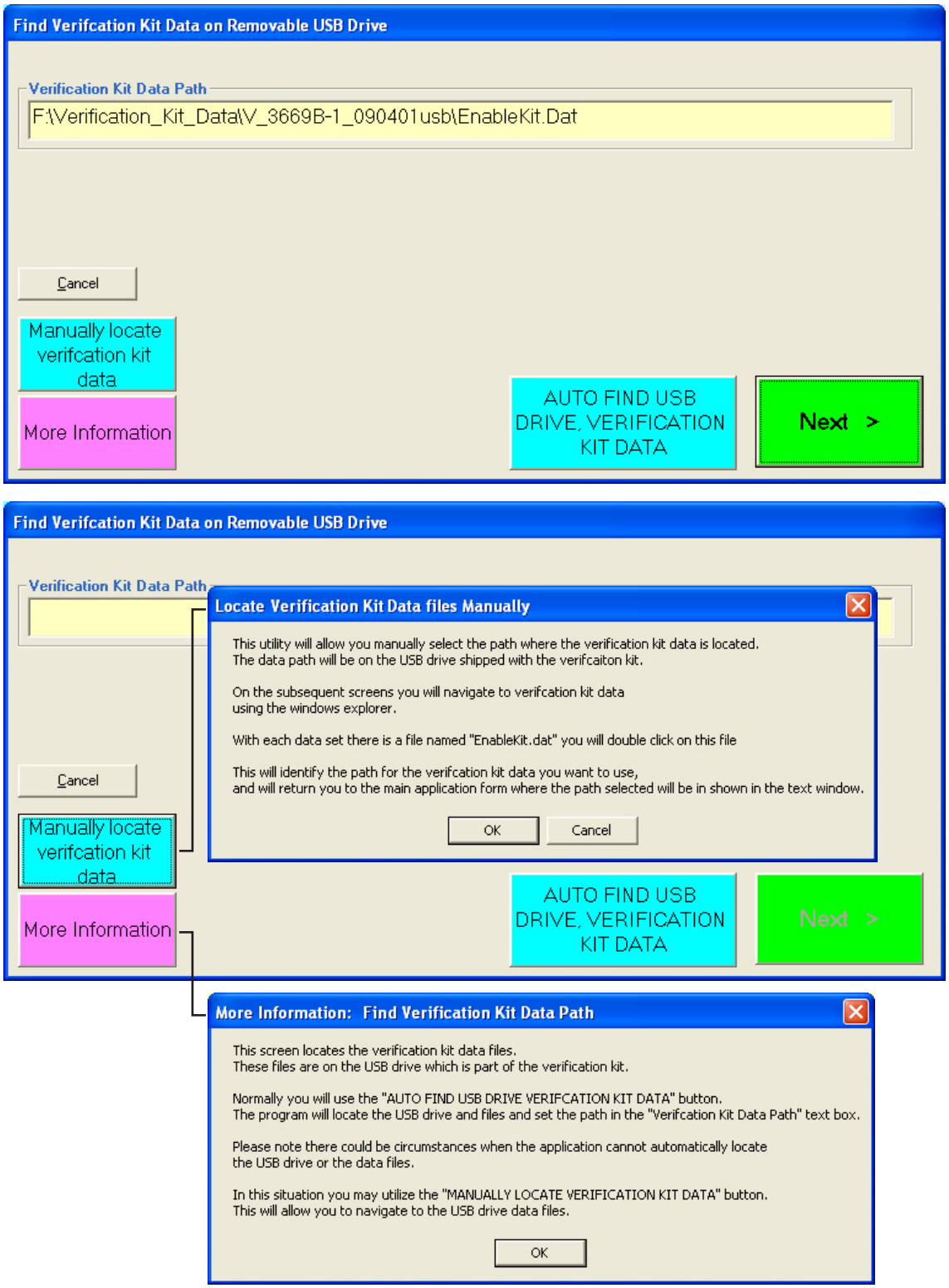


Figure 6-7. Find Verification Kit Data Dialog Boxes - Before (above) and After (below)

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

15. 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 6-7 above and the Next > button becomes available.
- **d.** If unsuccessful, an error message appears. In this case, use the step below.

16. 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.

17. When ready to proceed, click Next >.

Selecting the VNA Model Series and Test Definition Descriptors

18. The Test Definition Descriptor Files dialog box appears.

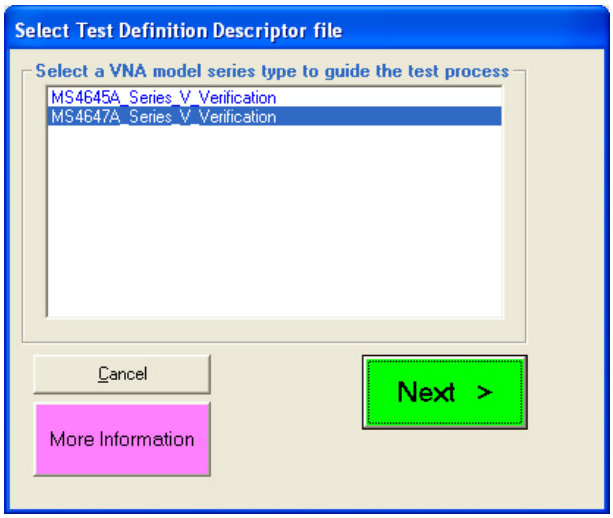


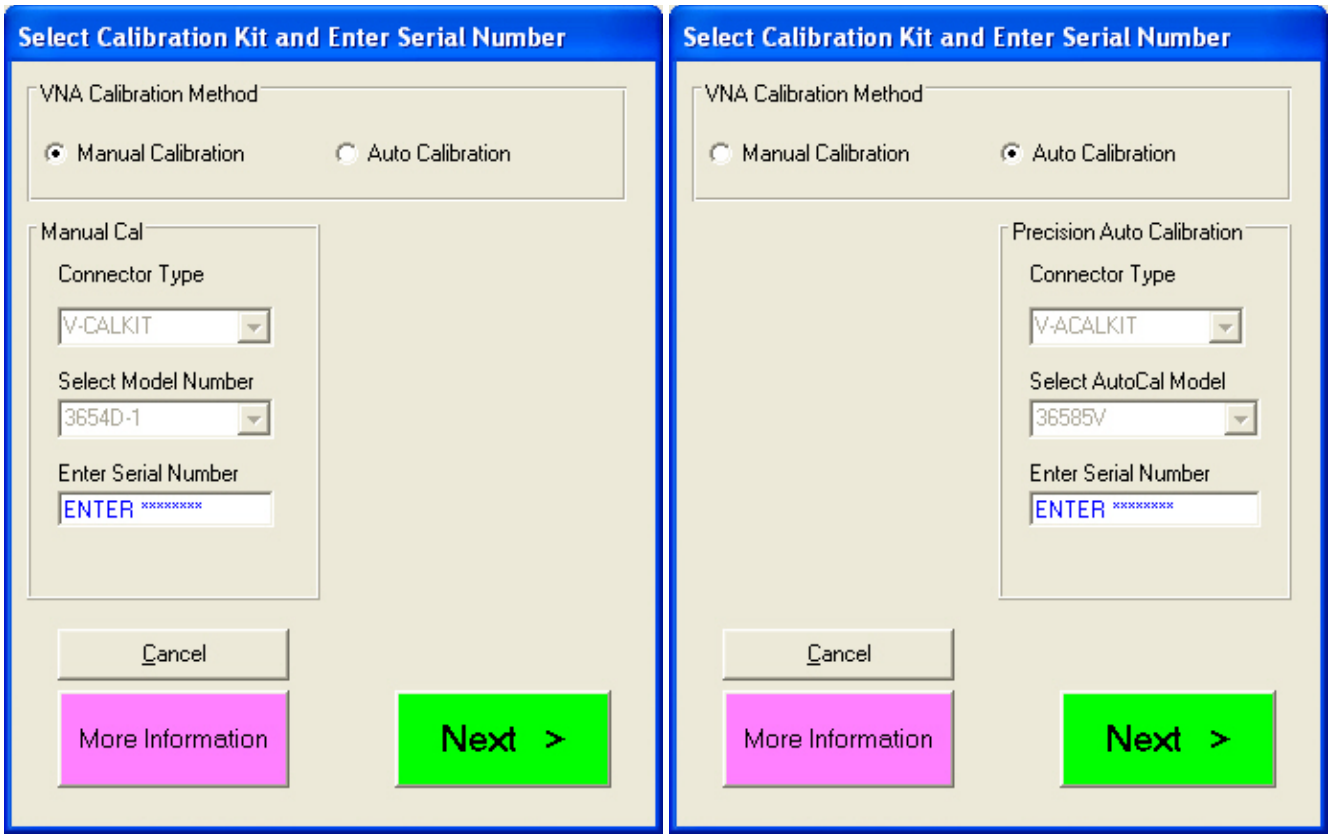
Figure 6-8. Select Test Definition Descriptor File Dialog Box

19. 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.

Selecting the Calibration Method

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

20. 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 6-9. Calibration Kit Type Selection Dialog Box and Fields

21. The next PVS action depends on the which calibration method was selected:

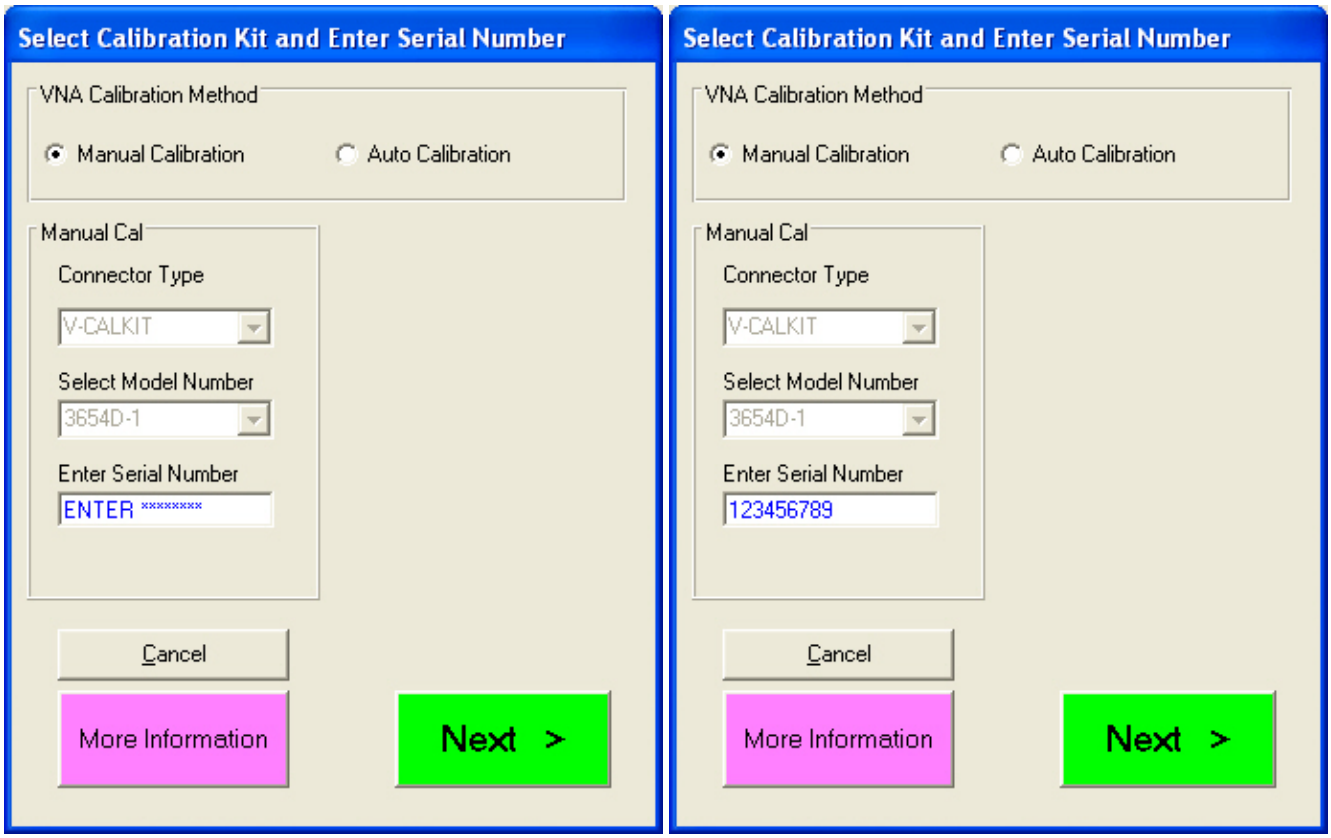
a. Manual Calibration selected: If the left side Manual Calibration button was selected, proceed below to Section 6-4 “Manual Calibration Kit Calibration Procedure” on page 6-12.

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 6-28.

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.

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 6-10. 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.

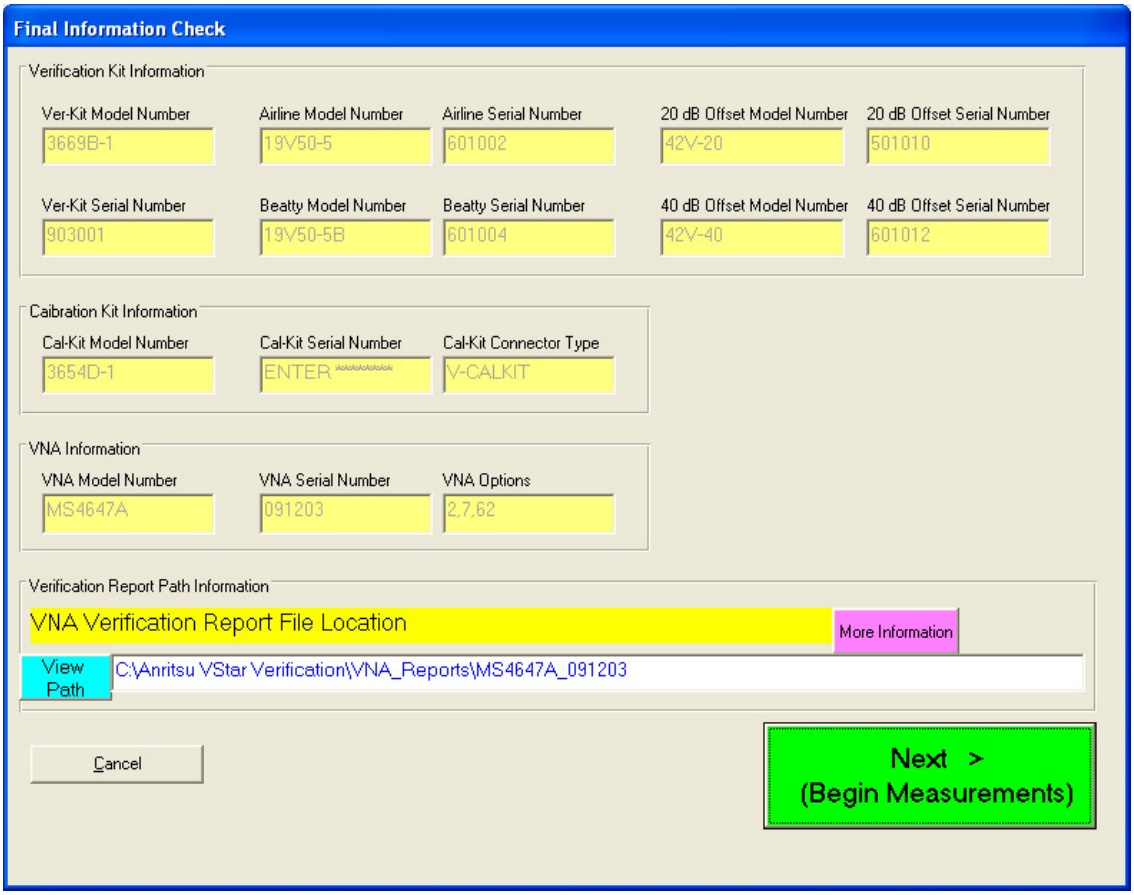
Note	If the fields are not available, then the exact calibration kit and or connector type must be utilized to perform the calibration.

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 6-11.



• 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\<VNA Model Number>_<VNA Serial Number>. • The path name must keep the first portion of the default path as C:\Anritsu VStar Verification\VNA_Reports\.

Figure 6-11. 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\<VNA Model Number>_<VNA Serial Number>` such as `...\MS4647A_091203`.

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.

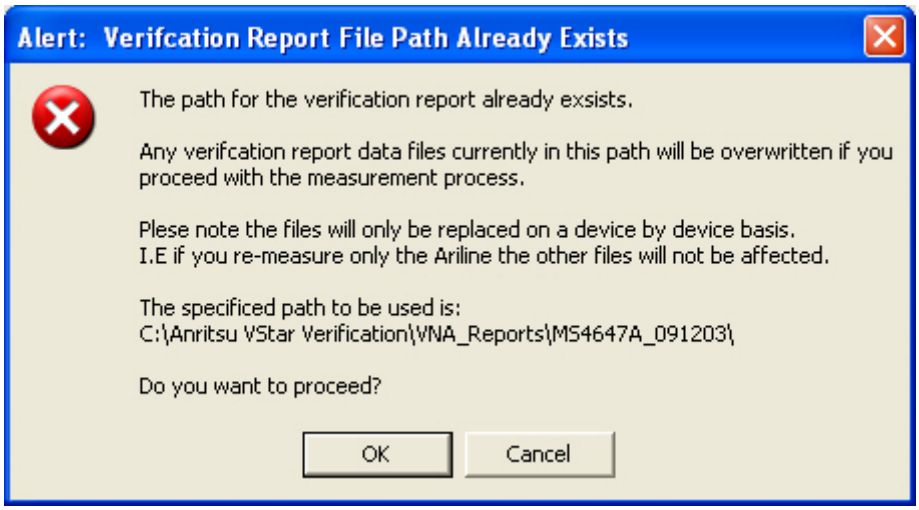


Figure 6-12. Alert Verification Report File Path Dialog Box

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 6-11.

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.

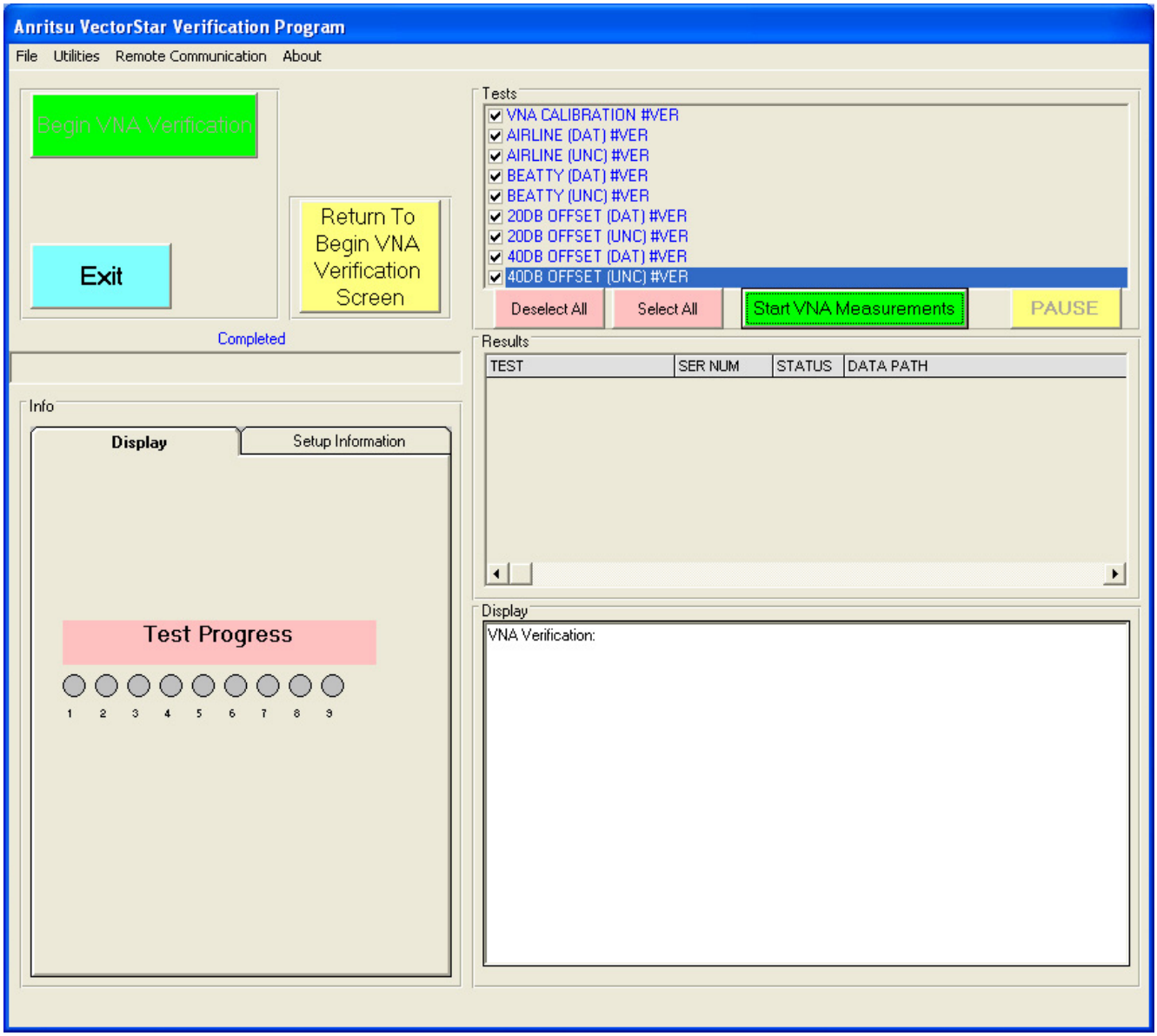
- If necessary, change the Verification Report Path as required. The top portion of the file path must be kept as `C:\Anritsu VStar Verification\VNA_Reports\...`
- The recommended destination directory is `C:\Anritsu VStar Verification\VNA_Reports\<VNA Model Number>_<VNA Serial Number>` such as **`...\MS4647A_091203`**.

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

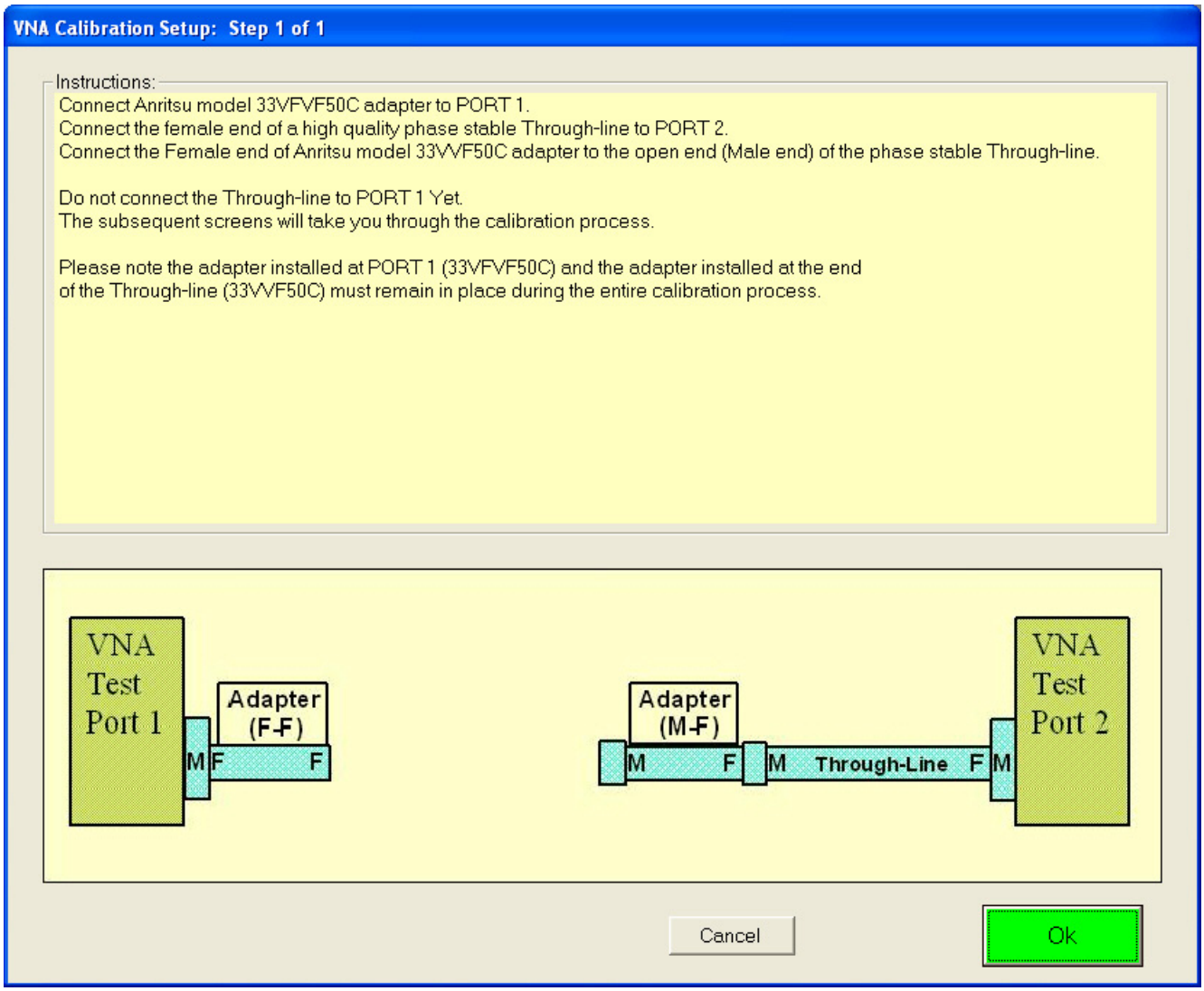
Figure 6-13. Verification Program Main Screen - Ready to Start Calibration

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.



- 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 6-14. VNA Calibration Initial Setup

15. At **Port 1**, connect the **F-F Adapter**.Connect the **F-End** of the **F-M Through Line** to **Port 2** and connect the M-F Adapter to the open end of the Through Line.

16. 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.

17. When ready to proceed, click OK.

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.

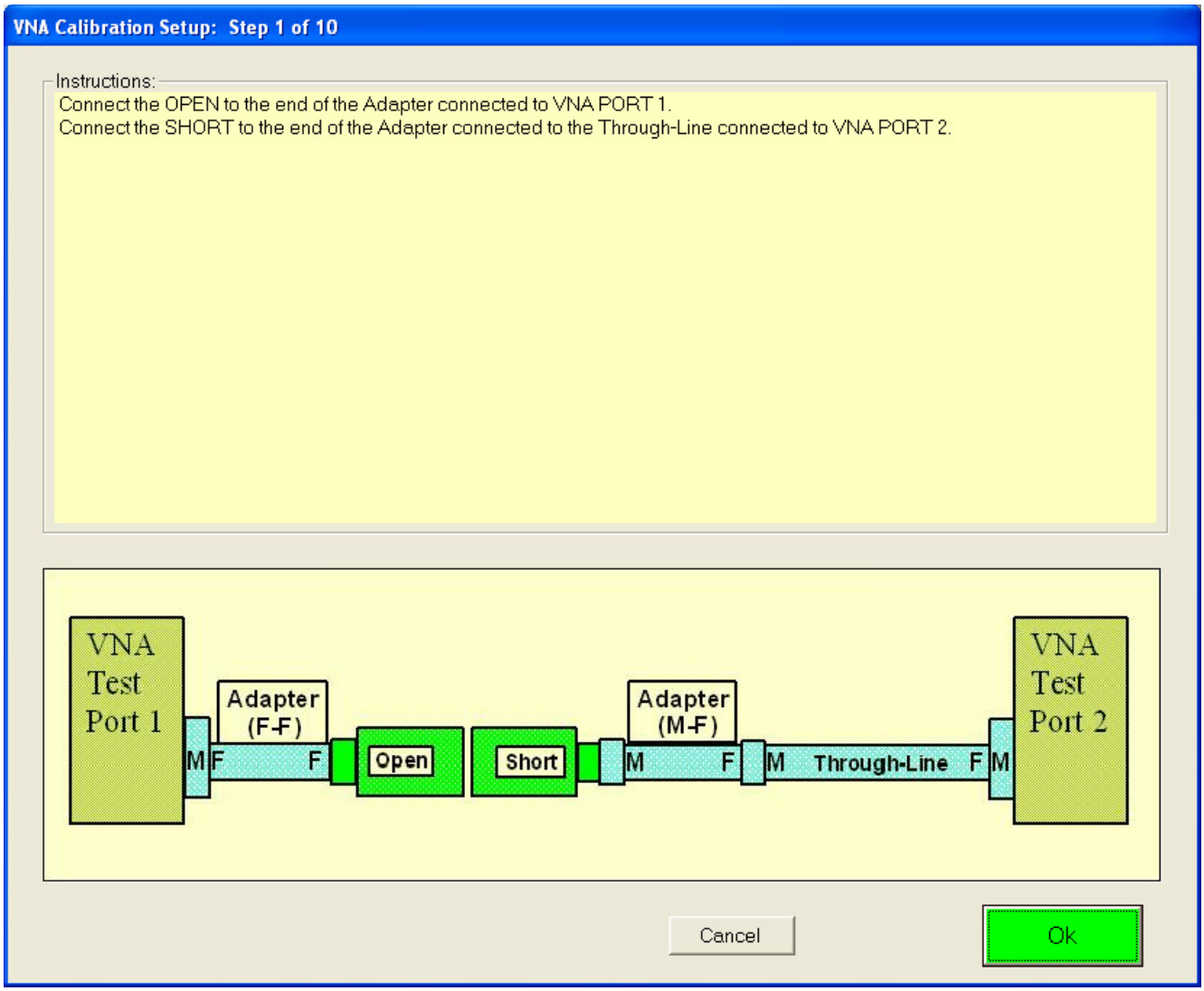


Figure 6-15. VNA Calibration Setup – Fixed Step 1 of 4 – Sliding Step 1 of 10

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.

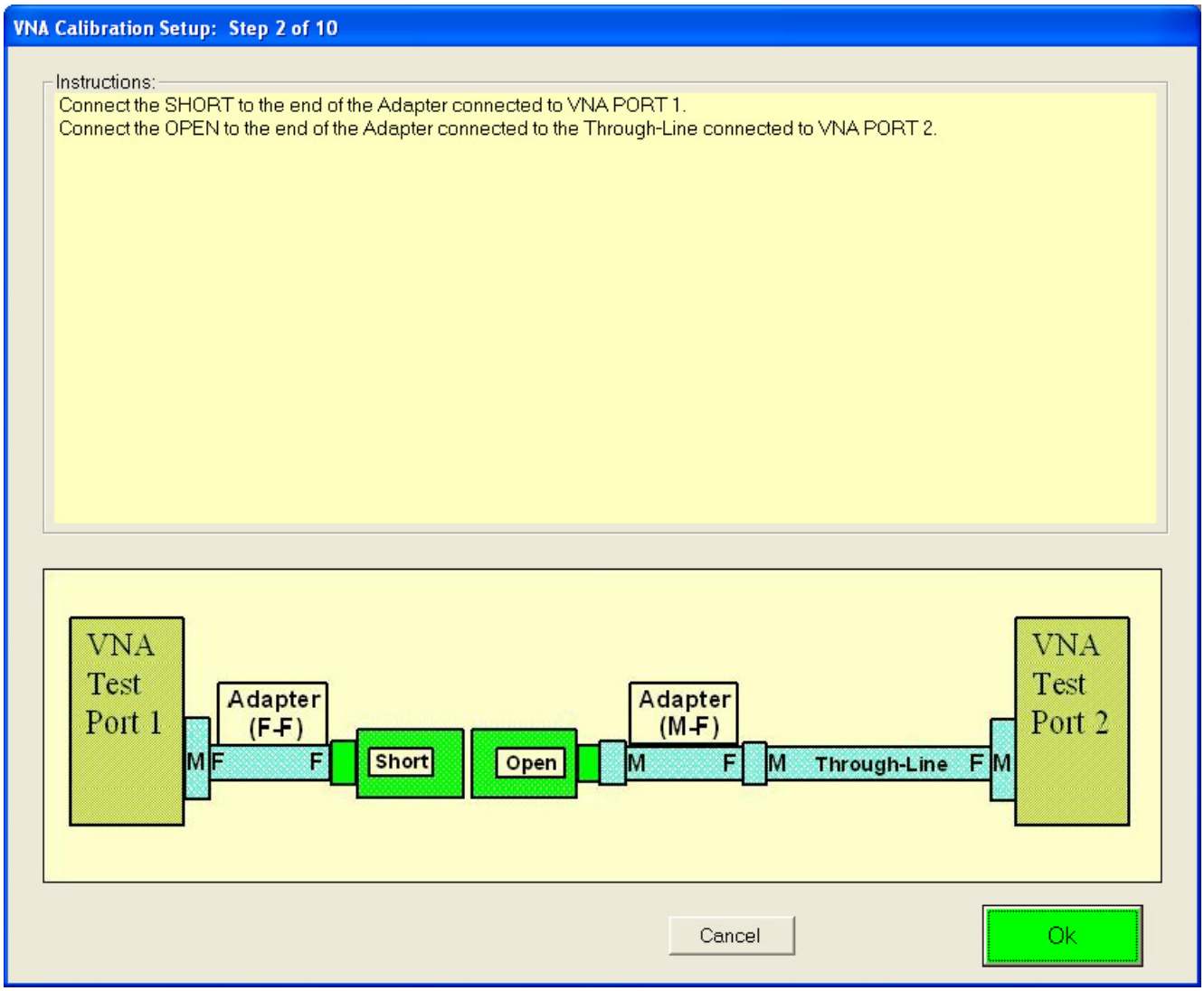


Figure 6-16. VNA Calibration Setup – Fixed Step 2 of 4 – Sliding Step 2 of 10

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.

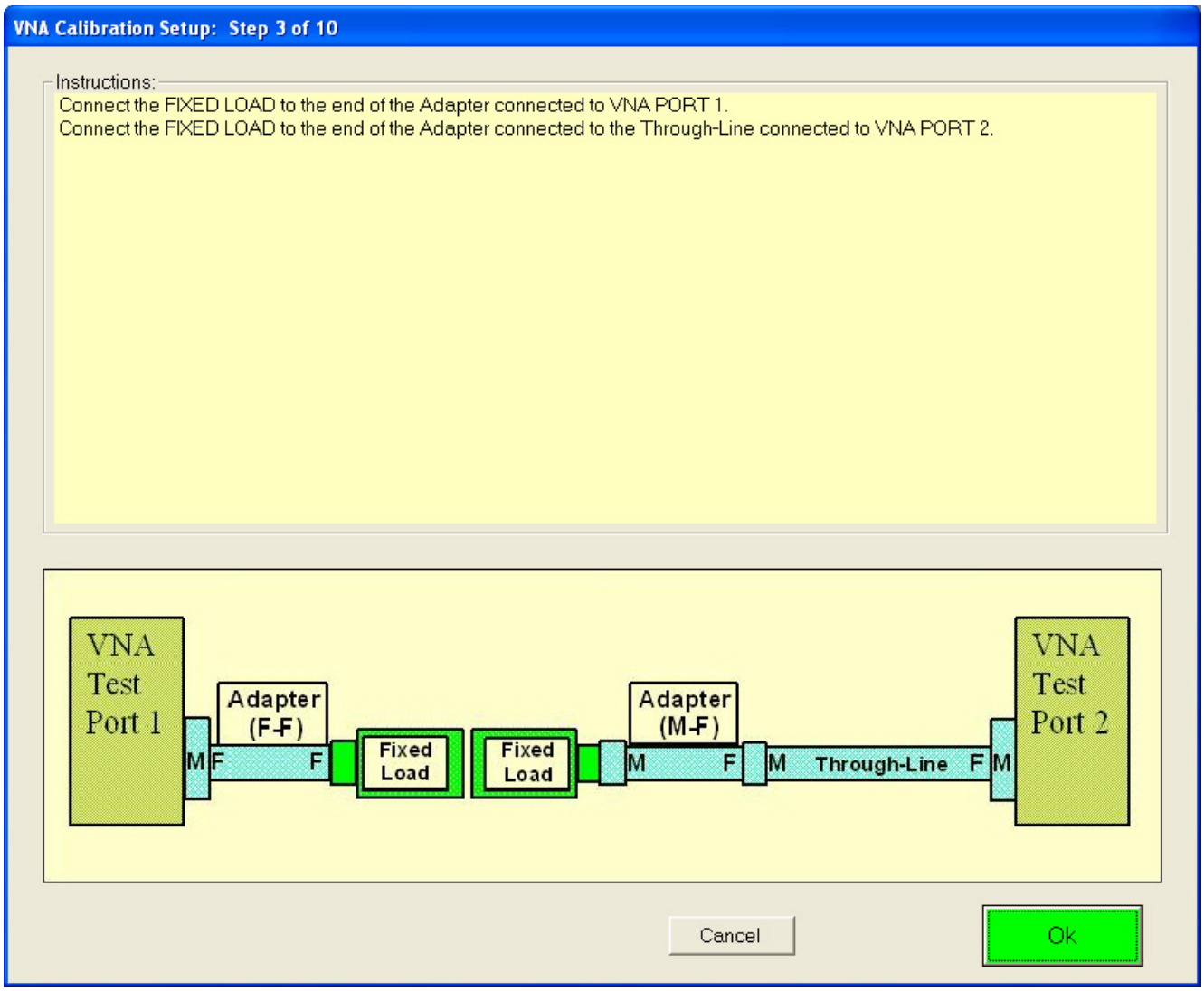


Figure 6-17. VNA Calibration Setup - Step 3 of 10

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 6-26 below.
- If using a calibration kit with sliding loads, continue below with "VNA Calibration Setup - Sliding Loads - Step 4 of 10" on page 6-20 immediately below.

VNA Calibration Setup - Sliding Loads - Step 4 of 10

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

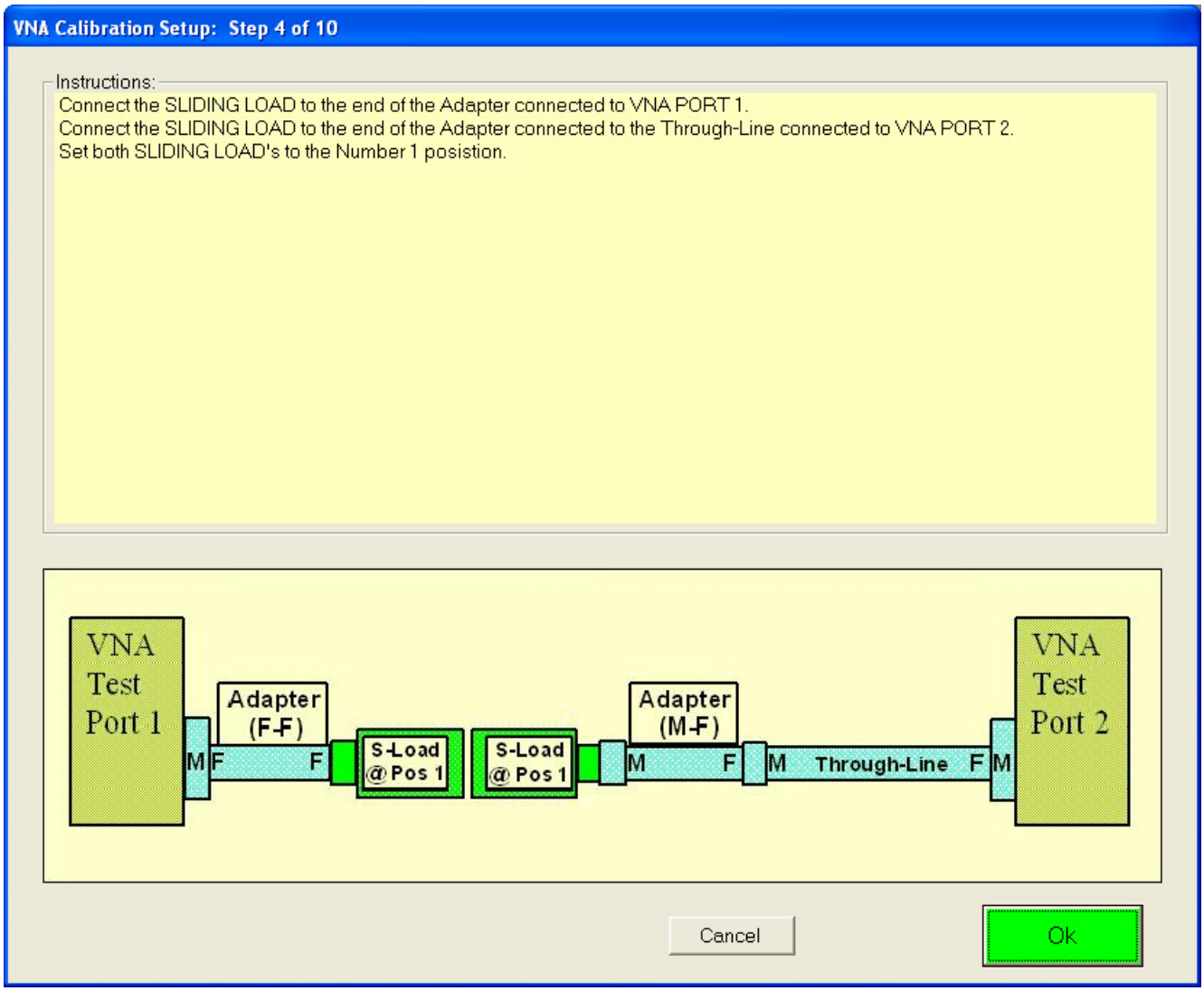


Figure 6-18. VNA Calibration Setup – Sliding Loads – Step 4 of 10

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.

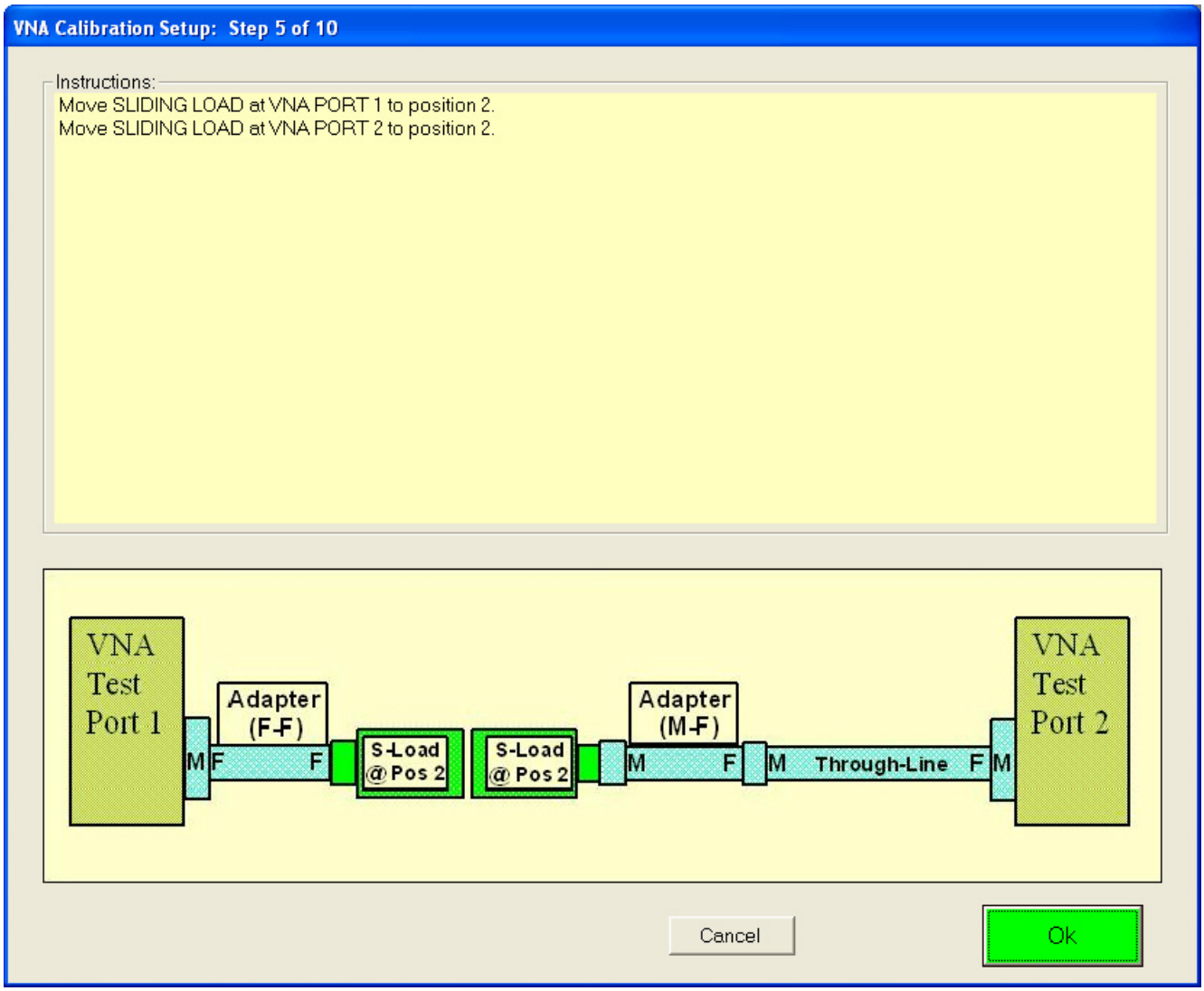


Figure 6-19. VNA Calibration Setup – Sliding Loads – Step 5 of 10

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.

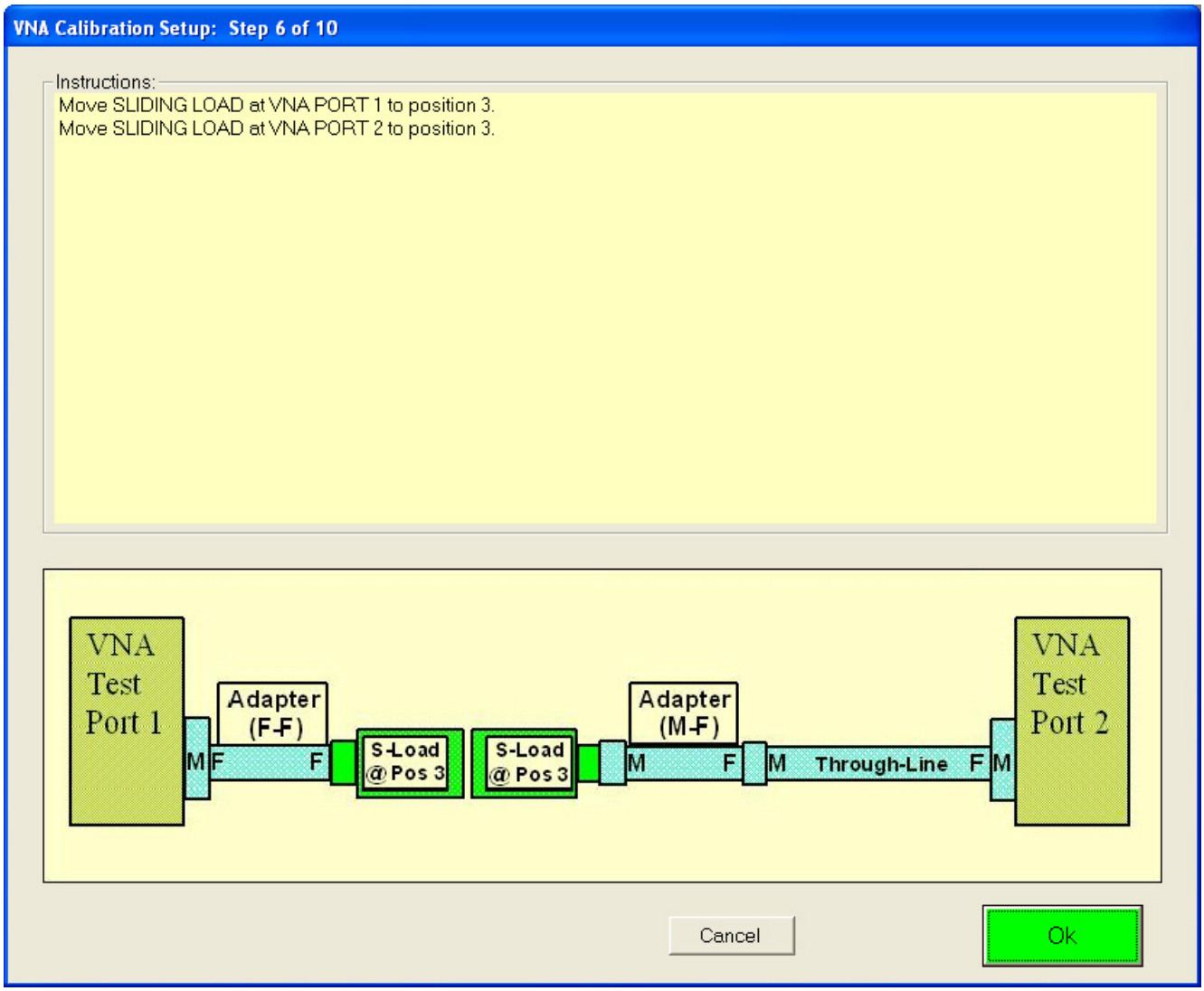


Figure 6-20. VNA Calibration Setup – Sliding Loads – Step 6 of 10

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.

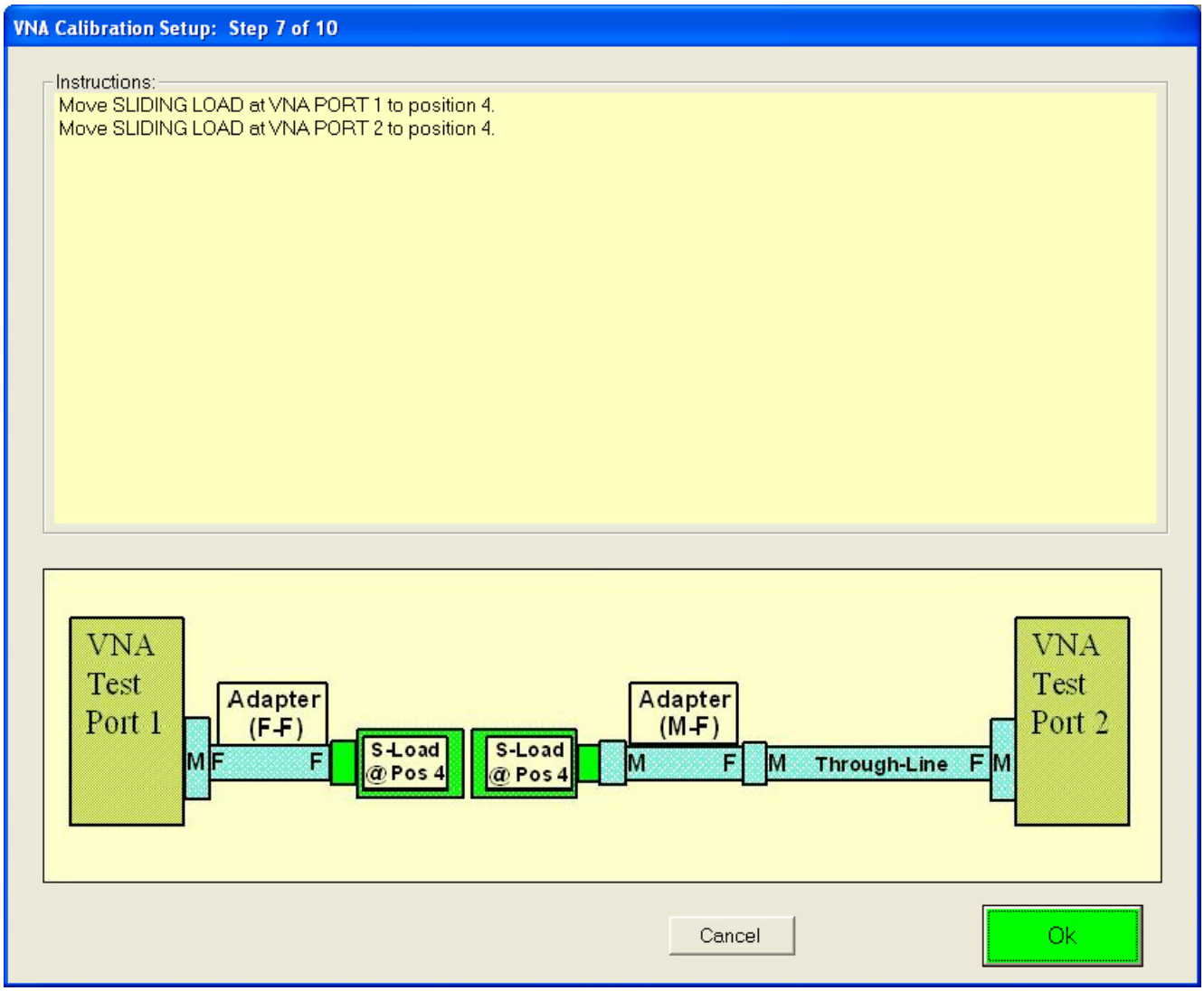


Figure 6-21. VNA Calibration Setup – Sliding Loads – Step 7 of 10

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.

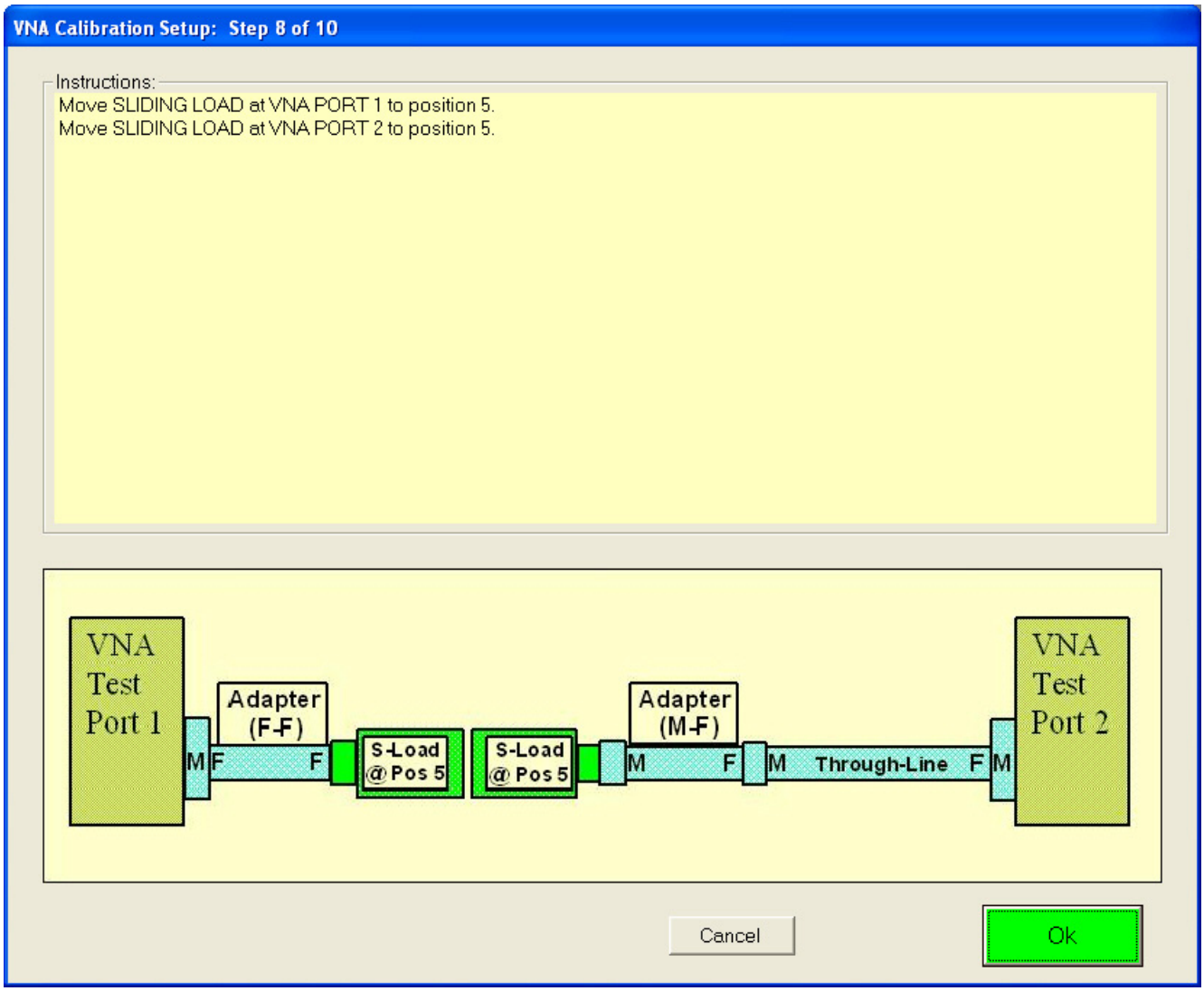


Figure 6-22. VNA Calibration Setup – Sliding Loads – Step 8 of 10

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.

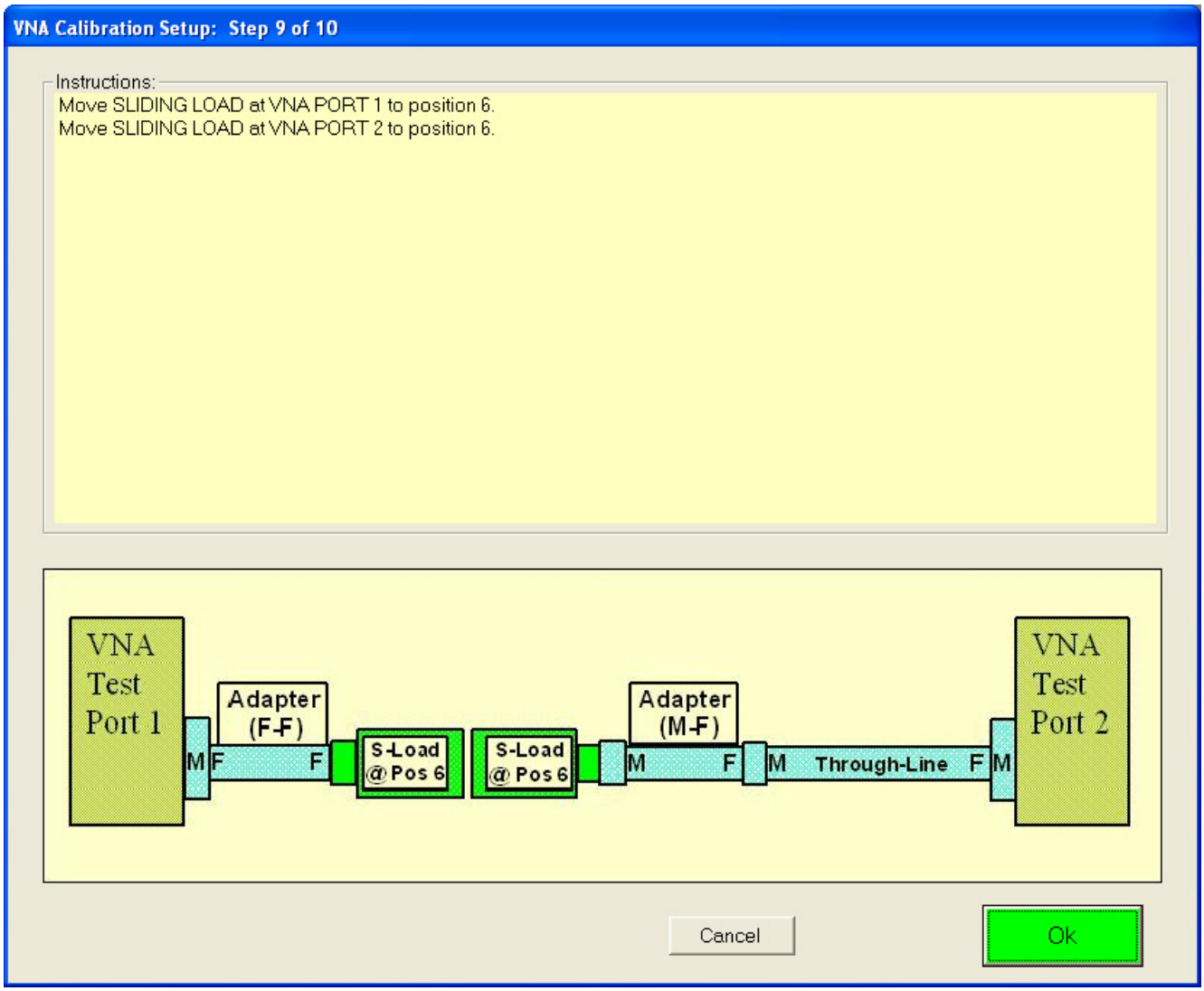


Figure 6-23. VNA Calibration Setup – Sliding Loads – Step 9 of 10

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.

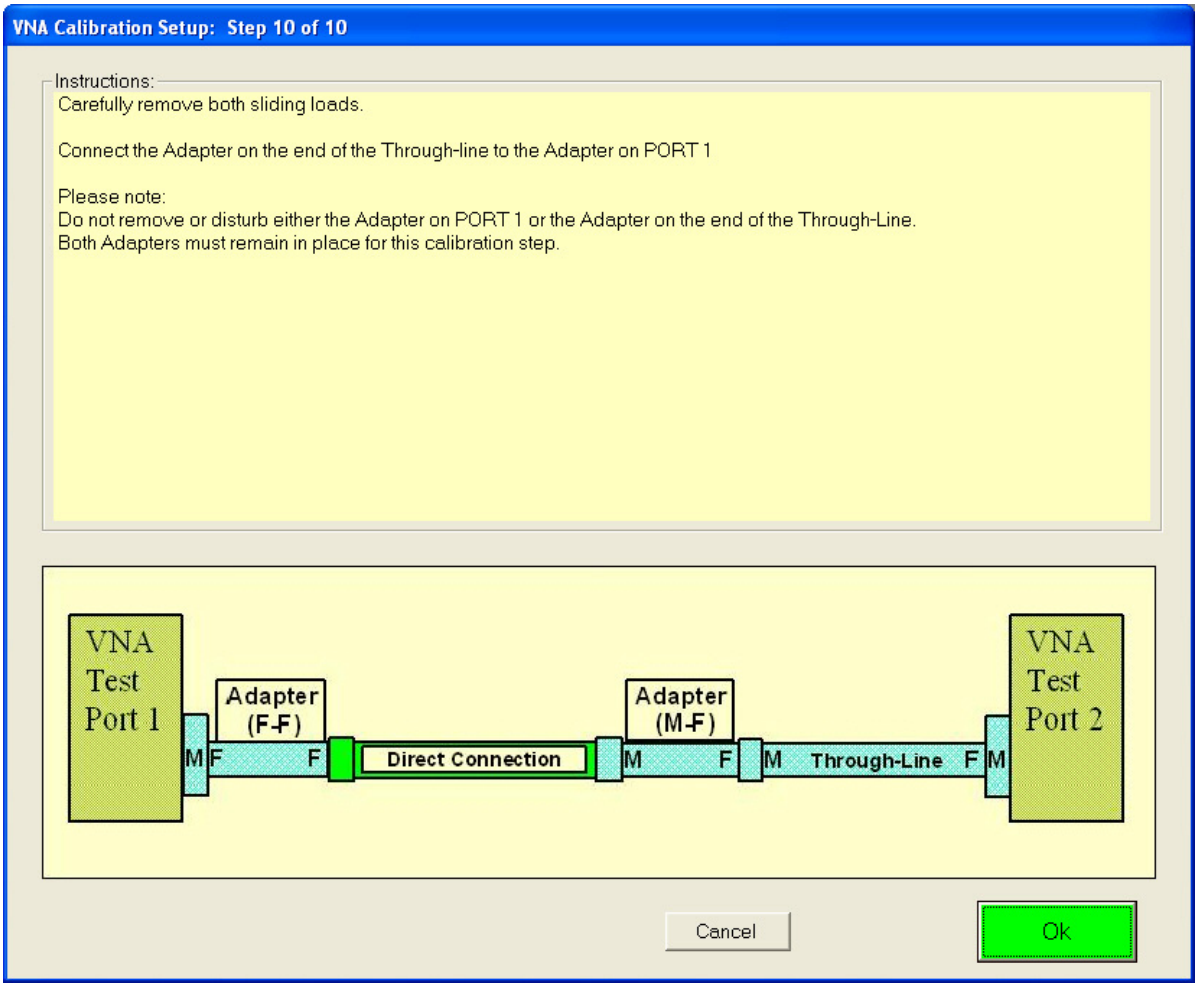


Figure 6-24. VNA Calibration Setup - Step 10 of 10

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 6-24.

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.

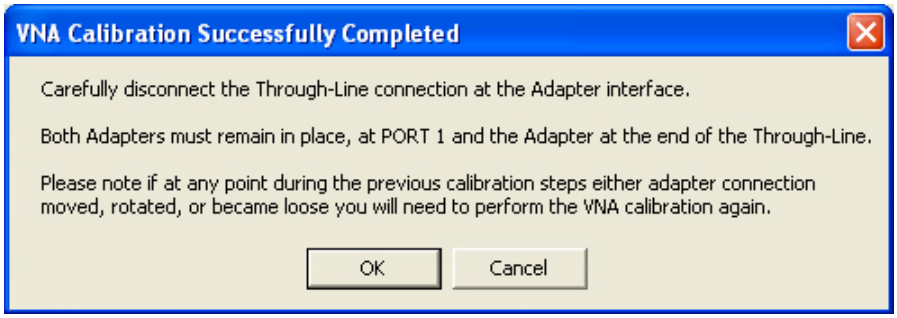


Figure 6-25. VNA Calibration Successfully Completed Dialog Box

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

Note	The **F-F Adapter** at **Port 1** and the **M-F Adapter** at the end of the **Through Line** on **Port 2** MUST 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.

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 the 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.

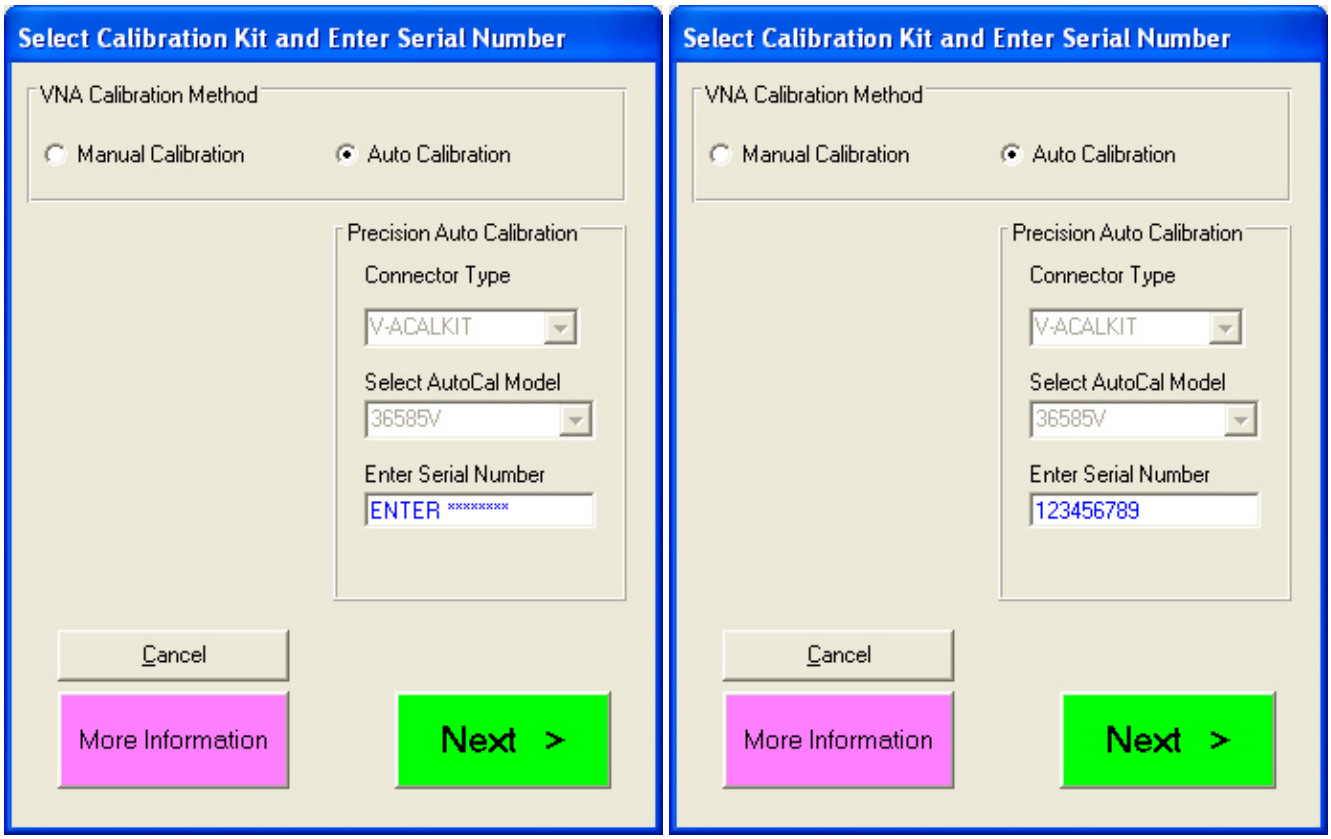
6-5 AutoCal Module Calibration Kit Procedure

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:

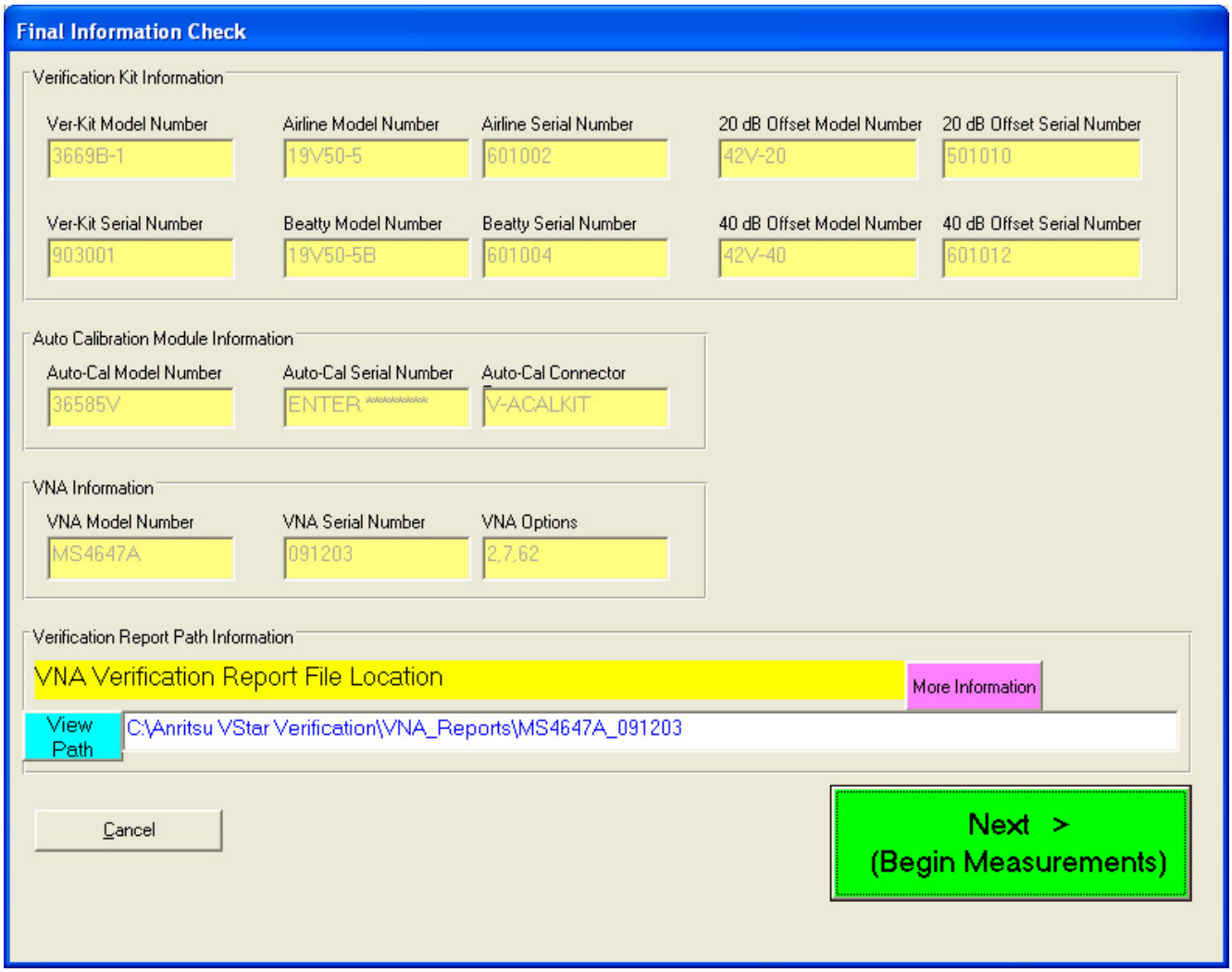
1. On the SELECT CALIBRATION KIT dialog box, select the Auto Calibration button.
   - The Precision Auto Calibration area appears with fields for Connector Type, Select AutoCal Model, and Enter Serial Number.



- 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 6-26. Select Calibration Kit Dialog Box - Auto Calibration Method Selected

2. 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 6-11.



• 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\<VNA Model Number>_<VNA Serial Number>. • The path name must keep the first portion of the default path as C:\Anritsu VStar Verification\VNA_Reports\.

Figure 6-27. Final Information Check Screen - Precision AutoCal Module

3. 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\<VNA Model Number>_<VNA Serial Number>` such as `...\MS4647A_091203`.

4. 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.

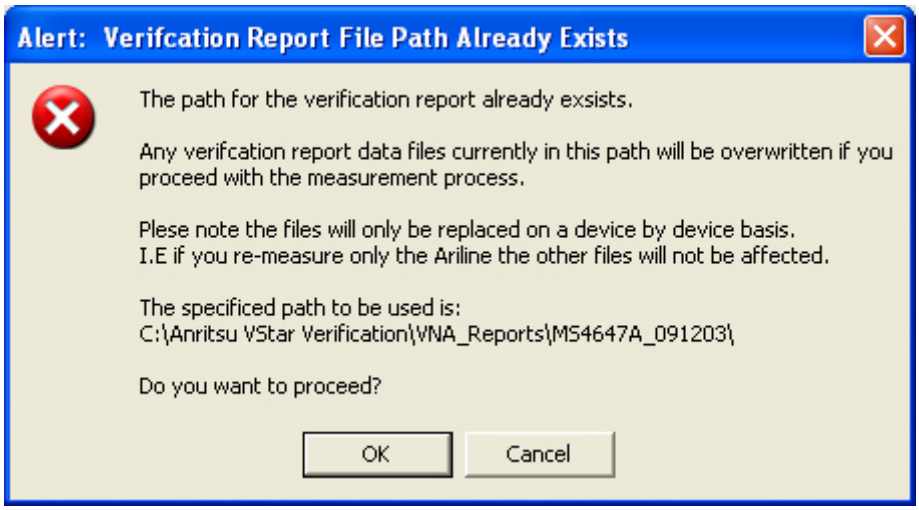


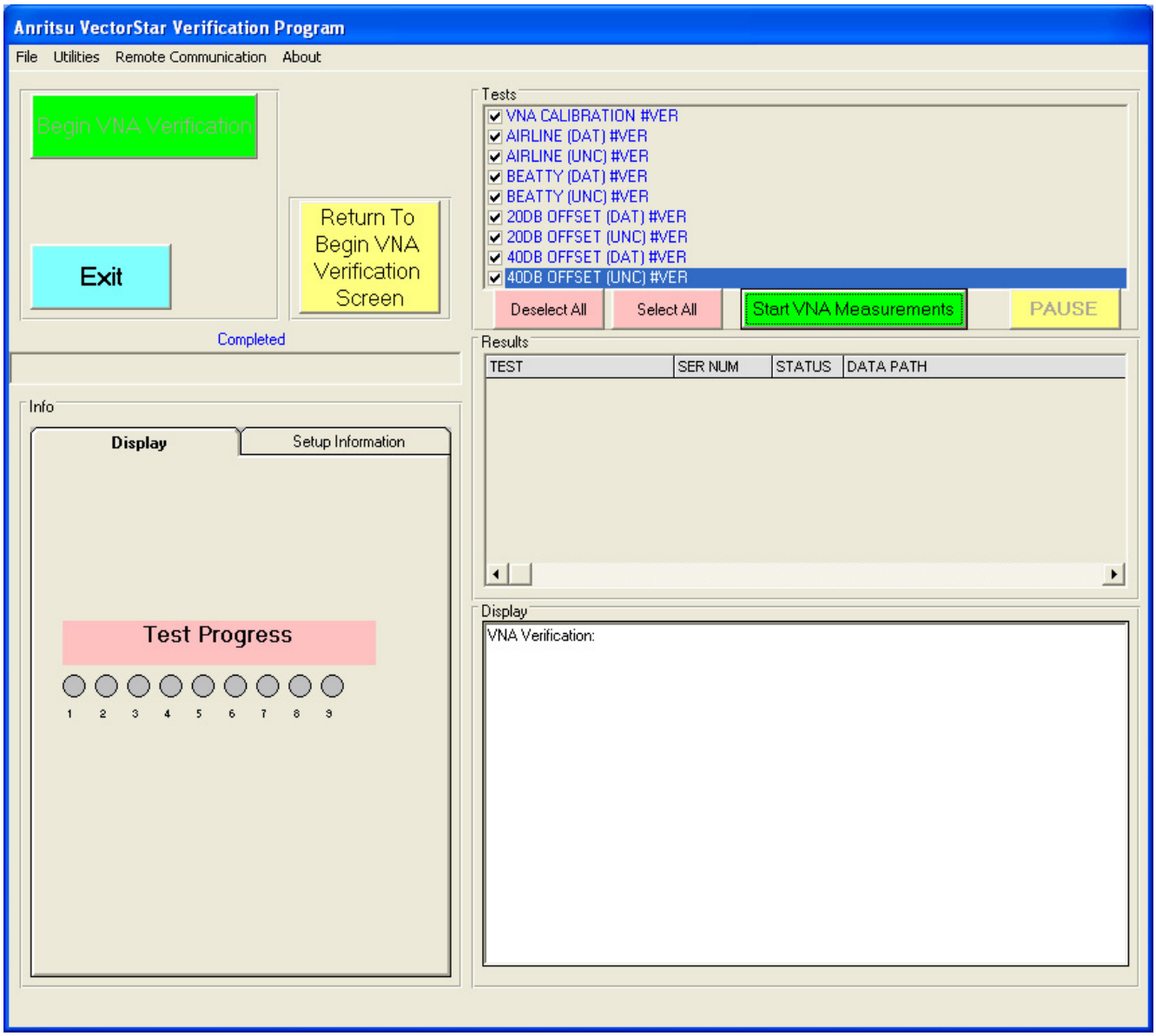
Figure 6-28. Alert Verification Report File Path Dialog Box

6. To stop the test and select another path, click Cancel. The program returns to the Final Information Check screen shown above in Figure 6-27.

- **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 6-29. 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.

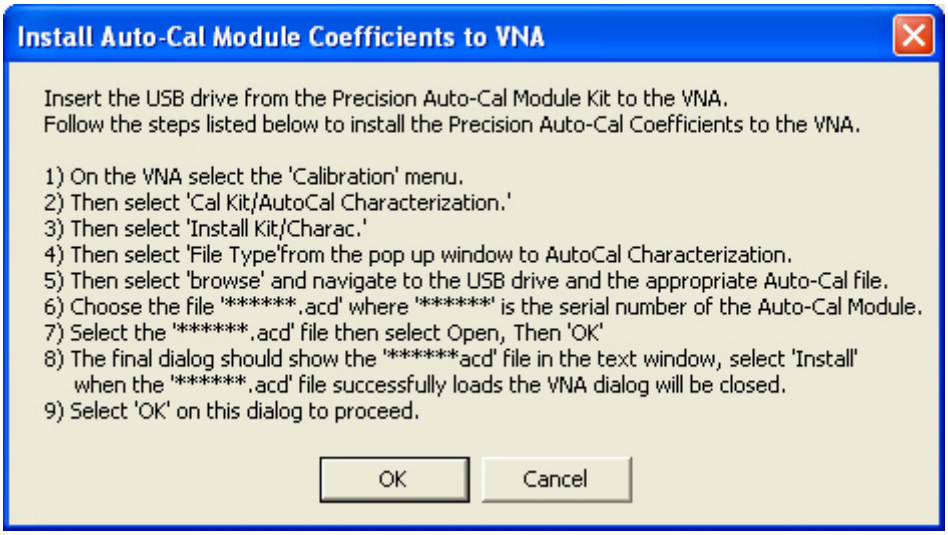


Figure 6-30. Install AutoCal Module Coefficients Dialog Box

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.

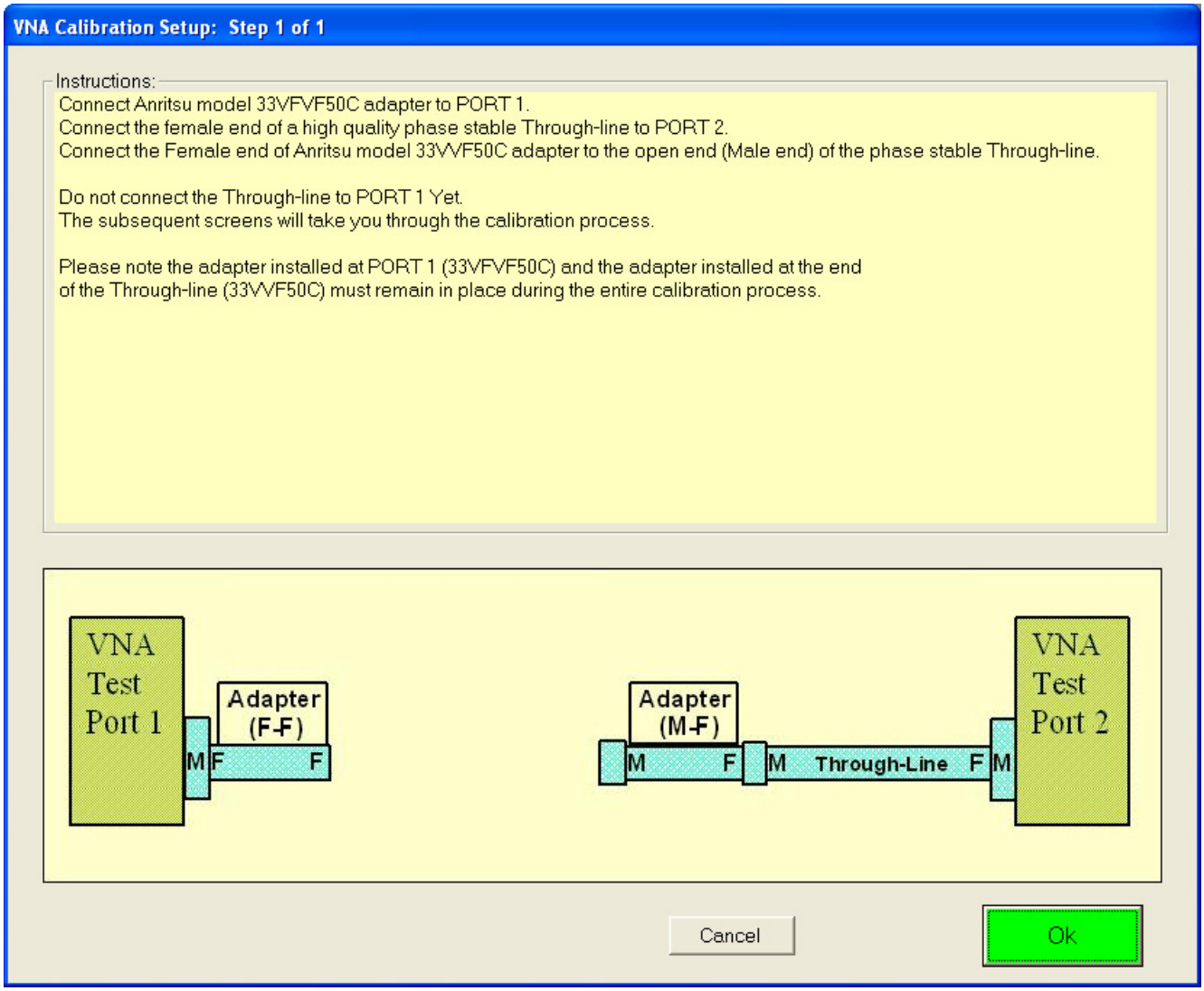


Figure 6-31. VNA AutoCal Calibration Setup

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**, connect an **F-F Adapter**.

17. To **Port 2**, 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 OK. 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.

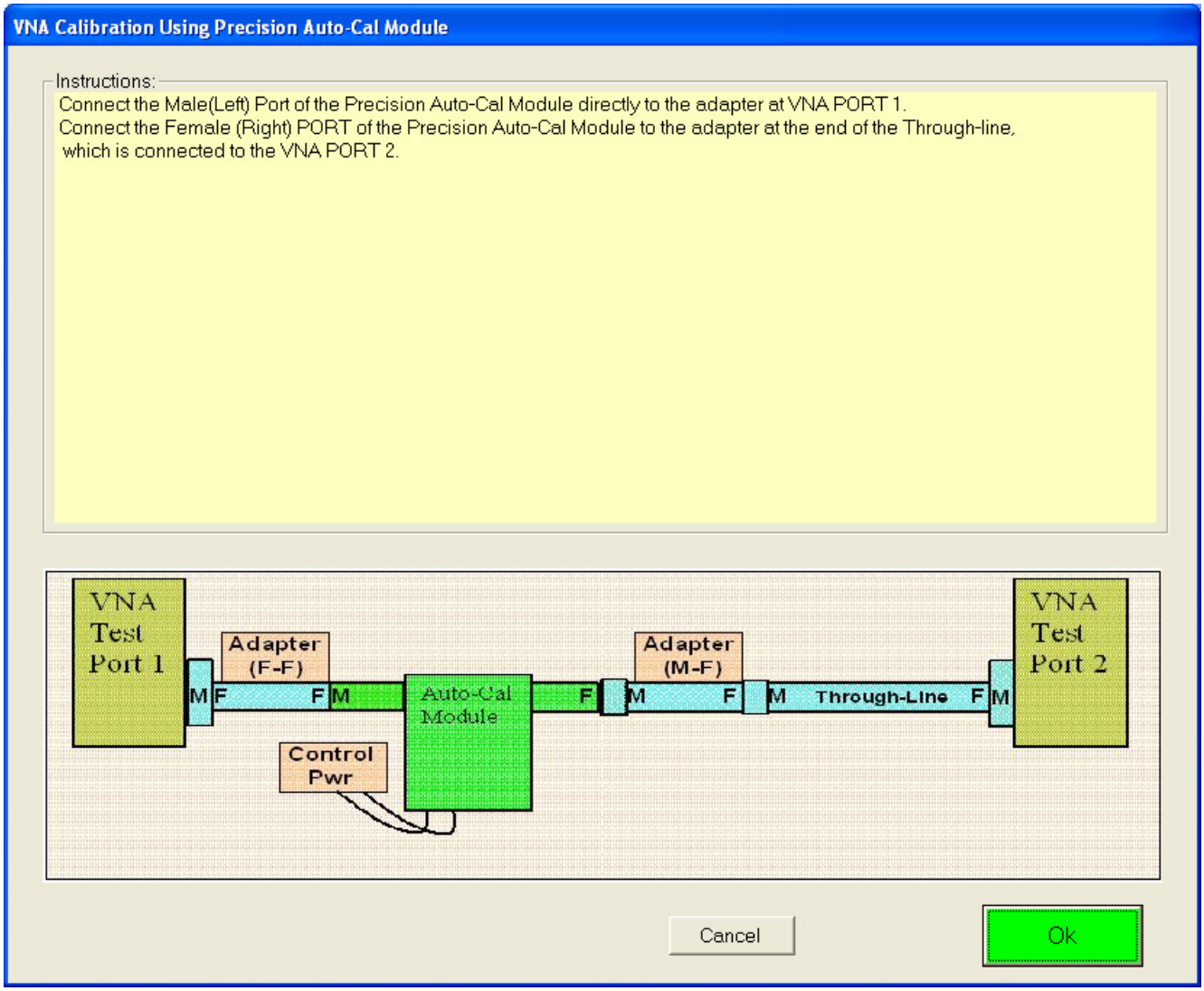


Figure 6-32. VNA Calibration Using a Precision AutoCal Module

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.

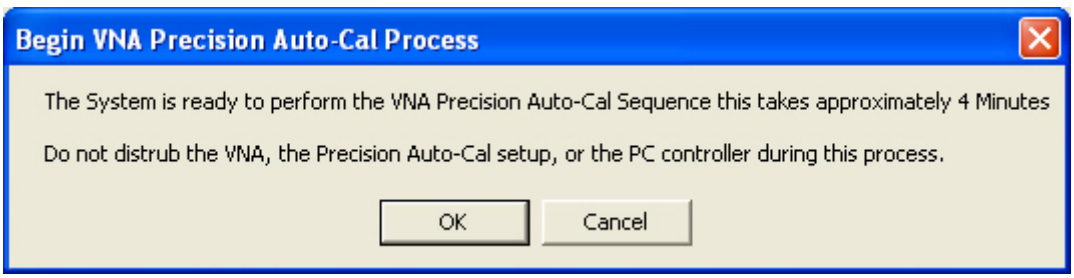


Figure 6-33. Begin VNA AutoCal Calibration Dialog Box

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.

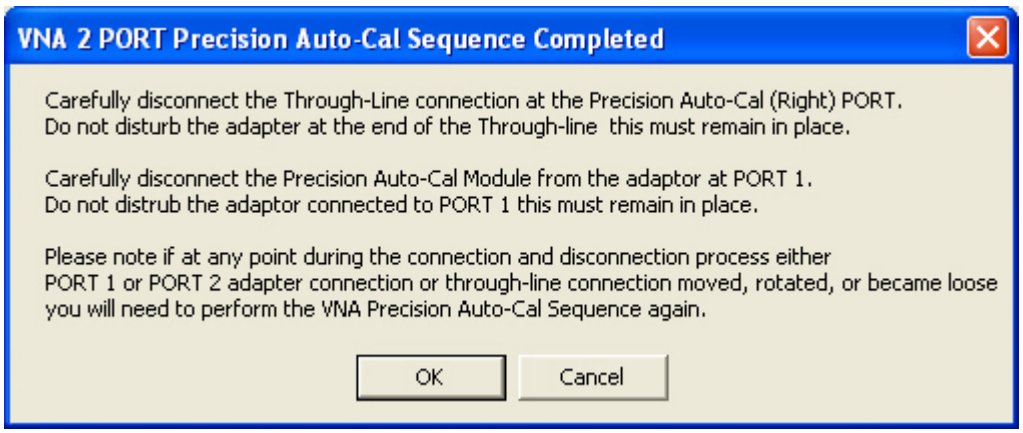


Figure 6-34. Precision AutoCal Sequence Completed Dialog Box

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 the 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 provides 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 6-28

7-3 Verification Program Main Screen

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

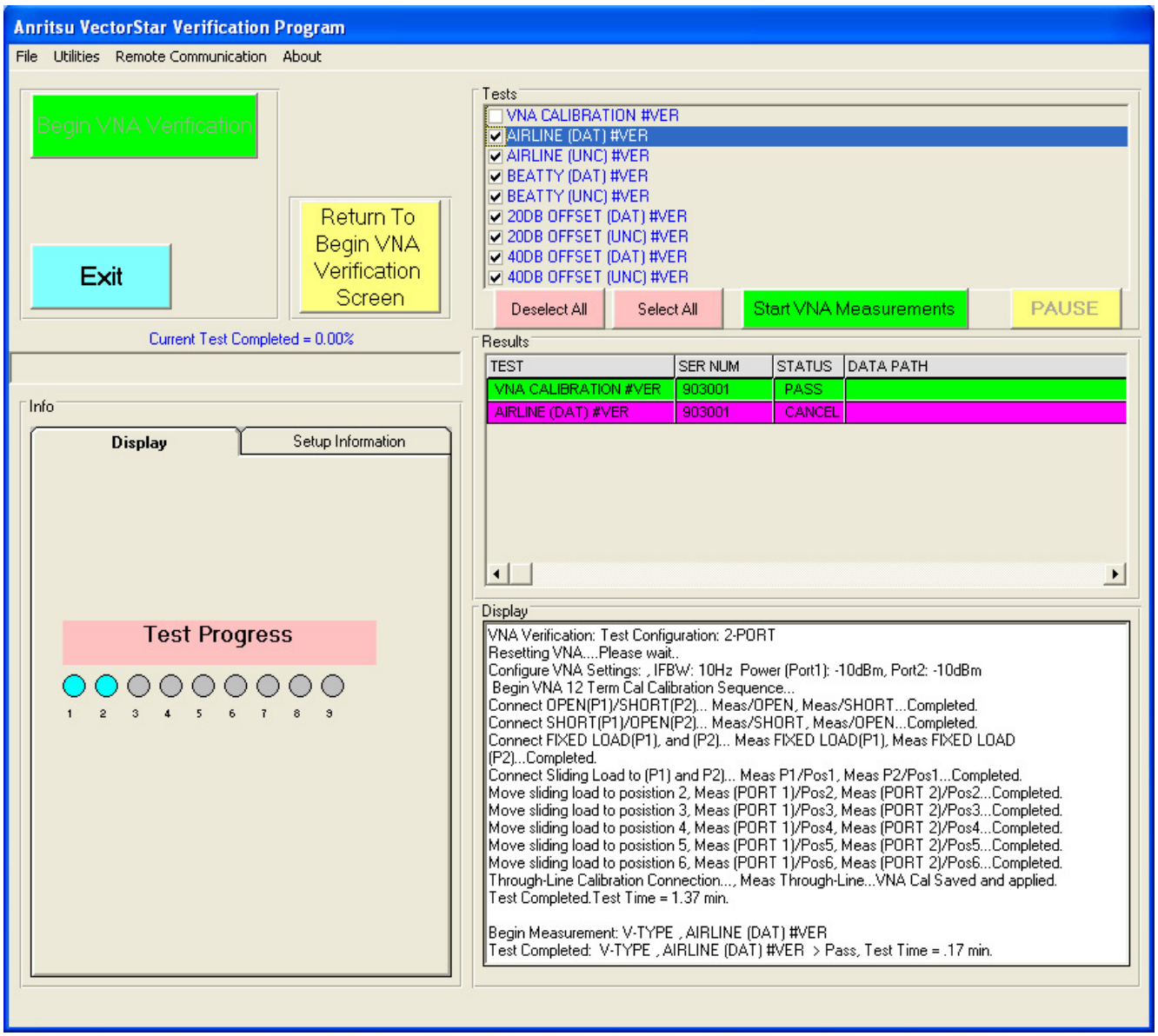


Figure 7-1. Verification Program Main Screen - Calibration Complete - Ready for Verification

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 6-28.
2. The Device Connection - AIRLINE screen appears as shown below.

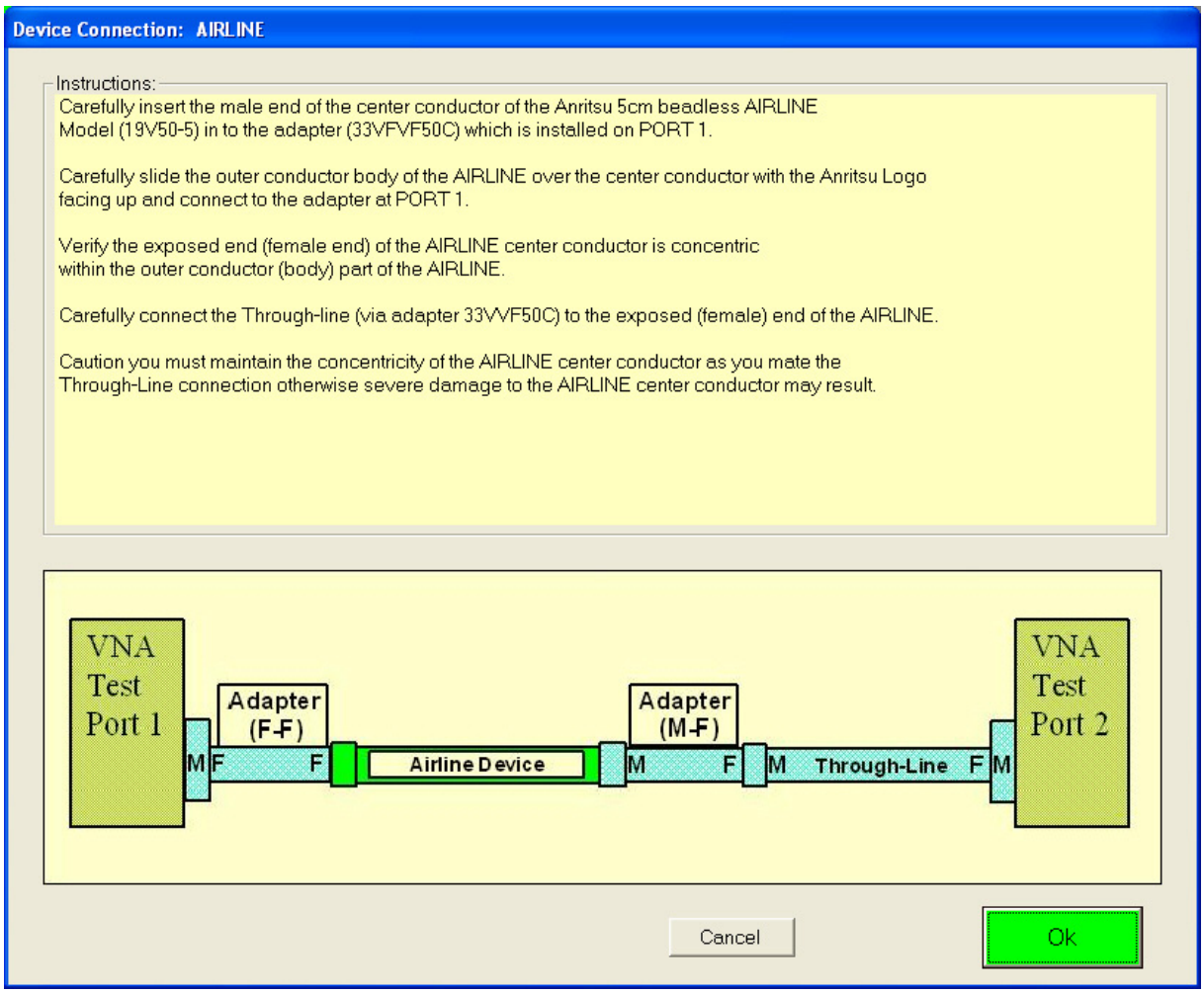


Figure 7-2. Device Connection - AIRLINE - DAT and UNC Tests

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.

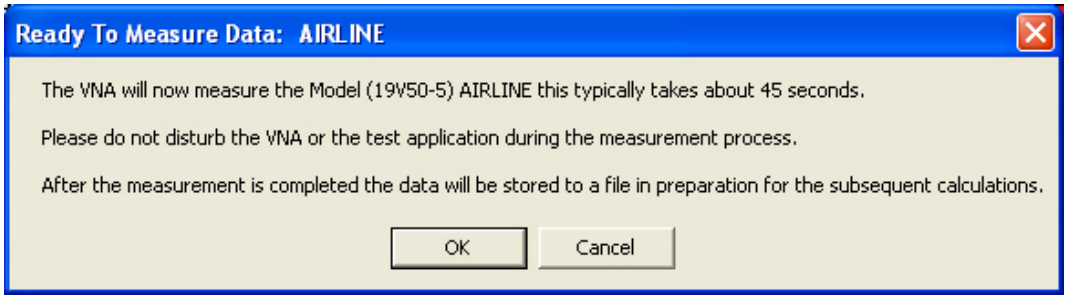


Figure 7-3. Ready to Measure Data - Airline - DAT Test

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 the 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.

Note	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

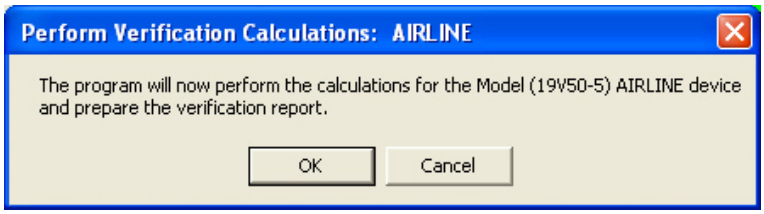


Figure 7-4. Perform Verification Calculations - AIRLINE - UNC Test

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 the 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.

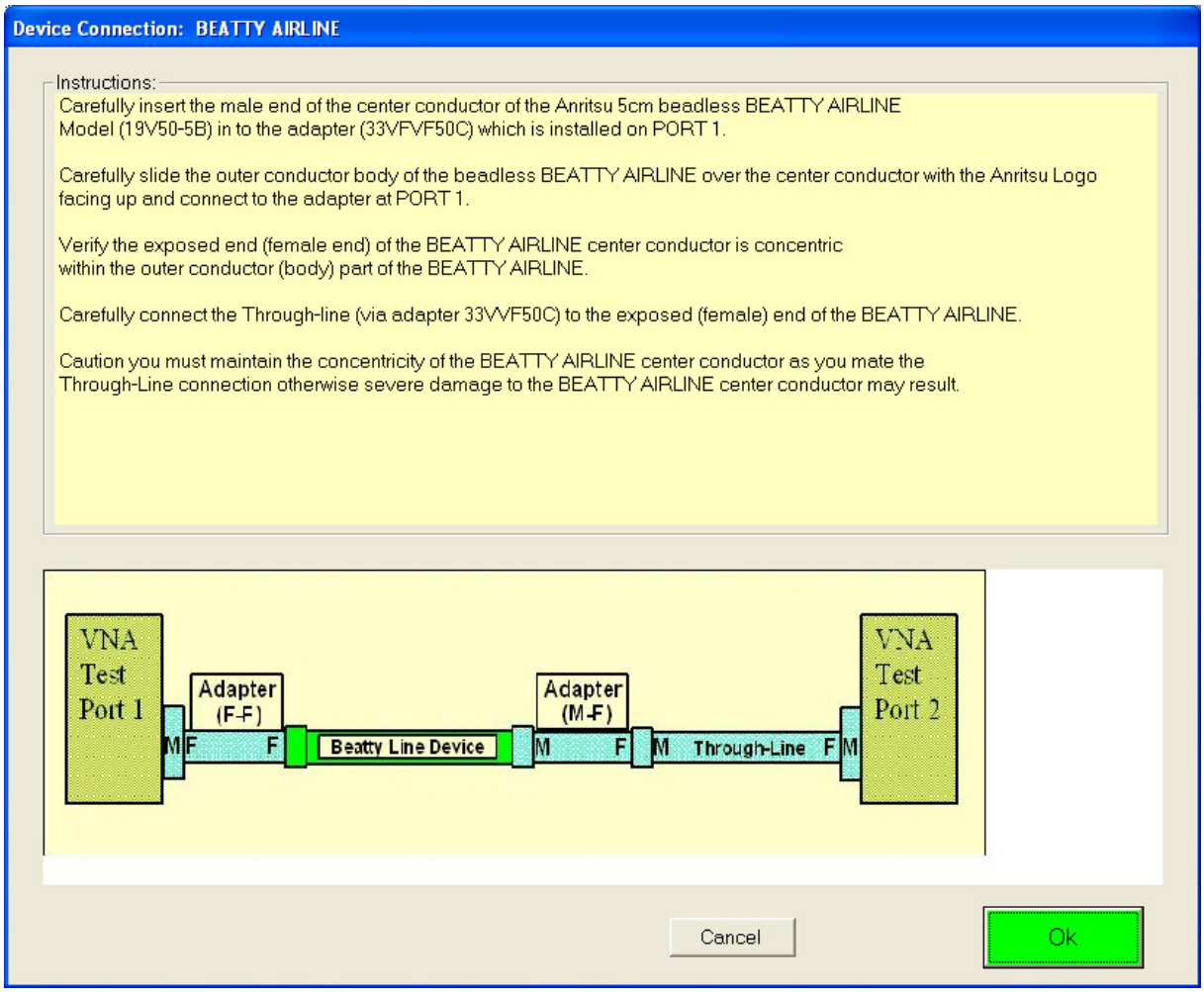


Figure 7-5. Device Connection - BEATTY AIRLINE - DAT and UNC Tests

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.

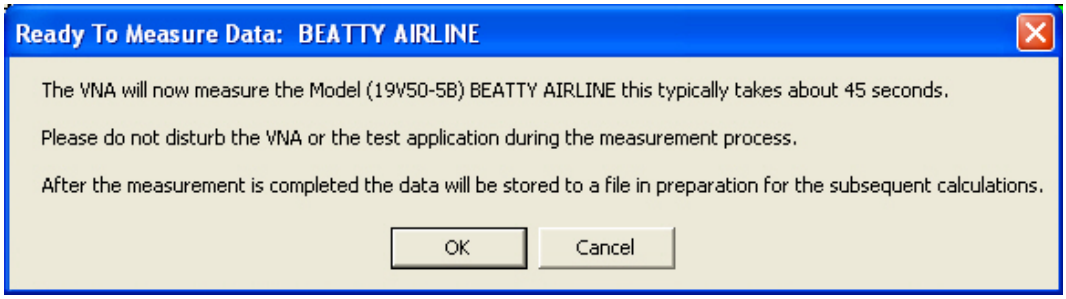


Figure 7-6. Ready to Measure Data - BEATTY AIRLINE - DAT Test

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 the 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.

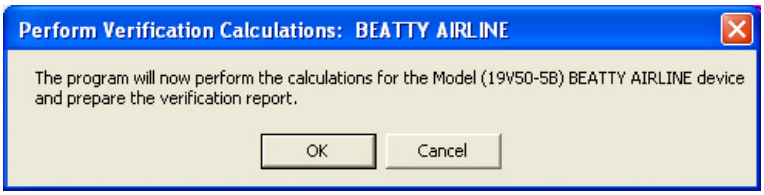


Figure 7-7. Perform Verification Calculations: BEATTY AIRLINE - UNC Test

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 the 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.

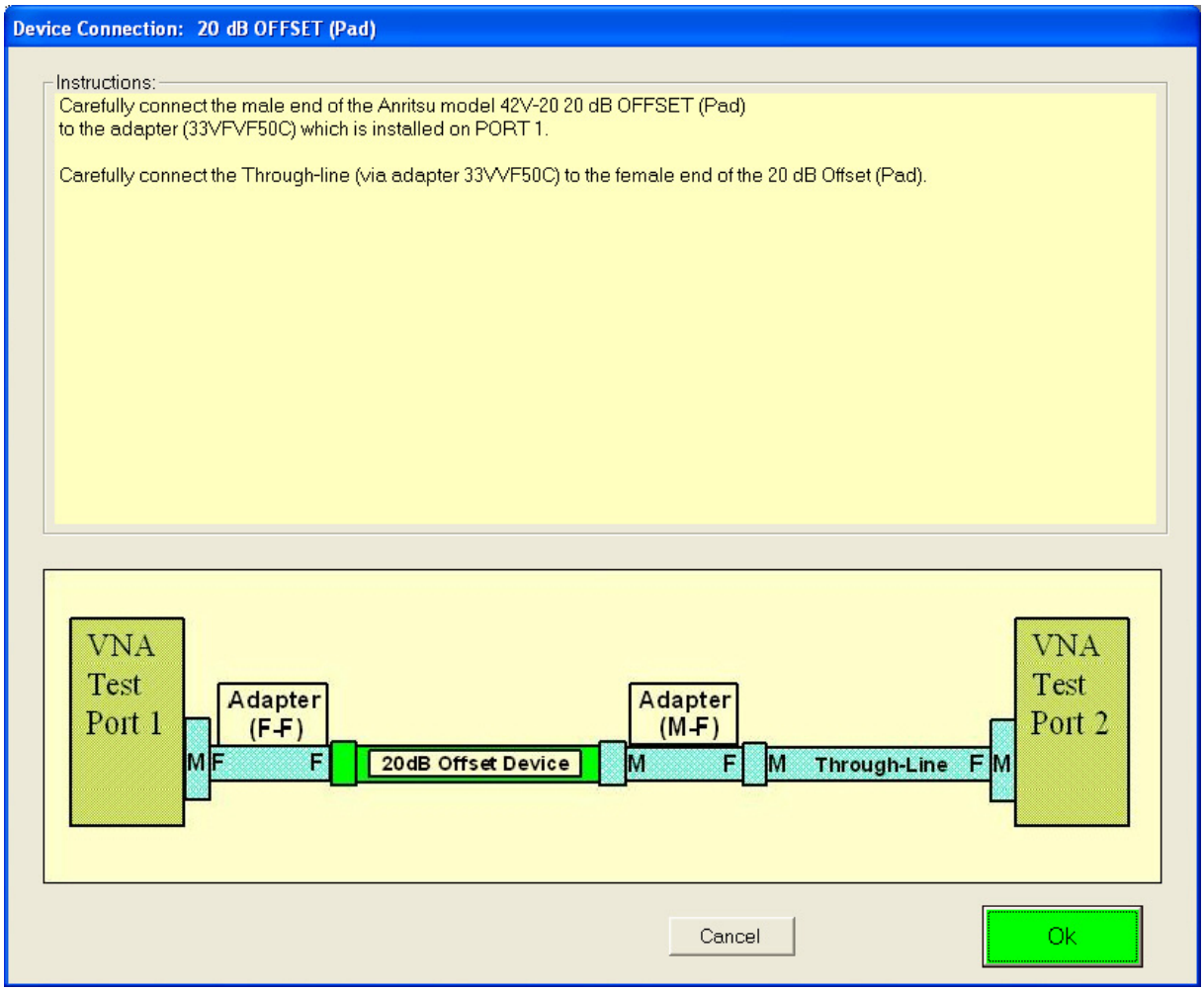


Figure 7-8. Device Connection - 20 dB OFFSET (Pad) - DAT and UNC Tests

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.

6. 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

7. Note that the contents of the dialog vary depending on the connector set selected.
8. When ready to proceed, click OK.
9. The 20DB OFFSET (DAT) #VER test runs and the progress bar shows percentage completed.
10. 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.
11. When the 20DB OFFSET (DAT) #VER test is complete, the next action depends on the which tests were selected.
    a. **ALL TESTS SELECTED**: If all tests were selected, the Perform Verification Calculations 20dB OFSET (Pad) dialog box appears as shown in the next section titled "20 dB Offset (UNC) (Pad) Test" on page 7-11.
    b. **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
    c. **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.

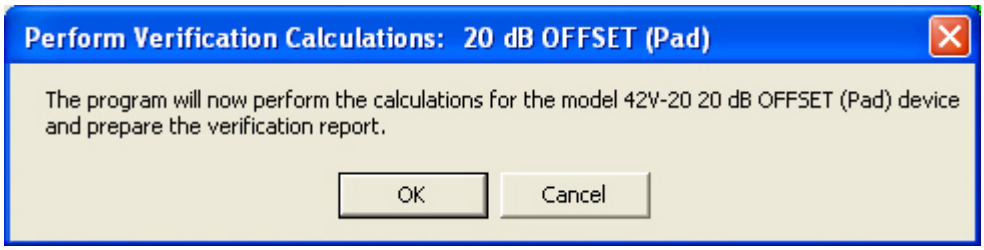


Figure 7-10. Perform Verification Calculations - 20 dB OFFSET (Pad) - UNC Test

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 the which tests were selected.
   a. **ALL TESTS SELECTED**: If all tests were selected, the Perform Verification Calculations 20dB OFSET (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.

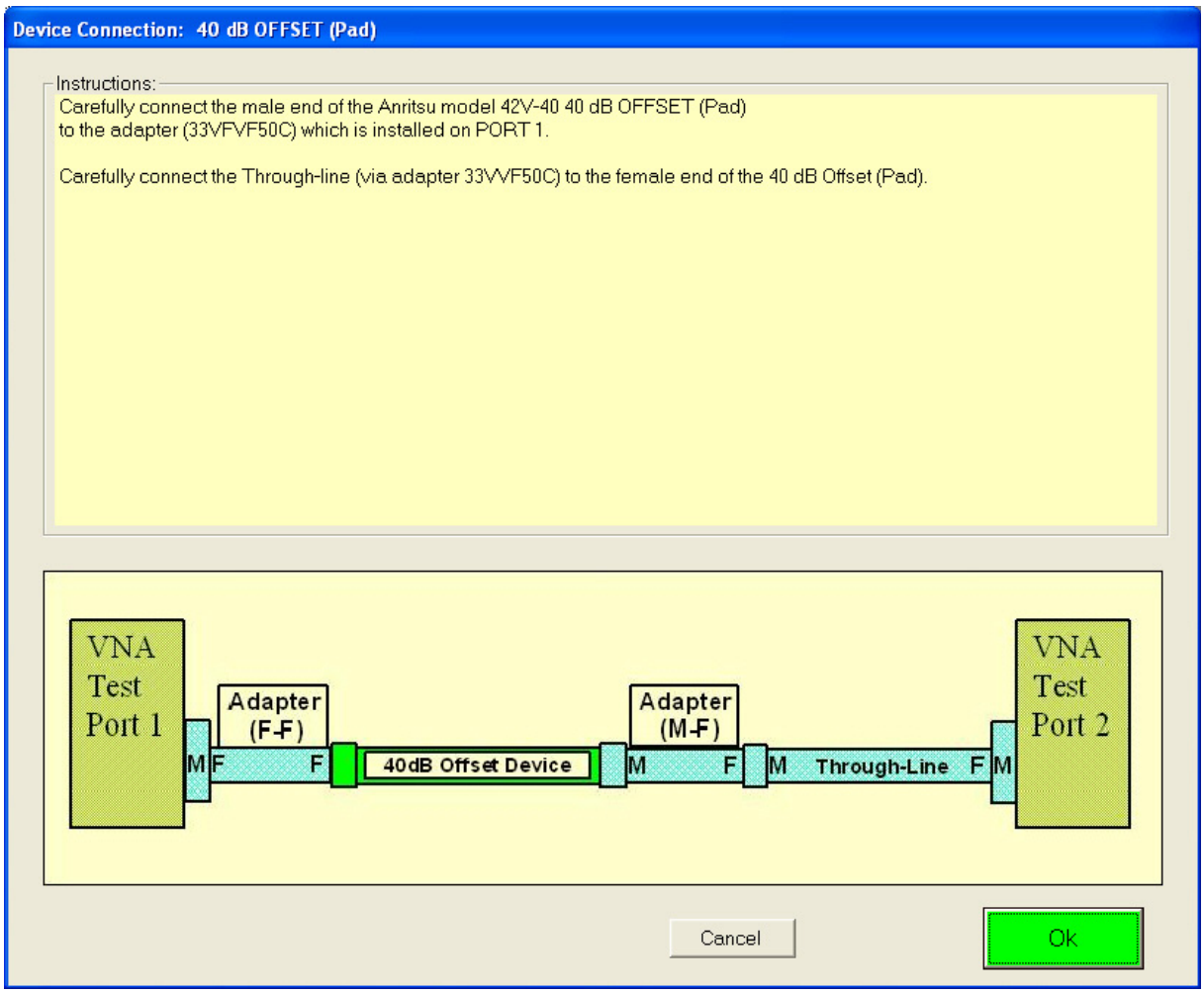


Figure 7-11. Device Connections - 40 dB or 50 dB OFFSET (Pad) - DAT and UNC Tests

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.

6. 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

7. When ready to proceed, click OK to continue.

8. The test runs and the progress bar shows test progress.

9. 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.

10. When the 40/50DB OFFSET (DAT) #VER test is complete, the next action depends on the which tests were selected.

- **a. 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.
- **b. 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.

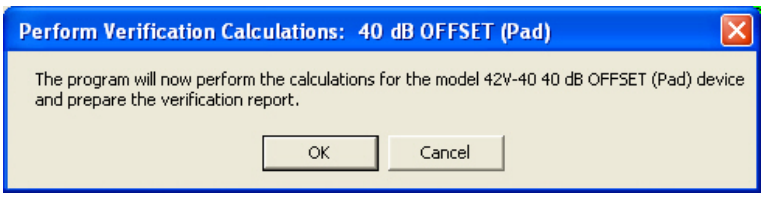


Figure 7-13. Perform Verification Calculations: 40 dB or 50 dB OFFSET (Pad) - UNC Test

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.

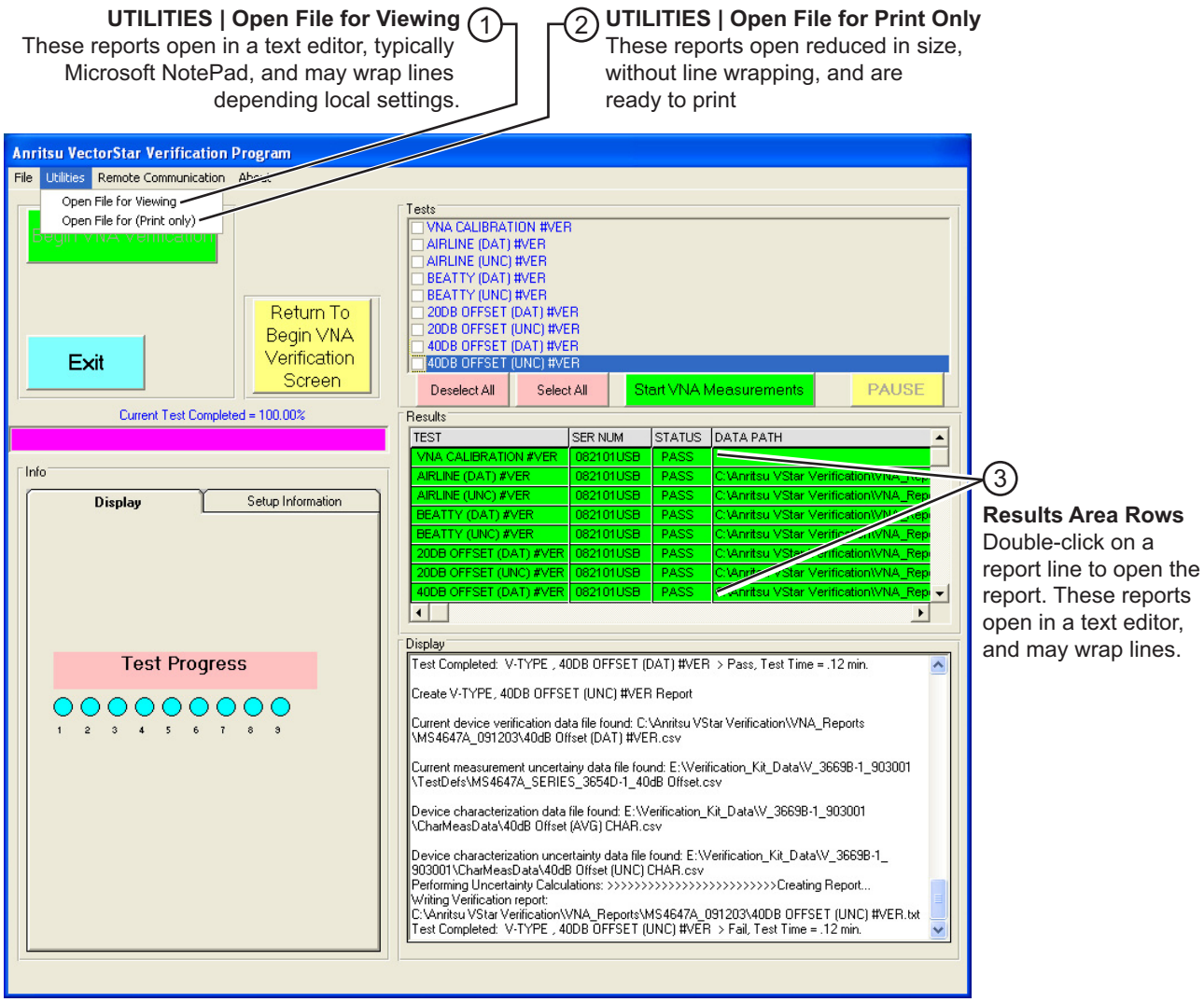
8-3 Report Options

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:

Navigating to Reports - Open File For Viewing

All reports can be opened from the program menu bar.

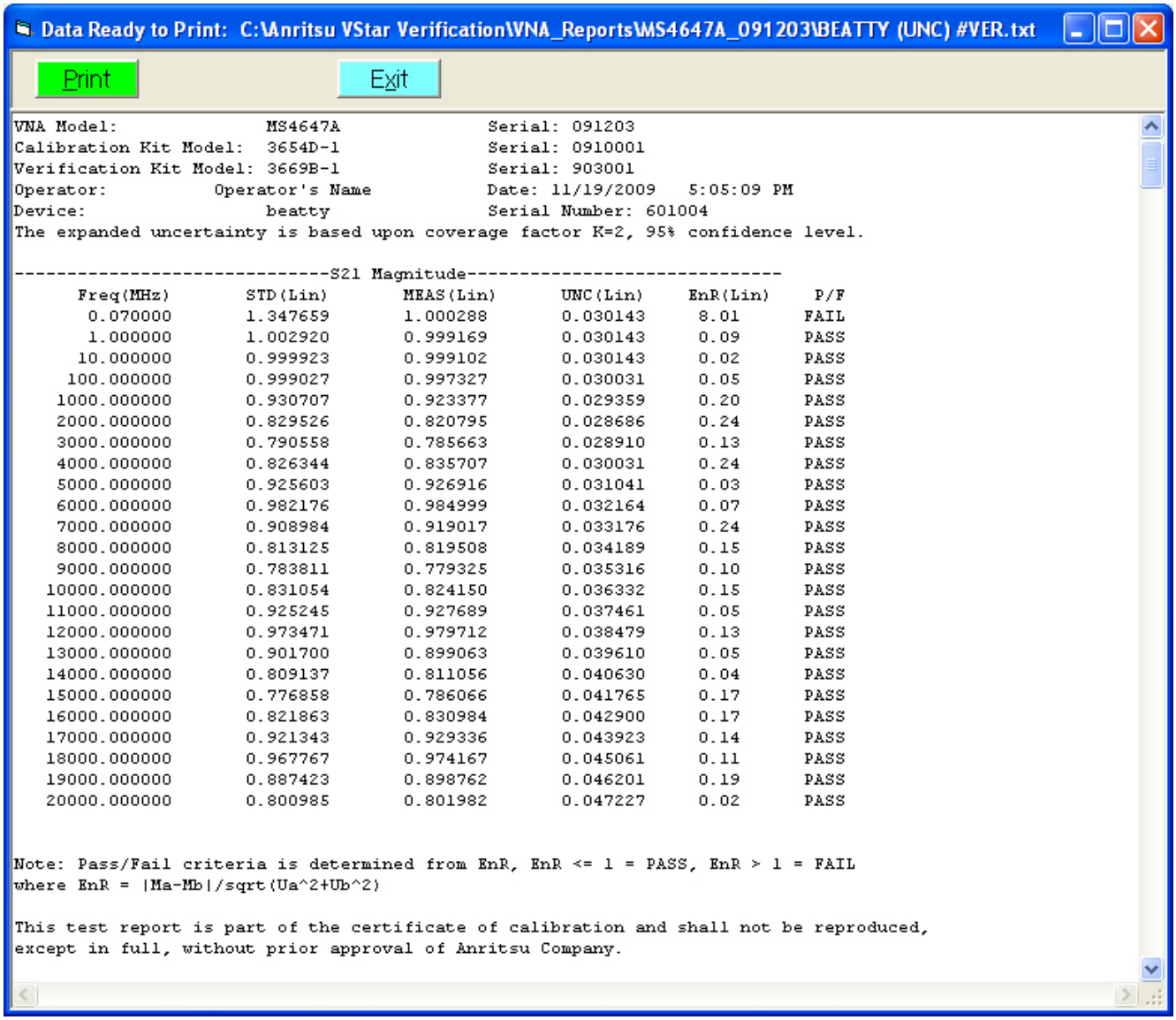
1. From the menu bar, select UTILITIES | Open File for Viewing.
2. Navigate to Anritsu VStar Verification | VNA_Reports.
3. In the Open dialog box, select the VectorStar model number and serial number of interest. For example, if you are using a VectorStar MS4647A VNA with a serial number of 091203, 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.



VNA Model: MS4647A Serial: 091203
Calibration Kit Model: 3654D-1 Serial: 0910001
Verification Kit Model: 3669B-1 Serial: 903001
Operator: Operator's Name Date: 11/19/2009 5:05:09 PM
Device: beatty Serial Number: 601004
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	1.347659	1.000288	0.030143	8.01	FAIL
1.000000	1.002920	0.999169	0.030143	0.09	PASS
10.000000	0.999923	0.999102	0.030143	0.02	PASS
100.000000	0.999027	0.997327	0.030031	0.05	PASS
1000.000000	0.930707	0.923377	0.029359	0.20	PASS
2000.000000	0.829526	0.820795	0.028686	0.24	PASS
3000.000000	0.790558	0.785663	0.028910	0.13	PASS
4000.000000	0.826344	0.835707	0.030031	0.24	PASS
5000.000000	0.925603	0.926916	0.031041	0.03	PASS
6000.000000	0.982176	0.984999	0.032164	0.07	PASS
7000.000000	0.908984	0.919017	0.033176	0.24	PASS
8000.000000	0.813125	0.819508	0.034189	0.15	PASS
9000.000000	0.783811	0.779325	0.035316	0.10	PASS
10000.000000	0.831054	0.824150	0.036332	0.15	PASS
11000.000000	0.925245	0.927689	0.037461	0.05	PASS
12000.000000	0.973471	0.979712	0.038479	0.13	PASS
13000.000000	0.901700	0.899063	0.039610	0.05	PASS
14000.000000	0.809137	0.811056	0.040630	0.04	PASS
15000.000000	0.776858	0.786066	0.041765	0.17	PASS
16000.000000	0.821863	0.830984	0.042900	0.17	PASS
17000.000000	0.921343	0.929336	0.043923	0.14	PASS
18000.000000	0.967767	0.974167	0.045061	0.11	PASS
19000.000000	0.887423	0.898762	0.046201	0.19	PASS
20000.000000	0.800985	0.801982	0.047227	0.02	PASS

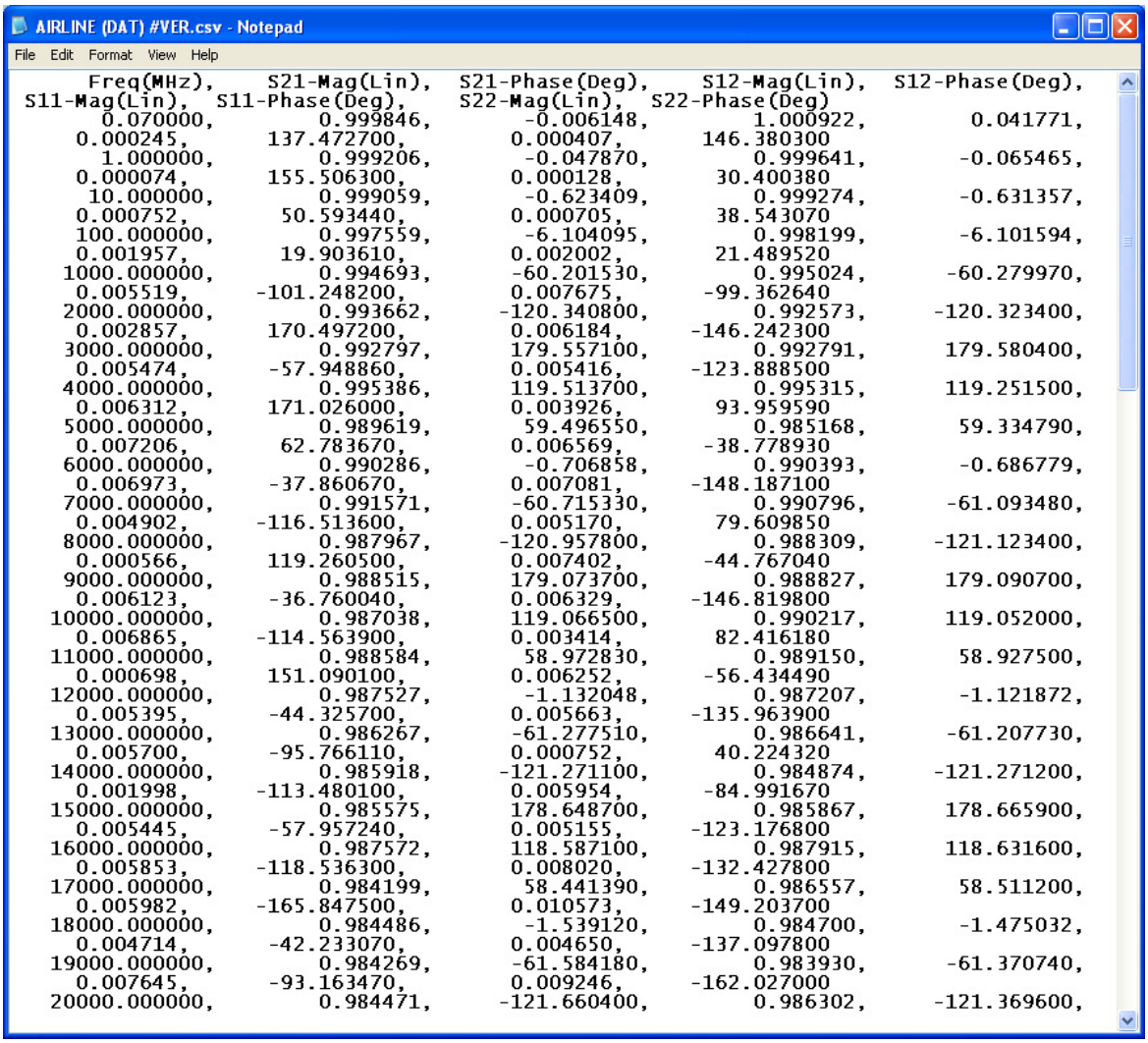
Note: Pass/Fail criteria is determined from EnR, EnR <= 1 = PASS, EnR > 1 = FAIL
where EnR = |Ma-Mb|/sqrt(Ua^2+Ub^2)

Figure 8-2. Data Ready To Print Dialog Box

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

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

This report is available from all VectorStar Verification Kits.



AIRLINE (DAT) #VER.csv - Notepad

File Edit Format View Help

Freq(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)	
0.070000,	0.999846,	-0.006148,	1.000922,	0.041771,
0.000245,	137.472700,	0.000407,	146.380300	
1.000000,	0.999206,	-0.047870,	0.999641,	-0.065465,
0.000074,	155.506300,	0.000128,	30.400380	
10.000000,	0.999059,	-0.623409,	0.999274,	-0.631357,
0.000752,	50.593440,	0.000705,	38.543070	
100.000000,	0.997559,	-6.104095,	0.998199,	-6.101594,
0.001957,	19.903610,	0.002002,	21.489520	
1000.000000,	0.994693,	-60.201530,	0.995024,	-60.279970,
0.005519,	-101.248200,	0.007675,	-99.362640	
2000.000000,	0.993662,	-120.340800,	0.992573,	-120.323400,
0.002857,	170.497200,	0.006184,	-146.242300	
3000.000000,	0.992797,	179.557100,	0.992791,	179.580400,
0.005474,	-57.948860,	0.005416,	-123.888500	
4000.000000,	0.995386,	119.513700,	0.995315,	119.251500,
0.006312,	171.026000,	0.003926,	93.959590	
5000.000000,	0.989619,	59.496550,	0.985168,	59.334790,
0.007206,	62.783670,	0.006569,	-38.778930	
6000.000000,	0.990286,	-0.706858,	0.990393,	-0.686779,
0.006973,	-37.860670,	0.007081,	-148.187100	
7000.000000,	0.991571,	-60.715330,	0.990796,	-61.093480,
0.004902,	-116.513600,	0.005170,	79.609850	
8000.000000,	0.987967,	-120.957800,	0.988309,	-121.123400,
0.000566,	119.260500,	0.007402,	-44.767040	
9000.000000,	0.988515,	179.073700,	0.988827,	179.090700,
0.006123,	-36.760040,	0.006329,	-146.819800	
10000.000000,	0.987038,	119.066500,	0.990217,	119.052000,
0.006865,	-114.563900,	0.003414,	82.416180	
11000.000000,	0.988584,	58.972830,	0.989150,	58.927500,
0.000698,	151.090100,	0.006252,	-56.434490	
12000.000000,	0.987527,	-1.132048,	0.987207,	-1.121872,
0.005395,	-44.325700,	0.005663,	-135.963900	
13000.000000,	0.986267,	-61.277510,	0.986641,	-61.207730,
0.005700,	-95.766110,	0.000752,	40.224320	
14000.000000,	0.985918,	-121.271100,	0.984874,	-121.271200,
0.001998,	-113.480100,	0.005954,	-84.991670	
15000.000000,	0.985575,	178.648700,	0.985867,	178.665900,
0.005445,	-57.957240,	0.005155,	-123.176800	
16000.000000,	0.987572,	118.587100,	0.987915,	118.631600,
0.005853,	-118.536300,	0.008020,	-132.427800	
17000.000000,	0.984199,	58.441390,	0.986557,	58.511200,
0.005982,	-165.847500,	0.010573,	-149.203700	
18000.000000,	0.984486,	-1.539120,	0.984700,	-1.475032,
0.004714,	-42.233070,	0.004650,	-137.097800	
19000.000000,	0.984269,	-61.584180,	0.983930,	-61.370740,
0.007645,	-93.163470,	0.009246,	-162.027000	
20000.000000,	0.984471,	-121.660400,	0.986302,	-121.369600,

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

Report Data Fields

- 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 Airline (UNC) #VER Report - TXT Format

This report is available for all VectorStar Verification Kits.

20DB OFFSET (UNC) #VER.txt - Notepad

File Edit Format View Help

```
Anritsu Verification Report, Application Program: 67688    Version 2.00
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
```

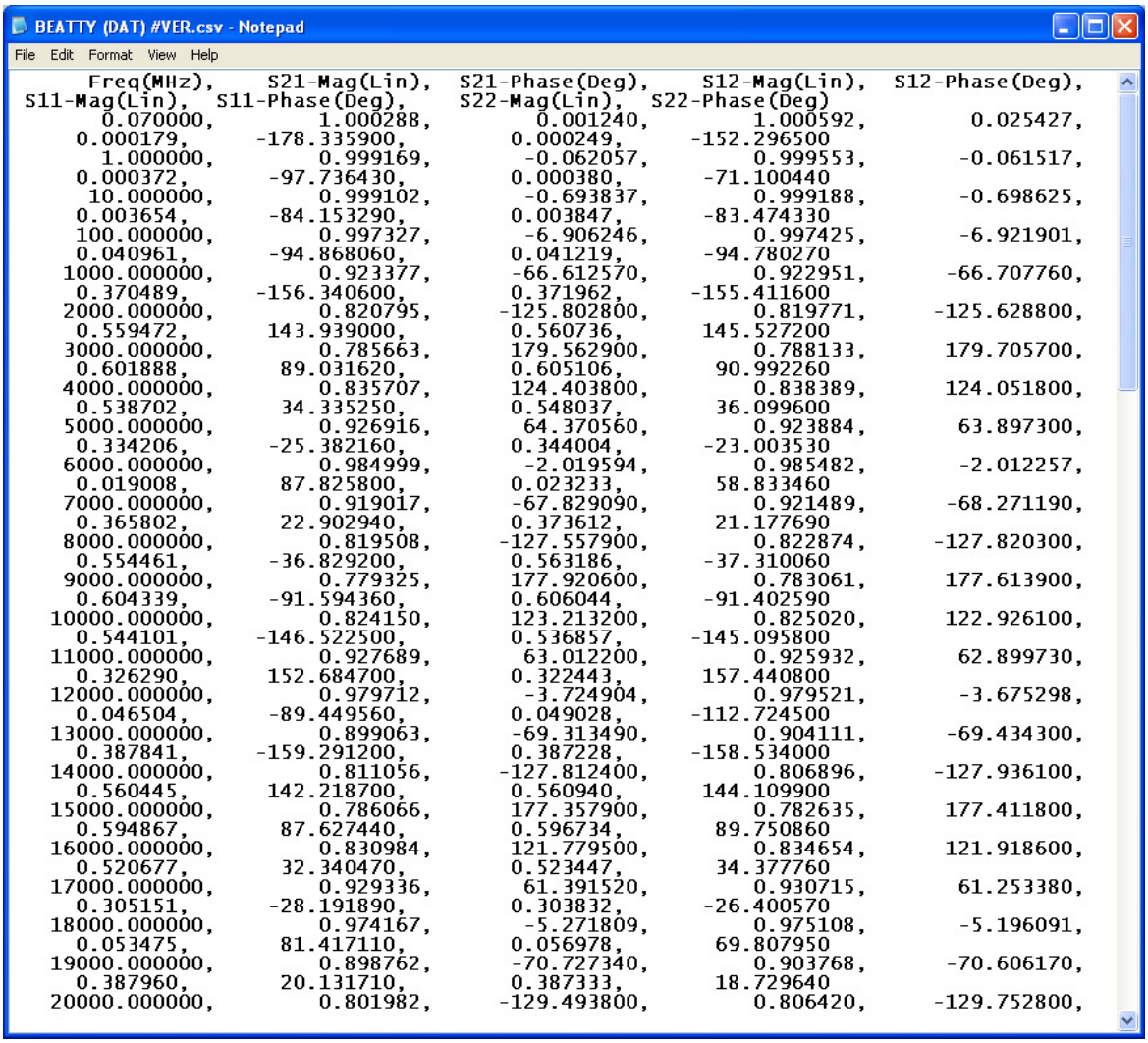
Figure 8-4. Airline (UNC) TXT Format Report

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)

8-6 Beatty Airline (DAT) #VER Report - CSV Format

The report is available from all VectorStar Verification Kits.



BEATTY (DAT) #VER.csv - Notepad

File Edit Format View Help

Freq(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)	
0.070000,	1.000288,	0.001240,	1.000592,	0.025427,
0.000179,	-178.335900,	0.000249,	-152.296500	
1.000000,	0.999169,	-0.062057,	0.999553,	-0.061517,
0.000372,	-97.736430,	0.000380,	-71.100440	
10.000000,	0.999102,	-0.693837,	0.999188,	-0.698625,
0.003654,	-84.153290,	0.003847,	-83.474330	
100.000000,	0.997327,	-6.906246,	0.997425,	-6.921901,
0.040961,	-94.868060,	0.041219,	-94.780270	
1000.000000,	0.923377,	-66.612570,	0.922951,	-66.707760,
0.370489,	-156.340600,	0.371962,	-155.411600	
2000.000000,	0.820795,	-125.802800,	0.819771,	-125.628800,
0.559472,	143.939000,	0.560736,	145.527200	
3000.000000,	0.785663,	179.562900,	0.788133,	179.705700,
0.601888,	89.031620,	0.605106,	90.992260	
4000.000000,	0.835707,	124.403800,	0.838389,	124.051800,
0.538702,	34.335250,	0.548037,	36.099600	
5000.000000,	0.926916,	64.370560,	0.923884,	63.897300,
0.334206,	-25.382160,	0.344004,	-23.003530	
6000.000000,	0.984999,	-2.019594,	0.985482,	-2.012257,
0.019008,	87.825800,	0.023233,	58.833460	
7000.000000,	0.919017,	-67.829090,	0.921489,	-68.271190,
0.365802,	22.902940,	0.373612,	21.177690	
8000.000000,	0.819508,	-127.557900,	0.822874,	-127.820300,
0.554461,	-36.829200,	0.563186,	-37.310060	
9000.000000,	0.779325,	177.920600,	0.783061,	177.613900,
0.604339,	-91.594360,	0.606044,	-91.402590	
10000.000000,	0.824150,	123.213200,	0.825020,	122.926100,
0.544101,	-146.522500,	0.536857,	-145.095800	
11000.000000,	0.927689,	63.012200,	0.925932,	62.899730,
0.326290,	152.684700,	0.322443,	157.440800	
12000.000000,	0.979712,	-3.724904,	0.979521,	-3.675298,
0.046504,	-89.449560,	0.049028,	-112.724500	
13000.000000,	0.899063,	-69.313490,	0.904111,	-69.434300,
0.387841,	-159.291200,	0.387228,	-158.534000	
14000.000000,	0.811056,	-127.812400,	0.806896,	-127.936100,
0.560445,	142.218700,	0.560940,	144.109900	
15000.000000,	0.786066,	177.357900,	0.782635,	177.411800,
0.594867,	87.627440,	0.596734,	89.750860	
16000.000000,	0.830984,	121.779500,	0.834654,	121.918600,
0.520677,	32.340470,	0.523447,	34.377760	
17000.000000,	0.929336,	61.391520,	0.930715,	61.253380,
0.305151,	-28.191890,	0.303832,	-26.400570	
18000.000000,	0.974167,	-5.271809,	0.975108,	-5.196091,
0.053475,	81.417110,	0.056978,	69.807950	
19000.000000,	0.898762,	-70.727340,	0.903768,	-70.606170,
0.387960,	20.131710,	0.387333,	18.729640	
20000.000000,	0.801982,	-129.493800,	0.806420,	-129.752800,

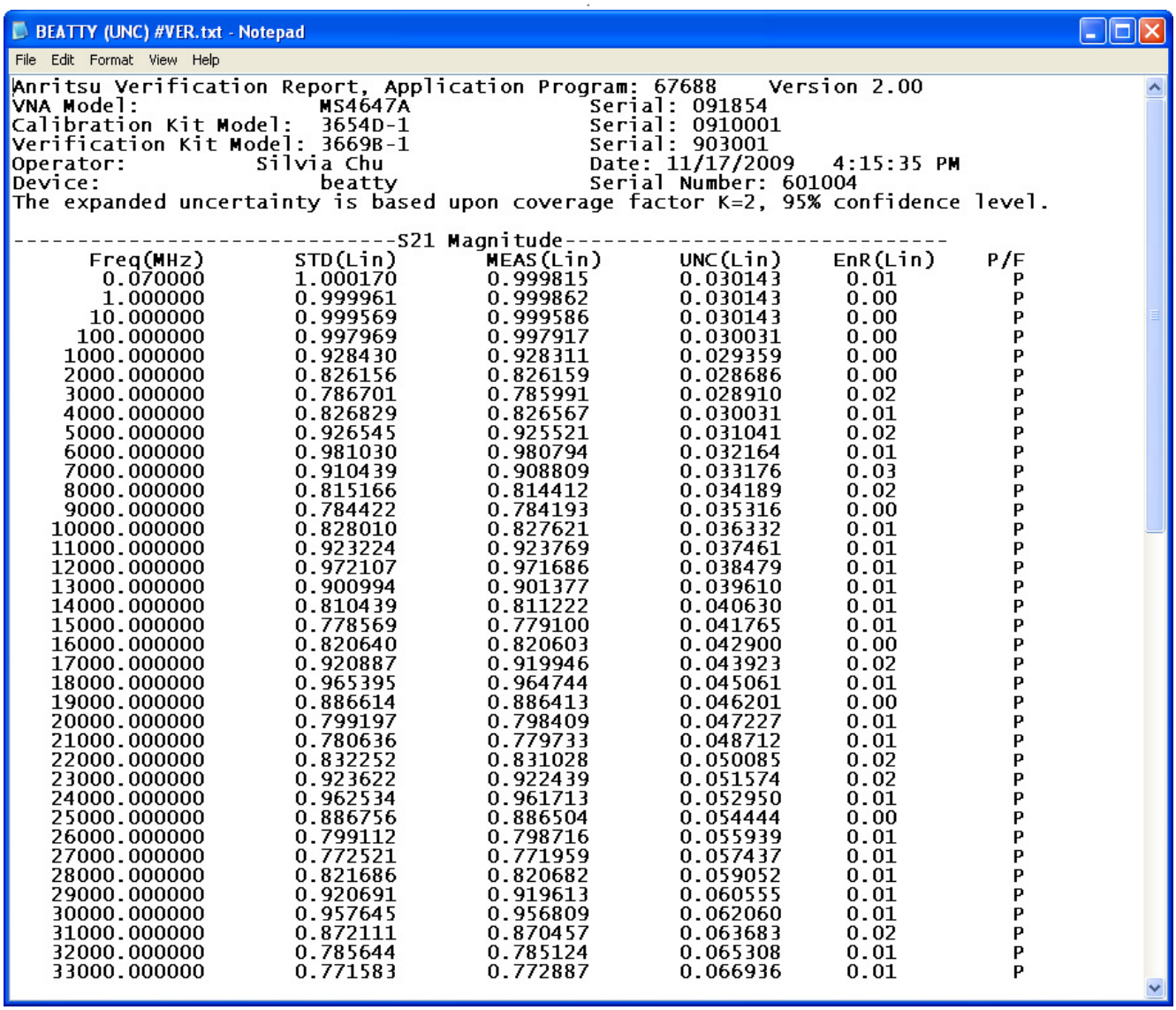
Figure 8-5. Beatty Airline (DAT) CSV Format Report

Report Data Fields

- 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)

8-7 Beatty Airline (UNC) #VER Report - TXT Format

This report is available from all VectorStar Verification Kits.



BEATTY (UNC) #VER.txt - Notepad

File Edit Format View Help

```
Anritsu Verification Report, Application Program: 67688    Version 2.00
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   4:15:35 PM
Device:                 beatty               Serial Number: 601004
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       1.000170        0.999815       0.030143      0.01        P
       1.000000       0.999961        0.999862       0.030143      0.00        P
      10.000000       0.999569        0.999586       0.030143      0.00        P
     100.000000       0.997969        0.997917       0.030031      0.00        P
    1000.000000       0.928430        0.928311       0.029359      0.00        P
    2000.000000       0.826156        0.826159       0.028686      0.00        P
    3000.000000       0.786701        0.785991       0.028910      0.02        P
    4000.000000       0.826829        0.826567       0.030031      0.01        P
    5000.000000       0.926545        0.925521       0.031041      0.02        P
    6000.000000       0.981030        0.980794       0.032164      0.01        P
    7000.000000       0.910439        0.908809       0.033176      0.03        P
    8000.000000       0.815166        0.814412       0.034189      0.02        P
    9000.000000       0.784422        0.784193       0.035316      0.00        P
   10000.000000       0.828010        0.827621       0.036332      0.01        P
   11000.000000       0.923224        0.923769       0.037461      0.01        P
   12000.000000       0.972107        0.971686       0.038479      0.01        P
   13000.000000       0.900994        0.901377       0.039610      0.01        P
   14000.000000       0.810439        0.811222       0.040630      0.01        P
   15000.000000       0.778569        0.779100       0.041765      0.01        P
   16000.000000       0.820640        0.820603       0.042900      0.00        P
   17000.000000       0.920887        0.919946       0.043923      0.02        P
   18000.000000       0.965395        0.964744       0.045061      0.01        P
   19000.000000       0.886614        0.886413       0.046201      0.00        P
   20000.000000       0.799197        0.798409       0.047227      0.01        P
   21000.000000       0.780636        0.779733       0.048712      0.01        P
   22000.000000       0.832252        0.831028       0.050085      0.02        P
   23000.000000       0.923622        0.922439       0.051574      0.02        P
   24000.000000       0.962534        0.961713       0.052950      0.01        P
   25000.000000       0.886756        0.886504       0.054444      0.00        P
   26000.000000       0.799112        0.798716       0.055939      0.01        P
   27000.000000       0.772521        0.771959       0.057437      0.01        P
   28000.000000       0.821686        0.820682       0.059052      0.01        P
   29000.000000       0.920691        0.919613       0.060555      0.01        P
   30000.000000       0.957645        0.956809       0.062060      0.01        P
   31000.000000       0.872111        0.870457       0.063683      0.02        P
   32000.000000       0.785644        0.785124       0.065308      0.01        P
   33000.000000       0.771583        0.772887       0.066936      0.01        P
```

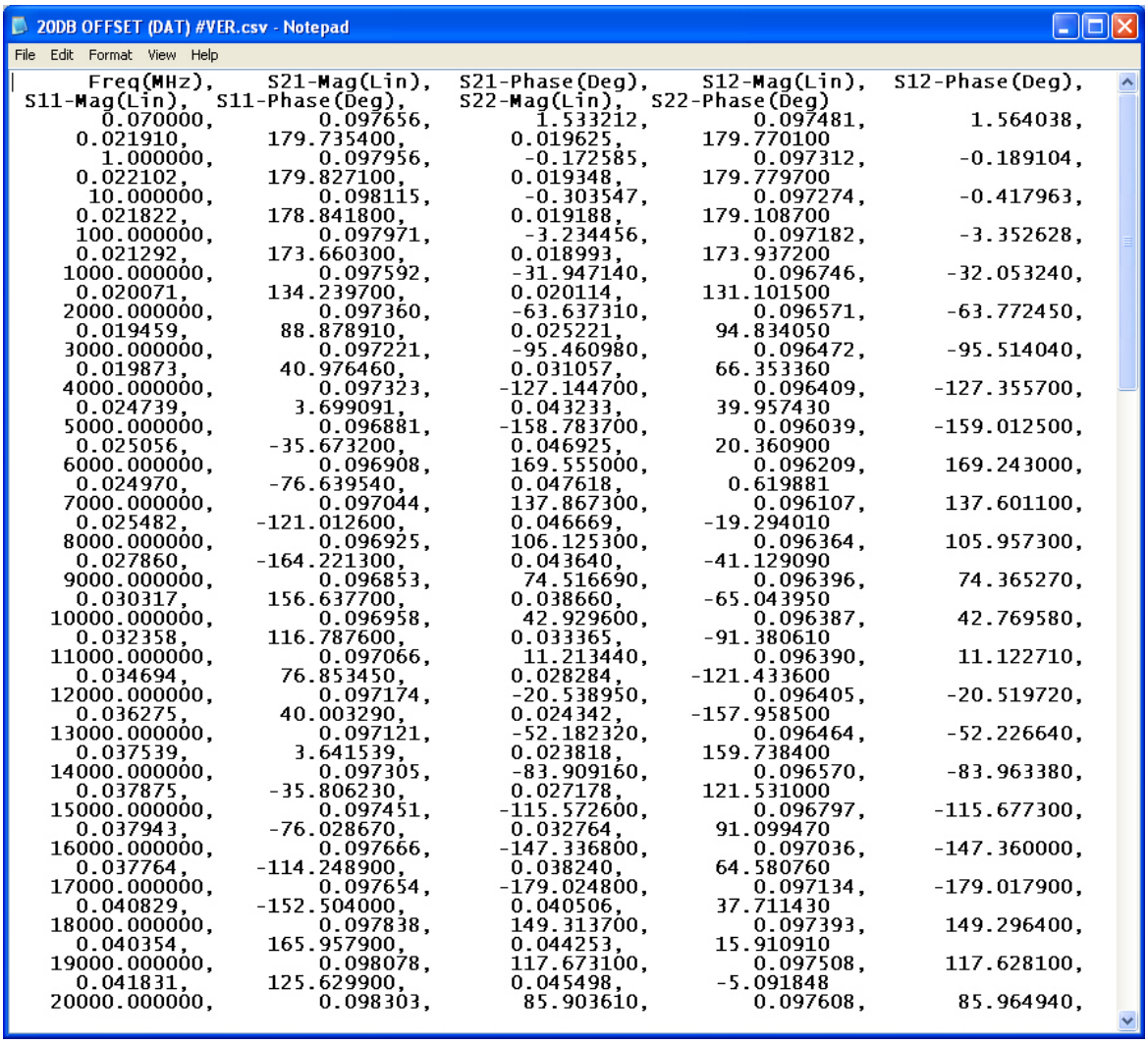
Figure 8-6. Beatty Airline (UNC) TXT Format Report

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)

8-8 20 dB Offset (DAT) #VER Report - CSV Format

This report is available from all VectorStar Verification Kits.



20DB OFFSET (DAT) #VER.csv - Notepad

File Edit Format View Help

Freq(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)	
0.070000,	0.097656,	1.533212,	0.097481,	1.564038,
0.021910,	179.735400,	0.019625,	179.770100	
1.000000,	0.097956,	-0.172585,	0.097312,	-0.189104,
0.022102,	179.827100,	0.019348,	179.779700	
10.000000,	0.098115,	-0.303547,	0.097274,	-0.417963,
0.021822,	178.841800,	0.019188,	179.108700	
100.000000,	0.097971,	-3.234456,	0.097182,	-3.352628,
0.021292,	173.660300,	0.018993,	173.937200	
1000.000000,	0.097592,	-31.947140,	0.096746,	-32.053240,
0.020071,	134.239700,	0.020114,	131.101500	
2000.000000,	0.097360,	-63.637310,	0.096571,	-63.772450,
0.019459,	88.878910,	0.025221,	94.834050	
3000.000000,	0.097221,	-95.460980,	0.096472,	-95.514040,
0.019873,	40.976460,	0.031057,	66.353360	
4000.000000,	0.097323,	-127.144700,	0.096409,	-127.355700,
0.024739,	3.699091,	0.043233,	39.957430	
5000.000000,	0.096881,	-158.783700,	0.096039,	-159.012500,
0.025056,	-35.673200,	0.046925,	20.360900	
6000.000000,	0.096908,	169.555000,	0.096209,	169.243000,
0.024970,	-76.639540,	0.047618,	0.619881	
7000.000000,	0.097044,	137.867300,	0.096107,	137.601100,
0.025482,	-121.012600,	0.046669,	-19.294010	
8000.000000,	0.096925,	106.125300,	0.096364,	105.957300,
0.027860,	-164.221300,	0.043640,	-41.129090	
9000.000000,	0.096853,	74.516690,	0.096396,	74.365270,
0.030317,	156.637700,	0.038660,	-65.043950	
10000.000000,	0.096958,	42.929600,	0.096387,	42.769580,
0.032358,	116.787600,	0.033365,	-91.380610	
11000.000000,	0.097066,	11.213440,	0.096390,	11.122710,
0.034694,	76.853450,	0.028284,	-121.433600	
12000.000000,	0.097174,	-20.538950,	0.096405,	-20.519720,
0.036275,	40.003290,	0.024342,	-157.958500	
13000.000000,	0.097121,	-52.182320,	0.096464,	-52.226640,
0.037539,	3.641539,	0.023818,	159.738400	
14000.000000,	0.097305,	-83.909160,	0.096570,	-83.963380,
0.037875,	-35.806230,	0.027178,	121.531000	
15000.000000,	0.097451,	-115.572600,	0.096797,	-115.677300,
0.037943,	-76.028670,	0.032764,	91.099470	
16000.000000,	0.097666,	-147.336800,	0.097036,	-147.360000,
0.037764,	-114.248900,	0.038240,	64.580760	
17000.000000,	0.097654,	-179.024800,	0.097134,	-179.017900,
0.040829,	-152.504000,	0.040506,	37.711430	
18000.000000,	0.097838,	149.313700,	0.097393,	149.296400,
0.040354,	165.957900,	0.044253,	15.910910	
19000.000000,	0.098078,	117.673100,	0.097508,	117.628100,
0.041831,	125.629900,	0.045498,	-5.091848	
20000.000000,	0.098303,	85.903610,	0.097608,	85.964940,

Figure 8-7. 20 dB Offset (DAT) CSV Format Report

Report Data Fields

- 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)

8-9 20 dB Offset (UNC) #VER Report - TXT Format

This report is available from all VectorStar Verification Kits.

20DB OFFSET (UNC) #VER.txt - Notepad

File Edit Format View Help

```
Anritsu Verification Report, Application Program: 67688    Version 2.00
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 8-8. 20 dB Offset (UNC) TXT Format Report

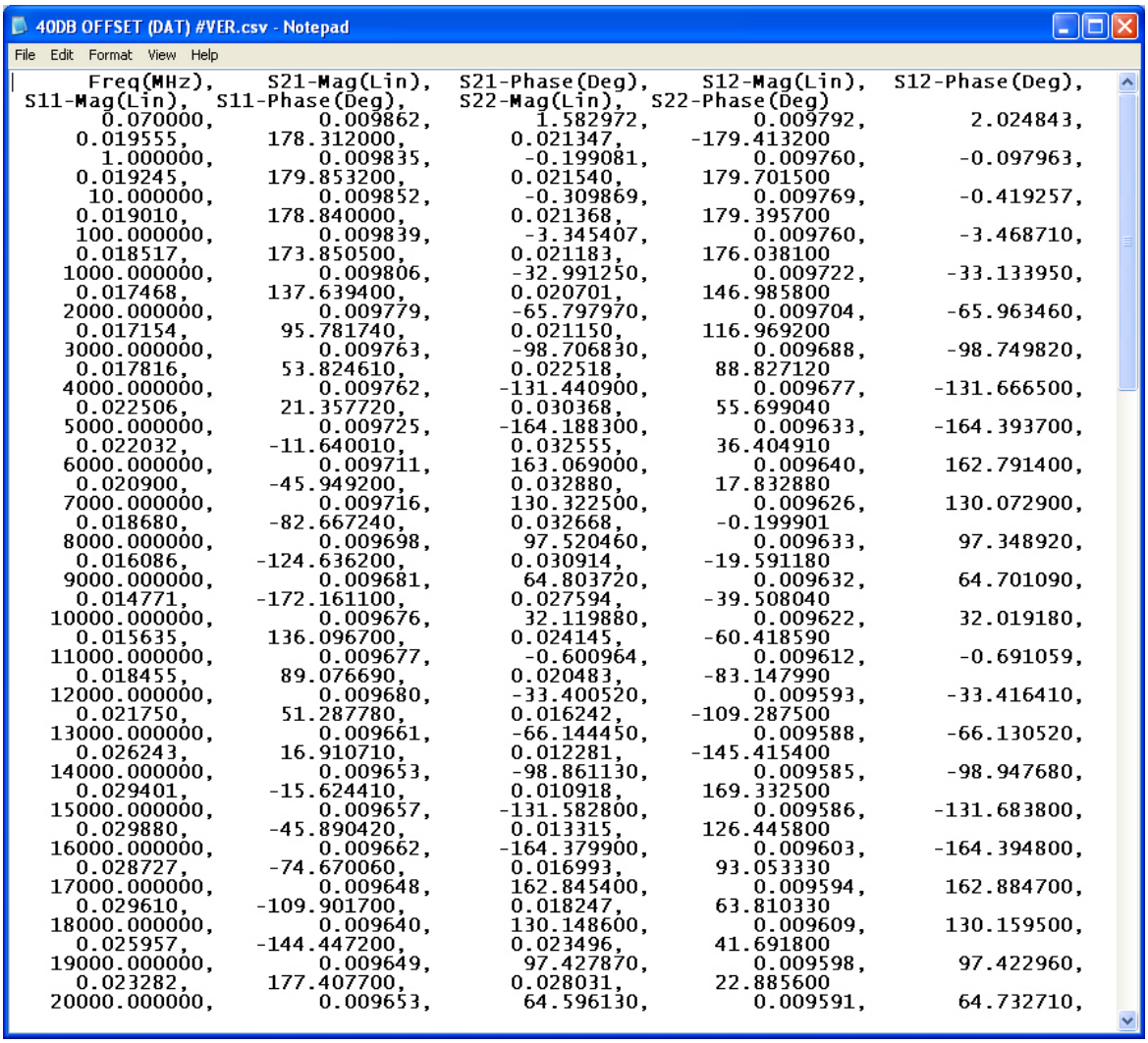
Report Data Fields

- 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)

8-10 40 dB or 50 dB Offset (DAT) #VER Report - CSV Format

The 40 dB offset report is only available from the VectorStar 3669B-1 V Connector Verification Kit running on a VectorStar MS4645A/B or MS4647A/B VNA.

A similar report, with identical report fields for a 50 dB offset, not shown in this document, is produced for the VectorStar 3668B K Connector, 3666-1 3.5 mm Connector, or 3663-1 Type N Connector Verification Kits.



Freq(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)	
0.070000,	0.009862,	1.582972,	0.009792,	2.024843,
0.019555,	178.312000,	0.021347,	-179.413200	
1.000000,	0.009835,	-0.199081,	0.009760,	-0.097963,
0.019245,	179.853200,	0.021540,	179.701500	
10.000000,	0.009852,	-0.309869,	0.009769,	-0.419257,
0.019010,	178.840000,	0.021368,	179.395700	
100.000000,	0.009839,	-3.345407,	0.009760,	-3.468710,
0.018517,	173.850500,	0.021183,	176.038100	
1000.000000,	0.009806,	-32.991250,	0.009722,	-33.133950,
0.017468,	137.639400,	0.020701,	146.985800	
2000.000000,	0.009779,	-65.797970,	0.009704,	-65.963460,
0.017154,	95.781740,	0.021150,	116.969200	
3000.000000,	0.009763,	-98.706830,	0.009688,	-98.749820,
0.017816,	53.824610,	0.022518,	88.827120	
4000.000000,	0.009762,	-131.440900,	0.009677,	-131.666500,
0.022506,	21.357720,	0.030368,	55.699040	
5000.000000,	0.009725,	-164.188300,	0.009633,	-164.393700,
0.022032,	-11.640010,	0.032555,	36.404910	
6000.000000,	0.009711,	163.069000,	0.009640,	162.791400,
0.020900,	-45.949200,	0.032880,	17.832880	
7000.000000,	0.009716,	130.322500,	0.009626,	130.072900,
0.018680,	-82.667240,	0.032668,	-0.199901	
8000.000000,	0.009698,	97.520460,	0.009633,	97.348920,
0.016086,	-124.636200,	0.030914,	-19.591180	
9000.000000,	0.009681,	64.803720,	0.009632,	64.701090,
0.014771,	-172.161100,	0.027594,	-39.508040	
10000.000000,	0.009676,	32.119880,	0.009622,	32.019180,
0.015635,	136.096700,	0.024145,	-60.418590	
11000.000000,	0.009677,	-0.600964,	0.009612,	-0.691059,
0.018455,	89.076690,	0.020483,	-83.147990	
12000.000000,	0.009680,	-33.400520,	0.009593,	-33.416410,
0.021750,	51.287780,	0.016242,	-109.287500	
13000.000000,	0.009661,	-66.144450,	0.009588,	-66.130520,
0.026243,	16.910710,	0.012281,	-145.415400	
14000.000000,	0.009653,	-98.861130,	0.009585,	-98.947680,
0.029401,	-15.624410,	0.010918,	169.332500	
15000.000000,	0.009657,	-131.582800,	0.009586,	-131.683800,
0.029880,	-45.890420,	0.013315,	126.445800	
16000.000000,	0.009662,	-164.379900,	0.009603,	-164.394800,
0.028727,	-74.670060,	0.016993,	93.053330	
17000.000000,	0.009648,	162.845400,	0.009594,	162.884700,
0.029610,	-109.901700,	0.018247,	63.810330	
18000.000000,	0.009640,	130.148600,	0.009609,	130.159500,
0.025957,	-144.447200,	0.023496,	41.691800	
19000.000000,	0.009649,	97.427870,	0.009598,	97.422960,
0.023282,	177.407700,	0.028031,	22.885600	
20000.000000,	0.009653,	64.596130,	0.009591,	64.732710,

Figure 8-9. 40 dB Offset (DAT) CSV Format Report

Report Data Fields

- 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)

8-11 P40 dB or 50 dB Offset (UNC) #VER Report - CSV Format

The 40 dB offset report is only available from the VectorStar 3669B-1 V Connector Verification Kit running on a VectorStar MS4645A/B or MS4647A/B VNA.

A similar report, with identical report fields for a 50 dB offset, not shown in this document, is produced for the VectorStar 3668B K Connector, 3666-1 3.5 mm Connector, or 3663-1 Type N Connector Verification Kits.

40DB OFFSET (UNC) #VER.txt - Notepad

File Edit Format View Help

Anritsu Verification Report, Application Program: 67688 Version 2.00
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 4:18:59 PM
Device: 40dB Offset Serial Number: 601012
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	0.009908	0.009794	0.000729	0.11	P
1.000000	0.009753	0.009752	0.000195	0.00	P
10.000000	0.009780	0.009782	0.000175	0.01	P
100.000000	0.009775	0.009777	0.000175	0.01	P
1000.000000	0.009741	0.009740	0.000179	0.00	P
2000.000000	0.009739	0.009737	0.000182	0.01	P
3000.000000	0.009736	0.009737	0.000189	0.00	P
4000.000000	0.009714	0.009726	0.000200	0.04	P
5000.000000	0.009722	0.009716	0.000211	0.02	P
6000.000000	0.009721	0.009718	0.000220	0.01	P
7000.000000	0.009716	0.009710	0.000231	0.02	P
8000.000000	0.009722	0.009713	0.000241	0.03	P
9000.000000	0.009727	0.009727	0.000252	0.00	P
10000.000000	0.009739	0.009740	0.000262	0.00	P
11000.000000	0.009752	0.009747	0.000272	0.01	P
12000.000000	0.009771	0.009766	0.000283	0.01	P
13000.000000	0.009793	0.009788	0.000293	0.01	P
14000.000000	0.009820	0.009825	0.000304	0.01	P
15000.000000	0.009844	0.009844	0.000315	0.00	P
16000.000000	0.009866	0.009866	0.000325	0.00	P
17000.000000	0.009899	0.009897	0.000336	0.00	P
18000.000000	0.009931	0.009925	0.000347	0.01	P
19000.000000	0.009960	0.009952	0.000357	0.02	P
20000.000000	0.009990	0.009981	0.000368	0.02	P
21000.000000	0.010030	0.010020	0.000379	0.02	P
22000.000000	0.010068	0.010060	0.000390	0.01	P
23000.000000	0.010111	0.010102	0.000402	0.02	P
24000.000000	0.010150	0.010138	0.000412	0.02	P
25000.000000	0.010195	0.010183	0.000424	0.02	P
26000.000000	0.010240	0.010234	0.000435	0.01	P
27000.000000	0.010279	0.010276	0.000447	0.00	P
28000.000000	0.010322	0.010311	0.000459	0.02	P
29000.000000	0.010366	0.010362	0.000470	0.01	P
30000.000000	0.010415	0.010416	0.000482	0.00	P
31000.000000	0.010457	0.010447	0.000494	0.01	P
32000.000000	0.010491	0.010483	0.000506	0.01	P
33000.000000	0.010525	0.010523	0.000518	0.00	P

Figure 8-10. 40 dB Offset (UNC) CSV Format Report

Report Data Fields

- 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)

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 CD-ROM. The program will not run if it is just copied from the CD-ROM 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 D 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.

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
VNA Information	
VNA Model Number	
VNA Test Port Connector Type	
VNA Serial Number	
VNA Installed Option Numbers	
VNA Application Version Number	
Calibration Kit Information	
Manual Calibration or Automatic Calibration	
Calibration Kit Model Number	
Calibration Kit Serial Number	
Calibration Kit Last Characterization Date	
Verification Kit Information	
Verification Kit Type	
Verification Kit Model Number	
Verification Kit Serial Number	
System Performance Verification Software	
Software Model Number (e.g. 2300-527)	
Software Part Number (e.g. 67688)	
Software Version Number	
Adapter Types Used - Start and End Gender	
Adapters Type - Gender	
Adapters	
Adapters	
Adapters	
Through Lines Used - Start and End Gender	
Through Lines	
Through Lines	
Through Lines	

Appendix B — Connector Care Overview

B-1 Introduction

This reference provides instructions for the use and care of the RF connectors on your Anritsu instrument, and any items you connect to the instrument.

Following the recommendations in this document prevents shortened connector life and less equipment downtime due to connector-related failures.

The main topics of connector care are:

- Inspection and cleaning
- Pin depth measurement
- Connection techniques
- Torque specifications and tools

Note	The components in these kits are of the highest quality and accuracy. All components are NIST (National Institute of Standards Technology) traceable. Handle with care.

B-2 Inspection

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.
- Connector pin protrusion can damage the mating connector.
- Connector pin recession can affect measurement accuracy.
- Worn or damaged threads can damage mating connectors.
- Over torquing connectors will introduce excessive stress to connector interface, which results in deformation for example. Under torquing will increase repeatability uncertainty.
- Applying excessive or inadequate torque can affect measurement repeatability.

A connector is a perfect conductor for electrostatic discharge (ESD). Excessive charge accumulation will damage expensive and sensitive electronic devices residing in the precision instrumentation.

Coaxial Connector Care

Most coax connectors are assembled into a system and forgotten, but some, especially on test equipment 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 torque wrench
- Appropriate gauging techniques

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

Outer Conductor and Thread Inspection

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

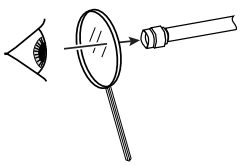
- Dirt, dust, metal particles and oil
- Damaged threads (distorted, dented, or crushed)
- Dents or raised edges on the mating plane

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. Careful visual inspection with a magnification aid and lighting should be performed at least once per day before connecting.

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.

Magnification

Use a device with a magnification range of 2X to 10X.

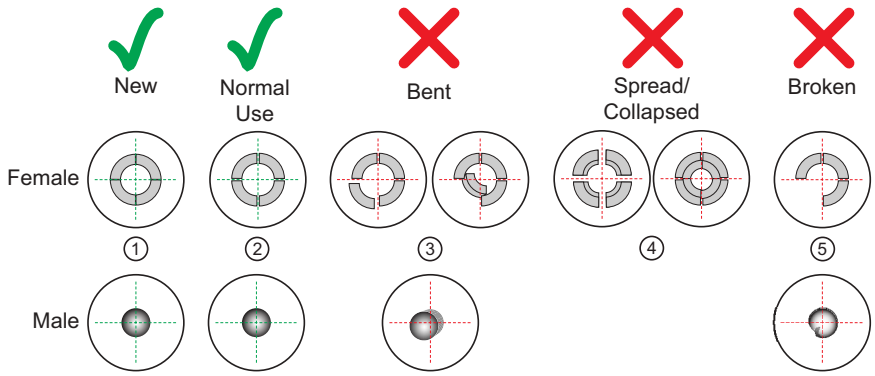


Connector Type	Minimum Magnification for Inspection
7/16 DIN	
Type N	2X
7 mm	
SMA	
3.5 mm	
WSMA	
K (2.92 mm)	7X
V (1.85 mm)	7X

Figure B-1. Connector Inspection

Center Conductor Inspection

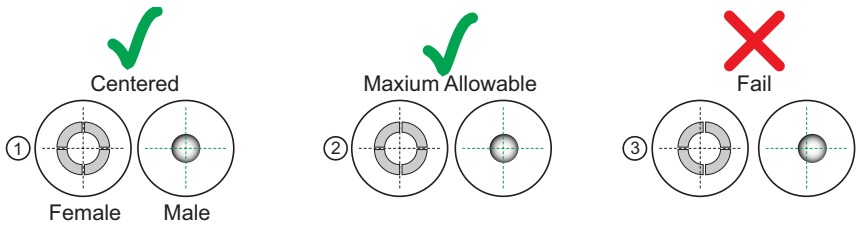
Inspect for bent, broken, or damaged center conductors:



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 B-2. Connector Damage States

Inspect for center pin concentricity:



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

Figure B-3. Connector Concentricity

B-3 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. 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

Caution	**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. 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. 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.

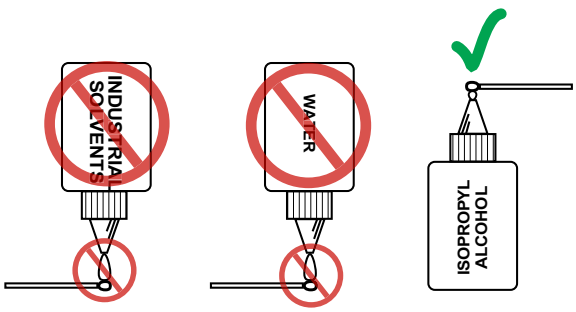


Figure B-4. Isopropyl Alcohol Only

1. Remove loose particles on the mating surfaces, threads, and similar surfaces using low-pressure (42 PSI max) compressed air applied at a shallow angle so dirt is not forced down into the connector.

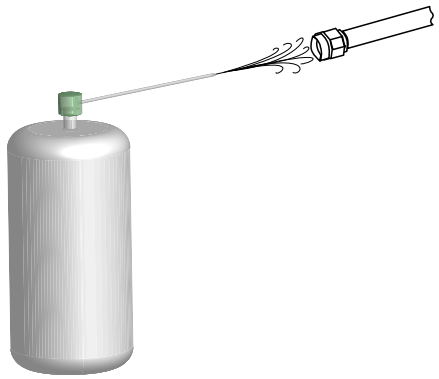


Figure B-5. Low Pressure Compressed Air Cleaning

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

Caution	Refer to Figure B-6. Do not insert cotton swabs at an angle. Doing so can damage the center pin. Do not use a cotton swab that is too large. It can stress and damage the center pin.

Figure B-6. Avoid Angled or Large Swab

3. Clean the mating plane surfaces and connector threads by gently moving the cotton swab around the center pin. Do *not* touch 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.

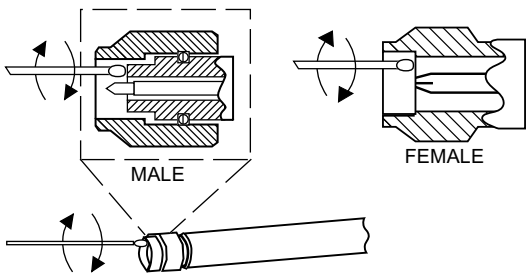


Figure B-7. Cleaning Connector with Cotton Swabs

4. After cleaning with swabs, again use low-pressure compressed air to remove any remaining small particles and dry the connector surfaces.

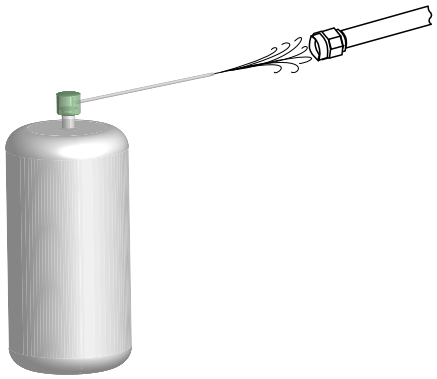


Figure B-8. Compressed Air Drying

5. With the aid of magnification and adequate lighting, inspect the connectors for damage, cotton strands or

Mechanical Shock

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

B-4 Measuring Pin Depth

Incorrect pin depth of mating connectors is the most frequent cause of equipment failure in the field. When an RF component is mated with a connector having a positive pin depth, damage will likely occur to the RF component connector. A connector should be checked a minimum of once per day before use. Check the pin depth of a new connector or a connector of unknown quality to determine if it is out of specification. If the connector is to be used on equipment with unknown connector condition, the connector on the equipment should also be gauged. Before mating, measure the pin depth Figure B-9 (below) of the device that will mate with the RF component, using an Anritsu Pin Depth Gauge or equivalentFigure B-10 (below).

Pin Depth Defined

Pin depth is measured from a connector reference plane to a defined point on the connector center pin (depending on the connector type). The mechanical gauging of the coaxial connectors for pin depth will detect and prevent the following problems:

Positive Pin Depth: This can result in buckling of the fingers of the female center conductor or damage to the internal structure of a device due to the axial forces generated.

Negative Pin Depth: This can result in poor return loss, possibly unreliable connections, and even physical breakdown under peak power conditions.

Pin Depth Guage

Connector pin depth gauge kits are available as part of the Anritsu 365xX Series Calibration Kits. Refer to www.anritsu.com . A typical pin depth gauge kit consists of the following items, depending on the type of connector you are measuring.

- Pin Depth Gauge
- Reference Block - for zeroing the gauge
- Adapters for connecting to a male or female connector
  (The gauge coupling nut and adapters will vary depending on the connector type.)

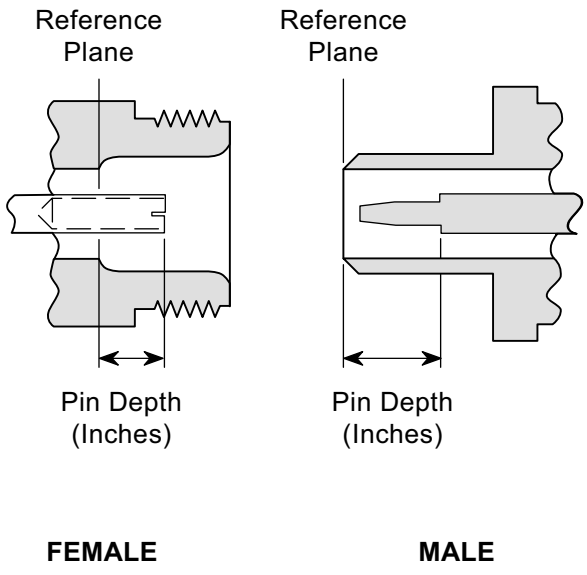
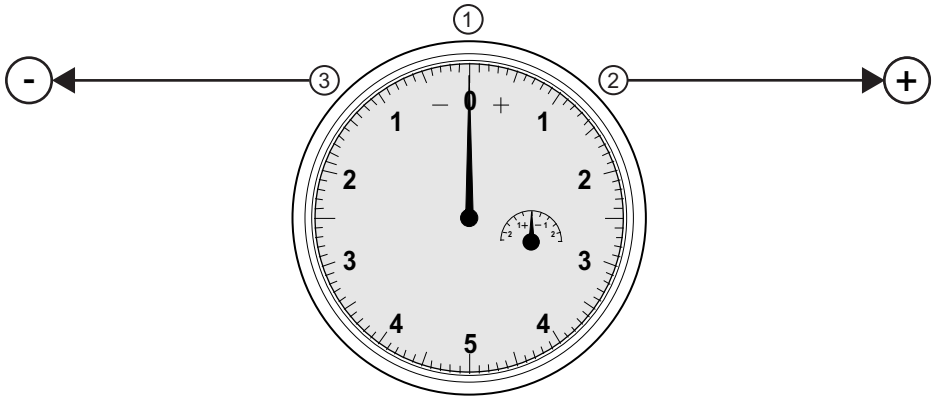


Figure B-9. Pin Depth



- The dial on the Anritsu gauge is always set to 0.000 with a gauge block as reference.
- The gauge block for Type N connectors has one end with a 0.207” protrusion for setting the Type N female pin depth and a 0.207” recessed hole for setting the N male pin depth.

1. Pin Depth Gauge – Needle Setting at zero.
2. Positive needle direction clockwise to right.
3. Negative needle direction counter-clockwise to left.

Figure B-10. Pin Depth Gauge

Caution	Destructive pin depth means a center pin is too long with respect to the connector’s reference plane. This can damage the mating connector.

Checking the Guage

Pin depth gauges should be checked for cleanliness before each use. Follow the procedures in Section B-3 to inspect and clean the pin depth gauge.

Type N Connector Measurement

1. On the pin depth gauge, loosen the side lock knob.

2. Hold the reference block against the end of the gauge body and turn the gauge outer ring until the pointer rests on zero.

3. Tighten the side lock knob.

4. To measure female Type N connectors, screw the female adapter onto the end of the gauge body. To measure male Type N connectors, remove the female adapter.

GPC-7 Connector Measurement

1. Loosen the side lock knob.

2. Hold the reference block against the end of the gauge connector and turn the outer ring until the pointer rests on zero.

3. Tighten the side lock knob.

4. Remove the GPC-7 center conductor contact collet from the connector to be measured using the collet removal tool.

5. Attach the gauge to the connector and read the pin depth.

6. Remove the gauge and replace the center conductor collet.

K, 3.5 mm, and WSMA Connector Measurement

1. On the pin depth gauge, loosen the side lock knob.
2. Remove the female adapter from the gauge body coupling nut.
3. Hold the reference block against the end of the gauge body and turn the gauge outer ring until the pointer rests on zero.
4. Tighten the side lock knob.
5. To measure female connectors, unscrew the gauge coupling nut and slide it forward.
6. To measure male connectors, leave the gauge coupling attached to the gauge body. Screw the female adapter to the coupling nut.

V Connector Measurement

1. On the pin depth gauge, loosen the side lock knob.
2. Hold the reference block against the end of the gauge body and turn the gauge outer ring until the pointer rests on zero.
3. Tighten the side lock knob.
4. To measure V male connectors, screw the female adapter onto the gauge coupling nut.
5. To measure V female connectors, screw the male adapter onto the gauge coupling nut.

Tolerance/Gauge Settings

Refer to Table B-1 below. When gauging pin depth, if the test device connector measures out of tolerance in the "+" region of the gauge, the center pin is too long. *Mating under this condition will likely damage the mating connector.*

On the other hand, if the test device connector measures out of tolerance in the "–" region, the center pin is too short. While this will not cause any damage, it may result in a poor connection and consequent degradation in performance.

Caution	The mating connectors of various RF components may not be precision types. Consequently, the center pins of these devices may not have the proper pin depth due to looser tolerances. The pin depth should be measured to ensure compatibility before attempting to mate it to a connector on Anritsu test equipment. Refer to Table B-3.

Table B-1. Pin Depth Tolerances and Gauge Settings

Connector Type	Pin Depth (Inch)	Pin Depth (mm)
7/16 Male	+0.0579 +0.0697	+1.47 +1.77
7/16 Female	–0.0697 –0.0815	–1.77 –2.07
GPC-7	+0.000 –0.003	+0.000 –0.076
Type N Male	–0.207 –0.210	– 5.258 –5.334
Type N Female	+0.207 +0.204	+5.258 +5.182

Table B-1. Pin Depth Tolerances and Gauge Settings (Continued)

Connector Type	Pin Depth (Inch)	Pin Depth (mm)
WSMA Male (3.5 mm)	–0.0025	–0.0635
WSMA Female (3.5 mm)	–0.0035	–0.0889
K Male (2.92 mm)	+0.000	+0.000
K Female (2.92 mm)	–0.0050	–0.127
V Male (1.85 mm)	+0.000	+0.000
V Female (1.85 mm)	–0.0040	–0.1016

B-5 Making a Connection

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

Caution	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. Over torquing connectors is destructive as it may damage the connector center pin. Never use pliers or adjustable wrenches to tighten connectors. For connectors with flats, always use the correct torque wrench with the correct setting to tighten the connector.

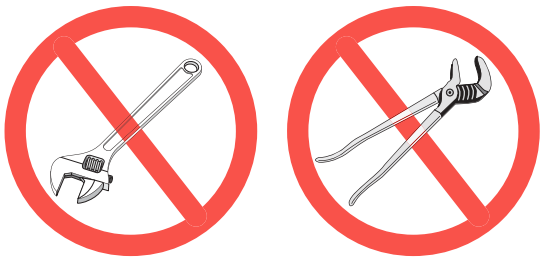


Figure B-11. Do not use pliers and wrenches

Pre-Connection Steps

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 B-3

   The coupling nut should move freely. If necessary, clean the connectors
3. Measure connector pin depth if the connector is new or of unknown condition. Refer to Section B-4 for details.
4. 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

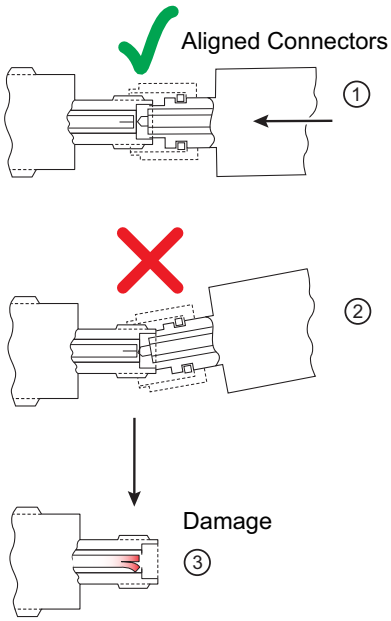
1. Carefully align the connectors as shown in Figure B-12.

   The male connector center pin must slip concentrically into the contact fingers of the female connector. You should never have to apply excessive force when making a connection.

2. Push the connectors straight together.

   Do not twist while pushing them together. As the center conductors mate, there is usually a slight resistance.

Warning	Having to apply excessive force to a connection is a reason to suspect the compatibility or quality of the connector and indicates a need to measure the pin depth



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

Figure B-12. Avoid Pin Damage Due to Misalignment

3. Finger-tighten the connection first by turning the connector nut.

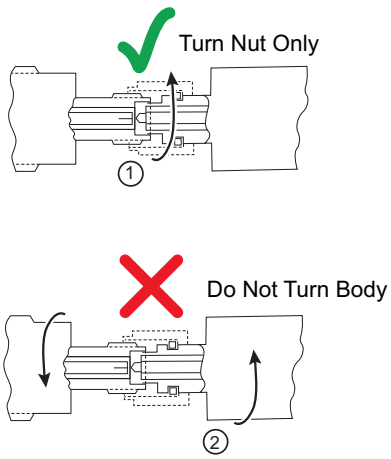
   Do not turn the connector body.

   Do not pre-tighten so much that there is no rotation of the nut when using the torque wrench.

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 as described in Table B-2

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 B-13. Tightening the Connector Nut

B-6 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. Applying proper torque will improve connection repeatability and reproducibility. Over torquing connectors is destructive; it may damage the connector center pin. Finger-tight is usually sufficient, especially on Type N connectors. *Never* use pliers to tighten connectors. For other connectors, use the correct torque wrench.

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 B-2 for torque specifications.
2. Place the two wrenches at an angle of less than 90° as shown in Figure B-15.
3. Hold the torque wrench at the end as shown below.

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

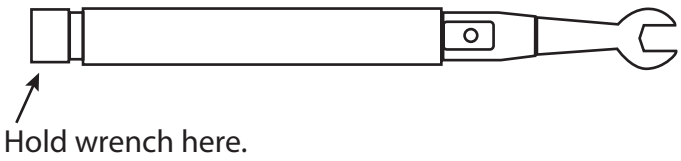


Figure B-14. Correct Place to Hold Torque Wrench

4. Before torquing, make sure long or heavy devices or cables are supported so there is no lateral pressure on the connection
5. Rotate *only* the connector nut when tightening the connection.

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.

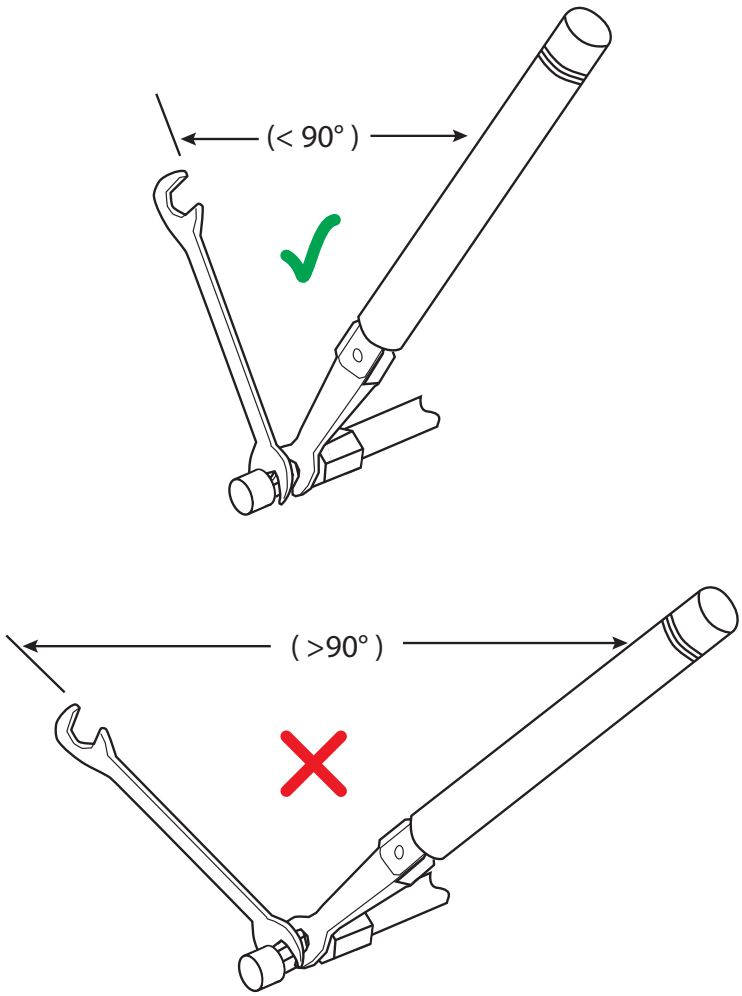
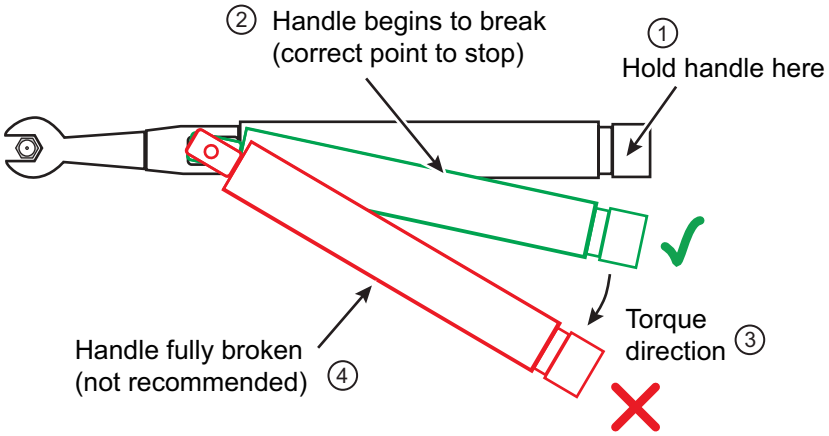


Figure B-15. bUsing Wrenches at Proper Angle

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

6. Apply torque to the fitting until the handle begins to break as shown in Figure B-15.



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 B-16. Using a Torque Wrench

Torque Specifications and Tools

Torque values are listed below for connectors used with Anritsu equipment. 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.

Table B-2. Connector Torque Settings and Recommended Tools

Connector Type/Size	Wrench Size	Torque Setting	Recommended Tools
7/16 DIN	32 mm 1 1/4 in	25 N·m 18.43 lbf·ft	01-513 Torque Wrench 01-510 Adjustable 10” End Wrench
	25.4 mm 1 in	25 N·m 18.43 lbf·ft	01-512 Torque Wrench 01-510 Adjustable 10” End Wrench
Type N (With Flats)	19 mm 3/4 in	1.35 N·m 12 lbf·in	01-200 3/4 in.Torque End Wrench
20 GHz Type N	19 mm 3/4 in	1.35 N·m 12 lbf·in	01-200 3/4 in.Torque End Wrench
Type N (Twist-On)	–	–	Twist-on connector version, therefore no torque setting Align connectors, thread, and then twist on until finger tight. *Do not use a wrench or pliers to tighten.*
7 mm	19.2 mm 3/4 in	1.35 N·m 12 lbf·in	01-200 3/4 in.Torque End Wrench
SMA[a] [b]	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. 8 mm Open End Wrench
3.5 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
WSMA[c]	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
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. 8 mm Open End Wrench
2.4 mm	8 mm 5/16 in	0.9 N·m 8 lbf·in	01-201 5/16” Torque End Wrench 01-204 5/16” 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. WSMA, 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 B-3 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 SMA. Refer to Table B-3 for connector compatibility information.

c. The WSMA connector is designed for best electrical performance when it is mated to an SMA connector.

Connector Types and Cross-Mating Compatibility

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

Table B-3. RF Connector Characteristics

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

Disconnection

To properly separate an RF connection:

1. Use the same wrenches technique as shown in Figure B-15.
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.

Appendix C — GPIB Settings

C-1 Introduction

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

C-2 GPIB Board and PC Settings

Use these settings for your GPIB controller board.

Table C-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

C-3 MS4640A/B VNA Instrument Settings

Table C-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

C-4 Instrument Default GPIB Addresses

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

Table C-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 D — USB and Installed Files

D-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.

D-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

D-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
```

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Anritsu

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