User Guide

3656C W1 Calibration/Verification Kit and 2300-616-R System Performance Verification Software

VectorStar™ ME7838A/AX Modular Broadband VNA System with 3743A/AX mmWave Modules

VectorStar™ ME7838E/EX Modular Broadband VNA System with 3743E/EX mmWave Module

VectorStar™ ME7838A4/A4X Modular Broadband VNA System with 3743A/AX mmWave Modules

VectorStar™ ME7838E4/E4X Modular Broadband VNA System with 3743E/EX mmWave Modules

VectorStar™ ME7828A Standard Broadband VNA System

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Part Number: 10410-00784
Revision: A
Published: September 2021

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Chapter 1 — 3656C W1 Calibration/Verification Kit Overview

1-1 Introduction

This manual provides description and maintenance instructions for the Model 3656C W1 (1 mm) Calibration and Verification Kit and describes the use of the Anritsu Performance Verification Software (PVS) for

- VectorStar™ ME7838A/AX Series Modular BB/mm-VNA System
- VectorStar™ ME7838E/EX Modular BB/mmWave VNA Measurement System
- VectorStar™ ME7838A4/A4X Modular BB/mmWave VNA Measurement System
- VectorStar™ ME7838E4/E4X Modular BB/mmWave VNA Measurement System
- VectorStar™ ME7828A Standard BB/mmWave VNA Measurement System,
- The 3656C calibration kit can also be used with other VNA systems (including the ME7838D and ME7838D4) with appropriate adapters to the 1 mm connector interface.

The verification processes only apply to the systems enumerated above.

This chapter provides an illustration and description of the kit components. General connector care instructions applicable to all calibration kits are provided in Chapter 6, “Maintenance”.

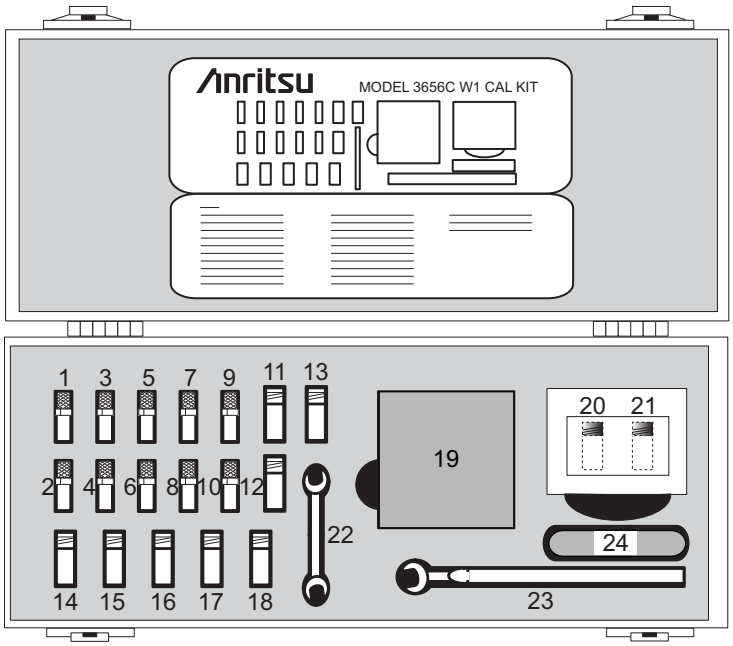
Operation and use of the 3656C W1 (1 mm) Calibration/Verification Kit is documented in procedures in the VectorStar Operation Manual and Measurement Guide.

Note	The components in this kit are of the highest quality and accuracy. All components are NIST (National Institute of Standards and Technology) traceable.

Note	This version of the PVS also supports the 3656B calibration/verification kit with measurements to 110 GHz. Even with the AX and A4X systems, verification will only be done to 110 GHz with the B kit.

1-2 Model 3656C W1 (1 mm) Calibration/Verification Kit

The 3656C W1 (1 mm) Calibration/Verification Kit is shown in Figure 1-1 with the listed components. The -3 option on this calibration kit will add .s1p files describing the calibration standards onto the USB memory device. This is in addition to the polynomial models (.ccf file format) supplied with the base 3656C calibration kit.



1. Male Broadband Termination – 28W50
2. Female Broadband Termination – 28WF50
3. Male Open – 24W50
4. Female Open (1.930 mm) – 24WF50
5. Male Offset Short 1 (2.02 mm) – 23W50-1
6. Female Offset Short 1 (2.02 mm) – 23WF50-1
7. Male Offset Short 2 (2.65 mm) – 23W50-2
8. Female Offset Short 2 (2.65 mm) – 23WF50-2
9. Male Offset Short 3 (3.180 mm) – 23W50-3
10. Female Offset Short 3 (3.180 mm) – 23WF50-3
11. Male-Male Adapter – 33WW50A
12. Male-Female Adapter – 33WWF50A
13. Female-Female Adapter – 33WFWF50A
14. Fixed Male SC Connector – 33WSC50
15. Fixed Female SC Connector – 33WFSC50
16. Interchangeable Slider, SC Connectors
    - 60939 (M)
    - 60943 (F)
17. Locking Keys, SC Connectors – 61265
18. Pin Exchange Tool – 01-402
19. Not Used
20. Stepped Impedance Mismatch Thru Line Verification Device inside plastic box – 18WWF50A-1B (3656C/3656C-3 only)
21. 50 Ohm Matched Thru Line Verification Device inside plastic box – 18WWF50A-1 (3656C/3656C-3 only)

Figure 1-1. 3656C W1 (1 mm) Calibration/Verification Kit Components (1 of 2)

22. 6x7 mm End Wrench – 01-505
23. 6 mm Torque Wrench – 01-504
24. USB Memory Device for VectorStar MS4640A/B Series VNAs containing the following:
    - W1 Component Coefficient Data for VectorStar
    - W1 Component Verification Data for VectorStar (3656C and 3656C-3 only)
    - System Performance Verification (PVS) Software (3656C and 3656C-3 only)
    - 3656x W1 (1 mm) Calibration/Verification Kit and System Performance Verification Software User Guide – 10410-00784 (this document) (3656C and 3656C-3 only)

The USB memory device is labeled with the Serial Number of the Calibration/Verification Kit

Figure 1-1. 3656C W1 (1 mm) Calibration/Verification Kit Components (2 of 2)

1-3 Required Equipment

This section describes the recommended equipment for installing and running the software.

GPIB Controller PC Operating System

Make sure that the following minimum requirements are met before installing and using the software:

- A minimum of 1 GB RAM
- Windows XP SP2, Windows 7, Windows 10
  - This application has not been tested on Microsoft® Windows Vista®.
- 20 MB hard-disk free space
- National Instruments® PCI-GPIB Controller (or suitable equivalent) associated drivers installed
- Display resolution 1024 × 768 and a USB port

Note	This program may not function on versions of Microsoft Windows that use 4-byte character sets.

Verification Software Overview

The Anritsu Broadband Measurement System Performance Verification Software is provided on a USB memory device. The verification software provides for automating measurements of the test components contained in the Anritsu Model 3656C Calibration/Verification Kit.

The software compares the measurements of NIST traceable standards made with your instrument to the standard's test data provided on the verification kit's USB memory device. This aids in determining if the measurement values are consistent with system specifications.

Data Output

The test data and results are output in the form of four files to a directory (`X:\installed directory`) on your computer's hard drive. The default file names, depending on the type of test being performed, are:

- Matched Thru Low.dat
- Mismatched Thru Low.dat
- Matched Thru High.dat
- Mismatched Thru High.dat

Note	This performance verification software allows you to rename these files using the default **.dat** extension. The tabular data in each file is given at discrete frequencies at 1 GHz intervals, along with separate start and stop frequencies if the start and stop frequencies do not fall on 1 GHz spacing. The test results can be viewed or printed from the **Main Menu** window.

GPIB Interface Card and Cable

Depending upon the Operating System and hardware used to perform the verification, there are different requirements for the GPIB hardware configurations. This software supports the following GPIB interfaces:

- National Instruments Model PCMCIA-GPIB (Driver Software Versions 1.2 and above)
- National Instruments Model PCI-GPIB (Driver Software Version 1.2 and above)

Regardless of which GPIB hardware and software is used, the GPIB card must be configured as "GPIB**0**." You also need a GPIB cable to interface the PC to the broadband measurement system (Anritsu PN: 2100-2-R).

Printer

A printer is not required for operation because the verification results and data are stored in four files on the computer hard disk drive. These files are saved in ASCII format for easy viewing and printing at a later time.

Note	The descriptive screen shots which appear in this manual may appear slightly different depending on the Windows operating system used and the VectorStar system under test.

1-4 Related Documentation

For more information on VNA systems, calibration/verification kits, and other supporting accessories, refer to:

- the Anritsu web site: http://www.anritsu.com
- the VectorStar product page: https://www.anritsu.com/test-measurement/products/ms4640b-series
- the ME7838x web page: https://www.anritsu.com/test-measurement/products/me7838

This and other VectorStar manuals are available for download as a PDF file.

Product Information, Compliance, and Safety

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

Chapter 2 — Using the PVS Software with the ME7838A/AX/E/EX

2-1 Introduction

This chapter describes the use of the Anritsu Performance Verification Software (PVS) with the VectorStar ME7838A/AX/E/EX Modular BB/mmWave VNA Measurement System. The ME7838A/AX/E/EX is based on the VectorStar MS4647A/B Vector Network Analyzer running VectorStar Application Version 1.5.0 or higher and equipped with Option 08x.

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.

2-2 Required Equipment

The VectorStar ME7838A/AX/E/EX Broadband/Millimeter Wave Measurement System consists of:

- VectorStar MS4647A/B VNA, 10 MHz to 70 GHz, V Connectors, equipped with Option 08x
- 3739A/B/C Broadband Test Set
- Two (2) 3743A/E/EX mmWave Modules, 70 GHz to 110 GHz or two (2) 3743AX mmWave Modules, 70 kHz to 125 GHz.
- Necessary ME7838A4/A4X/E4/E4X rear panel interconnect cables between the test set and the VNA
- Necessary front panel interconnect cables between the test set and the VNA
- Necessary interconnect cables to the 3743x mmWave Modules

2-3 Configuring the Hardware

This section describes how the various system elements are interconnected and describes the preliminary steps required for operation of the verification software. See Section 2-2, “Required Equipment” for a complete equipment list.

1. Ensure that the VNA system is set to “Broadband”.
2. To verify the setting, from the right side MAIN menu, select the broadband test set button:
   - MAIN | Application | APPLICATION | Rcvr Config | RCVR CONFIG | BB/mmWave (3738 Test Set) or BB/mmWave (3739 Test Set)
3. Select the Broadband Receiver Configuration.
4. Connect a GPIB cable between the PC Controller and the VNA Rear Panel GPIB port labeled IEEE 488.2 GPIB.

Caution	Do not connect the cable to the VNA Rear Panel GPIB port labeled **Dedicated GPIB**.

2-4 W1 Verification Application Installation

Prior to installation of the W1 Application, the National Instruments GPIB card and drivers must be installed in the Windows PC.

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

	In order to correctly install the PVS application, the user (logged in) must have Administrative rights on the Windows PC Controller.
Note	The PVS application is installed onto the PC Controller on an all-user basis.
	If your organization does not allow for all-user installations, consult your internal PC and network support group on how to best proceed.

1. Turn off all other running applications on the PC Controller.
2. Insert the USB Memory Device into the USB slot.
3. Open Windows Explorer, browse to the USB Drive, and double click on Startup.htm.

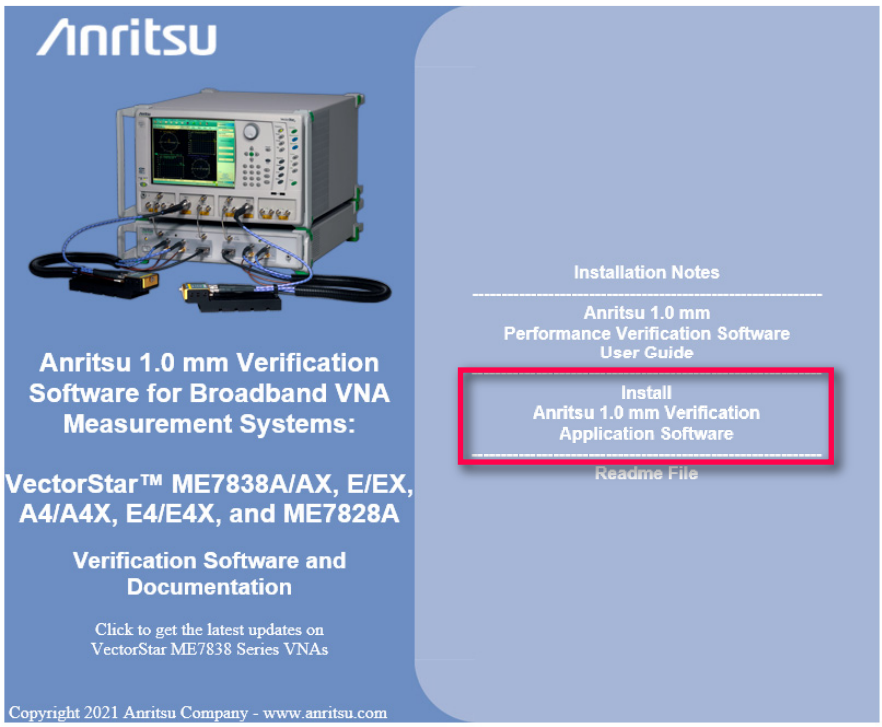


Figure 2-1. PVS Installation and Documentation Screen

4. On the navigation page, click the Install Anritsu 1.0 mm Verification Application Software link.
5. The first of several installation dialog boxes appears.

Note	The dialog box appearance may vary depending on the Operating System being used.

6. Click Run on the two security dialog boxes (Figure 2-2 on page 2-3).

7. If a dialog box appears that displays Error 1321 or Error 1931, follow these instructions:

- Error 1321 – Select Exit Installation and make sure you have Administrator privileges on the PC Controller.
- Error 1931 – Select OK to bypass the error message and continue the installation.

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

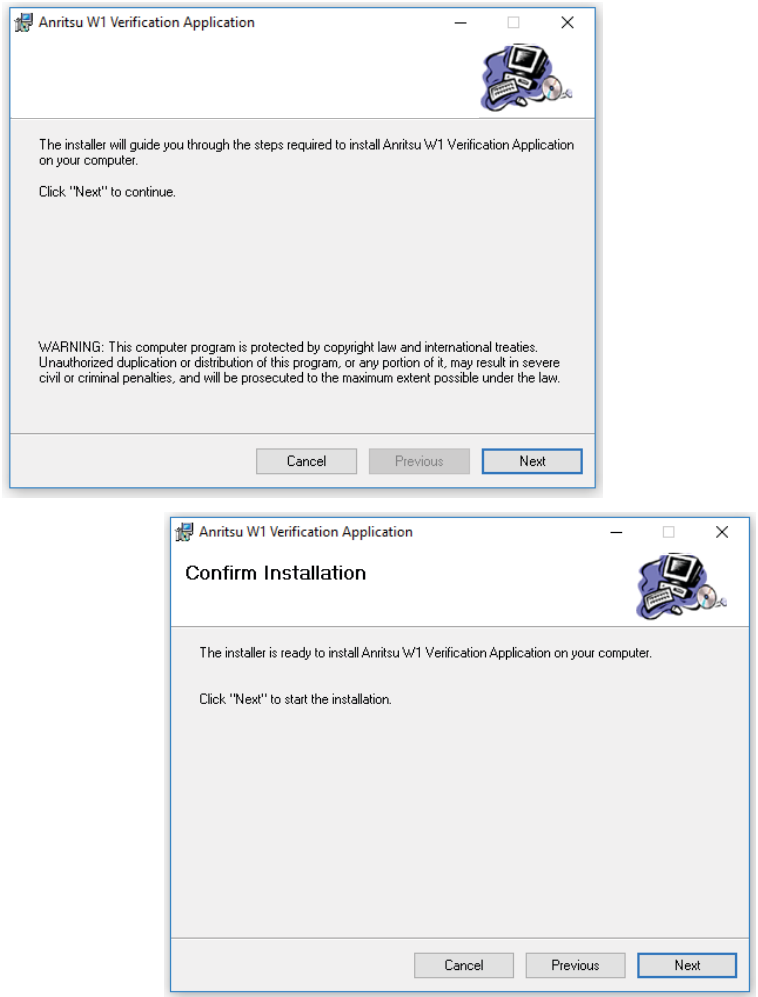


Figure 2-2. Installation Confirmation and Progress Dialog Boxes – Click Next on each

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.

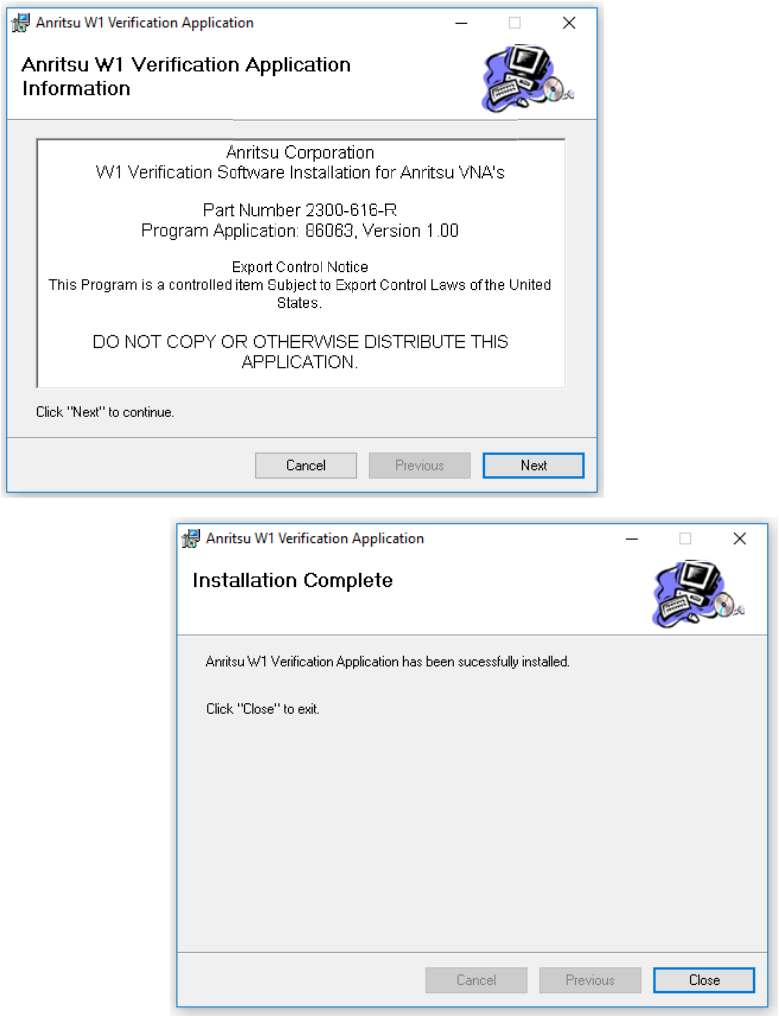


Figure 2-3. Final Application Information and Installation Complete Dialog Boxes

10. The installer adds all required files and makes the necessary registry updates on the PC Controller. When done, the navigation page (Figure 2-1) reappears.

11. If desired, open the User Guide (this document) and save and/or print a copy.

12. The PVS application is available in either the Start or Program menu of the PC Controller.

2-5 Running the Verification Software

After the VNA and PC have been configured as described above, you are ready to run the program and perform the calibration/verification. Make sure you have the following information available:

- Serial number of the 3656B/C W1 Calibration/Verification Kit
- Serial number of the 3739A/B/C Broadband/Millimeter Wave Test Set
- Model number and serial number of the Port 1 BB/mm Module
- Model number and serial number of the Port 2 BB/mm Module

The application process flow for a full verification of an ME7838A/AX/E/EX is as follows:

1. Choose your system configuration for Calibration/Verification kit type and system model number.
2. Measure Low Band
   a. Calibrate the low frequency band.
   b. Measure verification devices for low frequency band.
   c. Save verification data.
   d. Restart application for high frequency band.
3. Measure High Band
   a. Calibrate the high frequency band.
   b. Measure verification devices for the high frequency band.
   c. Save verification data.
   d. Exit program.

Note	Low-band (step 2) and high-band (step 3) calibration and verification can be performed in any order.

Procedure

1. With the equipment and software configured as described in "Configuring the Hardware" on page 2-1, turn on the computer and allow it to start Windows.
2. Locate the Anritsu W1 Verification icon (shown below) on the desktop and double-click it.

3. The program displays an About dialog box with version information. Click OK to continue.

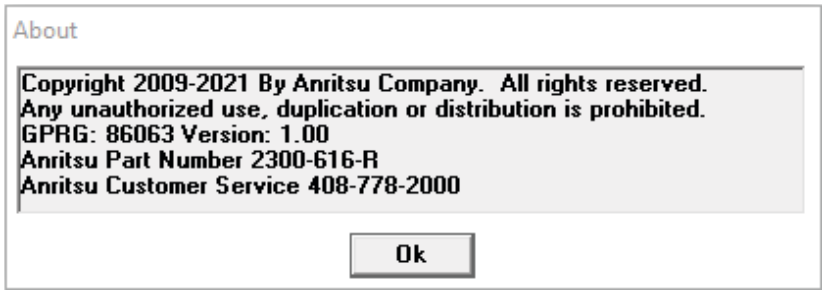


Figure 2-4. About Dialog Box

4. The Operator Name dialog box appears. Enter a user name or other identification.

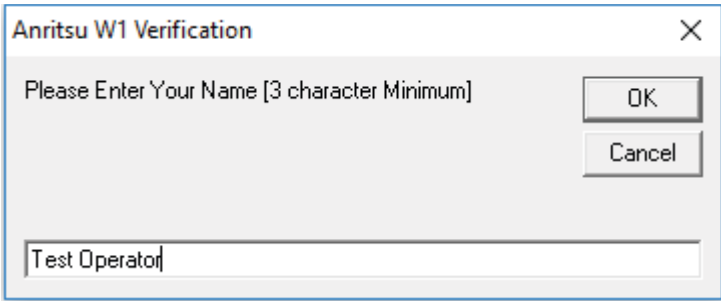


Figure 2-5. Operator Name Dialog Box

5. Click OK to continue. The program searches for a compatible VNA on the GPIB. It will also determine if the system is a 2-Port or 4-Port system.

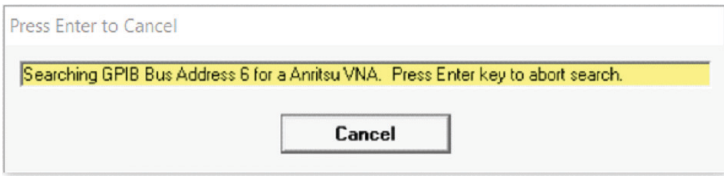


Figure 2-6. Number of Ports Dialog and Progress Tracker

6. When a VNA is found, a VNA confirmation box appears, as shown in Figure 2-7.

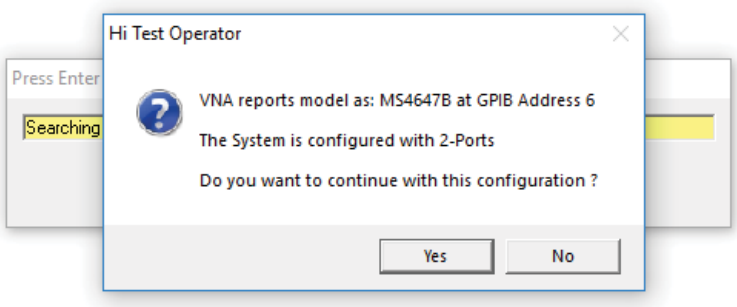


Figure 2-7. VNA Confirmation Dialog Box

7. Click Yes to continue or No to search for another VNA. If yes, then a Configure Application Settings dialog box appears:

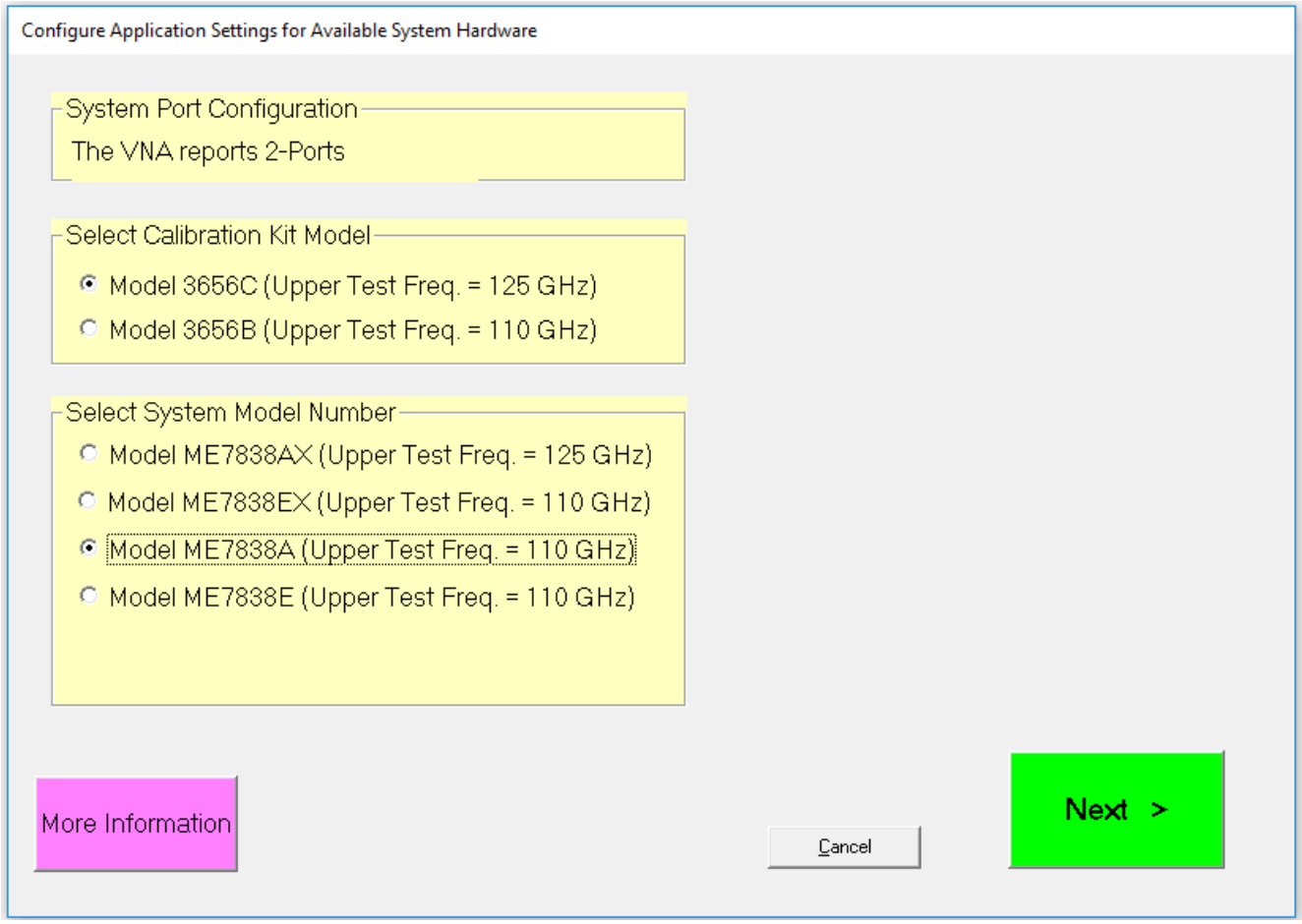


Figure 2-8. Configure Application Settings Dialog Box

8. Select the calibration kit model and the system model number to be used. Click Next to proceed. The program will request the model number and serial number of the test set and of each module.

Note	The ME7838AX will have a verification to 125 GHz. The ME7838A will have a verification to 110 GHz.

Enter Port 1 BB/mmWave Module Information

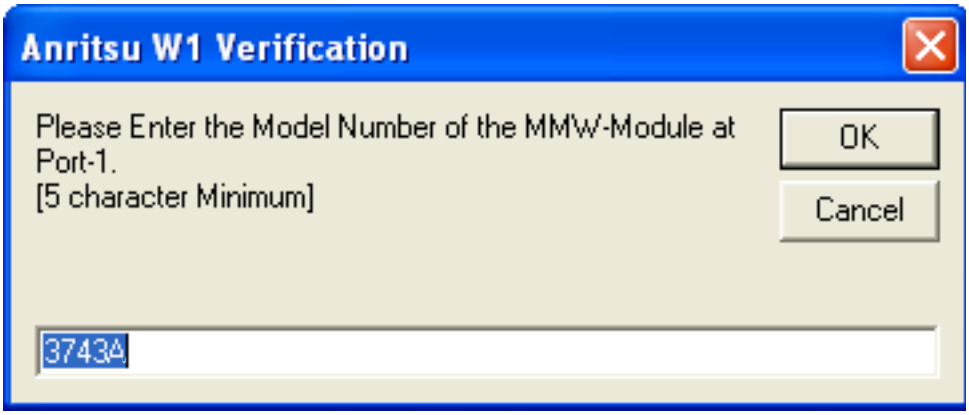


Figure 2-9. Anritsu W1 Verification Dialog – Port 1 BB/mmWave Module – Model Number

9. Enter the Port 1 BB/mmWave Module model number and click OK.

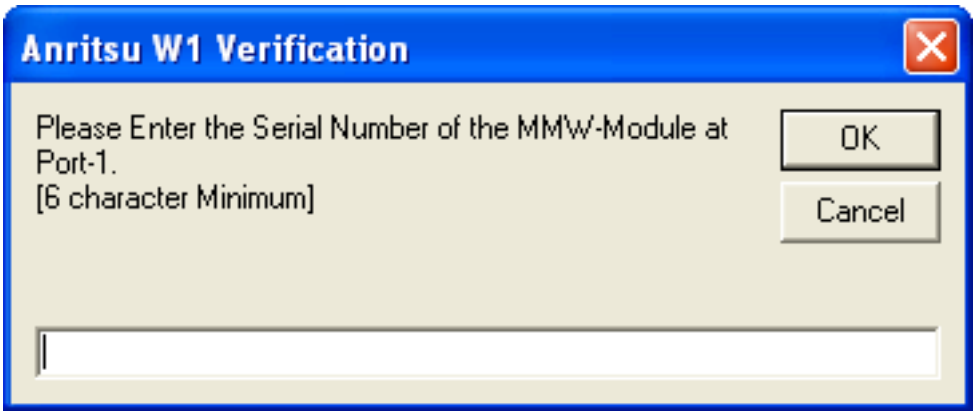


Figure 2-10. Anritsu W1 Verification Dialog – Port 1 BB/mmWave Module – Serial Number

Enter Port 2 BB/mmWave Module Information

10. Enter the Port 2 BB/mmWave Module model number and click OK.

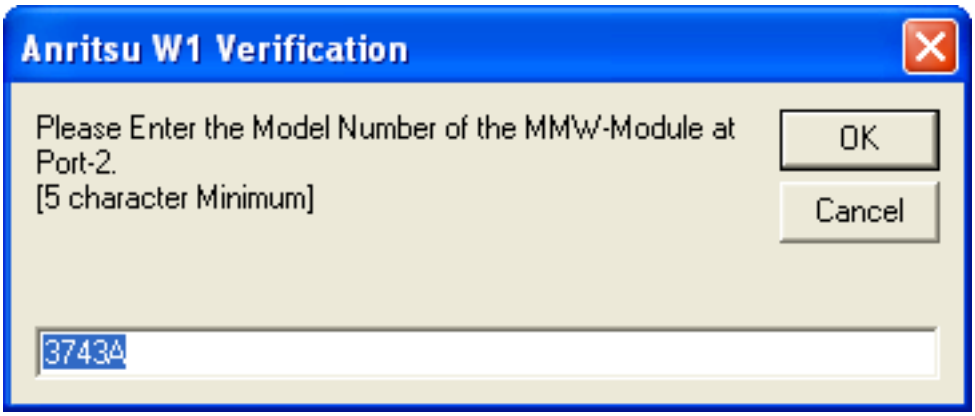


Figure 2-11. Anritsu W1 Verification Dialog – Port 2 BB/mmWave Module – Model Number

11. Enter the Port 2 BB/mmWave Module model number and click OK.

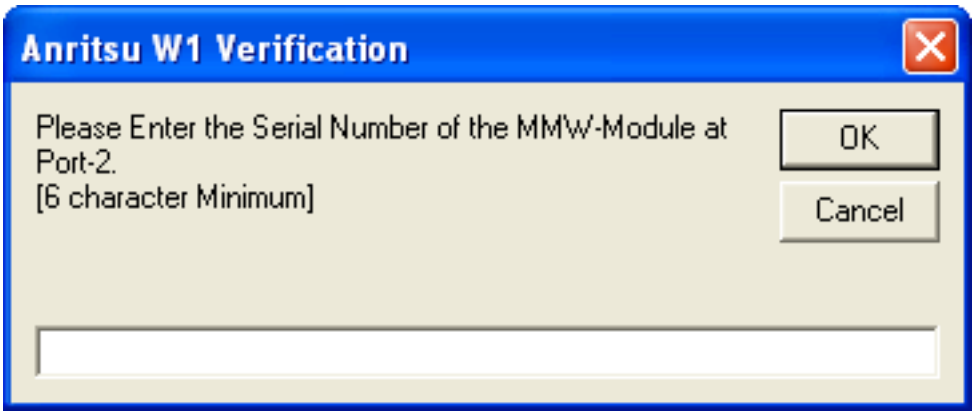


Figure 2-12. Anritsu W1 Verification Dialog – Port 2 BB/mmWave Module – Serial Number

Enter Test Set Information

12. Enter the Test Set model number and click OK.

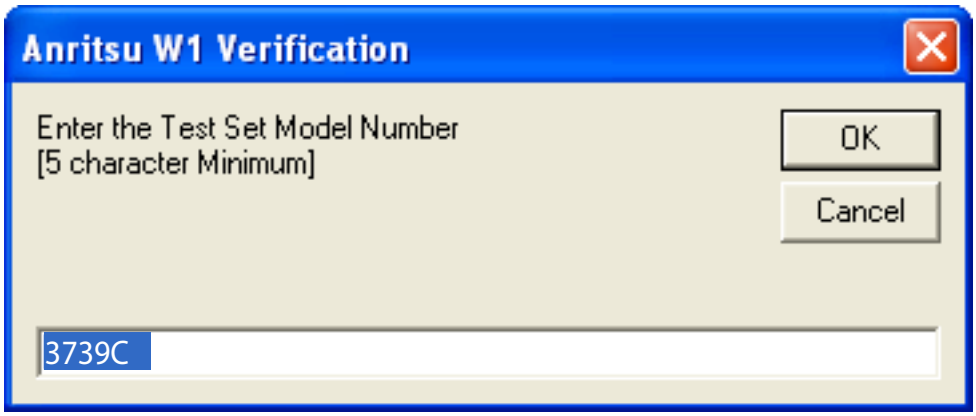


Figure 2-13. Anritsu W1 Verification Dialog – Test Set – Model Number

13. Enter the Test Set serial number found on the rear panel and click OK.

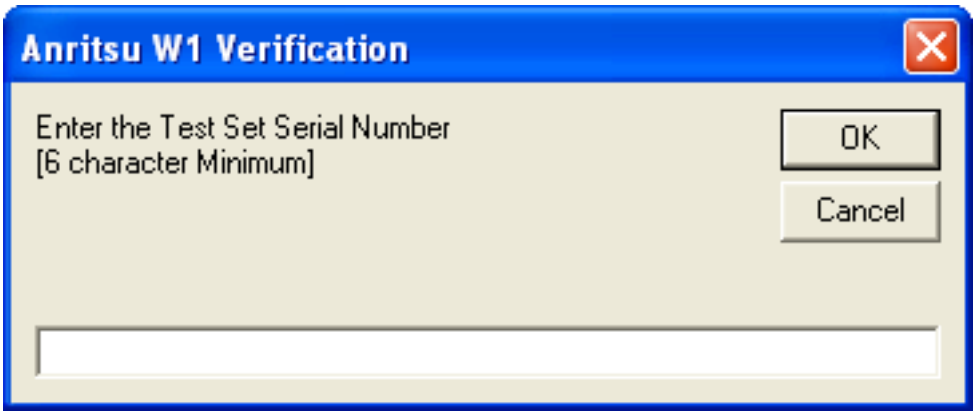


Figure 2-14. Anritsu W1 Verification Dialog – Test Set – Serial Number

14. The program execution continues to the following Section 2-6, “Application Interface – Setup Menu Tab” on page 2-11.

2-6 Application Interface – Setup Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections:

- The Setup Menu tab is described in this section.
- The Main Menu tab display is described in Section 2-9, "Application Interface – Main Menu Tab" on page 2-25.
- The Serial Number Info tab is described in Section 2-10, "Application Interface – Serial Number Info Tab" on page 2-29.

Procedure

The following procedure continues the program setup from the previous section:

1. In the Calibration Kit Type panel, select W Coax.
2. In the Serial Number (5 Digits) panel, enter the serial number for the 3656C Calibration/Verification Kit. At least five (5) digits are required.
3. In the Load Cal-Kit Coefficients to VNA panel, select Cal-Kit.

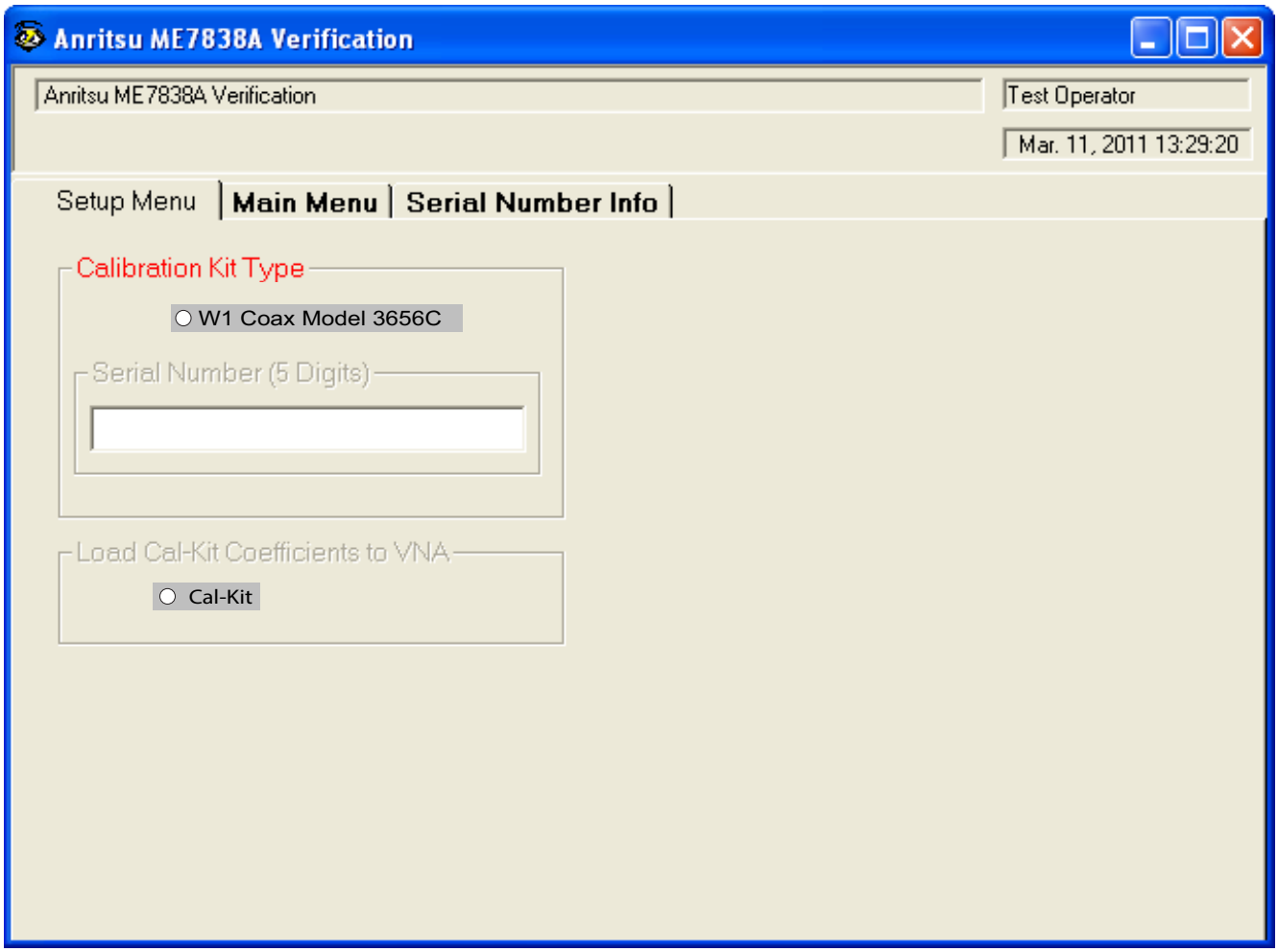


Figure 2-15. ME7838A Application Interface – Setup Menu Tab

4. The Install Calibration-Kit Coefficients to the VNA dialog box appears.

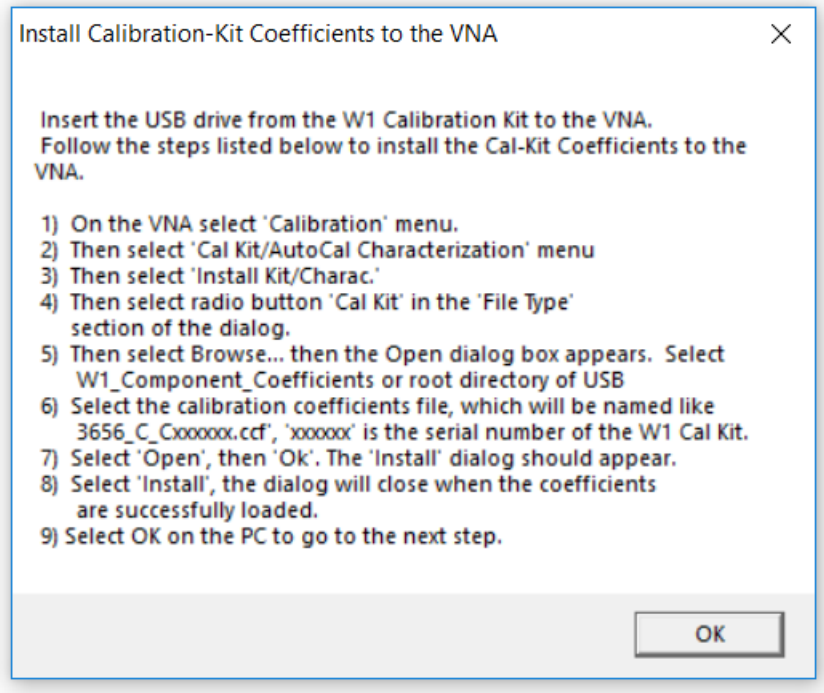


Figure 2-16. Install Calibration Kit Coefficients Dialog

5. The VNA displays an acknowledgment dialog box when the file load is complete, indicating that 10 files were loaded. After the VNA has loaded the 10 Calibration coefficient files, select OK on the PC application. The application will then prompt you to remove the USB drive from the VNA and install the USB drive to the PC.

Figure 2-17. Install USB Drive in PC Dialog

6. The Application Interface dialog box reappears displaying the Setup Menu tab and Frequency Range panels. In the Frequency Range panel, select either the low range (40 MHz to 67 GHz) or the high range (67 GHz to 110/125 GHz). For purposes of this document, the low band is done first. The range that is not selected is calibrated during the Restart Procedure described in Section 2-14 "Restart for Alternate Frequency Band" on page 2-37. After selecting the frequency range the Verification Kit Information panel appears.

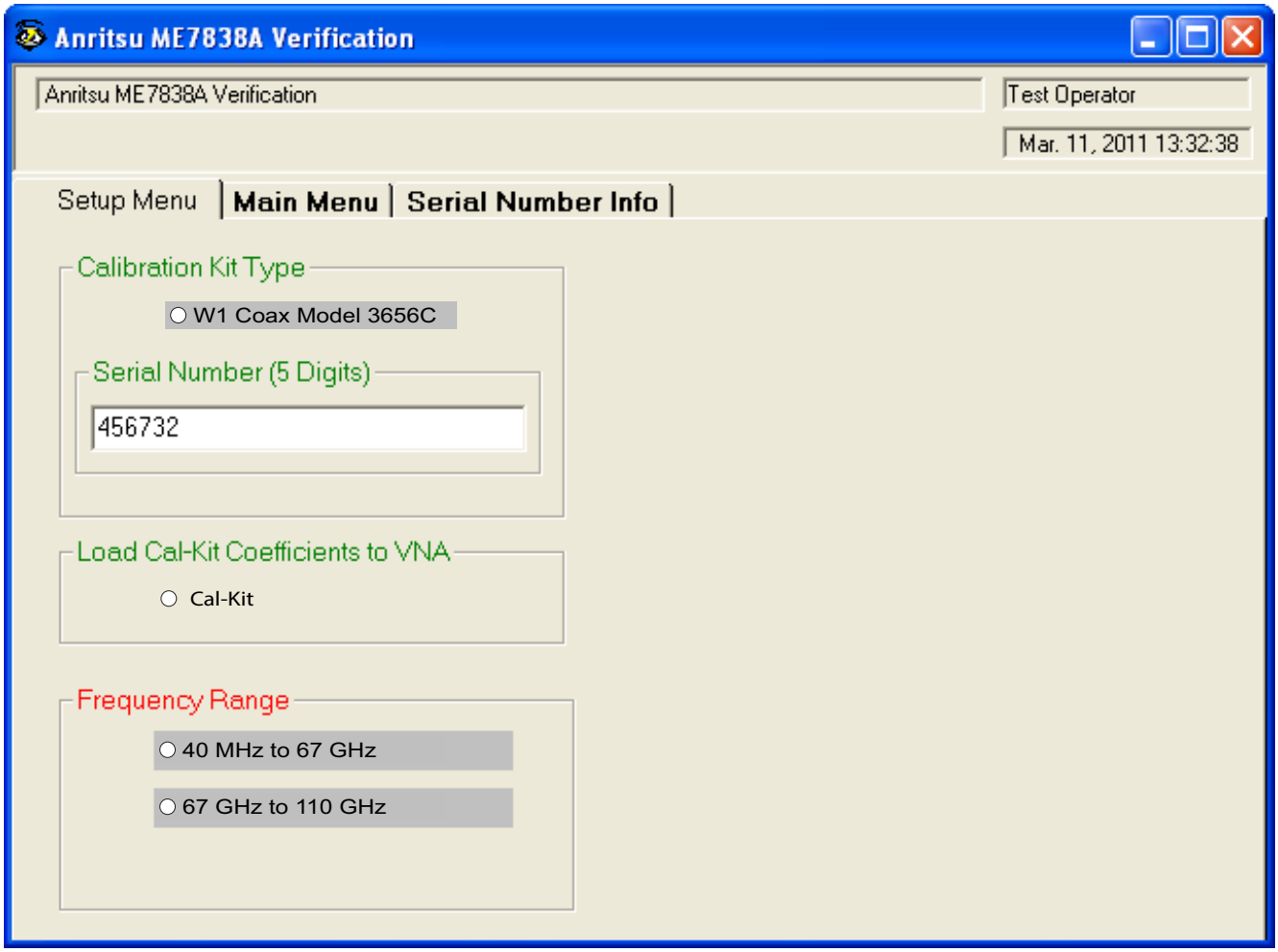


Figure 2-18. ME7838A Application Interface – Setup Menu Tab

7. In the Verification Kit pane, select the W Coax type; enter the Verification Kit Serial Number (usually the same as the Calibration Kit). When the Serial Number is complete, the Locate USB Drive Kit Data on PC panel appears.

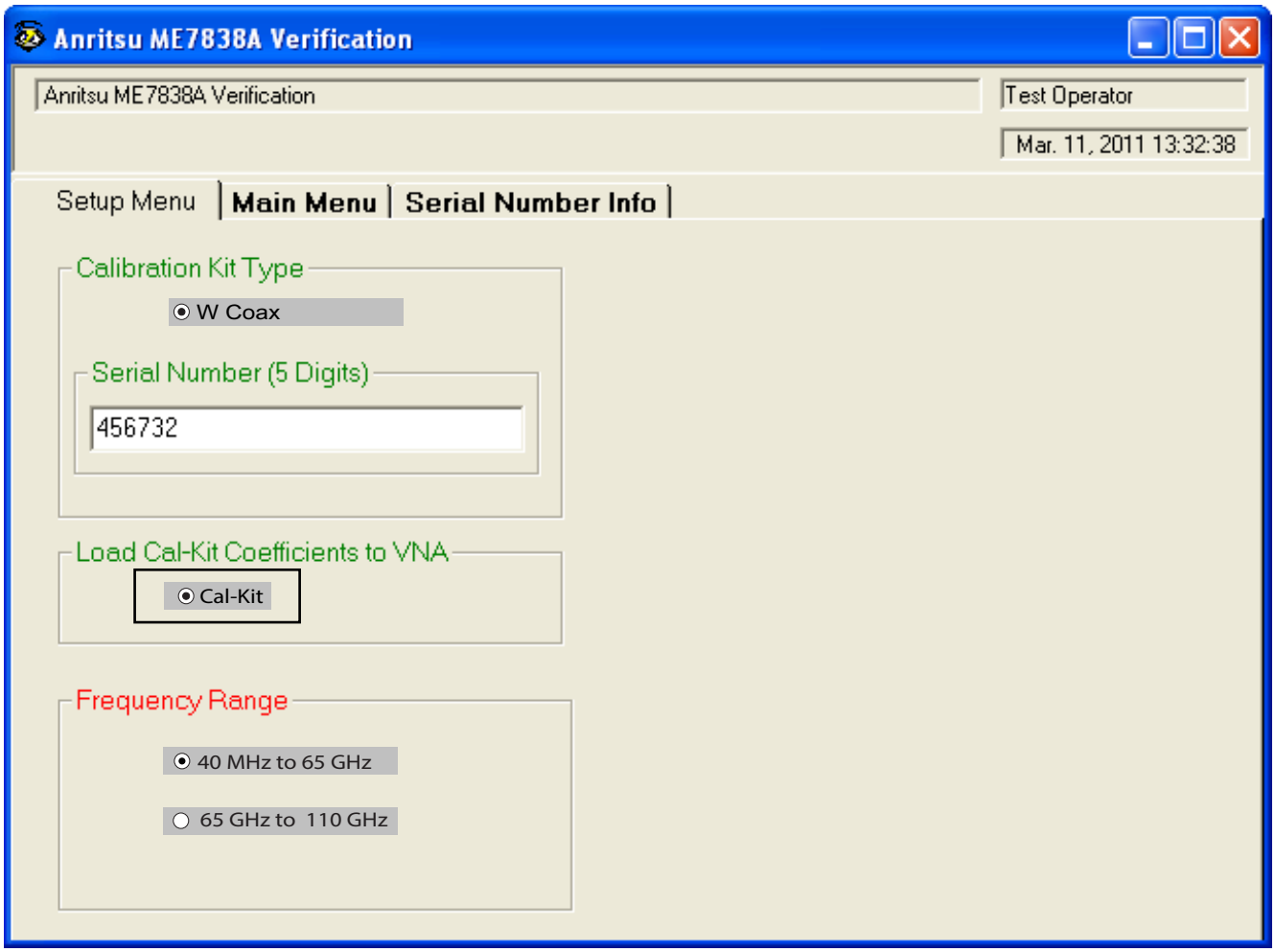


Figure 2-19. ME7838A Application Interface – Setup Menu Tab

8. In the Locate USB Drive Kit Data on PC panel, click the Go To USB Drive Locator button.

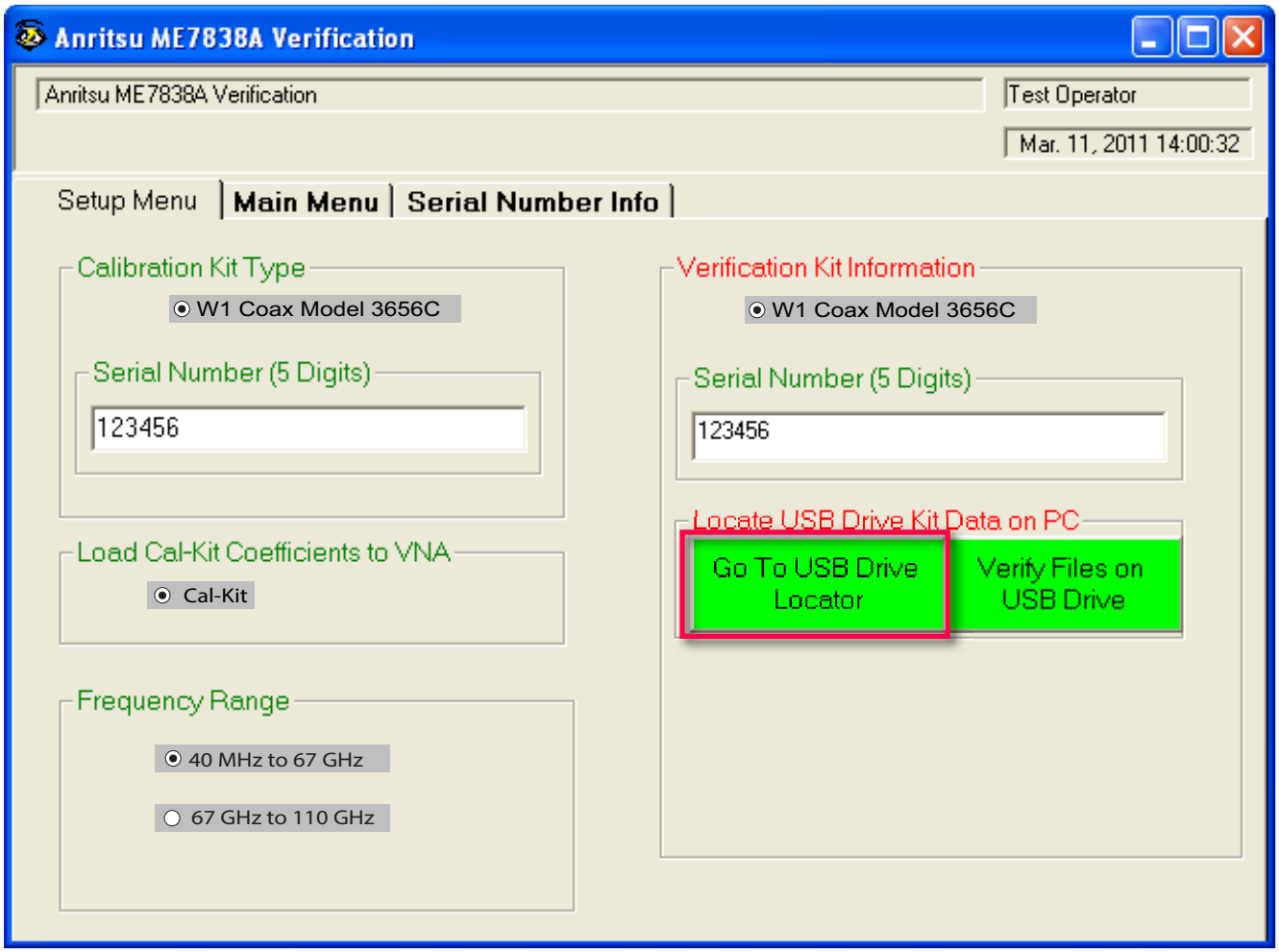


Figure 2-20. ME7838A Application Interface – Setup Menu Tab

9. When the Find Verification Kit Data dialog box first appears, the Verification Kit Data Path text field is blank. Click the Auto-Find USB Drive Verification Kit Data button. The application automatically locates the verification kit data on the USB drive and displays the path in the Verification Kit Data Path text field.

In rare instances, due to PC/USB configurations, the Auto-find function may not be able to locate the verification data on the USB drive. In this case, you may need to use the Manually Locate Verification Data Kit button. This utility allows you to manually select the path where the verification kit data is located. The data path will be on the USB drive shipped with the verification kit. On most PC's, this will be the E, F, or G drive assignments. Navigate to the verification kit data in the file-path location shown in the example below (for this example, the USB drive was at E:\):

```
E:\W1_Verification_Data\W1_3656C_xxxxxx
```

(where xxxxxx is the serial number of the Kit)

Within each data set on the USB, there is a file named EnableKit.dat. Double click that file to identify the file. This builds the path for the verification kit data and returns back to the Find Verification Kit Data on the removable USB drive. Once the data is found, the Verification Kit Data Path information appears in the text field. Click Next > to return to the Application Interface dialog box.

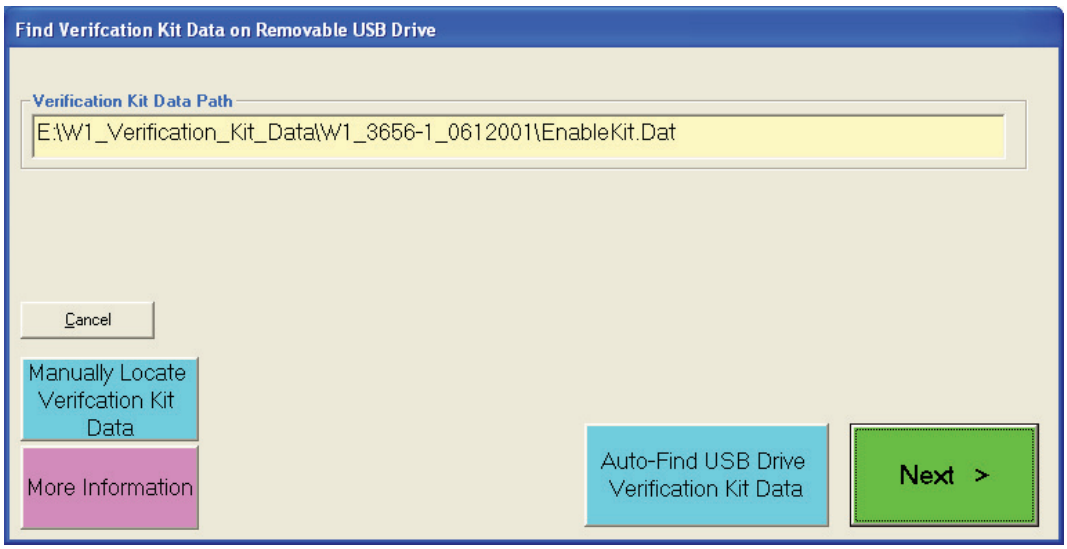


Figure 2-21. USB Drive Locater Dialog

10. Click Verify Files on USB Drive. The application checks the files on the USB drive to verify that all files are present and that each has the proper number of data points.

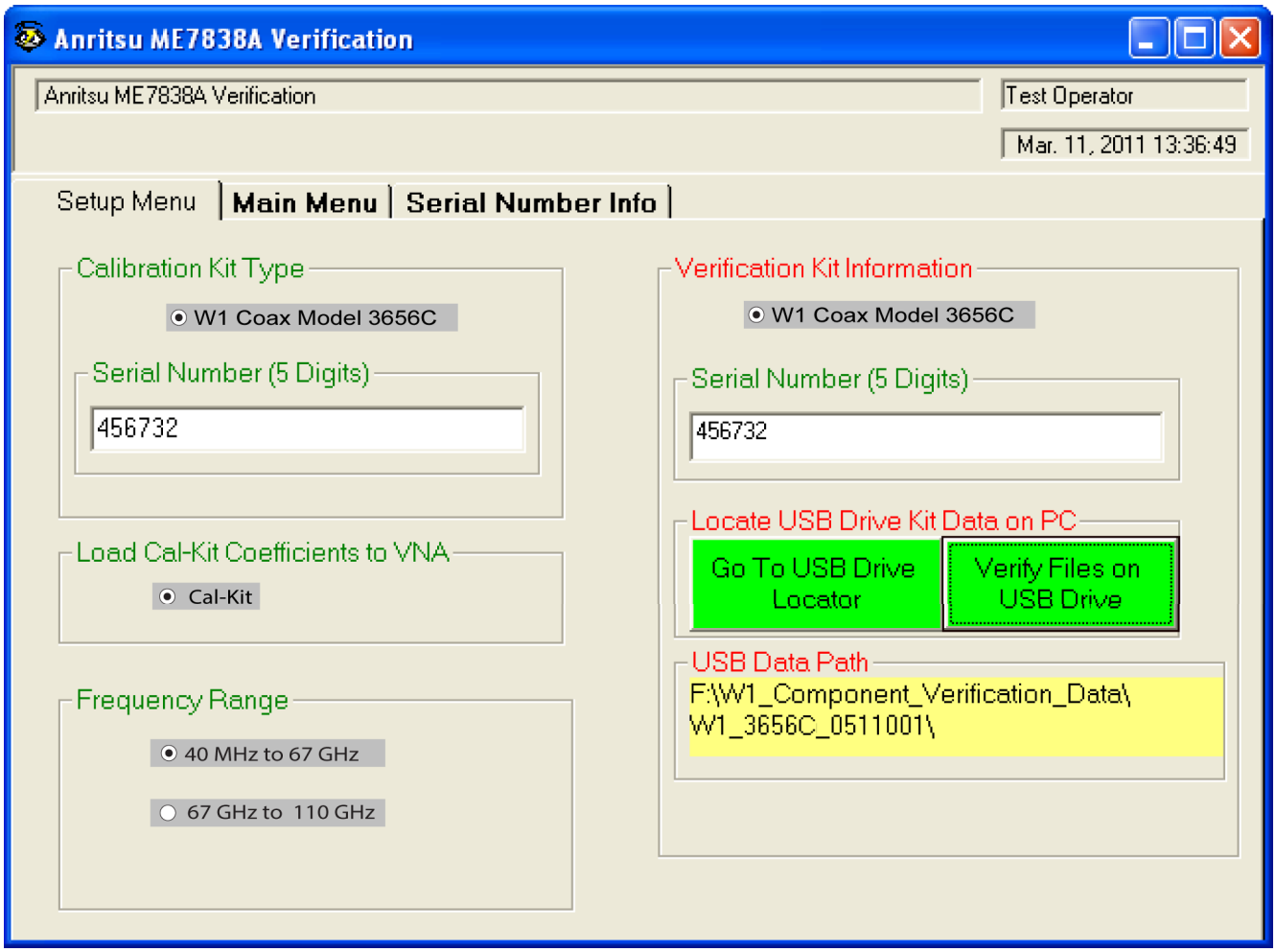


Figure 2-22. ME7838A Application Interface – Setup Menu Tab

11. When all information is entered and you are ready to start, click the Setup Calibration of VNA button.

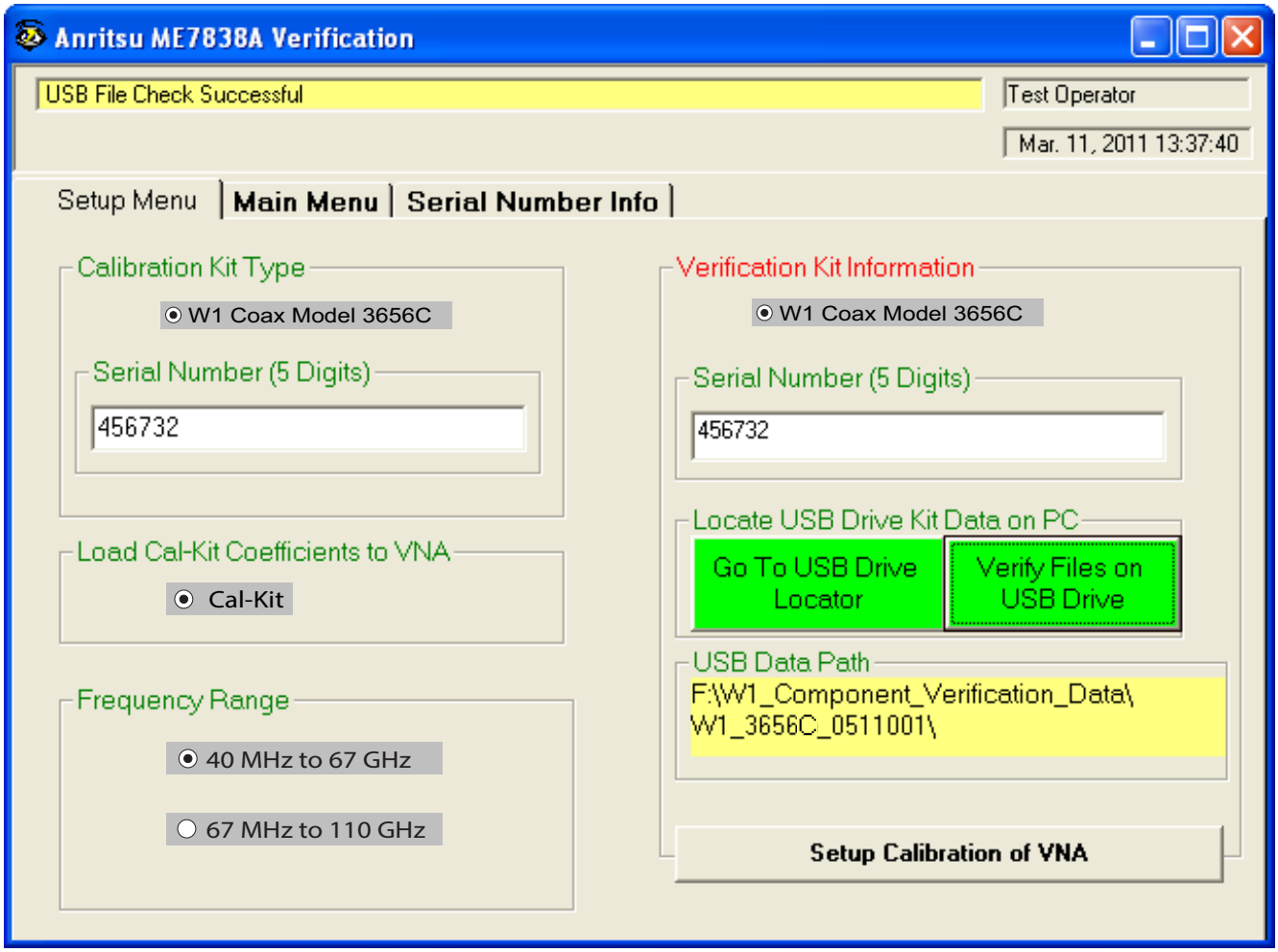


Figure 2-23. ME7838A Application Interface – Setup Menu Tab

12. The program execution continues in either Section 2-7, "Low-Band Calibration" on page 2-19 or Section 2-8, "High-Band Calibration" on page 2-22 depending on the previous band selection.

2-7 Low-Band Calibration

During this procedure, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration. In Section 2-8 “High-Band Calibration” on page 2-22, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 1 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 2 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

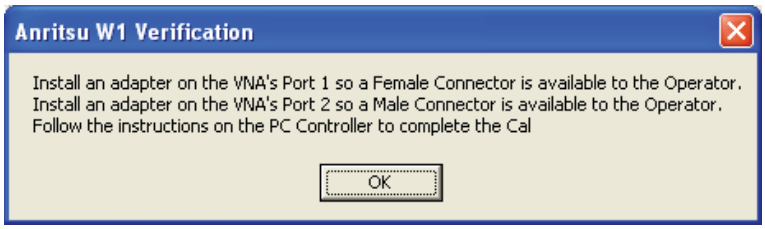


Figure 2-24. Anritsu W1 Verification Dialog

2. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 1.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 2.
   c. When ready to proceed, click OK.

Figure 2-25. VNA Calibration: Step 1 of 5 Dialog

3. The VNA measures the load device data, then the VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male Cal Kit Broadband Load Device to VNA Port 1.
   b. Connect the Female Broadband Load Device to VNA Port 2.
   c. When ready to proceed, click OK.

Figure 2-26. VNA Calibration: Step 2 of 5 Dialog

4. The VNA measures the broadband load device data, then the VNA Calibration: Step 3 of 5 dialog box appears.
   a. Connect the Male Cal Kit Open to VNA Port 1.
   b. Connect the Female Short #1 (2.02 mm) to VNA Port 2.
   c. When ready to proceed, click OK.

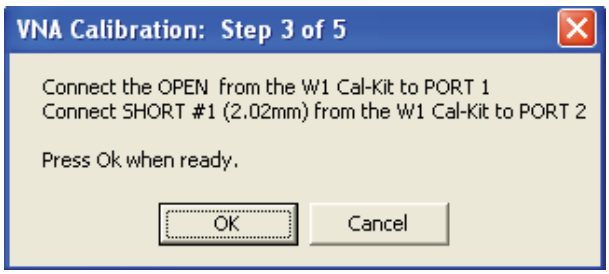


Figure 2-27. VNA Calibration: Step 3 of 5 Dialog

5. The VNA measures the open/short device data, then the VNA Calibration: Step 4 of 5 dialog box appears.
   a. Connect the Male Short #1 (2.02 mm) to VNA Port 1.
   b. Connect the Female Open to VNA Port 2.
   c. When ready to proceed, click OK.

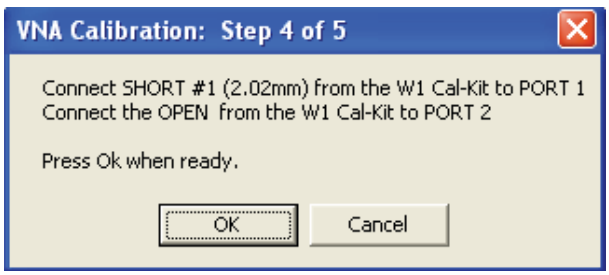


Figure 2-28. VNA Calibration: Step 4 of 5 Dialog

6. The VNA measures the short/open device data, then the VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the Short and the Open from Port 1 and Port 2, respectively.

b. Slide the two T-R modules towards each other and connect the VNA Port 1 (Female) to VNA Port 2 (Male) directly.

c. When ready to proceed, click OK.

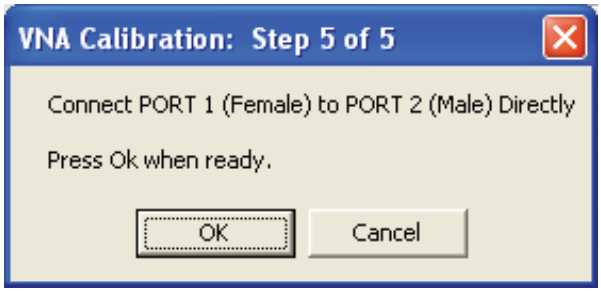


Figure 2-29. VNA Calibration: Step 5 of 5 Dialog

7. The program execution skips to Section 2-9 “Application Interface – Main Menu Tab” on page 2-25.

2-8 High-Band Calibration

During this procedure, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration. In Section 2-7 “Low-Band Calibration” on page 2-19, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 1 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 2 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

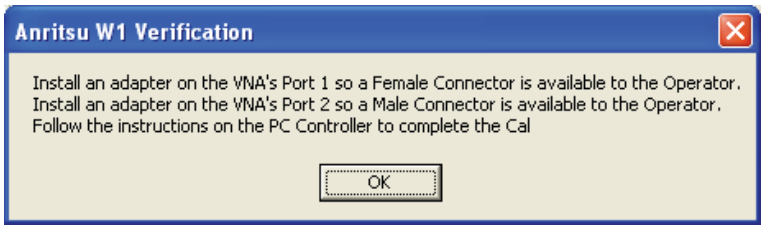


Figure 2-30. Anritsu W1 Verification Dialog

2. When ready to proceed, click OK. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 1.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 2.
   c. When ready to proceed, click OK.

Figure 2-31. VNA Calibration: Step 1 of 5 Dialog

   d.
3. The VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male 2.02 mm Short #1 to VNA Port 1.
   b. Connect the Female 2.65 mm Short #2 to VNA Port 2.

c. When ready to proceed, click OK.

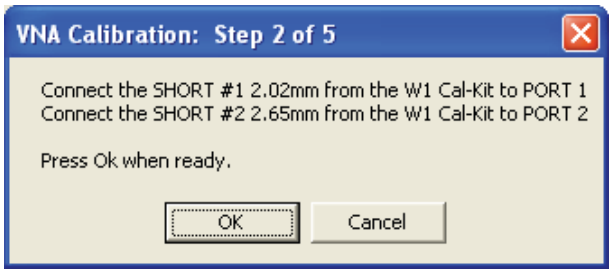


Figure 2-32. VNA Calibration: Step 2 of 5 Dialog

4. The VNA Calibration: Step 3 of 5 dialog box appears.

a. Connect the Male 2.65 mm Short #2 to VNA Port 1.

b. Connect the Female 3.18 mm Short #3 to VNA Port 2.

c. When ready to proceed, click OK.

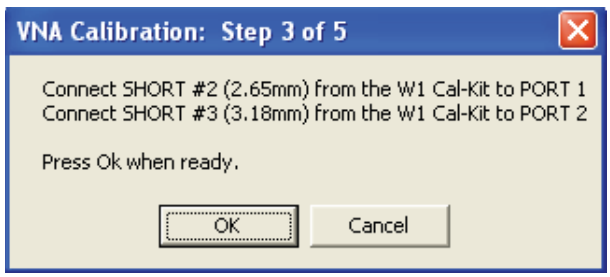


Figure 2-33. VNA Calibration: Step 3 of 5 Dialog

5. The VNA Calibration: Step 4 of 5 dialog box appears.

a. Connect the Male 3.18 mm Short #3 to VNA Port 1.

b. Connect the Female 2.02 mm Short #1 to VNA Port 2.

c. When ready to proceed, click OK.

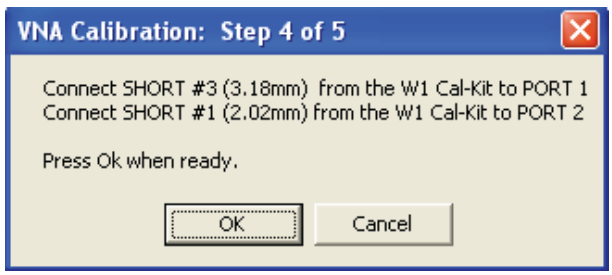


Figure 2-34. VNA Calibration: Step 4 of 5 Dialog

6. The VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the offset Shorts from Port 1 and Port 2.

b. Slide the two T-R modules towards each other and connect the VNA Port 1 (Female) to VNA Port 2 (Male) directly.

c. When ready to proceed, click OK.

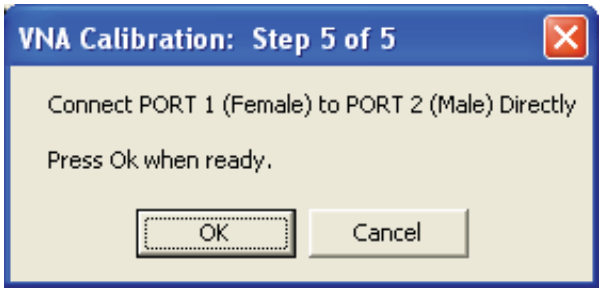


Figure 2-35. VNA Calibration: Step 5 of 5 Dialog

7. The program execution continues to Section 2-9 “Application Interface – Main Menu Tab” on page 2-25.

2-9 Application Interface – Main Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections below.

- The Setup Menu tab is described in Section 2-6, "Application Interface – Setup Menu Tab" on page 2-11.
- The Main Menu tab display is described in the section immediately following and is shown in Figure 2-36, "ME7838A Application Interface – Main Menu Tab" on page 2-25
- The Serial Number tab is described in Section 2-10, "Application Interface – Serial Number Info Tab" on page 2-29.

Whenever the program is executing a command from the main menu, the buttons are disabled, due to the event-driven nature of the Windows Operating System, until the current command is finished. While a command is being executed, informational messages are usually displayed on the screen to aid the operator in understanding which steps the application is performing.

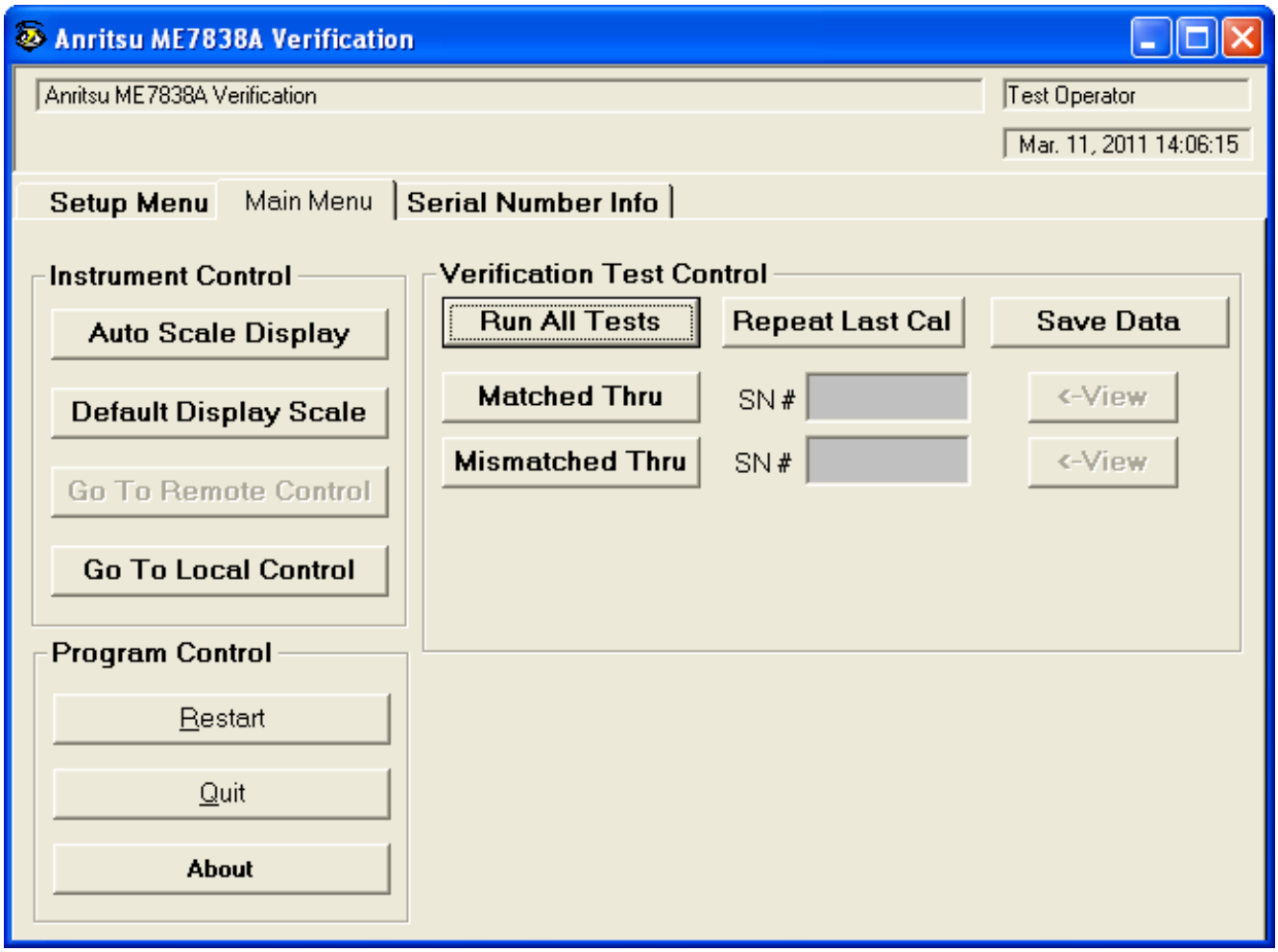


Figure 2-36. ME7838A Application Interface – Main Menu Tab

Auto Scale Display Button

This command automatically scales each channel on the Anritsu Vector Network Analyzer. It is the same as using the VectorStar VNA menus to navigate to and select either the Auto Scale Active Channel or Auto Scale All Channels buttons. The full path to these buttons is:

- MAIN | Scale | SCALE | Auto Scale Active Channel
- MAIN | Scale | SCALE | Auto Scale All Channels

When the program detects the VNA has finished a sweep, the program auto-scales all four channels before continuing.

The VNA display during the calibration and verification tests is set to one Channel and four traces. Each trace displays the following parameters:

- Upper-left quadrant – S21 – Forward Transmissions, Log Mag (top) and Phase (Bottom)
- Upper-right quadrant – S12 – Reverse Transmissions, Log Mag (top) and Phase (Bottom)
- Lower-left quadrant – S11 – Forward Reflections, Lin Mag (top) and Phase (Bottom)
- Lower-right quadrant – S22 – Reverse Reflections, Lin Mag (top) and Phase (Bottom)

See Figure 2-37 for a display example. This is a typical display immediately after performing the High Band calibration. Please note this is for reference only and that the actual data on the VNA display may not be identical.

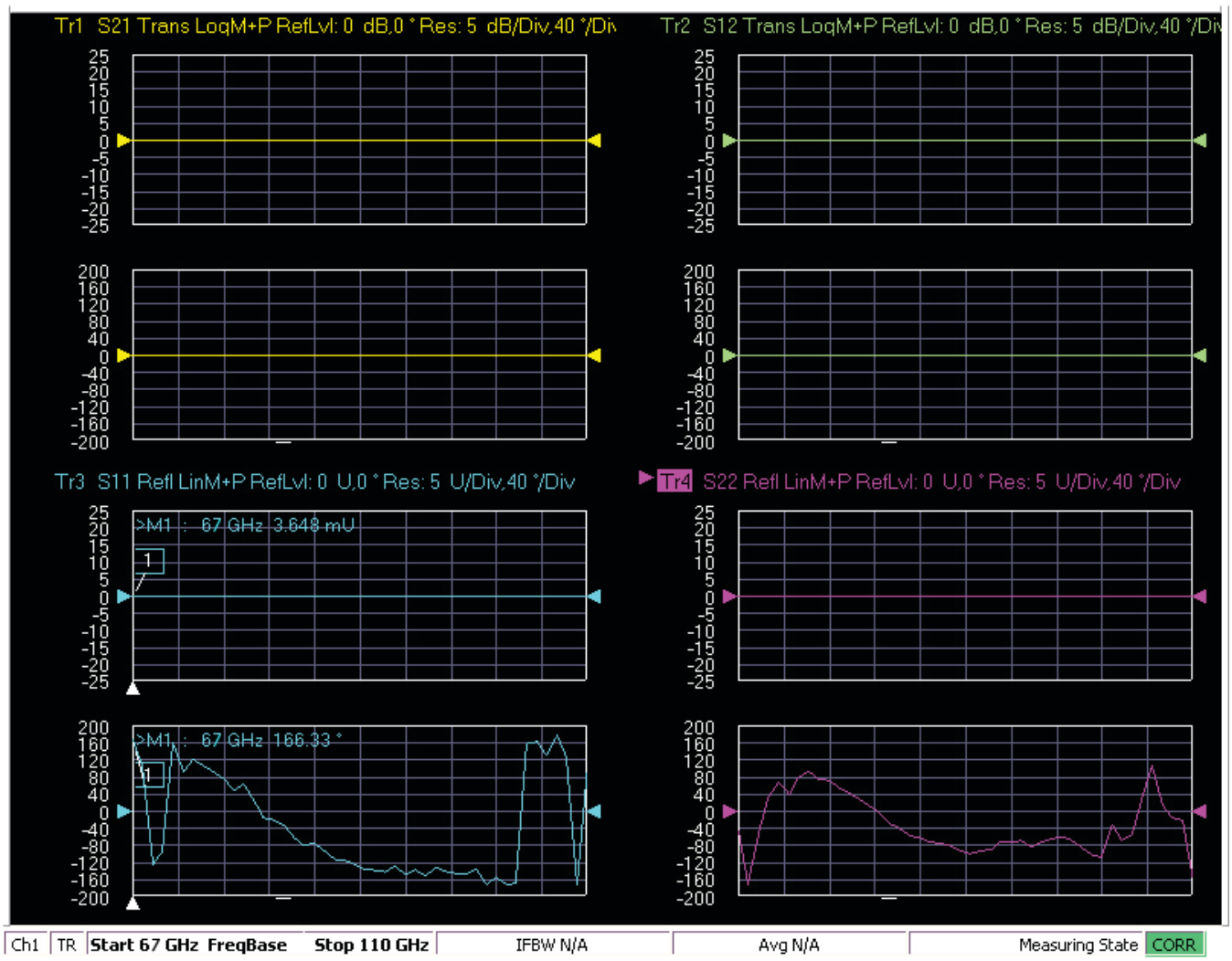


Figure 2-37. MS4640A/B Series VNA Auto Scale Example – Trace Display

Default Display Scale Button

This command sets all four channels to a scale of 5 dB/div for the Magnitude displays and to 40 degrees/div for the Phase displays, and the reference value to 0. This allows you to see if the device is properly connected.

Go To Remote Control Button

This command is only available after you have clicked the Go to Local Control button. When you click this button, the program takes control of the VNA Display type and Display scale settings and sets them to the program default values.

Go To Local Control Button

This command allows you access to the front panel buttons while the program is running. The instrument is in Local Lock Out unless this button is pushed. This prevents an inadvertent front panel button actuation from affecting the proper operation of the program.

Caution	Modifying the VNA settings (such as power level, bandwidth, averaging, etc.) could adversely affect the measurement results. This should only be used to view the data or for using markers.

Restart Button

The Restart button command allows you to change the tested instrument, the frequency range, or the selected verification kit. Selecting Yes causes the program to return to the program initialization stage.

Usually, this button is used to test for second frequency band and program execution continues in Section 2-14 “Restart for Alternate Frequency Band” on page 2-37 and the Choose The Restart Method dialog box appears.

Quit Button

Selecting Quit brings up a confirmation dialog box shown in Figure 2-38. Selecting Yes exits the program; selecting No returns you to the previous screen.

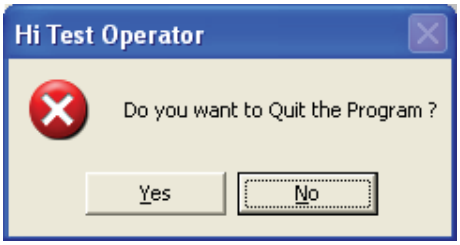


Figure 2-38. Confirmation Dialog

About

Displays version information, copyright, other legal notices, and company contact information.

Run All Tests

This command button runs both the Matched Thru and Mismatched Thru tests. Program execution starts with Section 2-11 “Matched Thru Tests” on page 2-30 and then continues with Section 2-12 “Mismatched Thru Tests” on page 2-33. When both tests are completed, program execution returns to the Main Menu tab shown in Figure 2-36, “ME7838A Application Interface – Main Menu Tab” on page 2-25.

Repeat Last Cal

This command button re-calibrates the VNA according to the CURRENT calibration. This provides a way to recalibrate the VNA without having to reset the program parameters in case the original calibration was flawed for some reason. When the calibration sequence is complete, program execution continues to the Main Menu tab shown previously in Figure 2-36, "ME7838A Application Interface – Main Menu Tab" on page 2-25.

Save Data

This command button writes data files to the PC Controller and stores the files at `C:\mmdcsvc\Data`. The program does not write data to the verification kit USB memory device. If selected, program execution continues as described in Section 2-13 "Saving Verification Data" on page 2-36.

The number of saved files varies depending on the user settings:

- If both the matched and mismatched thru tests are run, two files are written to the PC Controller hard drive.
- If only one of the tests was run, only one file is written to the PC hard drive at `C:\mmcsvc\Data`

Matched Thru

This command button runs only the Matched Thru tests. If selected, program execution continues as described in Section 2-11 "Matched Thru Tests" on page 2-30. When the tests are completed, the program returns to the Main Menu tab shown in Section 2-9 "Application Interface – Main Menu Tab" on page 2-25.

Matched Thru SN

This field is used to enter the serial number of the matched thru.

Mismatched Thru

This command button runs only the Mismatched Thru tests. If selected, program execution continues in Section 2-12 "Mismatched Thru Tests" on page 2-33. When the tests are completed, the program returns to the Main Menu tab shown in Figure 2-36, "ME7838A Application Interface – Main Menu Tab" on page 2-25.

Mismatched Thru SN

This field is used to enter the serial number of the matched thru.

2-10 Application Interface – Serial Number Info Tab

The Serial Number Info tab displays a summary of the model number and serial number for the following devices. All screen information is included in the report headers.

- Operator Name
- Calibration Kit
- Test Set
- Verification Kit
- Vector Network Analyzer
- Test Set

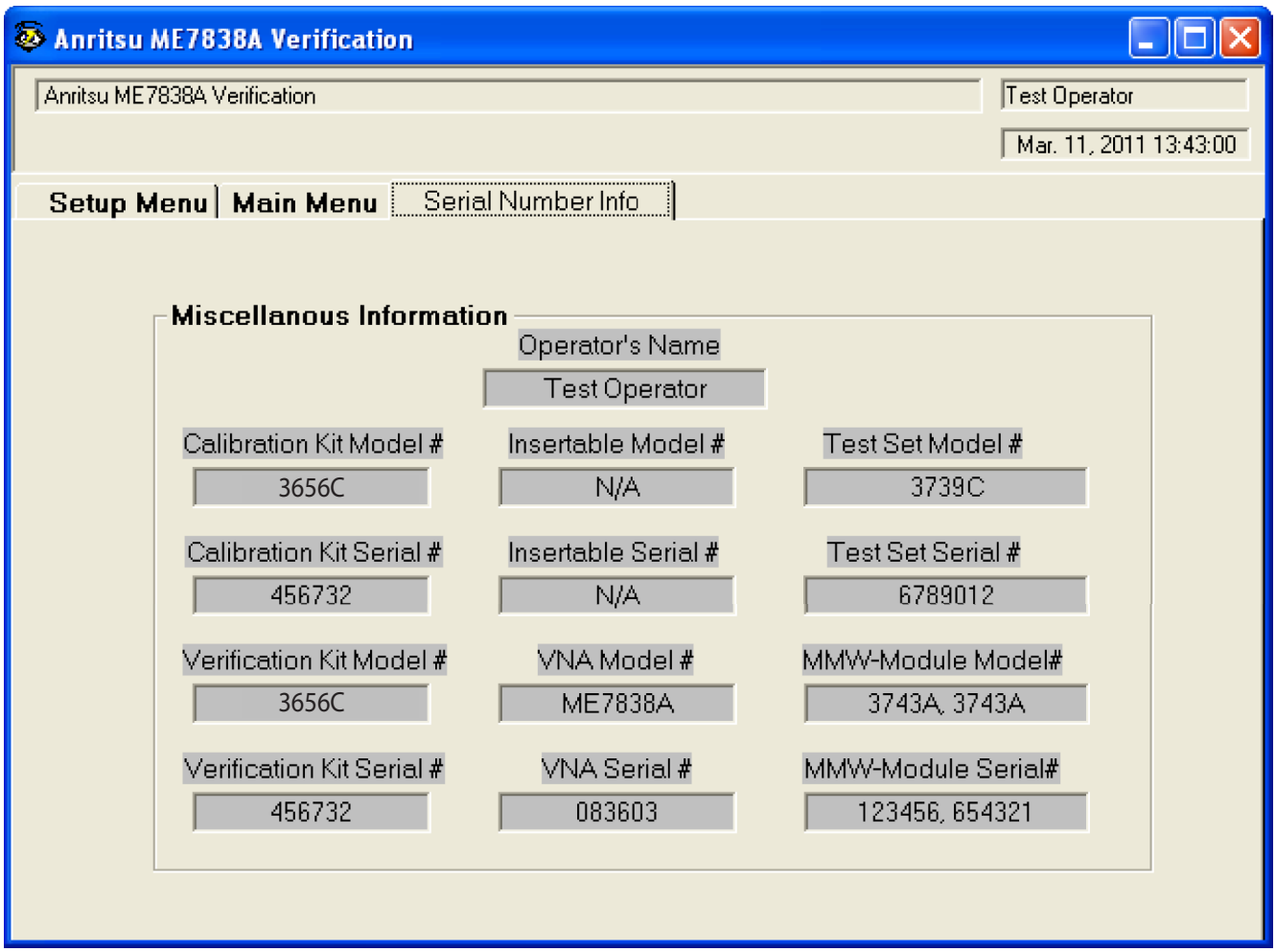


Figure 2-39. ME7838A Application Interface – Serial Number Tab

2-11 Matched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests are executed followed by the Mismatched Thru tests described in Section 2-12 “Mismatched Thru Tests” on page 2-33.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 2-9 “Application Interface – Main Menu Tab” on page 2-25.

Note	The verification devices must be connected to the W1 Connector Coupler Ports and not to the VNA Ports. Use the torque wrench supplied with the verification kit when tightening the device connections.

Procedure

1. The Enter Serial Number Matched Thru dialog box appears.

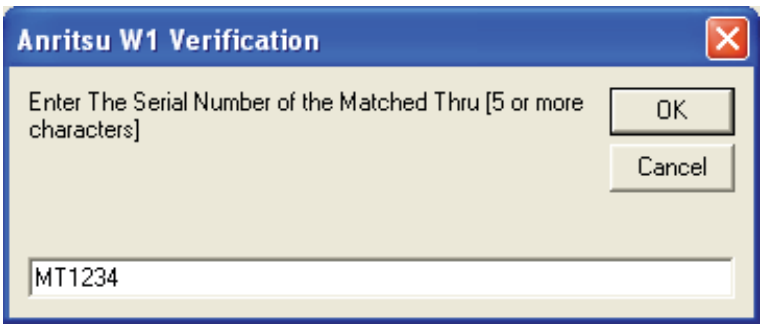


Figure 2-40. Anritsu W1 Verification Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. Enter the serial number of the Matched Thru.
4. When ready to proceed, click OK. The Connect Matched Thru Male Connector dialog box appears.

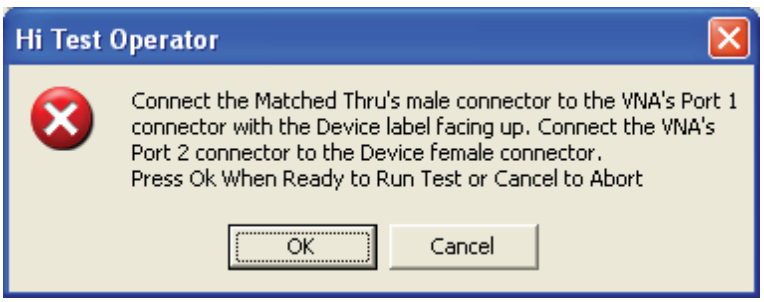


Figure 2-41. Matched Thru Dialog

5. Connect the Matched Thru male connector to VNA Port 1 with the label facing up.
6. Connect the Matched Thru female connector to VNA Port 2.

7. When ready to proceed, click OK. The matched thru test starts and the Matched Thru Test - Sweep 1 dialog box appears. After it completes, the Matched Thru Test - Sweep 2 dialog box appears.

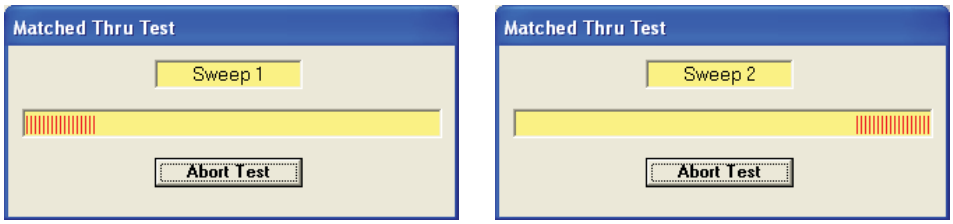


Figure 2-42. Matched Thru Test, Sweep 1 and Sweep 2 Dialog Boxes

8. When the test completes, the next action depends on what the user selected in the Main Menu tab above. The VNA main display should be similar to the one below. This is a typical display immediately after measuring the Matched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

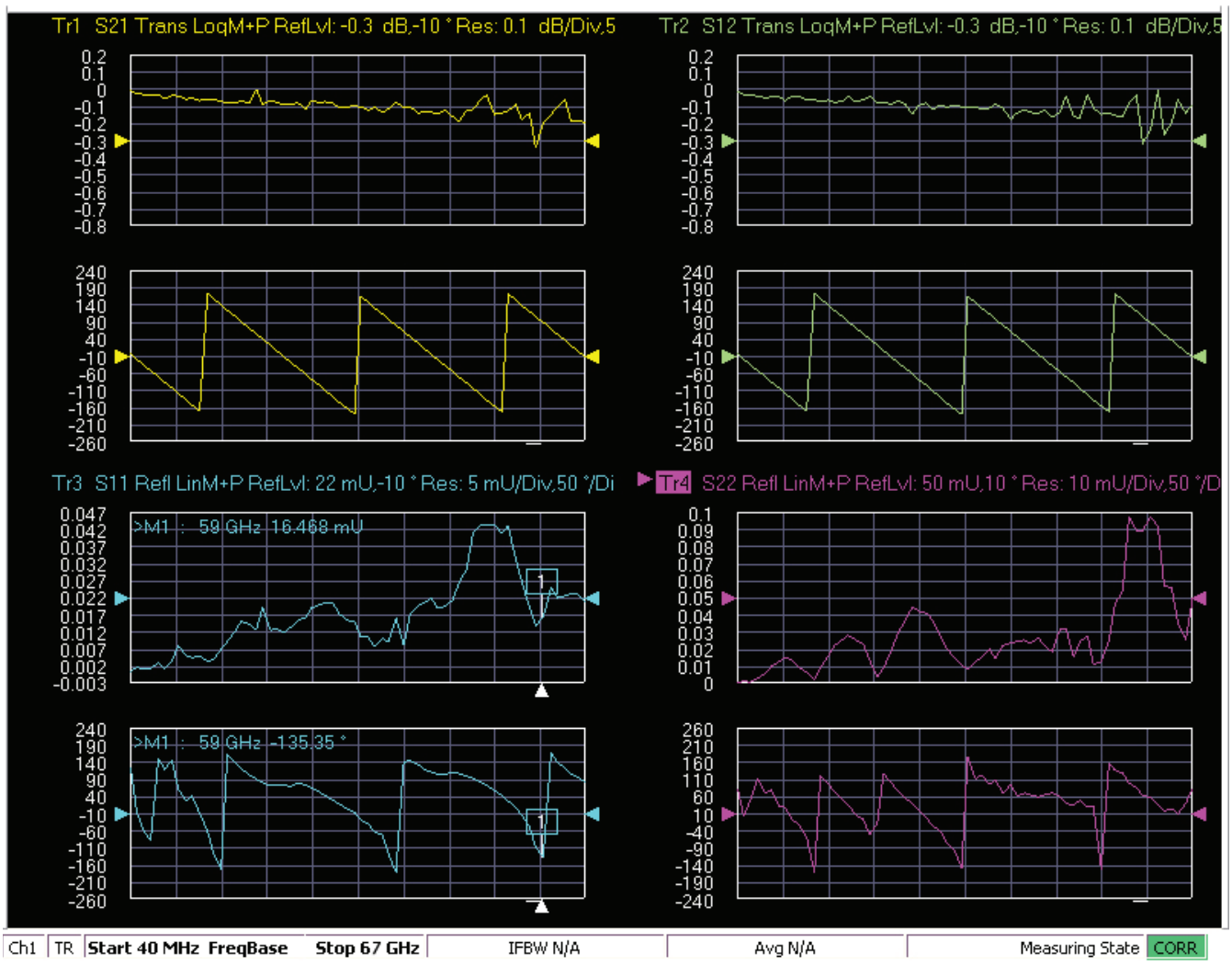


Figure 2-43. MS4640A/B Series VNA, Typical Matched Thru Data in Low Band
Upper-left quadrant= S21 – Forward Transmission
Upper-right quadrant= S12 – Reverse Transmission
Lower-left quadrant= S11 – Forward Reflection
Lower-right quadrant= S22 – Reverse Reflection

9. If only the Matched Thru button was selected, the program returns to the "Application Interface – Main Menu Tab" on page 2-25. The dialog box is shown in Figure 2-36, "ME7838A Application Interface – Main Menu Tab" on page 2-25.
10. If the Run All Tests button was selected, the program execution continues with the following Section 2-12, "Mismatched Thru Tests".

2-12 Mismatched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests (described in Section 2-11 "Matched Thru Tests" on page 2-30 is executed first, followed by the Mismatched Thru tests described in this section.

If the Mismatched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 2-9 "Application Interface – Main Menu Tab" on page 2-25.

Note	The verification devices must be connected to the **W1 Connector Coupler Ports** and not to the **VNA Ports**. Use the torque wrench supplied with the verification kit when tightening the device connections.

The entry point for this portion of the verification software depends on the user selections made in the Application Interface – Main Menu tab described in Section 2-9 "Application Interface – Main Menu Tab" on page 2-25.

The dialog box is shown in Figure 2-36, "ME7838A Application Interface – Main Menu Tab" on page 2-25.

If only the Mismatched Thru button was selected above, program execution starts here.

If the Run All Tests button was selected above, program execution continues here after the Matched Thru tests (described in Section 2-11 "Matched Thru Tests" on page 2-30) have been completed.

Procedure

1. The Enter Serial Number Offset Set Mismatch Device dialog box appears. Enter the serial number of the offset mismatch device.

Figure 2-44. Serial Number Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. When ready to continue, click OK. The Connect Mismatched Thru Airline dialog box appears.

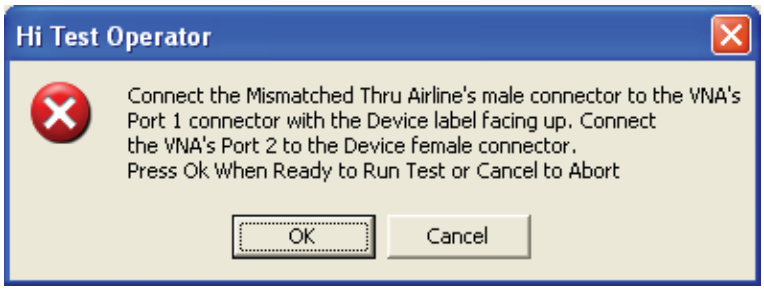


Figure 2-45. Instruction Dialog

4. Connect the Mismatched Thru Airline male connector to VNA Port 1 with the device label facing up.
5. Connect the Mismatched Thru Airline female connector to VNA Port 2.
6. When ready to continue, click OK. The Mismatched Thru Test - Sweep 1 dialog box is displayed first followed by the Mismatched Thru Test - Sweep 2 dialog box.

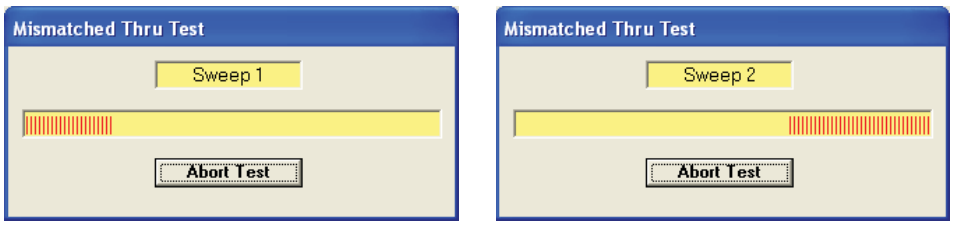


Figure 2-46. Status Dialogs

7. When the test completes, the program returns to the main menu described Section 2-9 “Application Interface – Main Menu Tab” on page 2-25, and the display should look similar to Figure 2-47. This is a

typical display immediately after measuring the Mismatched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

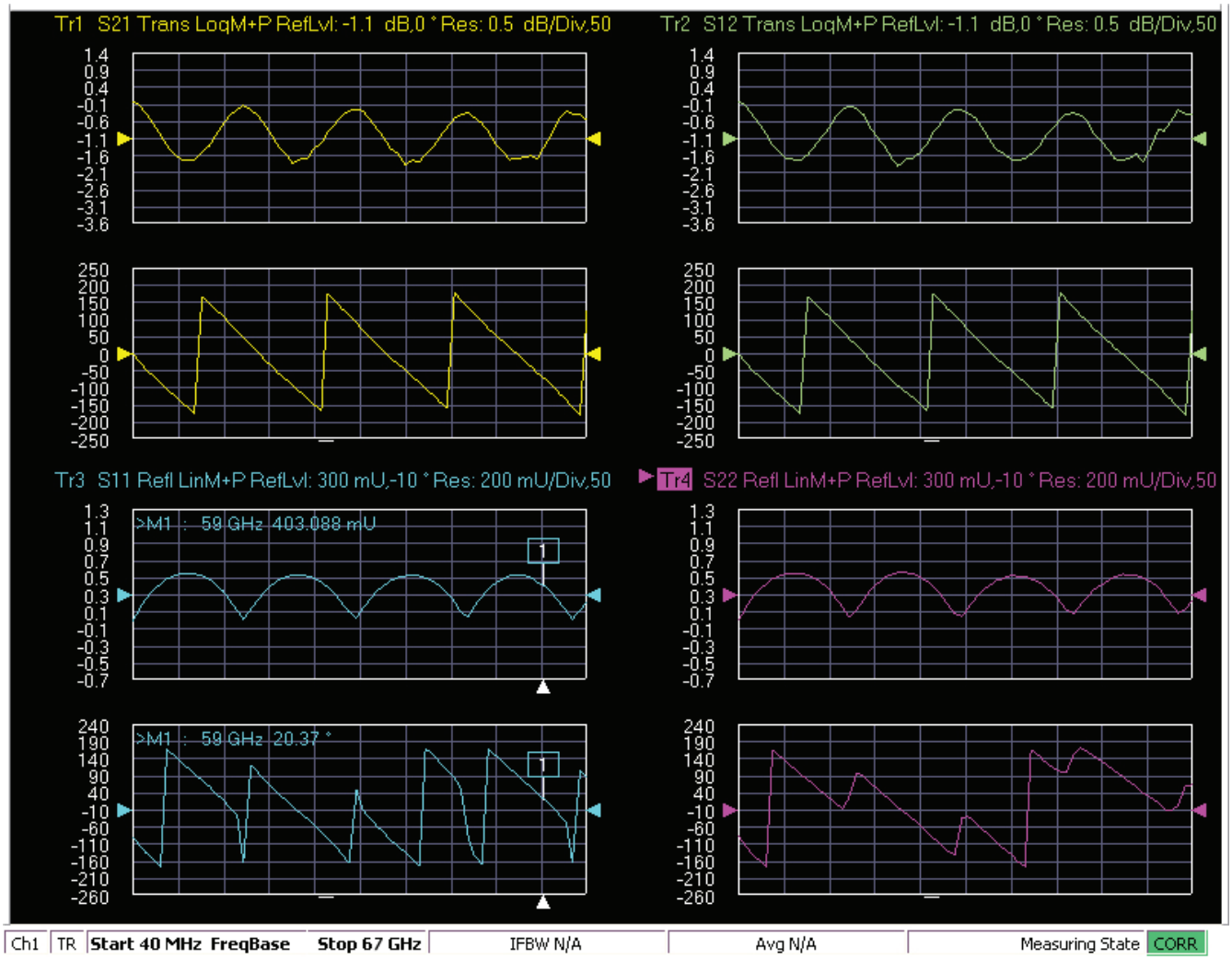


Figure 2-47. MS4640A/B Series VNA, Typical Mismatched Thru Data in Low Band

2-13 Saving Verification Data

If the Save Data button on the Main Menu tab was selected, the save data dialogs described below appear. When the save data procedure is completed, the program returns to the main menu as described previously in Section 2-9 “Application Interface – Main Menu Tab” on page 2-25.

The default directory path and file names are:

- `C:\mmdcsvc\Data\Matched Thru Low.dat`
- `C:\mmdcsvc\Data\Mismatched Thru Low.dat`
- `C:\mmdcsvc\Data\Matched Thru High.dat`
- `C:\mmdcsvc\Data\Mismatched Thru High.dat`

If the default file names should be changed, select Yes and enter the new file names. Otherwise, select No.

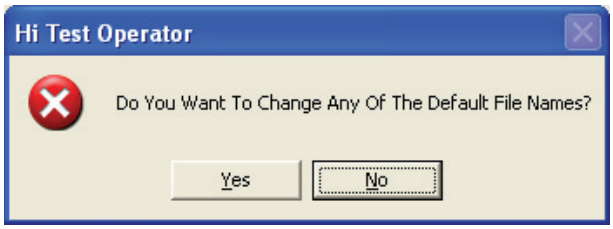


Figure 2-48. Confirmation Dialog

The following dialog is shown when the files are successfully saved to disk.

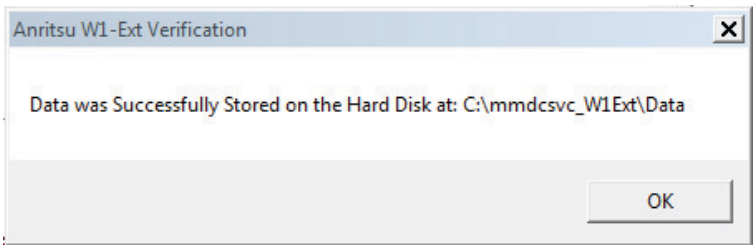


Figure 2-49. Information Dialog

2-14 Restart for Alternate Frequency Band

After the Matched Thru and Mismatched Thru tests have been successfully completed and the data saved, it is necessary to restart the program and test the other frequency band. For example, if you tested for 40 MHz to 67 GHz Frequency Range on your first calibration pass, on the second pass, select the 67 GHz to 110 GHz Frequency Range.

Procedure

1. Ensure that the verification results of the previous test have been saved to the `C:\mmdscvc\Data`.
2. To perform the verification tests for the second frequency range, on the System Verification Software Main Menu - Main Menu Tab, select the Restart button. The main menu is described in Section 2-9, "Application Interface – Main Menu Tab" on page 2-25.
3. The Choose The Restart Method dialog box appears as shown below in Figure 2-50.

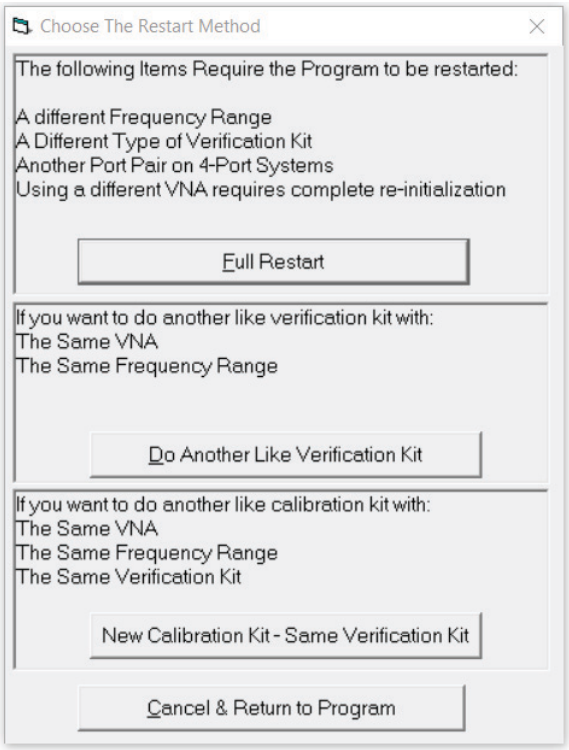


Figure 2-50. Choose The Restart Method Dialog

4. If you selected Full Restart, the calibration process starts again and the procedure steps are the same as the procedures described previously, starting in Section 2-5, "Running the Verification Software", Step 5 on page 2-6.
5. The application will go through the process again.

Note	When using the Restart Menu the system configuration from the first pass is retained when cycling through the second pass.

6. Dialog boxes will appear to confirm the component information in the system.

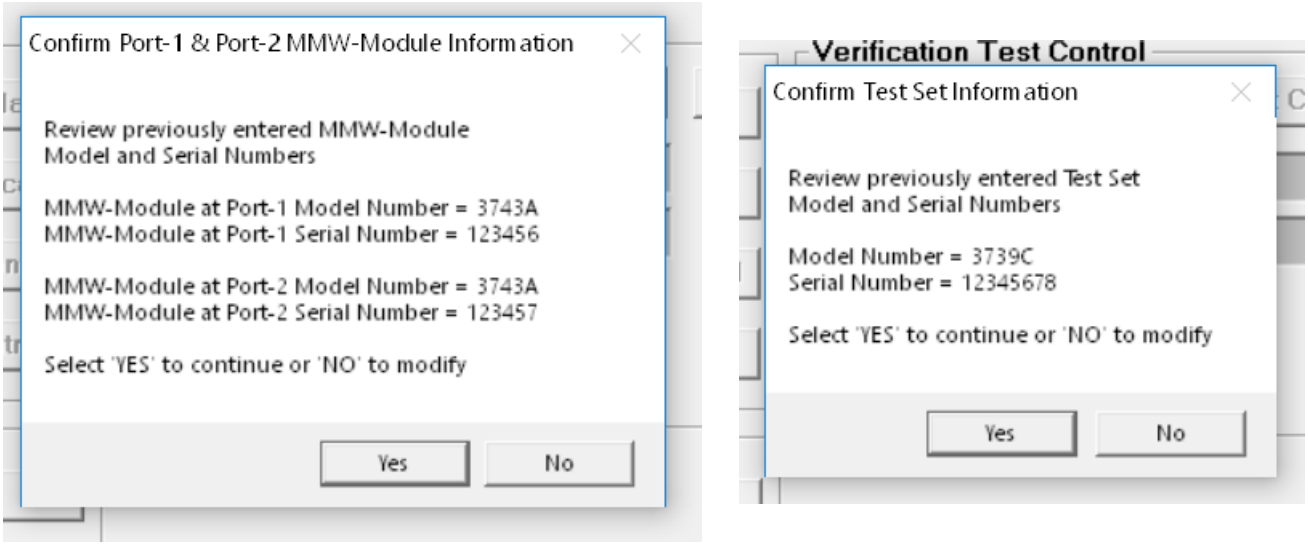


Figure 2-51. 2-Port Restart Dialog

7. Complete the calibration and verification of the devices for the second frequency range.
8. Save the second set of calibration data and verification results to `C:\mmdcsvc\Data`.
9. This series of automated tests has verified that the VectorStar ME7838A/AX/E/EX Broadband S-parameter measurement accuracy meets factory specifications and ends the calibration and verification procedure.
10. The program returns to the main menu described in Section 2-9, “Application Interface – Main Menu Tab” on page 2-25.

2-15 Troubleshooting

Difficulty Running the Program

If you have difficulty getting the program to run properly:

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 using the install program on the USB memory device. The program does not run if it is just copied from the USB memory device to the hard disk.
4. Ensure that, after starting the performance verification software, the verification kit data USB memory device is installed in the correct USB port and that it contains 20 files.

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.

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 USB drive matches that shown on the verification kit.
3. Repeat the process with a fresh calibration. Save the results of both measurements as an aid in troubleshooting, and in case you require factory assistance.
4. 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.
5. Assure all active systems have been powered on at least one hour before the start of the calibrations.

If you still have difficulty after following the above steps, please contact Anritsu customer service and ask for the Vector Network Analyzer support engineer for further assistance.

Chapter 3 — Using the PVS Software with the ME7838A4/A4X/E4/E4X

3-1 Introduction

This chapter describes the use of the Anritsu Performance Verification Software (PVS) with the VectorStar ME7838A4/A4X/E4/E4X Modular BB/mmWave VNA Measurement System. The ME7838A4/A4X/E4/E4X is based on the VectorStar MS4647B Vector Network Analyzer running VectorStar Application Version 1.5.0 or higher and equipped with Option 08x.

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.

3-2 Required Equipment

The VectorStar ME7838A4/A4X/E4/E4X Broadband/Millimeter Wave Measurement System consists of:

- VectorStar MS4647B VNA, 70 kHz to 70 GHz, V Connectors, equipped with Option 08x
- MN4697C 4-port Test Set
- 3736B Broadband Test Set
- 3739C Broadband Test Set
- Four (4) 3743A/E/EX mmWave Modules, covering up to 110 GHz or four (4) 3743AX mmWave Modules covering up to 125 GHz.
- Necessary rear panel interconnect cables between the test set and the VNA.
- Necessary front panel interconnect cables between the test set and the VNA
- Necessary interconnect cables to the 3743x mmWave Modules.

3-3 Configuring the Hardware

This section describes how the various system elements are interconnected and describes the preliminary steps required for operation of the verification software. See Section 3-2, “Required Equipment” for a complete equipment list.

1. Ensure that the VNA system is set to “Broadband”.
2. To verify the setting, from the right side MAIN menu, select the broadband test set button:
   - MAIN | Application | APPLICATION | Rcvr Config | RCVR CONFIG | BB/mmWave (3738 Test Set) or BB/mmWave (3739 Test Set)
3. Select the Broadband Receiver Configuration.
4. Connect a GPIB cable between the PC Controller and the VNA Rear Panel GPIB port labeled IEEE 488.2 GPIB.

Caution	Do not connect the cable to the VNA Rear Panel GPIB port labeled **Dedicated GPIB**.

3-4 W1 Verification W1 Verification Application Installation

Prior to installation of the W1 Application, the National Instruments GPIB card and drivers must be installed in the Windows PC.

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

	In order to correctly install the PVS application, the user (logged in) must have Administrative rights on the Windows PC Controller.
Note	The PVS application is installed onto the PC Controller on an all-user basis.
	If your organization does not allow for all-user installations, consult your internal PC and network support group on how to best proceed.

1. Turn off all other running applications on the PC Controller.
2. Insert the USB Memory Device into the USB slot.
3. Open Windows Explorer, browse to the USB Drive, and double click on Startup.htm.

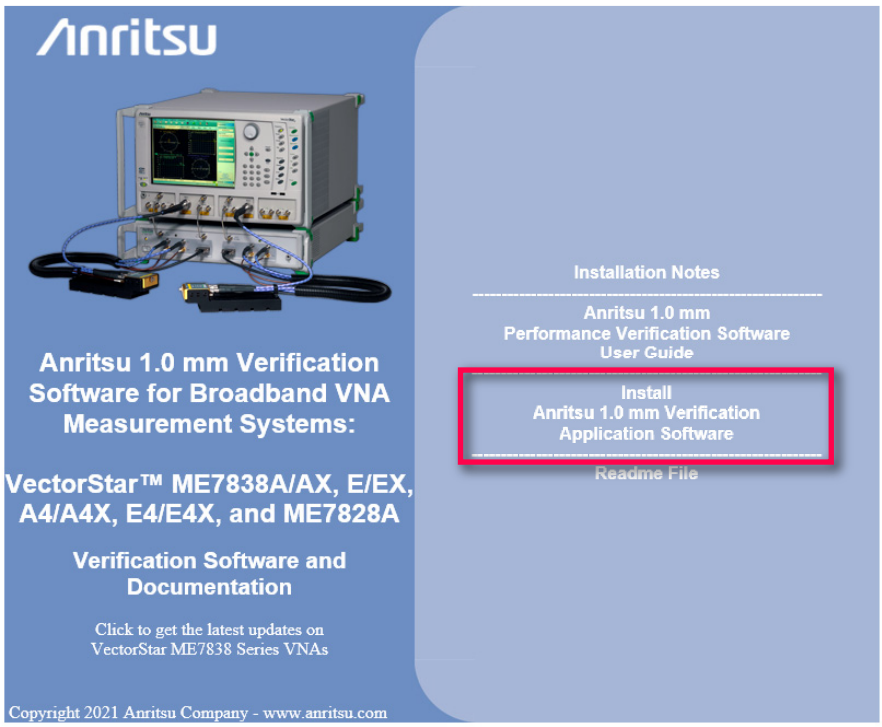


Figure 3-1. PVS Installation and Documentation Screen

4. On the navigation page, click the Install Anritsu 1.0 mm Verification Application Software link.
5. The first of several installation dialog boxes appears.

Note	The dialog box appearance may vary depending on the Operating System being used.

6. Click Run on the two security dialog boxes (Figure 3-2 on page 3-3).

7. If a dialog box appears that displays Error 1321 or Error 1931, follow these instructions:

- Error 1321 – Select Exit Installation and make sure you have Administrator privileges on the PC Controller.
- Error 1931 – Select OK to bypass the error message and continue the installation.

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

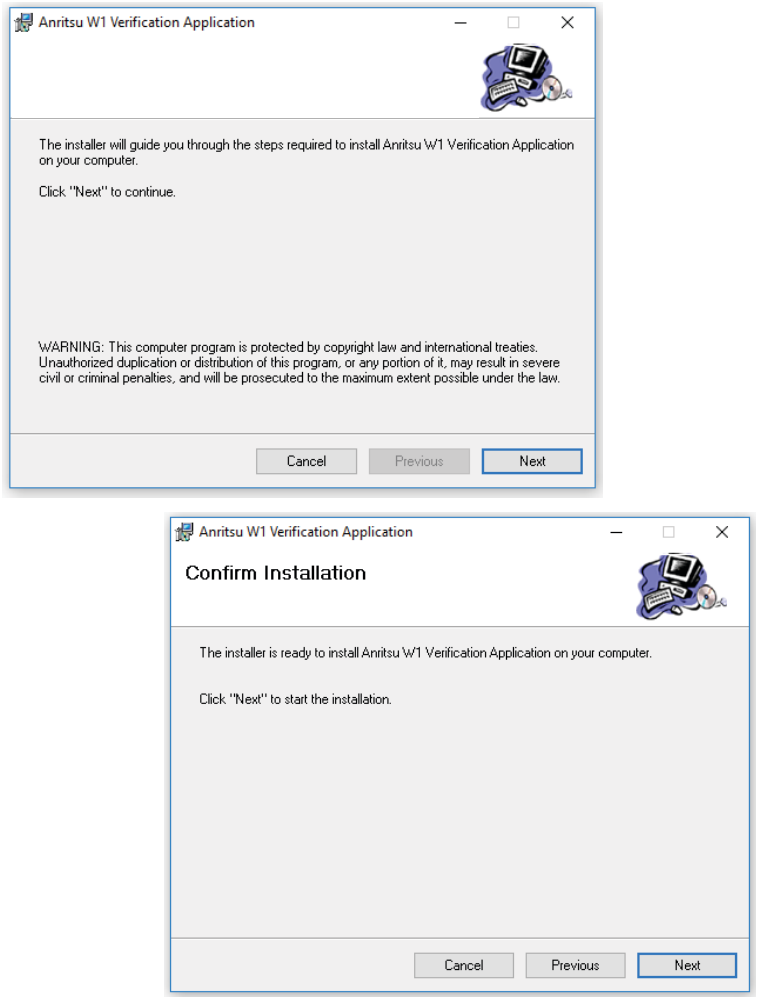


Figure 3-2. Installation Confirmation and Progress Dialog Boxes – Click Next on each

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.

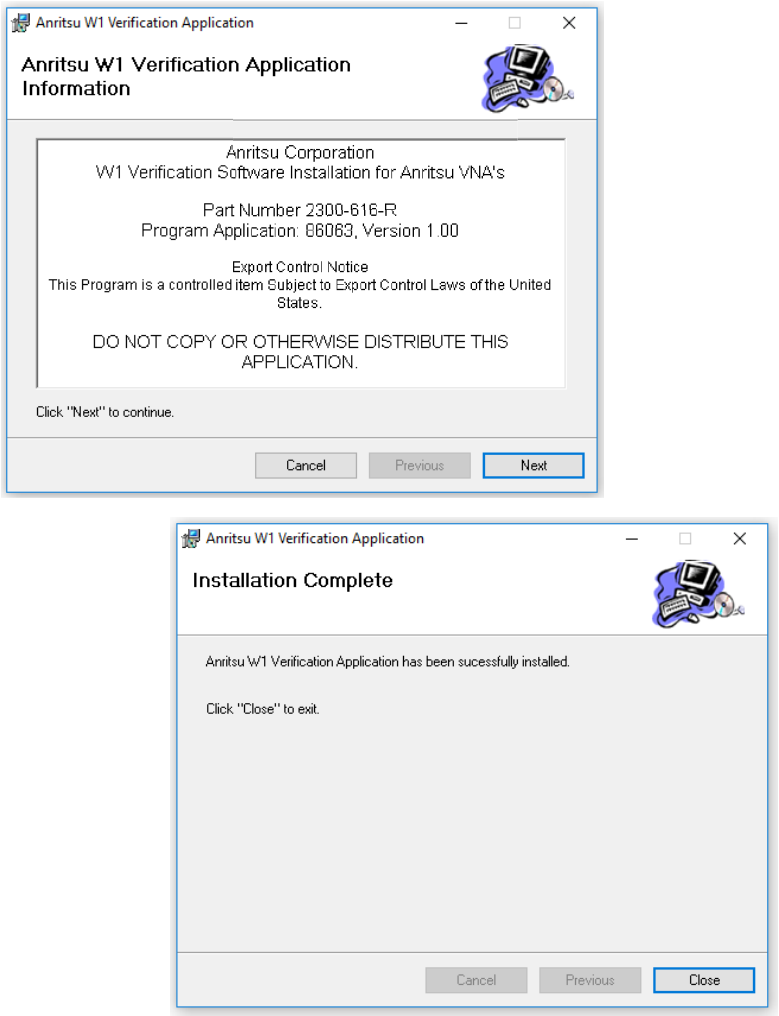


Figure 3-3. Final Application Information and Installation Complete Dialog Boxes

10. The installer adds all required files and makes the necessary registry updates on the PC Controller. When done, the navigation page (Figure 3-1) reappears.

11. If desired, open the User Guide (this document) and save and/or print a copy.

12. The PVS application is available in either the Start or Program menu of the PC Controller.

3-5 Running the Verification Software

After the VNA and PC have been configured as described above, you are ready to run the program and perform the calibration/verification. Make sure you have the following information available:

- Serial number of the 3656C W1 Calibration/Verification Kit
- Serial number of the 3739C Broadband/Millimeter Wave Test Set
- Serial Number of the 3736B Master Test Set
- MN469xC 4-port Test Set
- Model numbers and serial numbers of the Port 1 and Port 2 BB/mm Modules
- Model numbers and serial numbers of the Port 3 and Port 4 BB/mm Modules

The application process flow for a full verification of an ME7838A4/A4X/E4/E4X is as follows:

1. Choose your system configuration for Calibration/Verification kit type and system model number.

2. Select a two port pair to measure (Ports 1 & 2 or 3 & 4).

3. Measure Low Band on Ports 1 & 2

- **a.** Calibrate the low frequency band.
- **b.** Measure verification devices for low frequency band.
- **c.** Save verification data.
- **d.** Restart application for high frequency band.

4. Measure High Band on Ports 1 & 2

- **a.** Calibrate the high frequency band.
- **b.** Measure verification devices for the high frequency band.
- **c.** Save verification data.
- **d.** Restart the program to switch to the other port pair to measure.

5. Measure Low Band on alternate port pair (Ports 3 & 4)

- **a.** Calibrate the low frequency band.
- **b.** Measure verification devices for low frequency band.
- **c.** Save verification data.
- **d.** Restart application for high frequency band.

6. Measure High Band on alternate port pair (Ports 3 & 4)

- **a.** Calibrate the high frequency band.
- **b.** Measure verification devices for the high frequency band.
- **c.** Save verification data.
- **d.** Exit program.

Note Low-band (steps 3 and 5) and high-band (steps 4 and 6) calibration and verification can be performed in any order.

The port pairs can be measured in any order.

Procedure

1. With the equipment and software configured as described in "Configuring the Hardware" on page 3-1, turn on the computer and allow it to start Windows.
2. Locate the Anritsu W1 Verification icon (shown below) on the desktop and double-click it.

3. The program displays an About dialog box with version information. Click OK to continue.

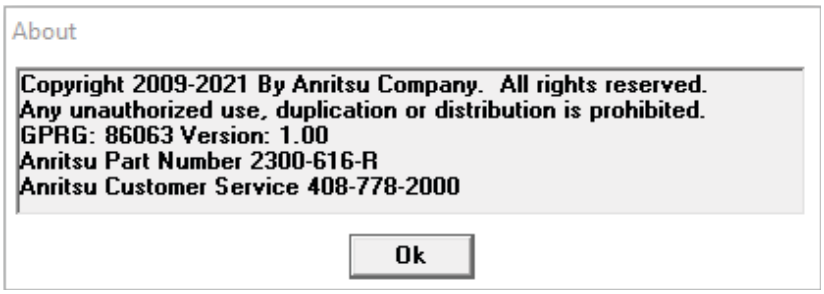


Figure 3-4. About Dialog

4. The Operator Name dialog box appears. Enter a user name or other identification.

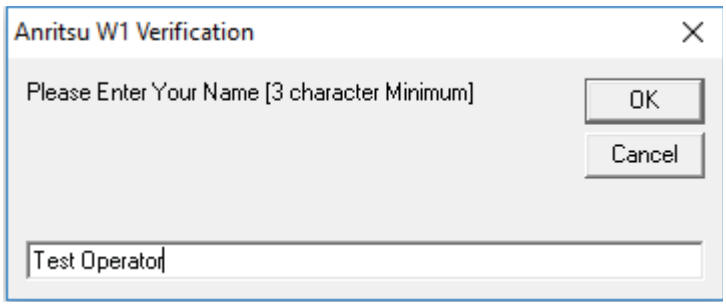


Figure 3-5. Operator Name Dialog

5. Click OK to continue. The program searches for a compatible VNA on the GPIB. It will also determine if the system is a 2-Port or 4-Port system.

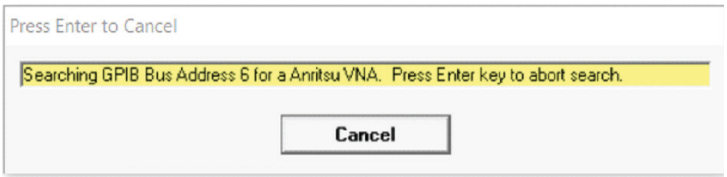


Figure 3-6. Number of Ports Dialog and Progress Tracker

6. Click OK and continue. When a VNA is found, a VNA confirmation box appears, as shown in Figure 3-7.

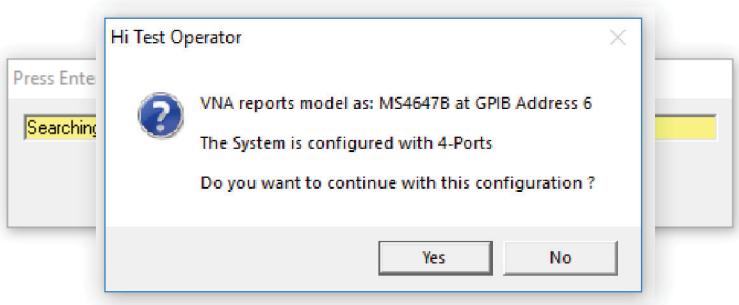


Figure 3-7. VNA Confirmation Dialog Box

7. Click Yes to continue, or click No to search for another VNA.

8. If Yes is clicked above, a Port Selection dialog box appears.

9. Select the calibration kit model and system model number to be used and click Next.

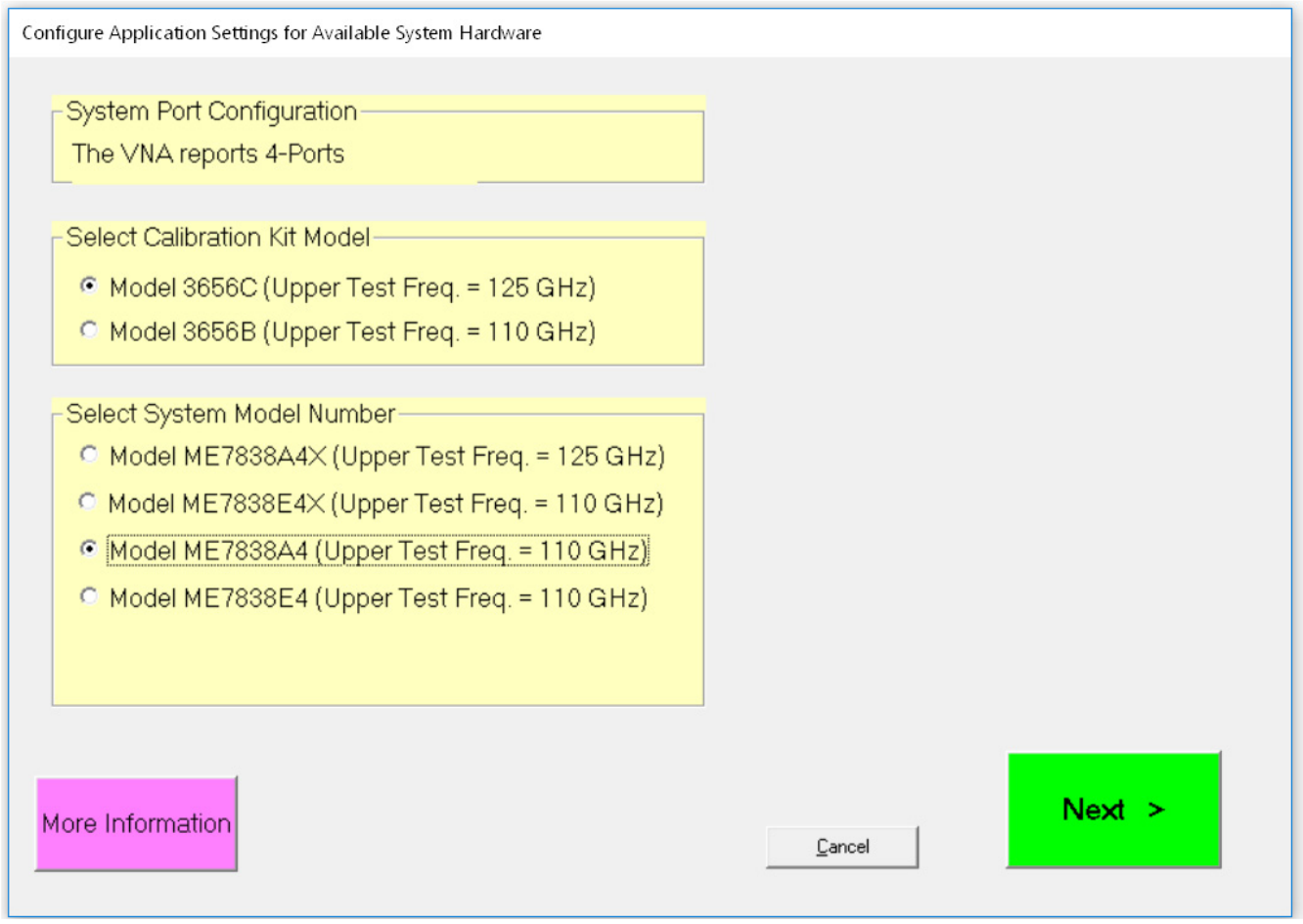


Figure 3-8. Number of Ports Dialog and Progress Tracker

Note	The ME7838A4/E4/E4X systems will have a verification to 110 GHz. The ME7838A4X system will have a verification to 125 GHz when using the 3656C Calibration/Verification Kit.

10. The ME7838A4/A4X/E4/E4X are 4-port systems. The calibration and verification testing can be performed on only two ports at a time. At the prompt below, select to test either Port 1 and Port 2, or test Port 3 and Port 4, the click Next. The program will request the model numbers and serial numbers of the test sets and of each module.

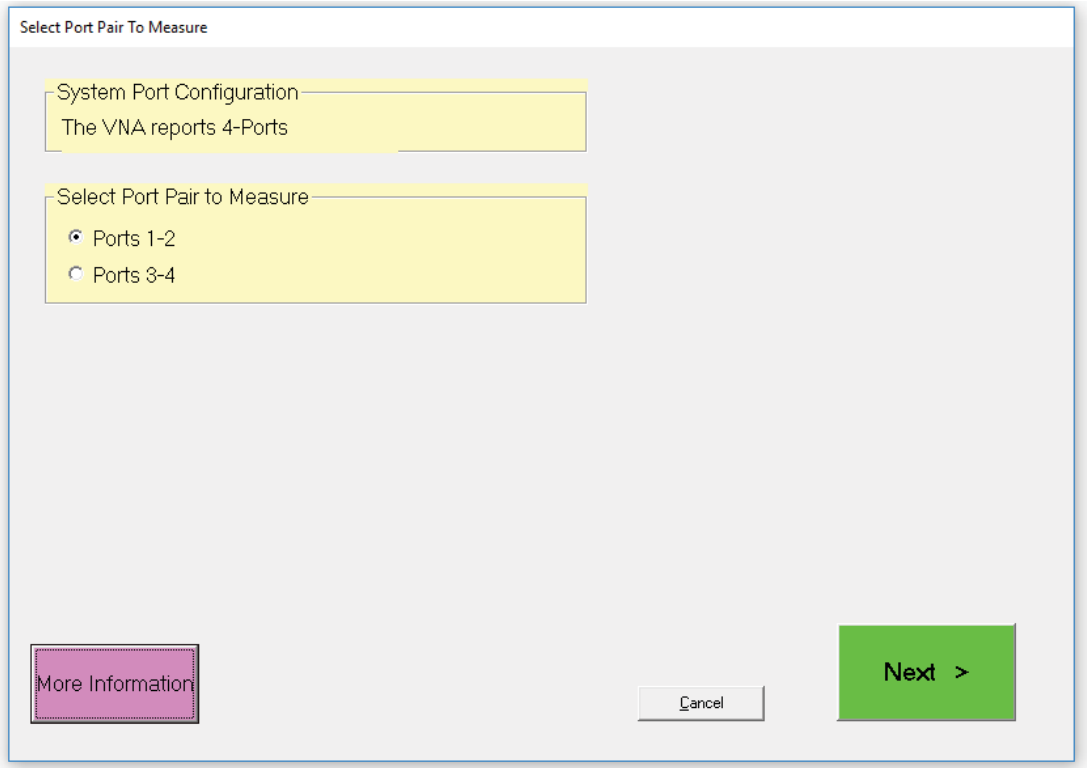


Figure 3-9. Port Test Selection Dialog Box

Enter Port 1 BB/mmWave Module Information

11. Enter the Port 1 BB/mmWave Module model number and click OK.

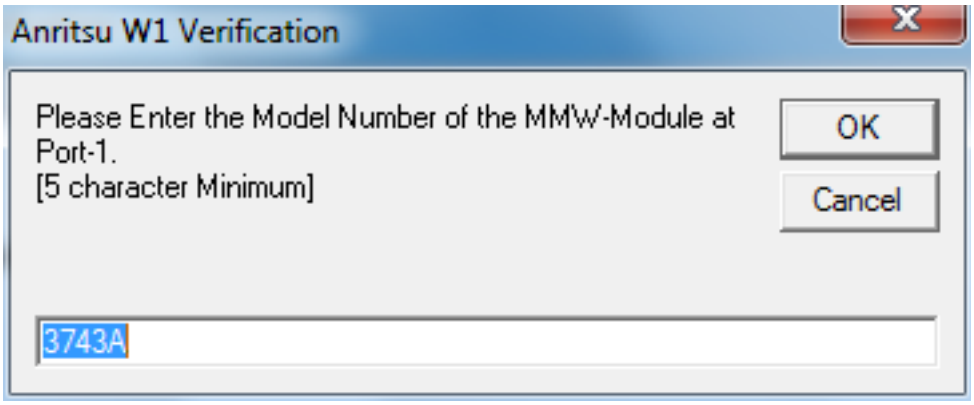


Figure 3-10. Anritsu W1 Verification Dialog – Port 1 BB/mmWave Module – Model Number

12. Enter the Port 1 BB/mmWave Module serial number and click OK.

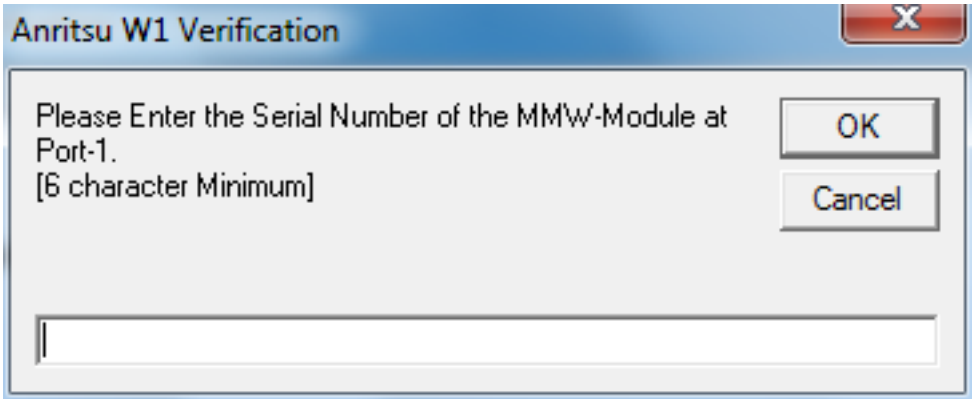


Figure 3-11. Anritsu W1 Verification Dialog – Port 1 BB/mmWave Module – Serial Number

Enter Port 2 BB/mmWave Module Information

13. Enter the Port 2 BB/mmWave Module model number and click OK.

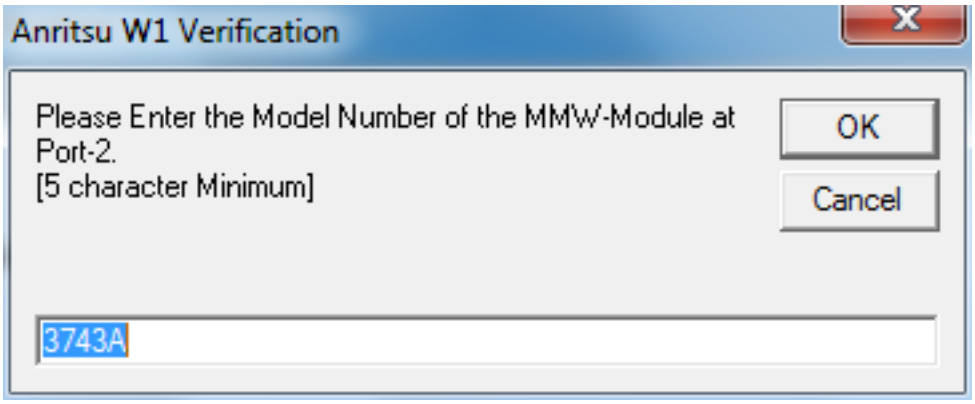


Figure 3-12. Anritsu W1 Verification Dialog – Port 2 BB/mmWave Module – Model Number

14. Enter the Port 2 BB/mmWave Module serial number and click OK.

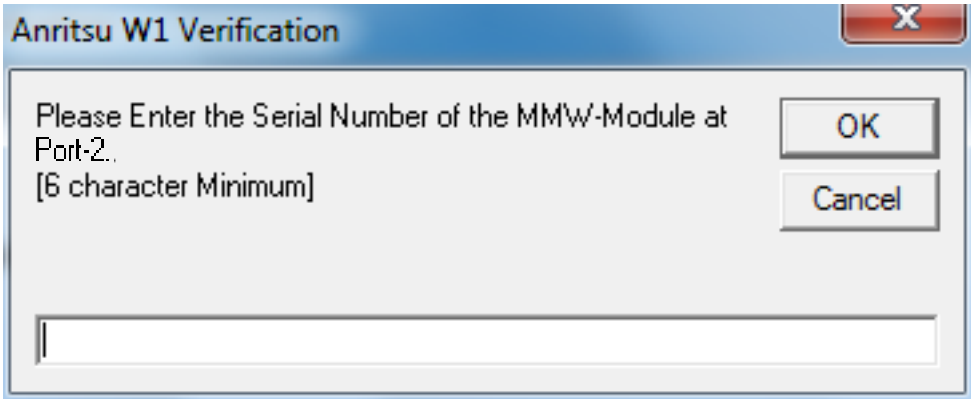


Figure 3-13. Anritsu W1 Verification Dialog – Port 2 BB/mmWave Module – Serial Number

If Doing Ports 3 and 4, Then Enter Port 3 BB/mmWave Module Information

15. Enter the Port 3 BB/mmWave Module model number and click OK.

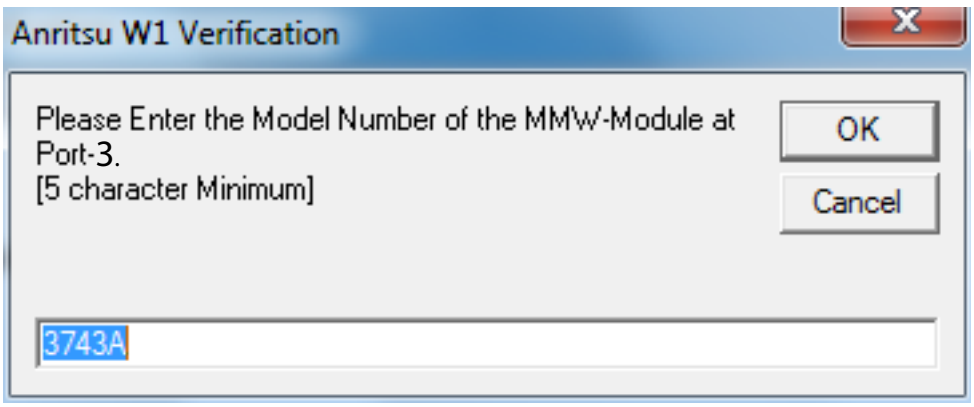


Figure 3-14. Anritsu W1 Verification Dialog – Port 3 BB/mmWave Module – Model Number

16. Enter the Port 3 BB/mmWave Module serial number and click OK.

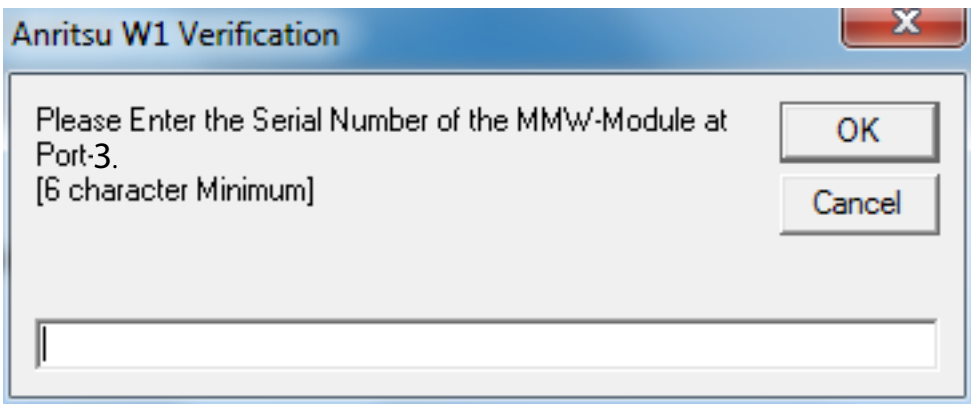


Figure 3-15. Anritsu W1 Verification Dialog – Port 3 BB/mmWave Module – Serial Number

Enter Port 4 BB/mmWave Module Information

17. Enter the Port 4 BB/mmWave Module model number and click OK.

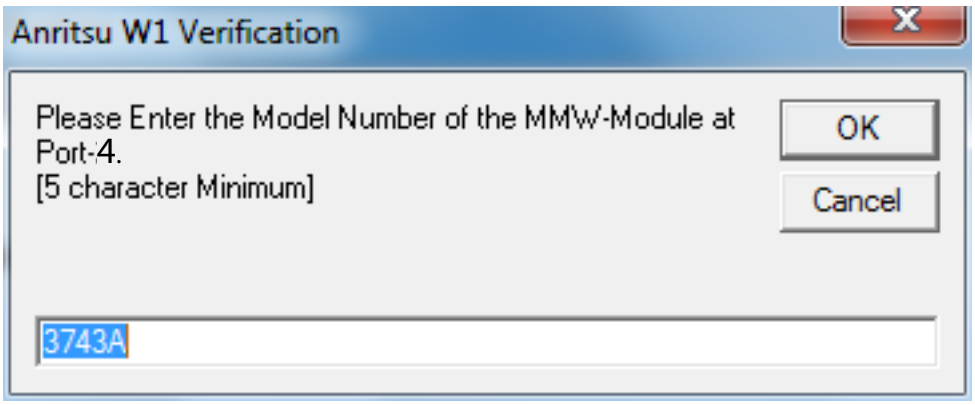


Figure 3-16. Anritsu W1 Verification Dialog – Port 4 BB/mmWave Module – Model Number

18. Enter the Port 4 BB/mmWave Module serial number and click OK.

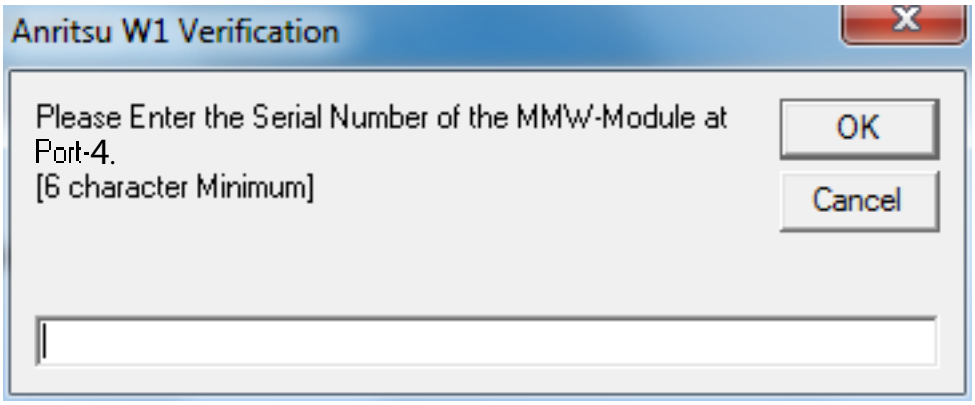


Figure 3-17. Anritsu W1 Verification Dialog – Port 4 BB/mmWave Module – Serial Number

19. In the first cycle through, the application will ask for the test set information for both Ports 1 and 2, and Ports 3 and 4.

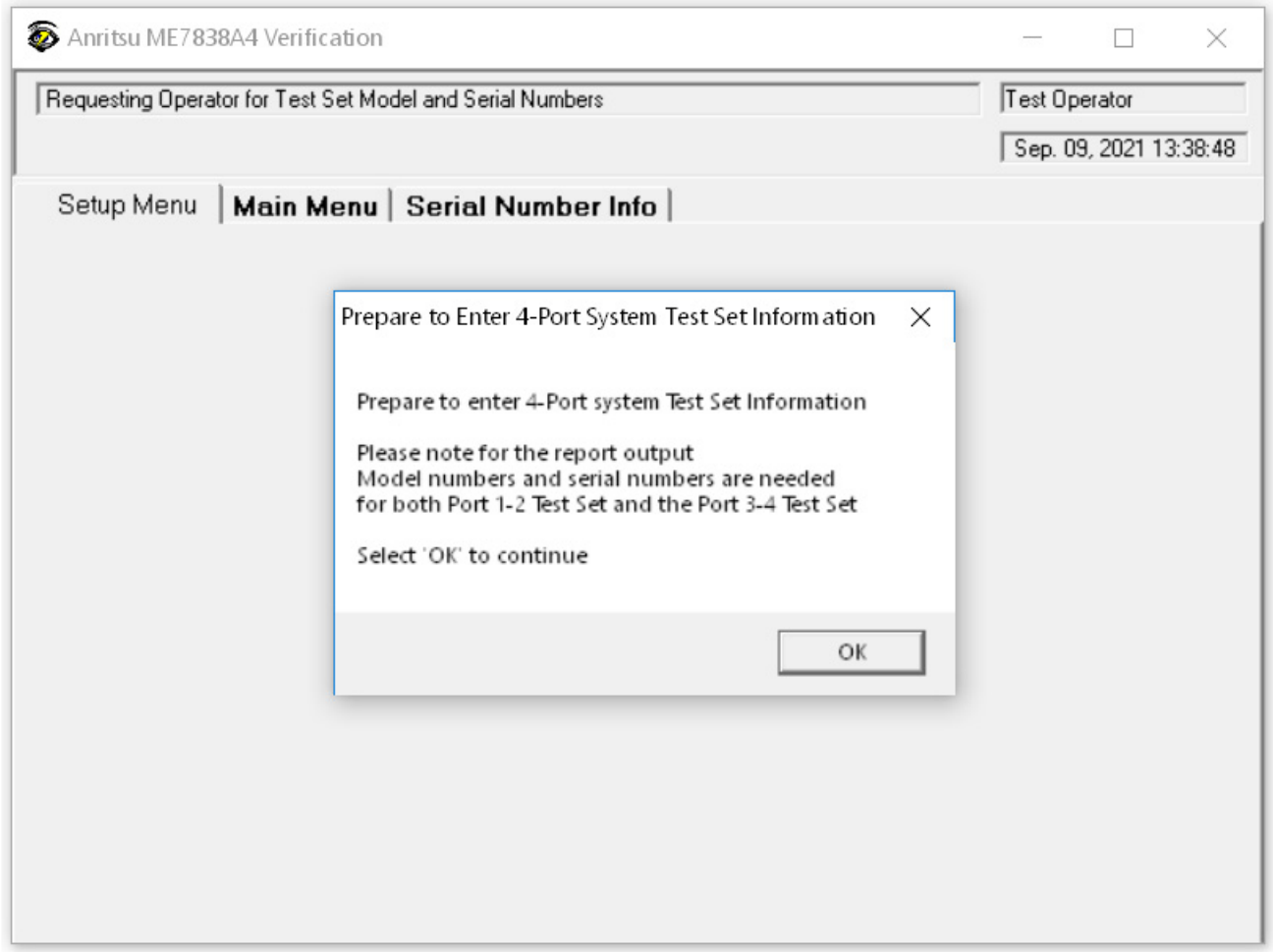


Figure 3-18. Anritsu W1 Verification Dialog – Port 4 BB/mmWave Module – Serial Number

Enter Port 1 and Port 2 Test Set Information

20. Enter the Test Set model number and click OK.

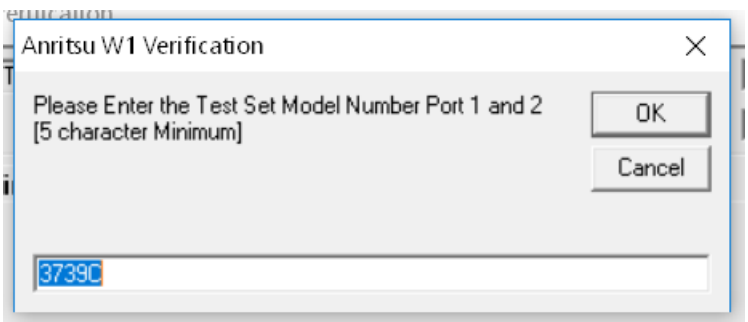


Figure 3-19. Anritsu W1 Verification Dialog – Test Set Model Number – Ports 1 and 2

21. Enter the Test Set serial number found on the rear panel and click OK.

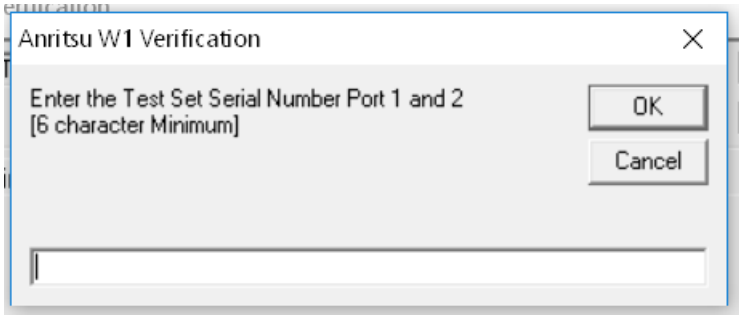


Figure 3-20. Anritsu W1 Verification Dialog – Test Set Serial Number – Ports 1 and 2

Enter Port 3 and Port 4 Test Set Information

22. Enter the Test Set model number and click OK.

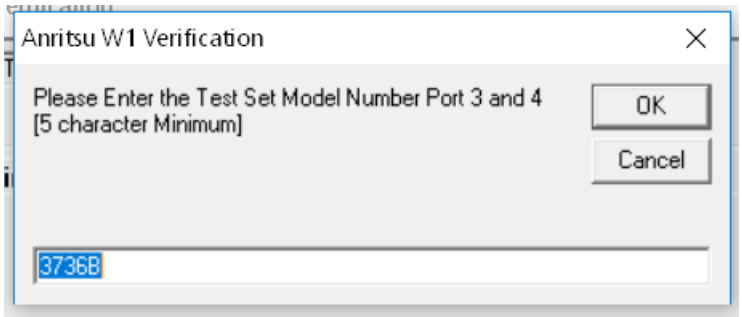


Figure 3-21. Anritsu W1 Verification Dialog – Test Set Model Number – Ports 3 and 4

23. Enter the Test Set serial number found on the rear panel and click OK.

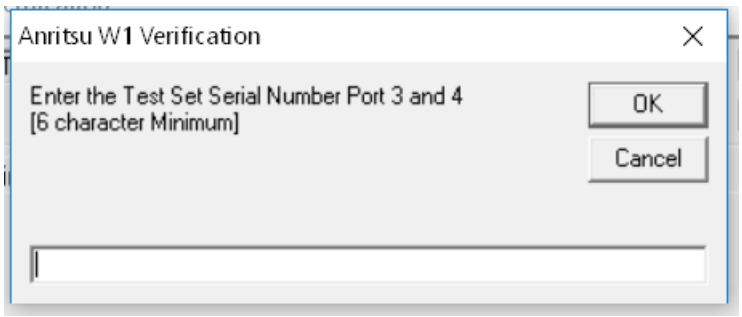


Figure 3-22. Anritsu W1 Verification Dialog – Test Set Serial Number – Ports 3 and 4

The program execution continues to the following Section 3-6, “Application Interface – Setup Menu Tab” on page 3-14.

3-6 Application Interface – Setup Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections:

- The Setup Menu tab is described in this section.
- The Main Menu tab display is described in Section 3-9, "Application Interface – Main Menu Tab" on page 3-27.
- The Serial Number Info tab is described in Section 3-10, "Application Interface – Serial Number Tabs" on page 3-31.

Procedure

The following procedure continues the program setup from the previous section:

1. In the Calibration Kit Type area, select W Coax.
2. In the Serial Number (5 Digits) area, enter the serial number for the 3656C Calibration/Verification Kit. At least five (5) digits are required.
3. In the Load Cal-Kit Coefficients to VNA area, select Cal-Kit.

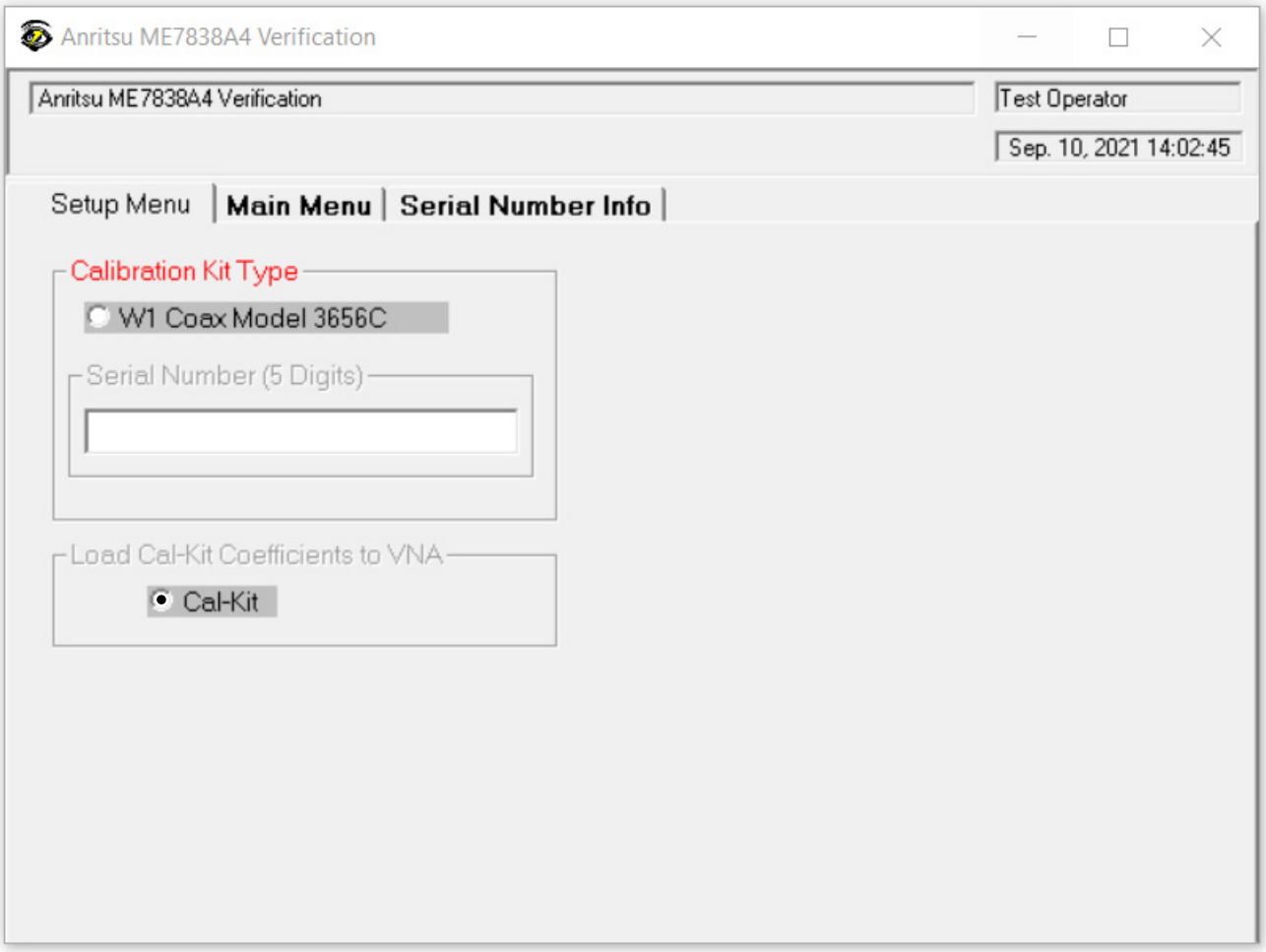


Figure 3-23. ME7838A4 Application Interface – Setup Menu Tab

4. The Install Calibration-Kit Coefficients to the VNA dialog box appears.

5. Follow the dialog box instructions for installing the 3656C calibration coefficients into the VNA, then click OK.

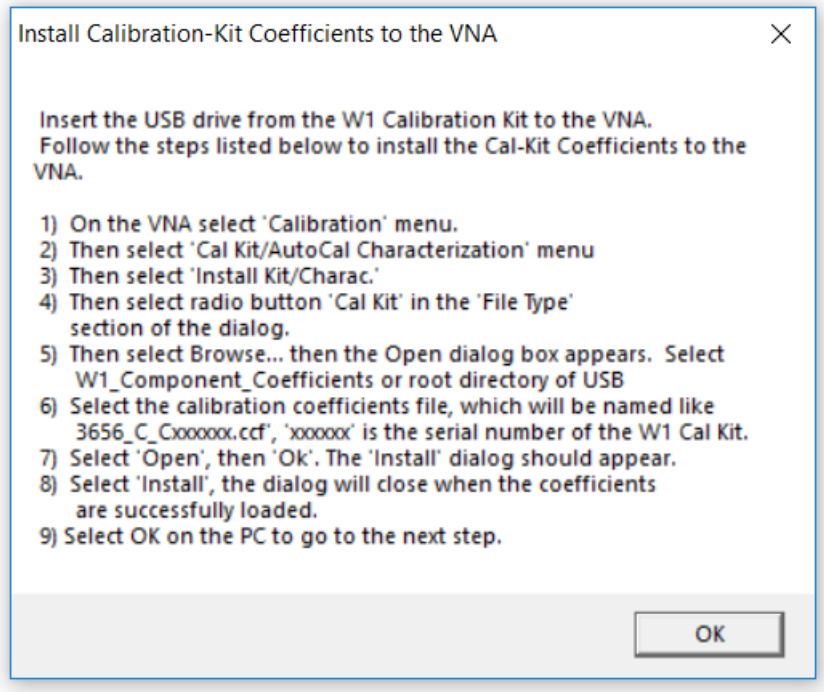


Figure 3-24. Install Calibration Kit Coefficients Dialog

6. The VNA displays an acknowledgment dialog box when the file load is complete, indicating that 10 files were loaded. After the VNA has loaded the 10 Calibration coefficient files, select OK on the PC application. The application will then prompt you to remove the USB drive from the VNA and install the USB drive to the PC.

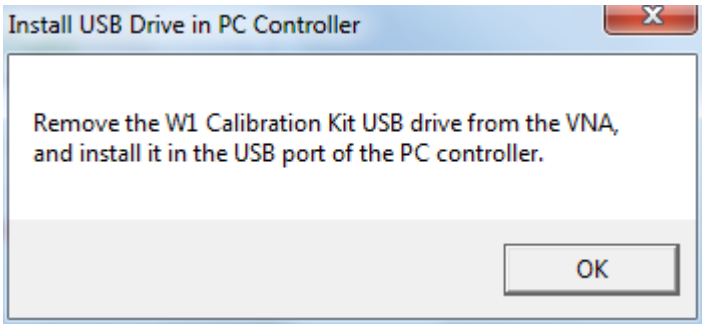


Figure 3-25. Install USB Drive in PC Dialog

7. The Application Interface dialog box reappears displaying the Setup Menu tab and Frequency Range area. In the Frequency Range area, select either the low range (40 MHz to 67 GHz) or the high range (67 GHz to 110/125 GHz). For purposes of this document, the low band is done first. The range that is not selected is calibrated during the Restart Procedure described in Section 3-21 "Restart for Alternate Frequency Band or Alternative Port Pair" on page 3-58. After selecting the frequency range, the Verification Kit Information area appears. Note that for A4X systems using the 3656C calibration/verification kit, the high frequency limit is 125 GHz.

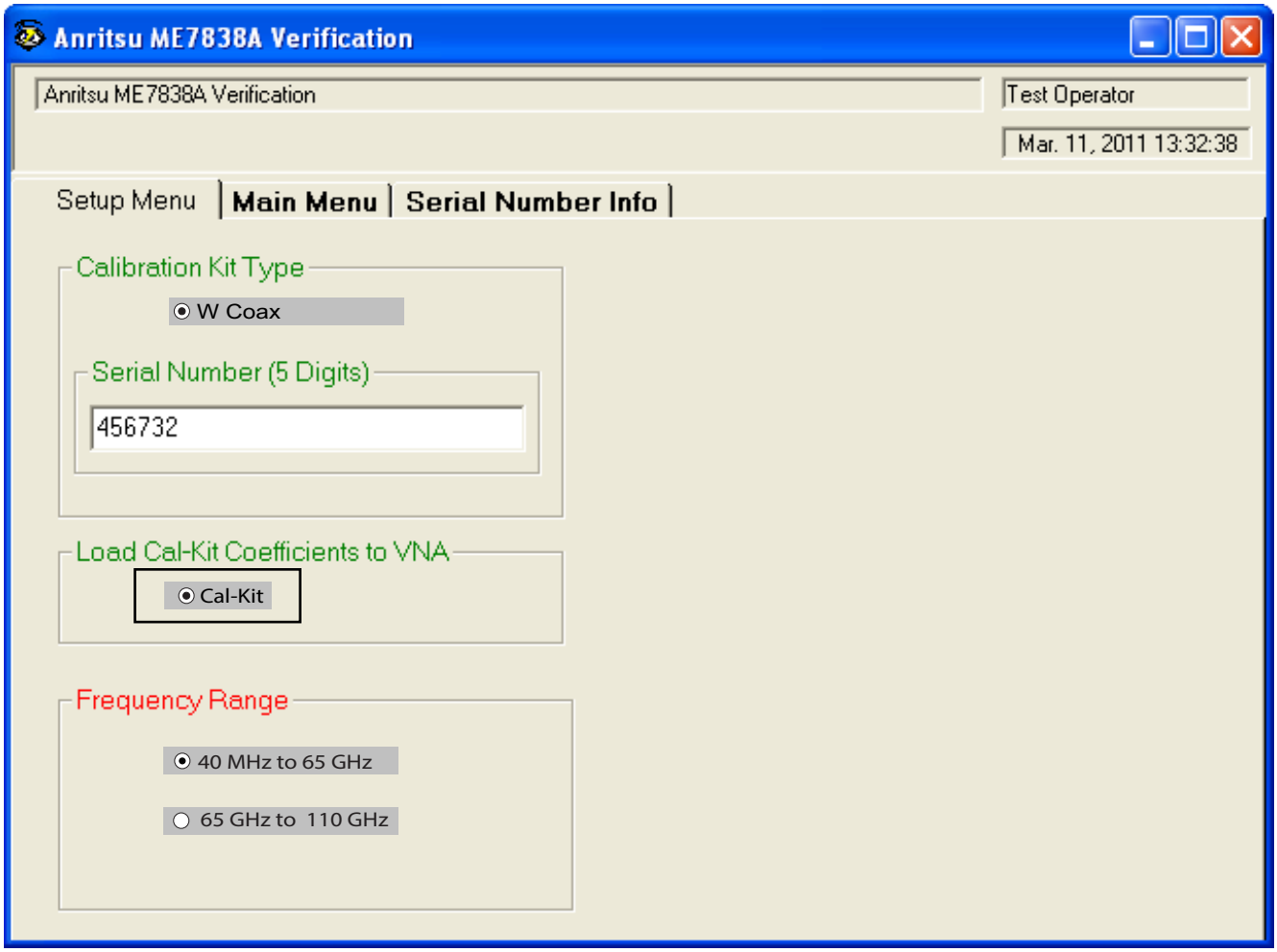


Figure 3-26. ME7838A4 Application Interface – Setup Menu Tab

8. Select the W1 Coax type, and then the Verification Kit Serial Number (usually the same as the Calibration Kit). When the Serial Number is complete, the Locate USB Drive Kit Data on PC area appears.

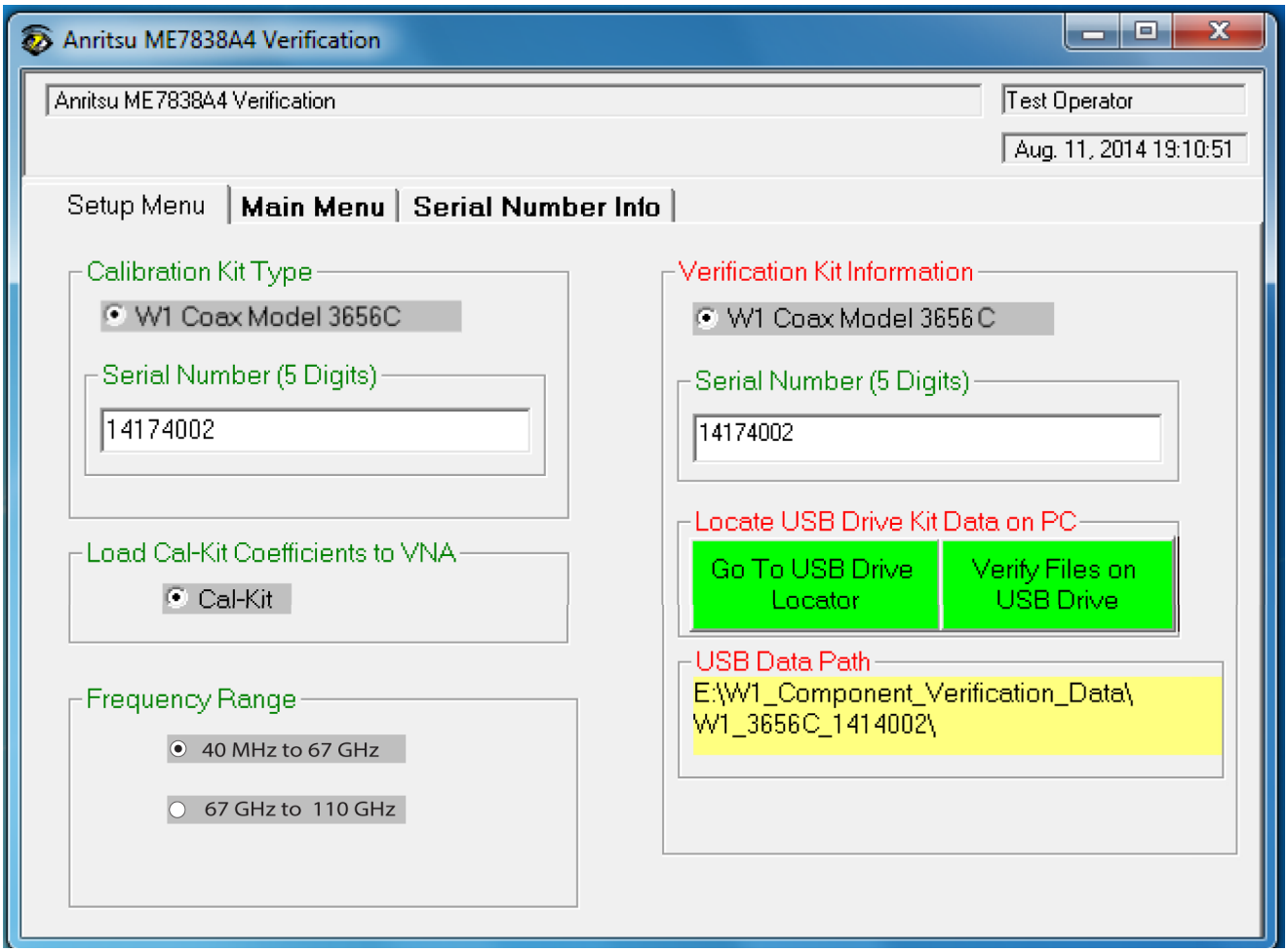


Figure 3-27. ME7838A4 Application Interface – Setup Menu Tab

9. In Figure 3-27 find the Locate USB Drive Kit Data on PC area, click the Go To USB Drive Locator button.

10. When the Auto Find Verification Kit Data dialog box first appears in Figure 3-28, the Verification Kit Data Path text field is blank. Click the Auto-Locate USB Drive Verification Kit Data on PC button. The application automatically locates the verification kit data on the USB drive and displays the path in the Verification Kit Data Path text field.

In rare instances, due to PC/USB configurations, the Auto-find function may not be able to locate the verification data on the USB drive. In this case, you may need to use the Manually Locate Verification Data Kit button. This utility allows you to manually select the path where the verification kit data is located. The data path will be on the USB drive shipped with the verification kit. On most PC's, this will be the E, F, or G drive assignments. Navigate to the verification kit data in the file-path location shown in the example below (for this example, the USB drive was at E:\):

```
E:\W1_Verification_Data\W1_3656C_xxxxxx
```

(where xxxxxx is the serial number of the Kit)

Within each data set on the USB, there is a file named EnableKit.dat. Double click that file to identify the file. This builds the path for the verification kit data and returns back to the Find Verification Kit Data on the removable USB drive. Once the data is found, the Verification Kit Data Path information appears in the text field. Click Next > to return to the Application Interface dialog box.

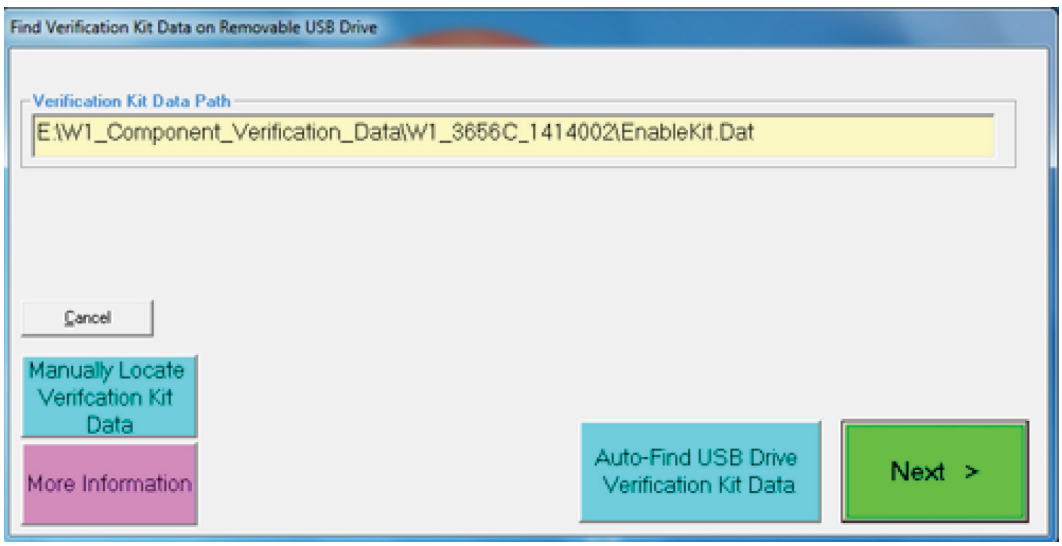


Figure 3-28. USB Drive Locater Dialog

11. Click Verify Files on USB Drive. The application checks the files on the USB drive to verify that all files are present and that each has the proper number of data points.

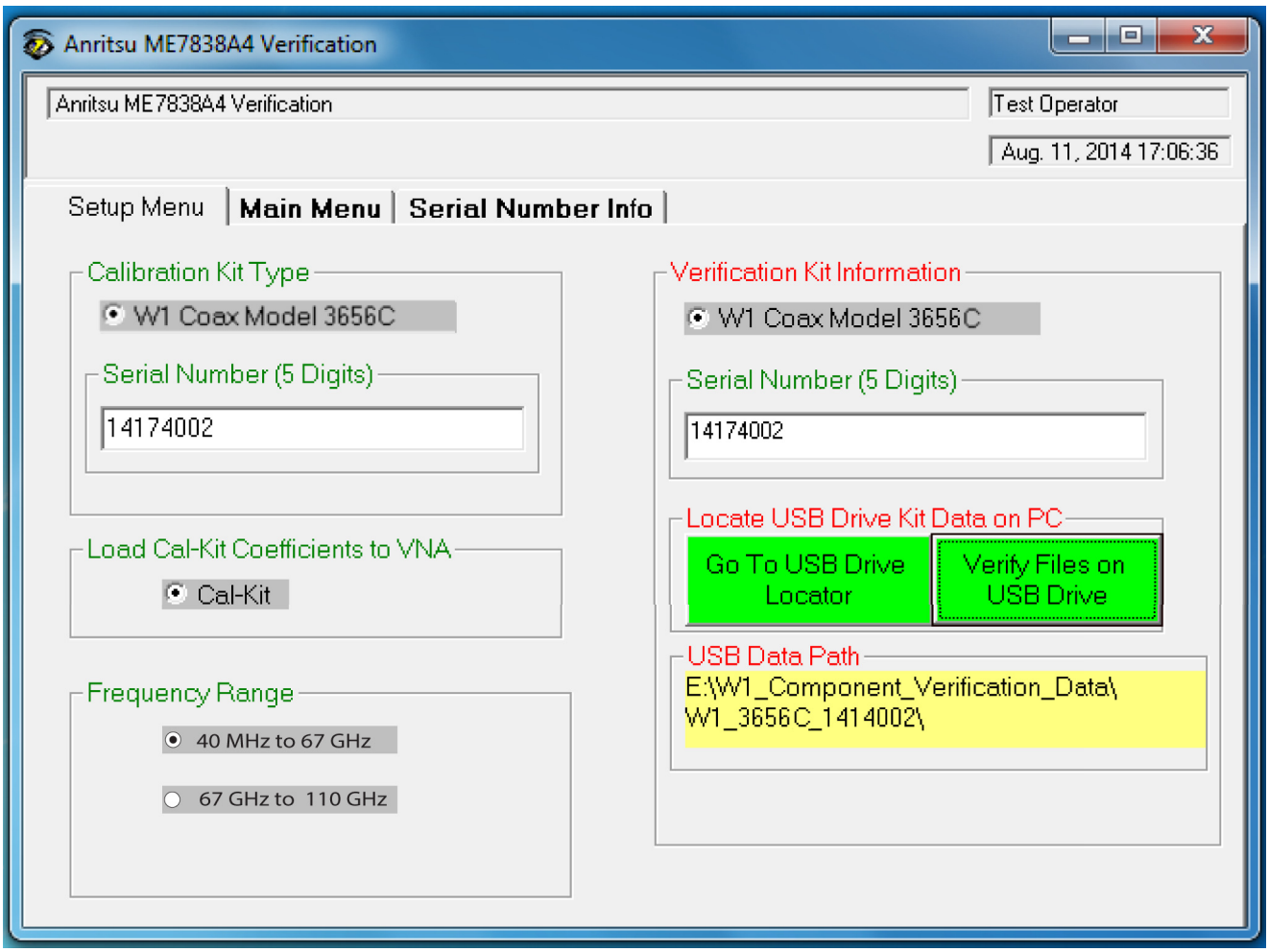


Figure 3-29. ME7838A4 Application Interface – Setup Menu Tab

12. When all information is entered and you are ready to start, click the Setup Calibration of VNA button.

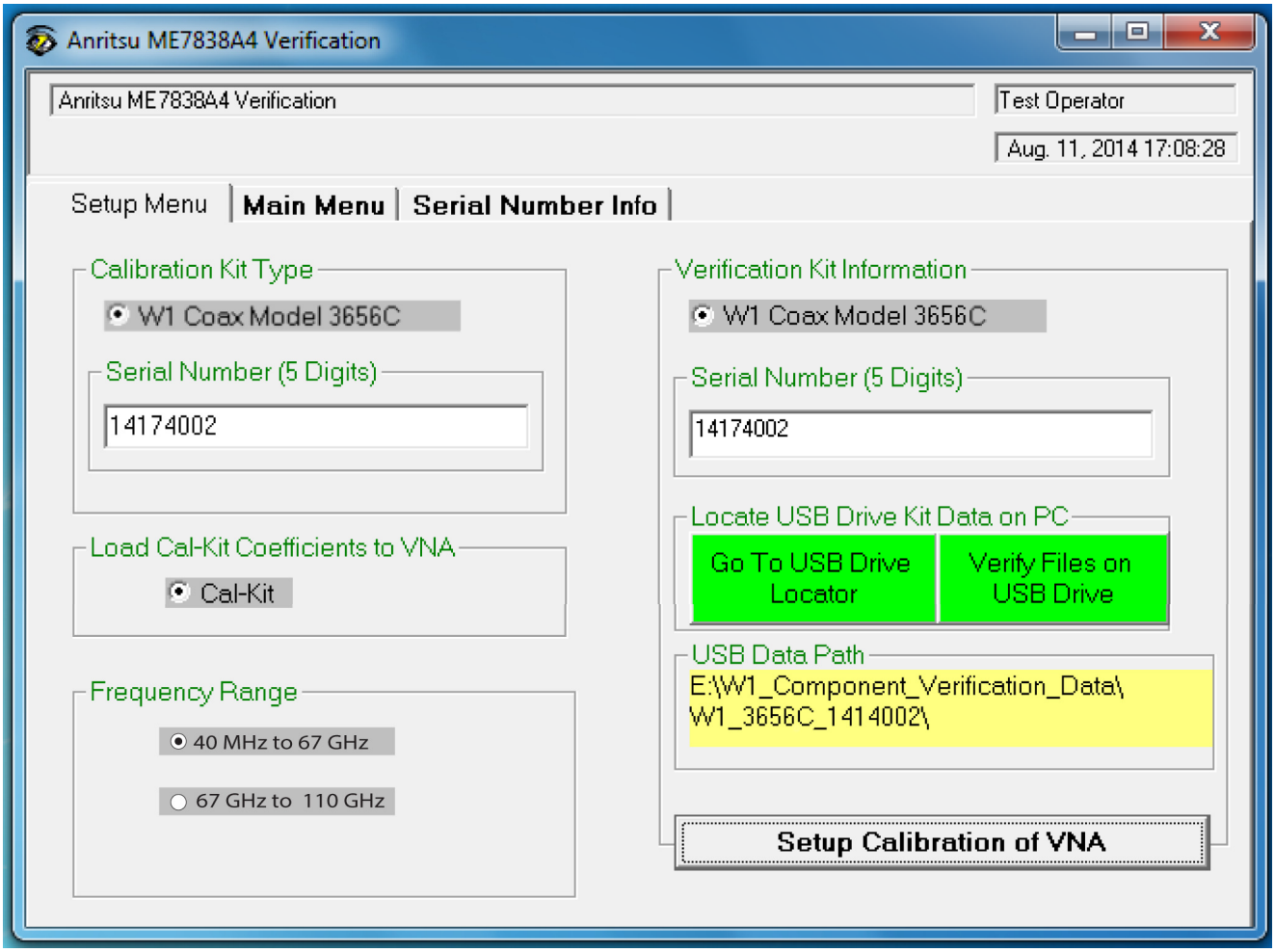


Figure 3-30. ME7838A4 Application Interface – Setup Menu Tab

13. The ME7838A4/A4X/E4/E4X system is a 4-port system which requires a low-band calibration and a high-band calibration to be performed on only two ports at a time. The program execution for port 1 and port 2 continues in either Section 3-7, “Low-Band Calibration Port 1 – Port 2” on page 3-21 or Section 3-8, “High-Band Calibration Port 1 – Port 2” on page 3-24. The program execution for port 3 and port 4 continues in either Section 3-14, “Low-Band Calibration Port 3 – Port 4” on page 3-39 or Section 3-15, “High-Band Calibration Port 3 – Port 4” on page 3-42.

3-7 Low-Band Calibration Port 1 – Port 2

During this procedure, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration. In Section 3-8 “High-Band Calibration Port 1 – Port 2” on page 3-24, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 1 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 2 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

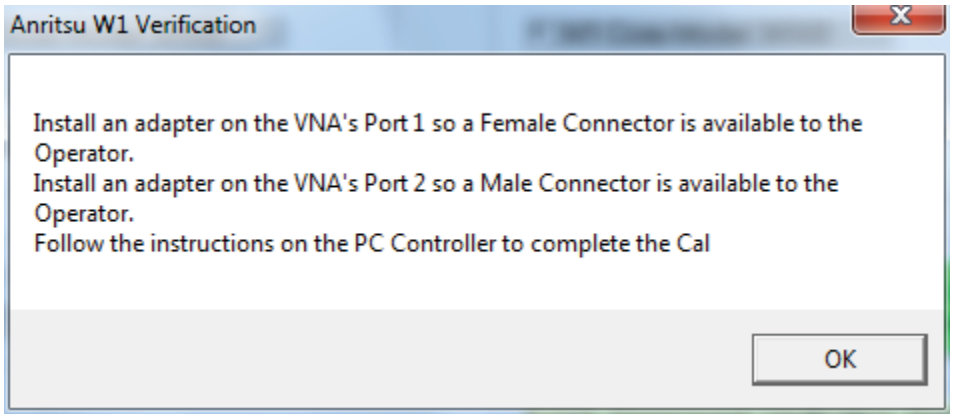


Figure 3-31. Anritsu W1 Verification Dialog

2. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 1.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 2.
   c. When ready to proceed, click OK.

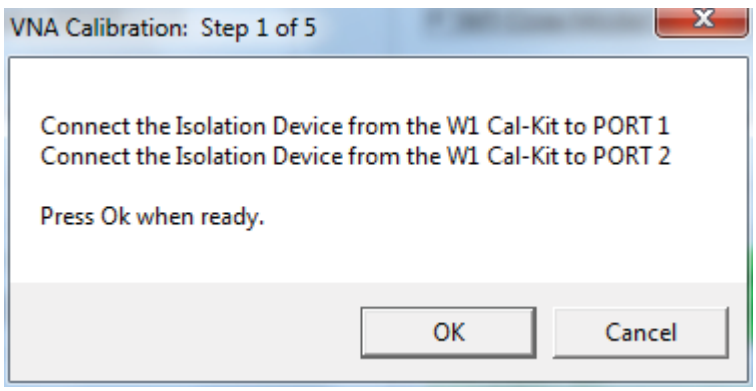


Figure 3-32. VNA Calibration: Step 1 of 5 Dialog

3. The VNA measures the load device data, then the VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male Cal Kit Broadband Load Device to VNA Port 1.
   b. Connect the Female Broadband Load Device to VNA Port 2.
   c. When ready to proceed, click OK.

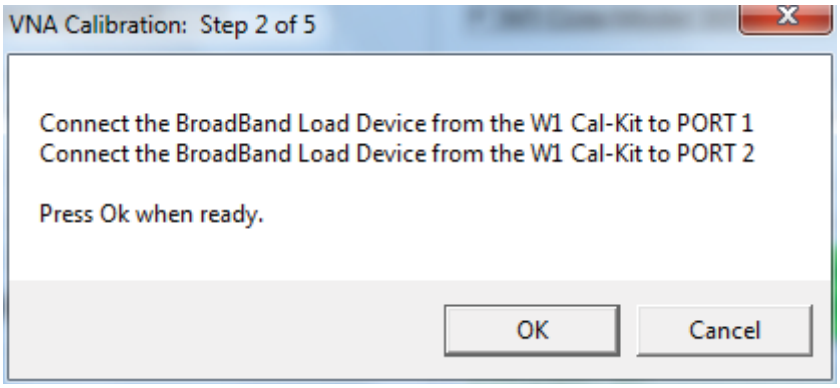


Figure 3-33. VNA Calibration: Step 2 of 5 Dialog

4. The VNA measures the broadband load device data, then the VNA Calibration: Step 3 of 5 dialog box appears.
   a. Connect the Male Cal Kit Open to VNA Port 1.
   b. Connect the Female Short #1 (2.02 mm) to VNA Port 2.
   c. When ready to proceed, click OK.

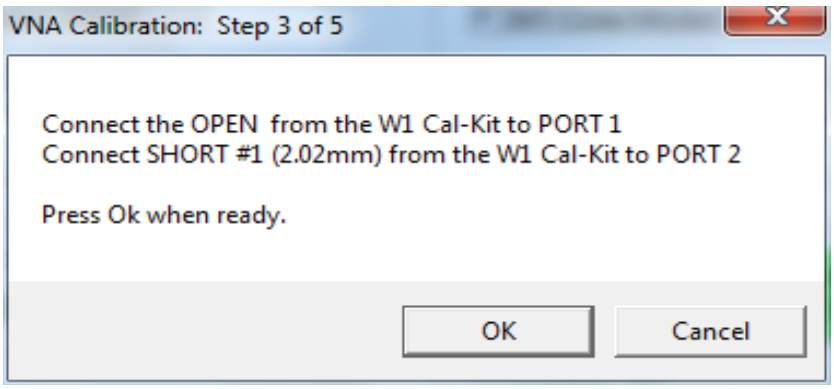


Figure 3-34. VNA Calibration: Step 3 of 5 Dialog

5. The VNA measures the open/short device data, then the VNA Calibration: Step 4 of 5 dialog box appears.
   a. Connect the Male Short #1 (2.02 mm) to VNA Port 1.
   b. Connect the Female Open to VNA Port 2.

c. When ready to proceed, click OK.

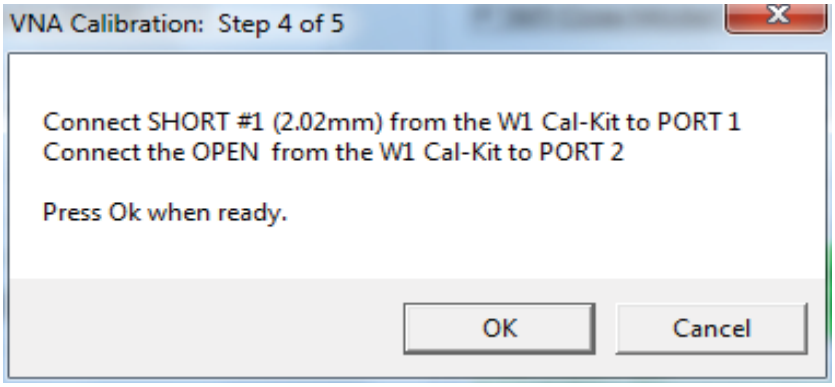


Figure 3-35. VNA Calibration: Step 4 of 5 Dialog

6. The VNA measures the short/open device data, then the VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the Short and the Open from Port 1 and Port 2, respectively.

b. Slide the two T-R modules towards each other and connect the VNA Port 1 (Female) to VNA Port 2 (Male) directly.

c. When ready to proceed, click OK.

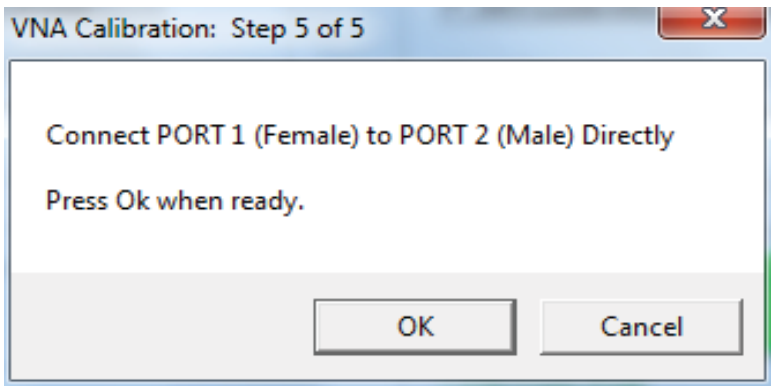


Figure 3-36. VNA Calibration: Step 5 of 5 Dialog

7. The program execution skips to Section 3-9 “Application Interface – Main Menu Tab” on page 3-27.

3-8 High-Band Calibration Port 1 – Port 2

During this procedure, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration. In Section 3-7 “Low-Band Calibration Port 1 – Port 2” on page 3-21, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 1 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 2 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

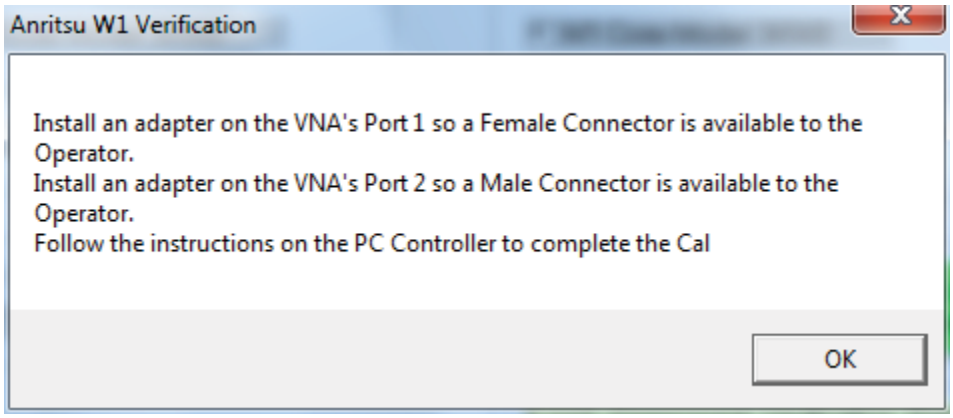


Figure 3-37. Anritsu W1 Verification Dialog

2. When ready to proceed, click OK. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 1.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 2.
   c. When ready to proceed, click OK.

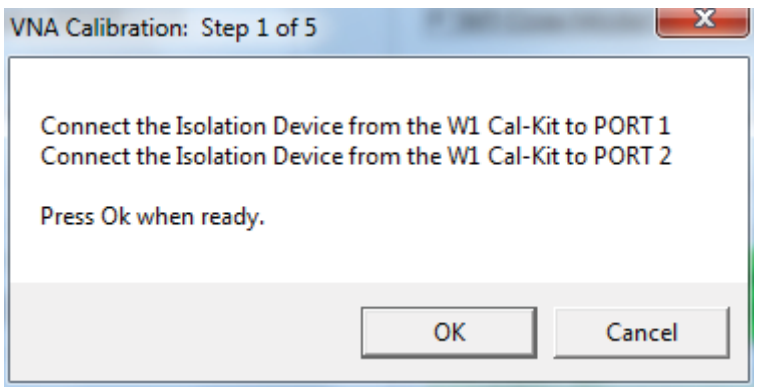


Figure 3-38. VNA Calibration: Step 1 of 5 Dialog

3. The VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male 2.02 mm Short #1 to VNA Port 1.
   b. Connect the Female 2.65 mm Short #2 to VNA Port 2.
   c. When ready to proceed, click OK.

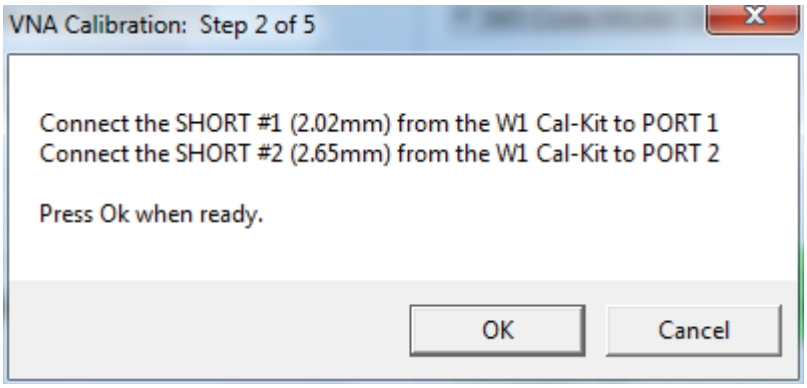


Figure 3-39. VNA Calibration: Step 2 of 5 Dialog

4. The VNA Calibration: Step 3 of 5 dialog box appears.
   a. Connect the Male 2.65 mm Short #2 to VNA Port 1.
   b. Connect the Female 3.18 mm Short #3 to VNA Port 2.
   c. When ready to proceed, click OK.

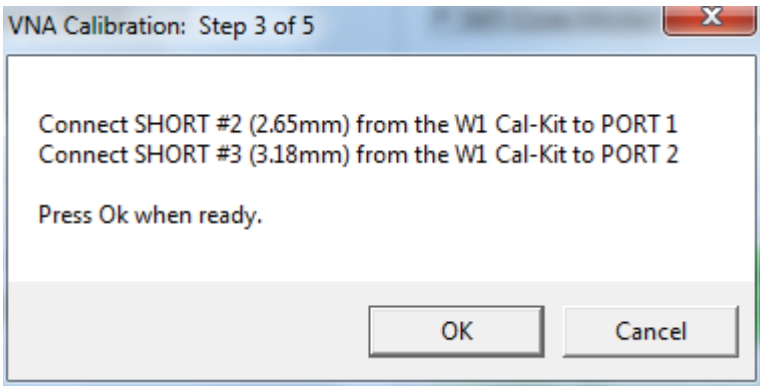


Figure 3-40. VNA Calibration: Step 3 of 5 Dialog

5. The VNA Calibration: Step 4 of 5 dialog box appears.

a. Connect the Male 3.18 mm Short #3 to VNA Port 1.

b. Connect the Female 2.02 mm Short #1 to VNA Port 2.

c. When ready to proceed, click OK.

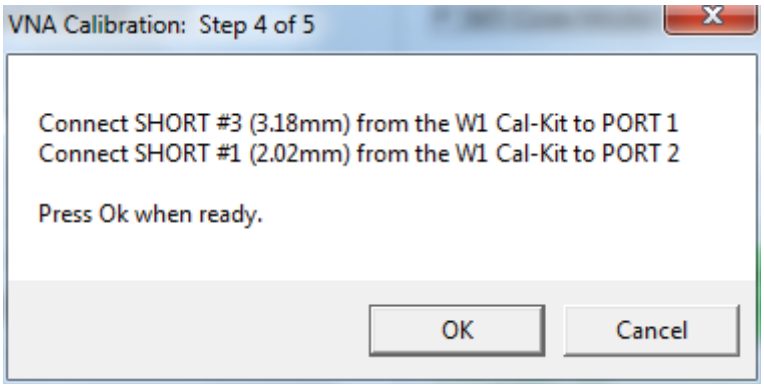


Figure 3-41. VNA Calibration: Step 4 of 5 Dialog

6. The VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the offset Shorts from Port 1 and Port 2.

b. Slide the two T-R modules towards each other and connect the VNA Port 1 (Female) to VNA Port 2 (Male) directly.

c. When ready to proceed, click OK.

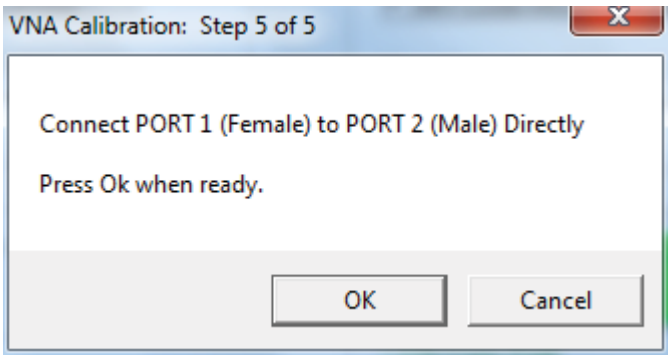


Figure 3-42. VNA Calibration: Step 5 of 5 Dialog

7. The program execution continues to Section 3-9 “Application Interface – Main Menu Tab” on page 3-27.

3-9 Application Interface – Main Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections below.

- The Setup Menu tab is described in Section 3-6, "Application Interface – Setup Menu Tab" on page 3-14.
- The Main Menu tab display is described in the section immediately following and is shown in Figure 3-43
- The Serial Number tab is described in Section 3-10, "Application Interface – Serial Number Tabs" on page 3-31.

Whenever the program is executing a command from the main menu, the buttons are disabled, due to the event-driven nature of the Windows Operating System, until the current command is finished. While a command is being executed, informational messages are usually displayed on the screen to aid the operator in understanding which steps the application is performing.

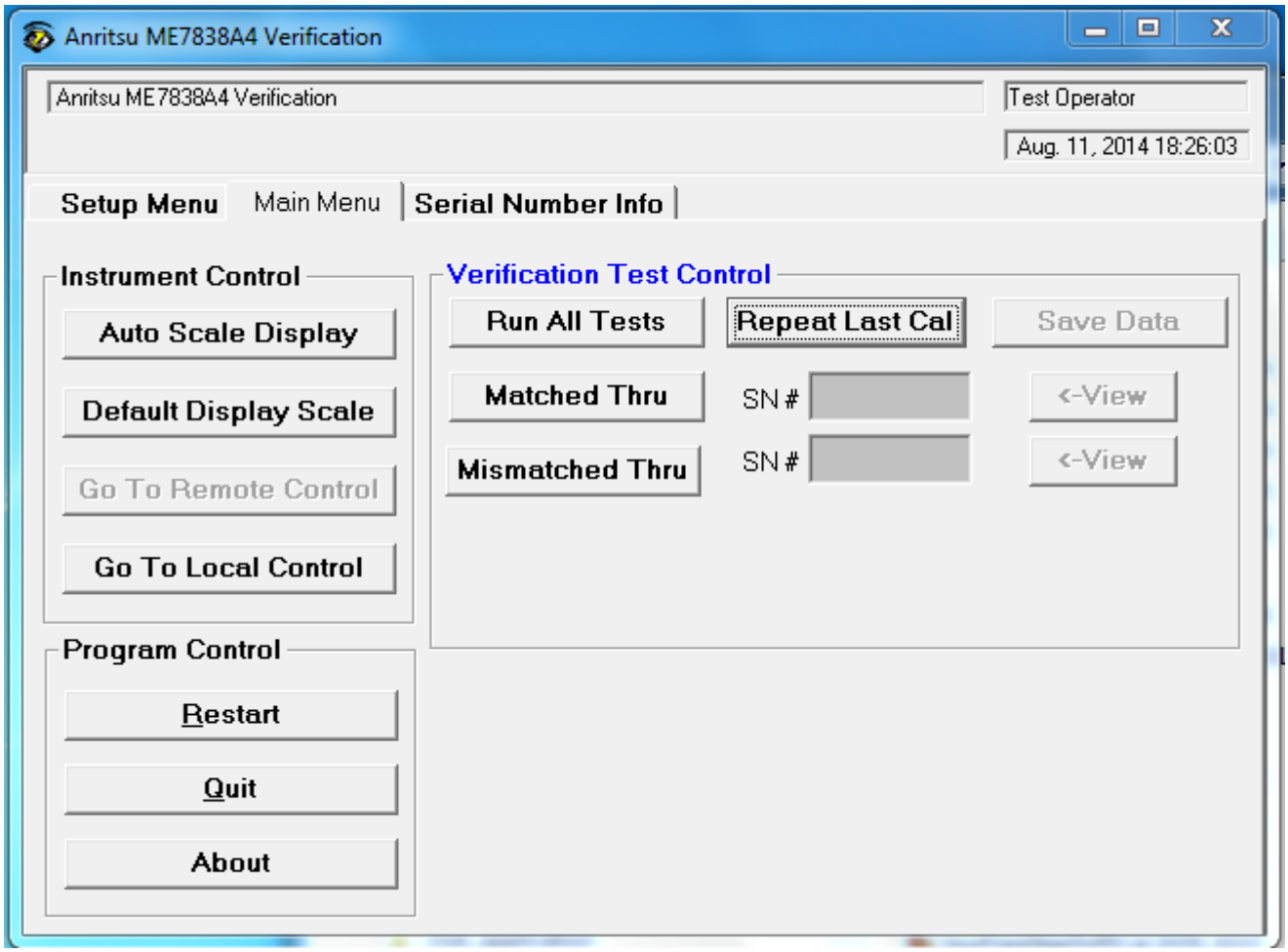


Figure 3-43. ME7838A4 Application Interface – Main Menu Tab

Auto Scale Display Button

This command automatically scales each channel on the Anritsu Vector Network Analyzer. It is the same as using the VectorStar VNA menus to navigate to and select either the Auto Scale Active Channel or Auto Scale All Channels buttons. The full path to these buttons is:

- MAIN | Scale | SCALE | Auto Scale Active Channel
- MAIN | Scale | SCALE | Auto Scale All Channels

When the program detects the VNA has finished a sweep, the program auto-scales all four channels before continuing.

The VNA display during the calibration and verification tests is set to one Channel and four traces. Each trace displays the following parameters:

- Upper-left quadrant – S21 – Forward Transmissions, Log Mag (top) and Phase (Bottom)
- Upper-right quadrant – S12 – Reverse Transmissions, Log Mag (top) and Phase (Bottom)
- Lower-left quadrant – S11 – Forward Reflections, Lin Mag (top) and Phase (Bottom)
- Lower-right quadrant – S22 – Reverse Reflections, Lin Mag (top) and Phase (Bottom)

See Figure 3-44 for a display example. This is a typical display immediately after performing the High Band calibration. Please note this is for reference only and that the actual data on the VNA display may not be identical.

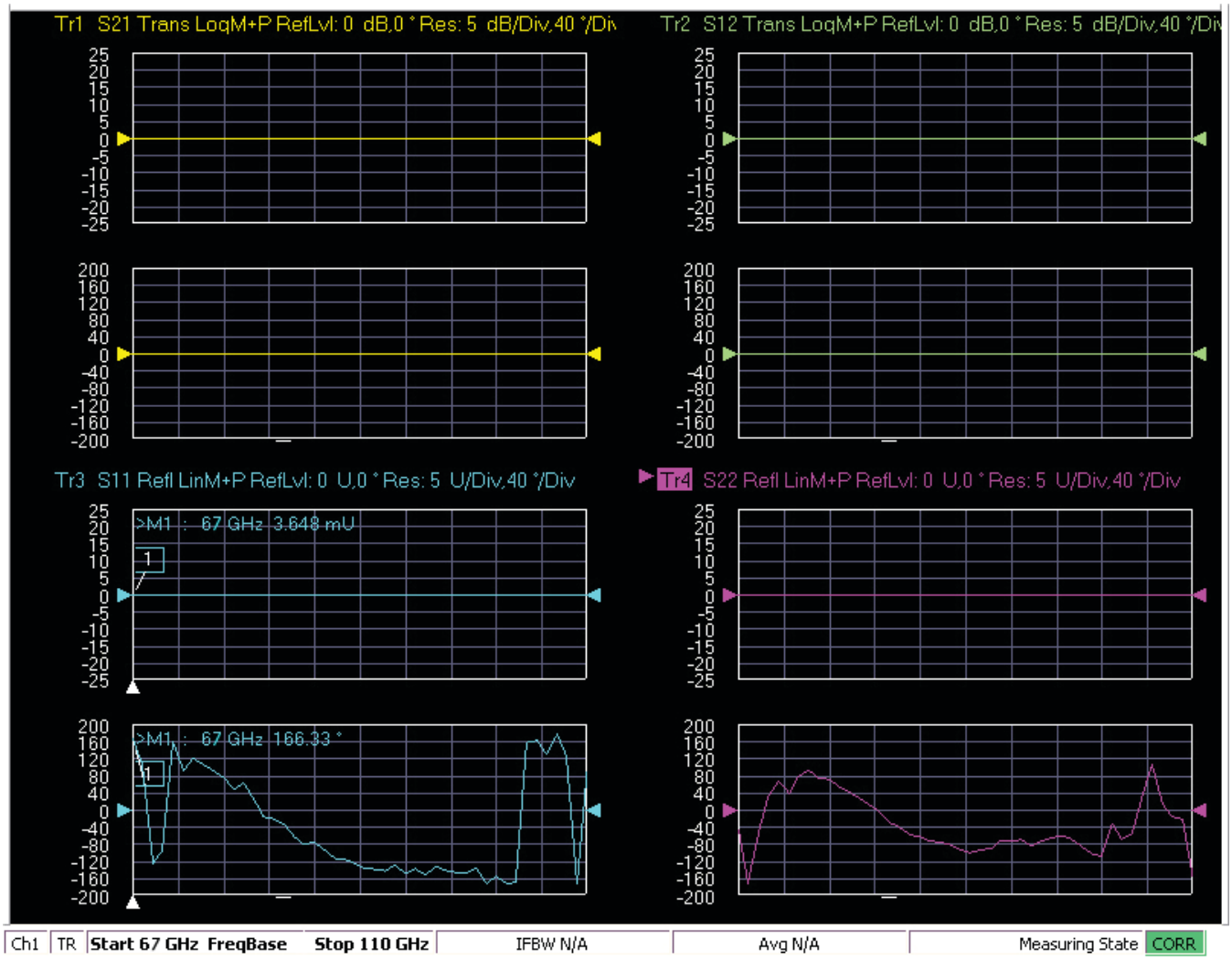


Figure 3-44. MS4640B Series VNA Auto Scale Example Trace Display

Default Display Scale Button

This command sets all four channels to a scale of 5 dB/div for the Magnitude displays and to 40 degrees/div for the Phase displays, and the reference value to 0. This allows you to see if the device is properly connected.

Go To Remote Control Button

This command is only available after you have clicked the Go to Local Control button. When you click this button, the program takes control of the VNA Display type and Display scale settings and sets them to the program default values.

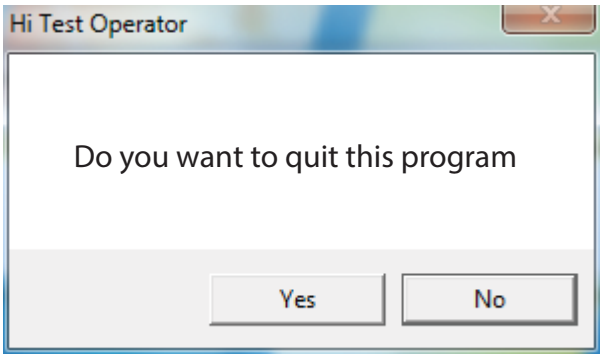
Go To Local Control Button

This command allows you access to the front panel buttons while the program is running. The instrument is in Local Lock Out unless this button is pushed. This prevents an inadvertent front panel button actuation from affecting the proper operation of the program.

Caution	Modifying the VNA settings (such as power level, bandwidth, averaging, etc.) could adversely affect the measurement results. This should only be used to view the data or for using markers.

Restart Button

The Restart button command allows you to change the tested instrument, the frequency range, or the selected verification kit. Selecting Yes causes the program to return to the program initialization stage.



Usually, this button is used to test for second frequency band and program execution continues in Section 3-21 “Restart for Alternate Frequency Band or Alternative Port Pair” on page 3-58 and the Choose The Restart Method dialog box appears.

Quit Button

Selecting Quit brings up a confirmation dialog box. Selecting Yes exits the program; selecting No returns you to the previous screen.

About

Displays version information, copyright, other legal notices, and company contact information.

Run All Tests

This command button runs both the Matched Thru and Mismatched Thru tests. Program execution starts with Section 3-11 “Matched Thru Tests” on page 3-32 and then continues with Section 3-12 “Mismatched Thru Tests” on page 3-35. When both tests are completed, program execution returns to the Main Menu tab shown in Figure 3-43 on page 3-27.

Repeat Last Cal

This command button re-calibrates the VNA according to the CURRENT calibration. This provides a way to recalibrate the VNA without having to reset the program parameters in case the original calibration was flawed for some reason. When the calibration sequence is complete, program execution continues to the Main Menu tab shown previously in Figure 3-43 on page 3-27.

Save Data

This command button writes data files to the PC Controller and stores the files at `C:\mmdcsvc\Data`. The program does not write data to the verification kit USB memory device. If selected, program execution continues as described in Section 3-13 “Saving Verification Data” on page 3-38.

The number of saved files varies depending on the user settings:

- If both the matched and mismatched thru tests are run, two files are written to the PC Controller hard drive.
- If only one of the tests was run, only one file is written to the PC Controller’s hard drive at `C:\mmcsvc\Data`

Matched Thru

This command button only runs the Matched Thru tests. If selected, program execution continues as described in Section 3-11 “Matched Thru Tests” on page 3-32. When the tests are completed, the program returns to the Main Menu tab shown in Section 3-9 “Application Interface – Main Menu Tab” on page 3-27.

Matched Thru SN

This field is used to enter the serial number of the matched thru.

Mismatched Thru

This command button only runs the Mismatched Thru tests. If selected, program execution continues in Section 3-12 “Mismatched Thru Tests” on page 3-35. When the tests are completed, the program returns to the Main Menu tab shown in Table 3-43 on page 3-27.

Mismatched Thru SN

This field is used to enter the serial number of the matched thru.

3-10 Application Interface – Serial Number Tabs

The Serial Number Info tab displays a summary of the model number and serial number for the following devices. All screen information is included in the report headers.

- Operator Name
- Calibration Kit
- Test Set
- Verification Kit
- Vector Network Analyzer
- Test Set
- Signal Generator Sources

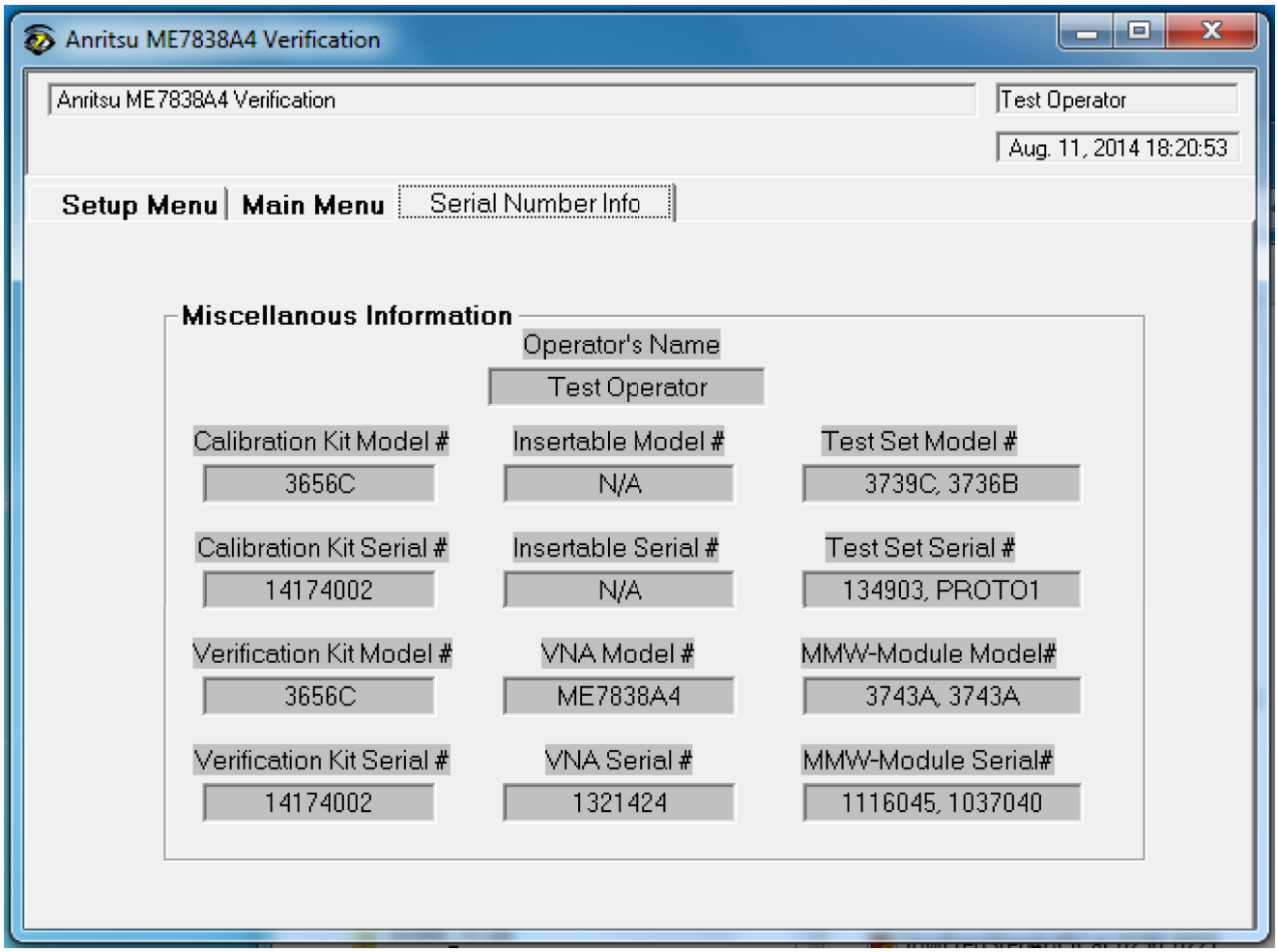


Figure 3-45. ME7838A4 Application Interface – Serial Number Tab

3-11 Matched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests are executed followed by the Mismatched Thru tests described in Section 3-12 “Mismatched Thru Tests” on page 3-35.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 3-9 “Application Interface – Main Menu Tab” on page 3-27.

Note	The verification devices must be connected to the W1 Connector Coupler Ports and not to the VNA Ports. Use the torque wrench supplied with the verification kit when tightening the device connections.

Procedure

1. The Enter Serial Number Match Thru dialog box appears.

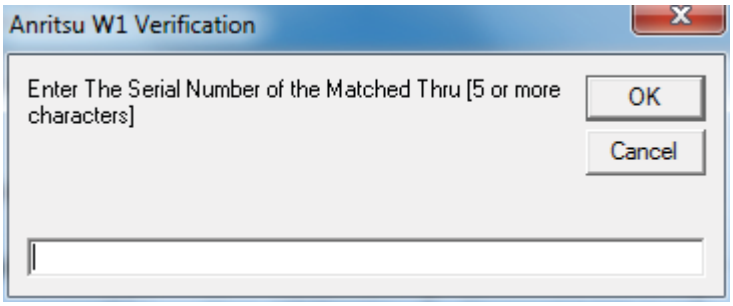


Figure 3-46. Anritsu W1 Verification Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. Enter the serial number of the Matched Thru.
4. When ready to proceed, click OK. The Connect Matched Thru Male Connector dialog box appears.

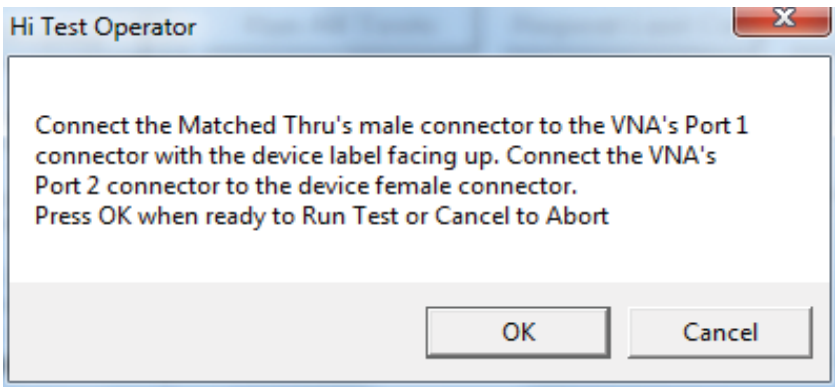


Figure 3-47. Matched Thru Dialog

5. Connect the Matched Thru male connector to VNA Port 1 with the label facing up.
6. Connect the Matched Thru female connector to VNA Port 2.
7. When ready to proceed, click OK. The matched thru test starts and the Matched Thru Test - Sweep 1 dialog box appears. After it completes, the Matched Thru Test - Sweep 2 dialog box appears.

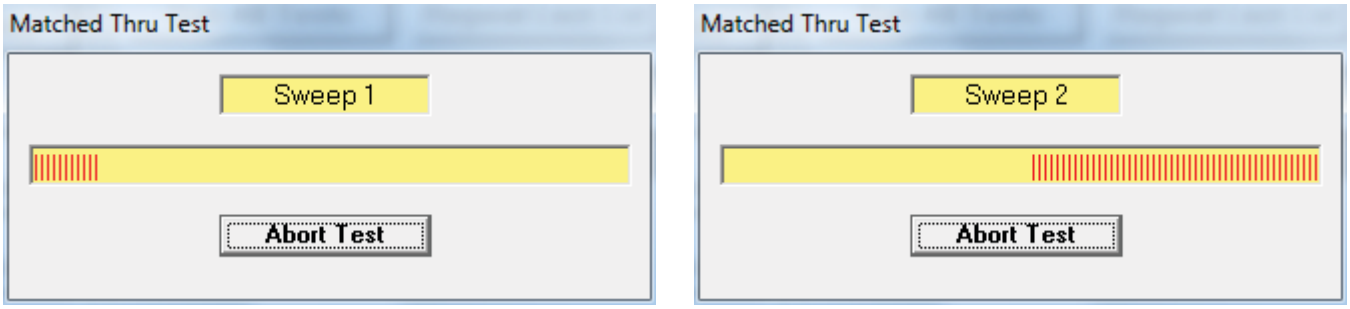


Figure 3-48. Matched Thru Test, Sweep 1 and Sweep 2 Dialog Boxes

8. When the test completes, the next action depends on what the user selected in the Main Menu tab above. The VNA main display should be similar to the one below. This is a typical display immediately after measuring the Matched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

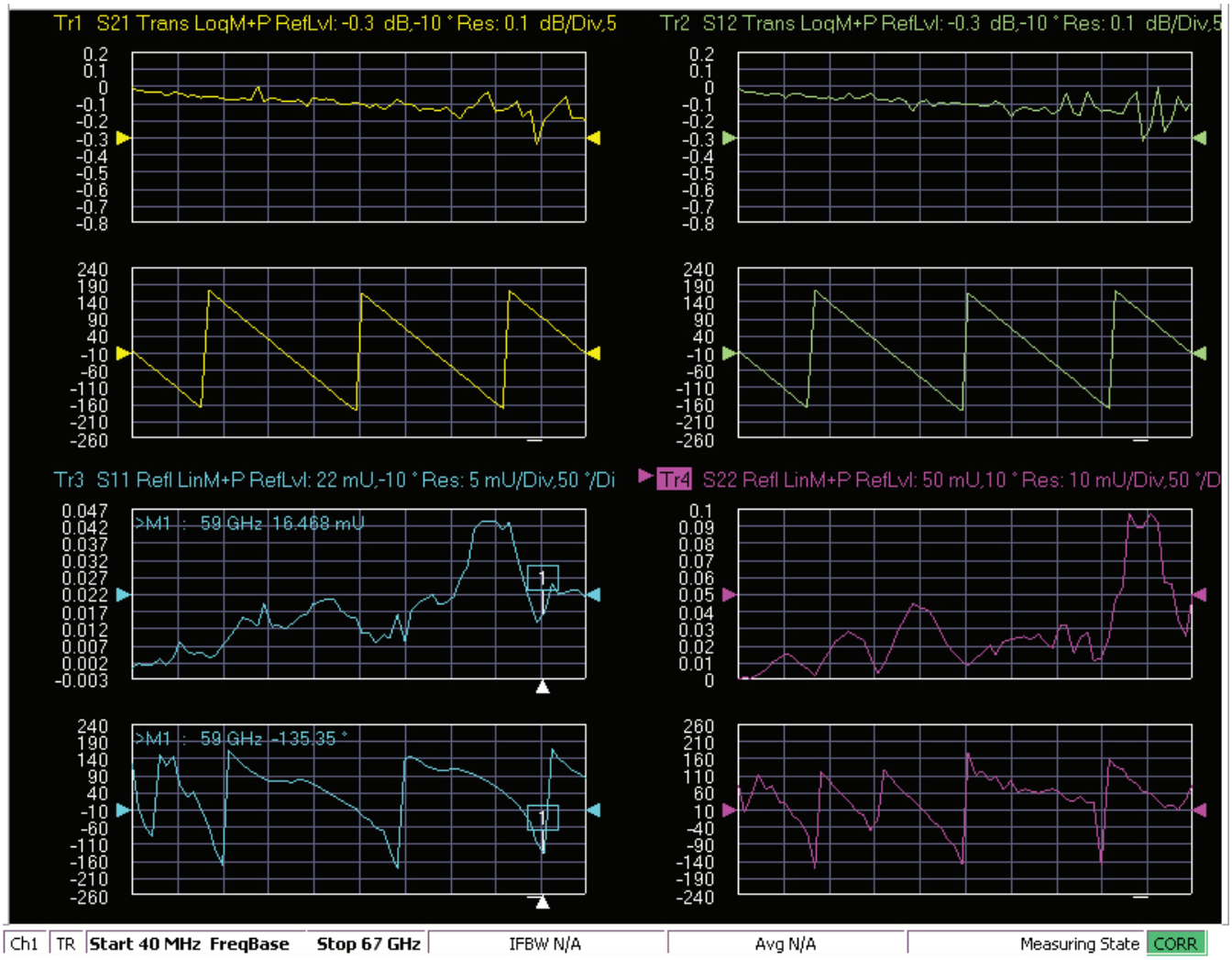


Figure 3-49. MS4640B Series VNA, Typical Matched Thru Data in Low Band
Upper-left quadrant= S21 – Forward Transmission
Upper-right quadrant= S12 – Reverse Transmission
Lower-left quadrant= S11 – Forward Reflection
Lower-right quadrant= S22 – Reverse Reflection

9. If only the Matched Thru button was selected, the program returns to the "Application Interface – Main Menu Tab" on page 3-27. The dialog box is shown in Figure 3-43, "ME7838A4 Application Interface – Main Menu Tab" on page 3-27.

10. If the Run All Tests button was selected, the program execution continues with the following Section 3-12, "Mismatched Thru Tests".

3-12 Mismatched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests (described in Section 3-11 "Matched Thru Tests" on page 3-32 is executed first, followed by the Mismatched Thru tests described in this section.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 3-9 "Application Interface – Main Menu Tab" on page 3-27.

Note	The verification devices must be connected to the **W1 Connector Coupler Ports** and not to the **VNA Ports**. Use the torque wrench supplied with the verification kit when tightening the device connections.

The entry point for this portion of the verification software depends on the user selections made in the Application Interface – Main Menu tab described in Section 3-9 "Application Interface – Main Menu Tab" on page 3-27.

The dialog box is shown in Figure 3-43, "ME7838A4 Application Interface – Main Menu Tab" on page 3-27.

If only the Mismatched Thru button was selected above, program execution starts here.

If the Run All Tests button was selected above, program execution continues here after the Matched Thru tests (described in Section 3-11 "Matched Thru Tests" on page 3-32) have been completed.

Procedure

1. The Enter Serial Number Offset Set Mismatch Device dialog box appears. Enter the serial number of the offset mismatch device.

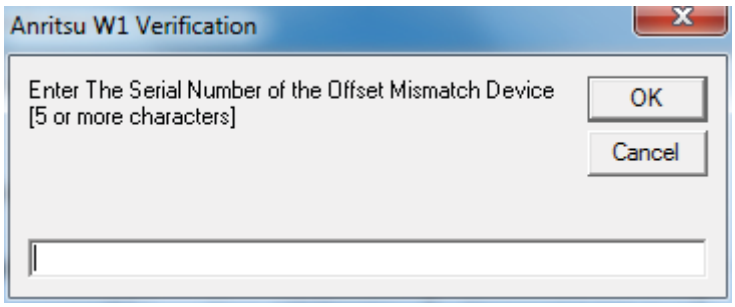


Figure 3-50. Serial Number Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. When ready to continue, click OK. The Connect Mismatched Thru Airline dialog box appears.

Figure 3-51. Instruction Dialog

4. Connect the Mismatched Thru Airline male connector to VNA Port 1 with the device label facing up.
5. Connect the Mismatched Thru Airline female connector to VNA Port 2.
6. When ready to continue, click OK. The Mismatched Thru Test - Sweep 1 dialog box is displayed first followed by the Mismatched Thru Test - Sweep 2 dialog box.

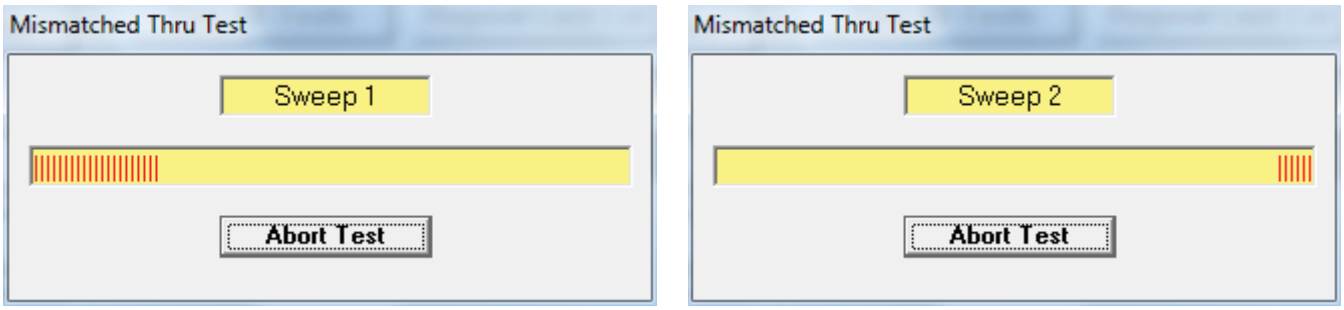


Figure 3-52. Status Dialogs

7. When the test completes, the program returns to the main menu described Section 3-9 “Application Interface – Main Menu Tab” on page 3-27, and the display should look similar to Figure 3-53. This is a

typical display immediately after measuring the Mismatched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

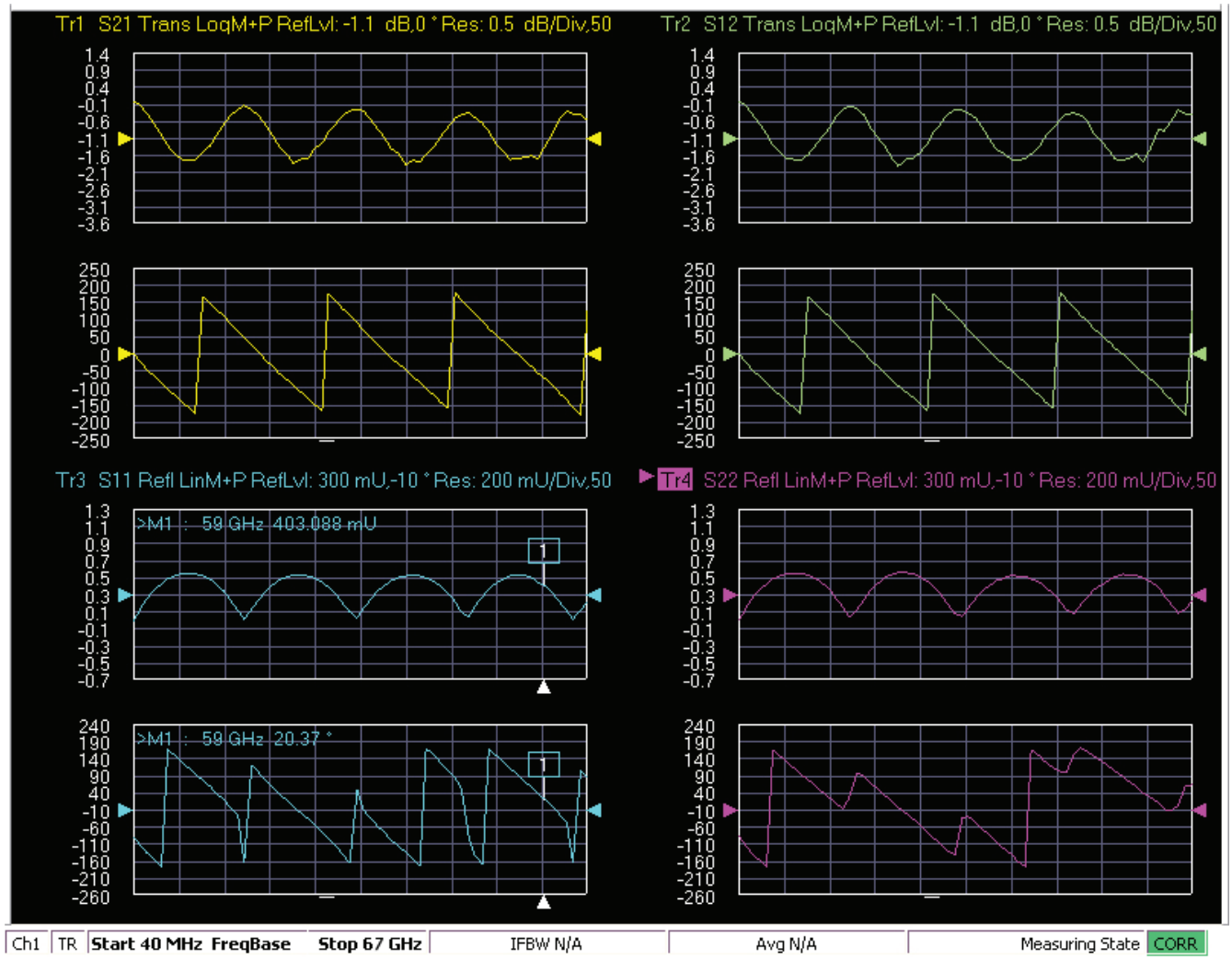


Figure 3-53. MS4640B Series VNA, Typical Mismatched Thru Data in Low Band

3-13 Saving Verification Data

If the Save Data button on the Main Menu tab was selected, the save data dialogs described below appear. When the save data procedure is completed, the program returns to the main menu as described previously in Section 3-9 “Application Interface – Main Menu Tab” on page 3-27.

The default directory path and file names are:

- `C:\mmdcsvc\Data\Matched Thru Low.dat`
- `C:\mmdcsvc\Data\Mismatched Thru Low.dat`
- `C:\mmdcsvc\Data\Matched Thru High.dat`
- `C:\mmdcsvc\Data\Mismatched Thru High.dat`

If the default file names should be changed, select Yes and enter the new file names. Otherwise, select No.

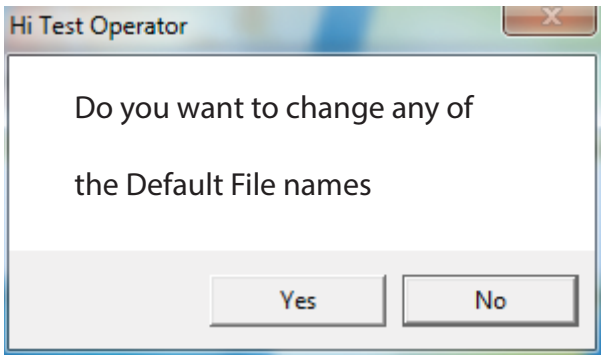


Figure 3-54. Confirmation Dialog

The following dialog is shown when the files are successfully saved to disk.

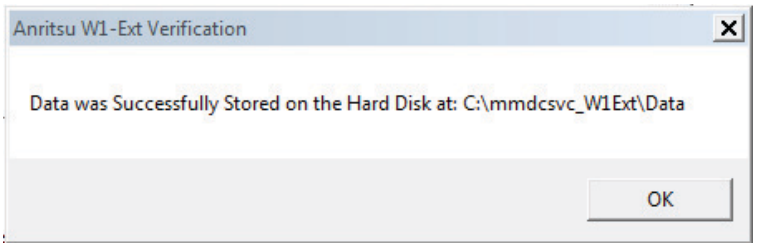


Figure 3-55. Information Dialog

3-14 Low-Band Calibration Port 3 – Port 4

During this procedure, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration. In Section 3-15 “High-Band Calibration Port 3 – Port 4” on page 3-42, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 3 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 4 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

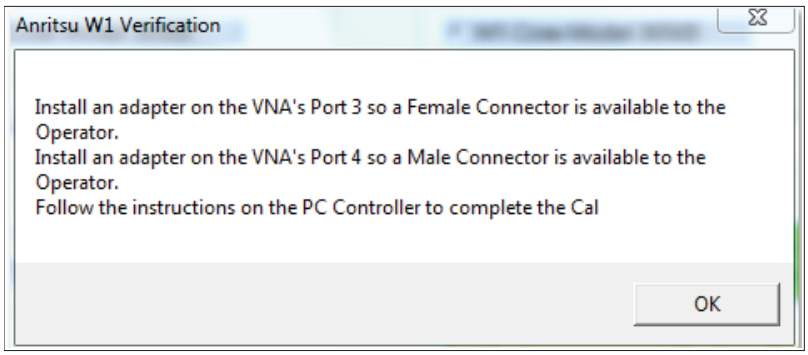


Figure 3-56. Anritsu W1 Verification Dialog

2. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 3.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 4.
   c. When ready to proceed, click OK.

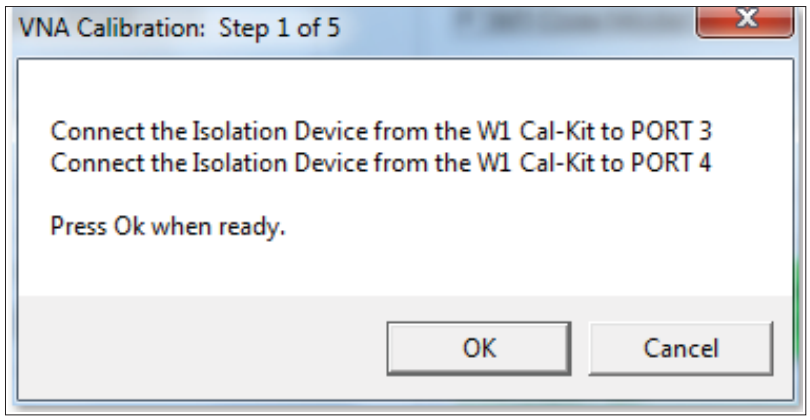


Figure 3-57. VNA Calibration: Step 1 of 5 Dialog

3. The VNA measures the load device data, then the VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male Cal Kit Broadband Load Device to VNA Port 3.
   b. Connect the Female Broadband Load Device to VNA Port 4.
   c. When ready to proceed, click OK.

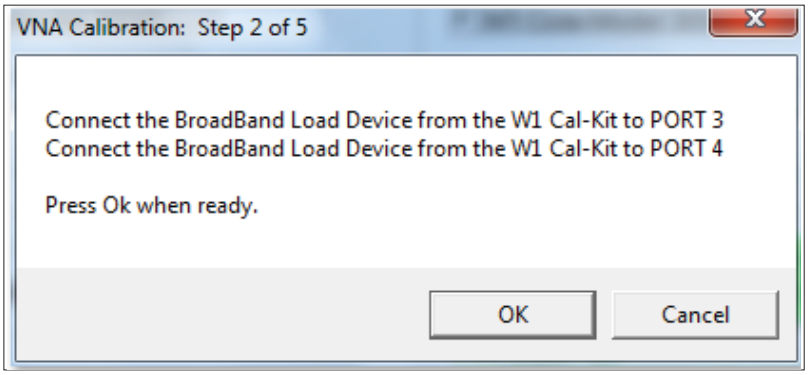


Figure 3-58. VNA Calibration: Step 2 of 5 Dialog

4. The VNA measures the broadband load device data, then the VNA Calibration: Step 3 of 5 dialog box appears.
   a. Connect the Male Cal Kit Open to VNA Port 3.
   b. Connect the Female Short #1 (2.02 mm) to VNA Port 4.
   c. When ready to proceed, click OK.

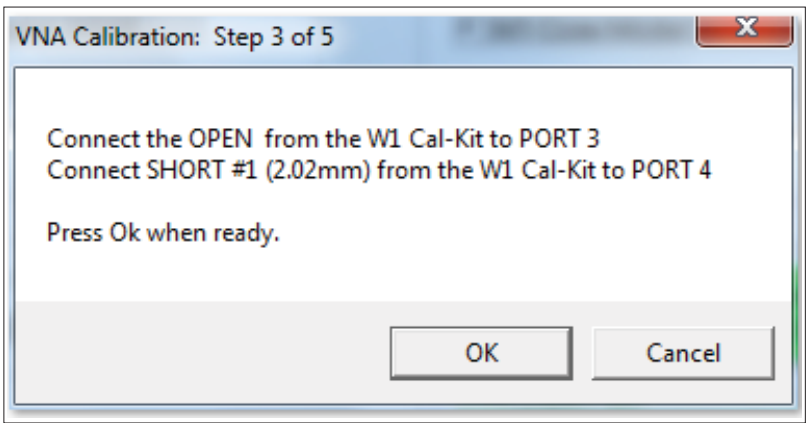


Figure 3-59. VNA Calibration: Step 3 of 5 Dialog

5. The VNA measures the open/short device data, then the VNA Calibration: Step 4 of 5 dialog box appears.

a. Connect the Male Short #1 (2.02 mm) to VNA Port 3.

b. Connect the Female Open to VNA Port 4.

c. When ready to proceed, click OK.

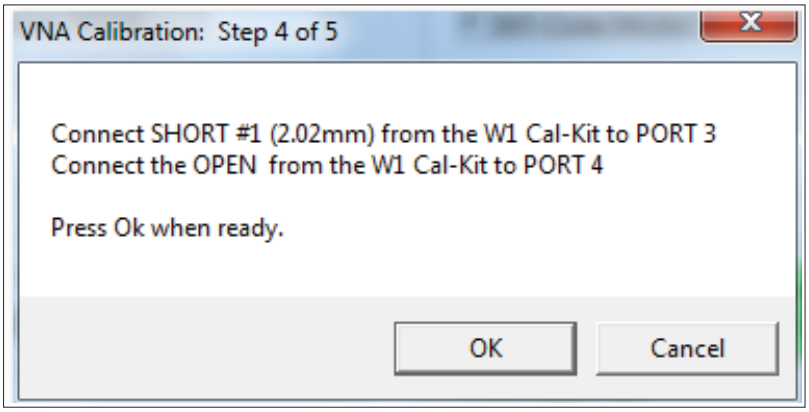


Figure 3-60. VNA Calibration: Step 4 of 5 Dialog

6. The VNA measures the short/open device data, then the VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the Short and the Open from Port 3 and Port 4, respectively.

b. Slide the two T-R modules towards each other and connect the VNA Port 3 (Female) to VNA Port 4 (Male) directly.

c. When ready to proceed, click OK.

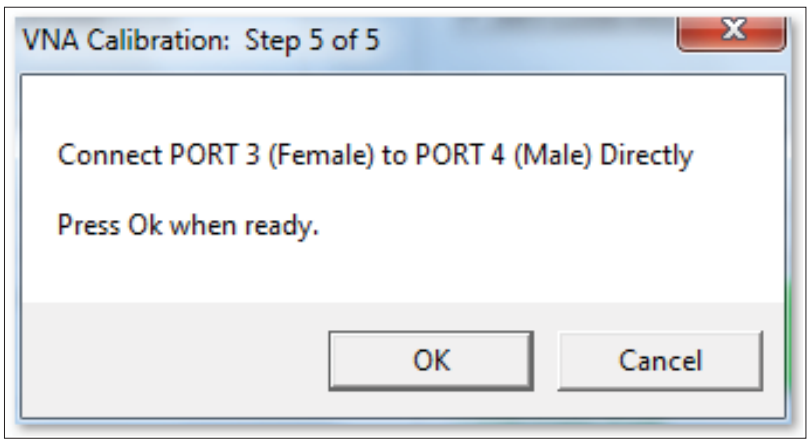


Figure 3-61. VNA Calibration: Step 5 of 5 Dialog

7. The program execution skips to Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

3-15 High-Band Calibration Port 3 – Port 4

During this procedure, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration. In Section 3-14 “Low-Band Calibration Port 3 – Port 4” on page 3-39, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 3 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 4 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

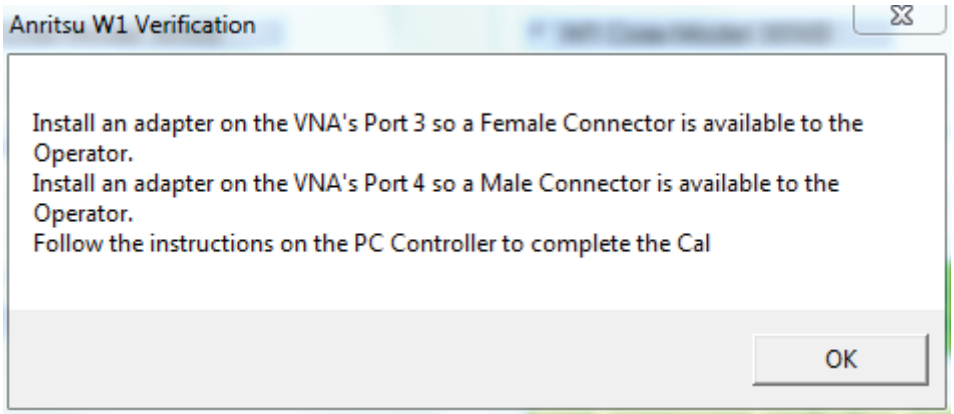


Figure 3-62. Anritsu W1 Verification Dialog

2. When ready to proceed, click OK. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 3.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 4.
   c. When ready to proceed, click OK.

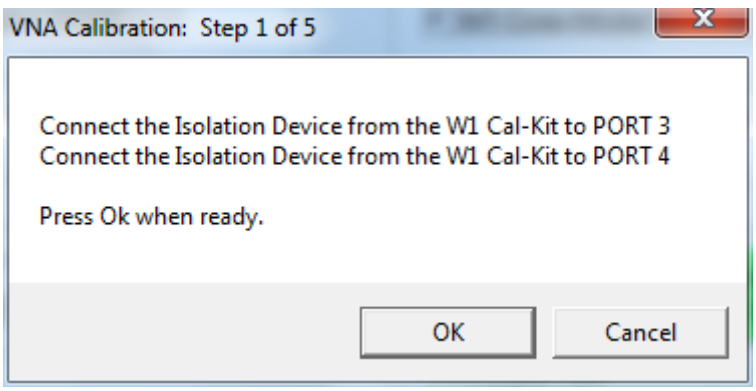


Figure 3-63. VNA Calibration: Step 1 of 5 Dialog

3. The VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male 2.02 mm Short #1 to VNA Port 3.
   b. Connect the Female 2.65 mm Short #2 to VNA Port 4.
   c. When ready to proceed, click OK.

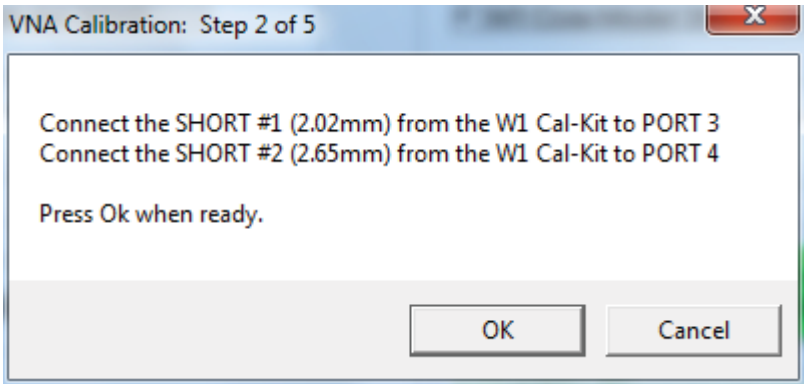


Figure 3-64. VNA Calibration: Step 2 of 5 Dialog

4. The VNA Calibration: Step 3 of 5 dialog box appears.
   a. Connect the Male 2.65 mm Short #2 to VNA Port 3.
   b. Connect the Female 3.18 mm Short #3 to VNA Port 4.
   c. When ready to proceed, click OK.

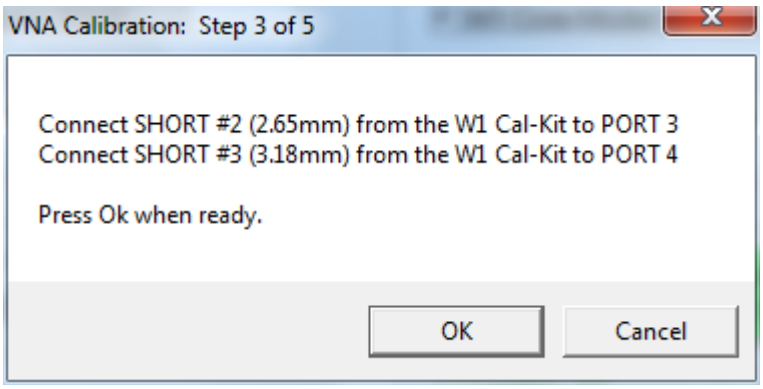


Figure 3-65. VNA Calibration: Step 3 of 5 Dialog

5. The VNA Calibration: Step 4 of 5 dialog box appears.

a. Connect the Male 3.18 mm Short #3 to VNA Port 3.

b. Connect the Female 2.02 mm Short #1 to VNA Port 4.

c. When ready to proceed, click OK.

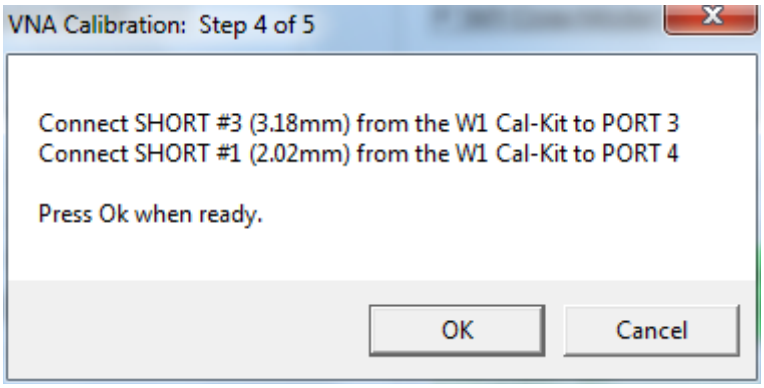


Figure 3-66. VNA Calibration: Step 4 of 5 Dialog

6. The VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the offset Shorts from Port 3 and Port 4.

b. Slide the two T-R modules towards each other and connect the VNA Port 3 (Female) to VNA Port 4 (Male) directly.

c. When ready to proceed, click OK.

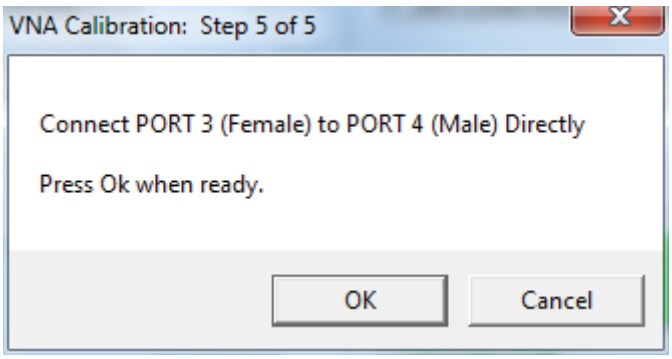


Figure 3-67. VNA Calibration: Step 5 of 5 Dialog

7. The program execution continues to Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

3-16 Application Interface – Main Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections.

- The Setup Menu tab is described in Section 3-6, "Application Interface – Setup Menu Tab" on page 3-14.
- The Main Menu tab display is described in the section immediately following and is shown in Figure 3-43
- The Serial Number tab is described in Section 3-17, "Application Interface – Serial Number Tabs" on page 3-50.

Whenever the program is executing a command from the main menu, the buttons are disabled, due to the event-driven nature of the Windows Operating System, until the current command is finished. While a command is being executed, informational messages are usually displayed on the screen to aid the operator in understanding which steps the application is performing.

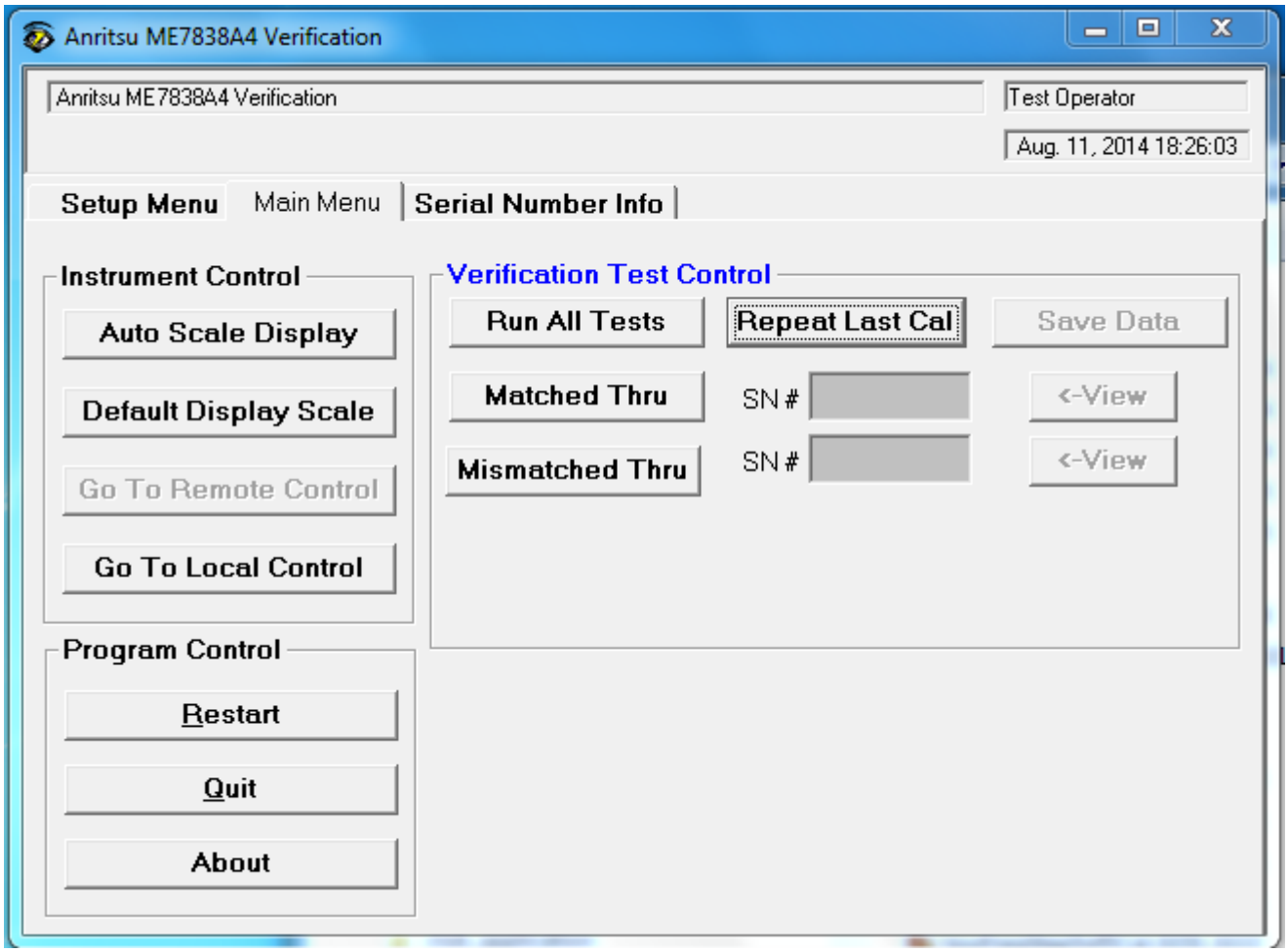


Figure 3-68. ME7838A4 Application Interface – Main Menu Tab

Auto Scale Display Button

This command automatically scales each channel on the Anritsu Vector Network Analyzer. It is the same as using the VectorStar VNA menus to navigate to and select either the Auto Scale Active Channel or Auto Scale All Channels buttons. The full path to these buttons is:

- MAIN | Scale | SCALE | Auto Scale Active Channel
- MAIN | Scale | SCALE | Auto Scale All Channels

When the program detects the VNA has finished a sweep, the program auto-scales all four channels before continuing.

The VNA display during the calibration and verification tests is set to one channel and four traces. Each trace displays the following parameters:

- Upper-left quadrant – S43 – Forward Transmissions, Log Mag (top) and Phase (Bottom)
- Upper-right quadrant – S34 – Reverse Transmissions, Log Mag (top) and Phase (Bottom)
- Lower-left quadrant – S33 – Forward Reflections, Lin Mag (top) and Phase (Bottom)
- Lower-right quadrant – S44 – Reverse Reflections, Lin Mag (top) and Phase (Bottom)

See Figure 3-69 for a display example. This is a typical display immediately after performing the High Band calibration. Please note this is for reference only and that the actual data on the VNA display may not be identical.

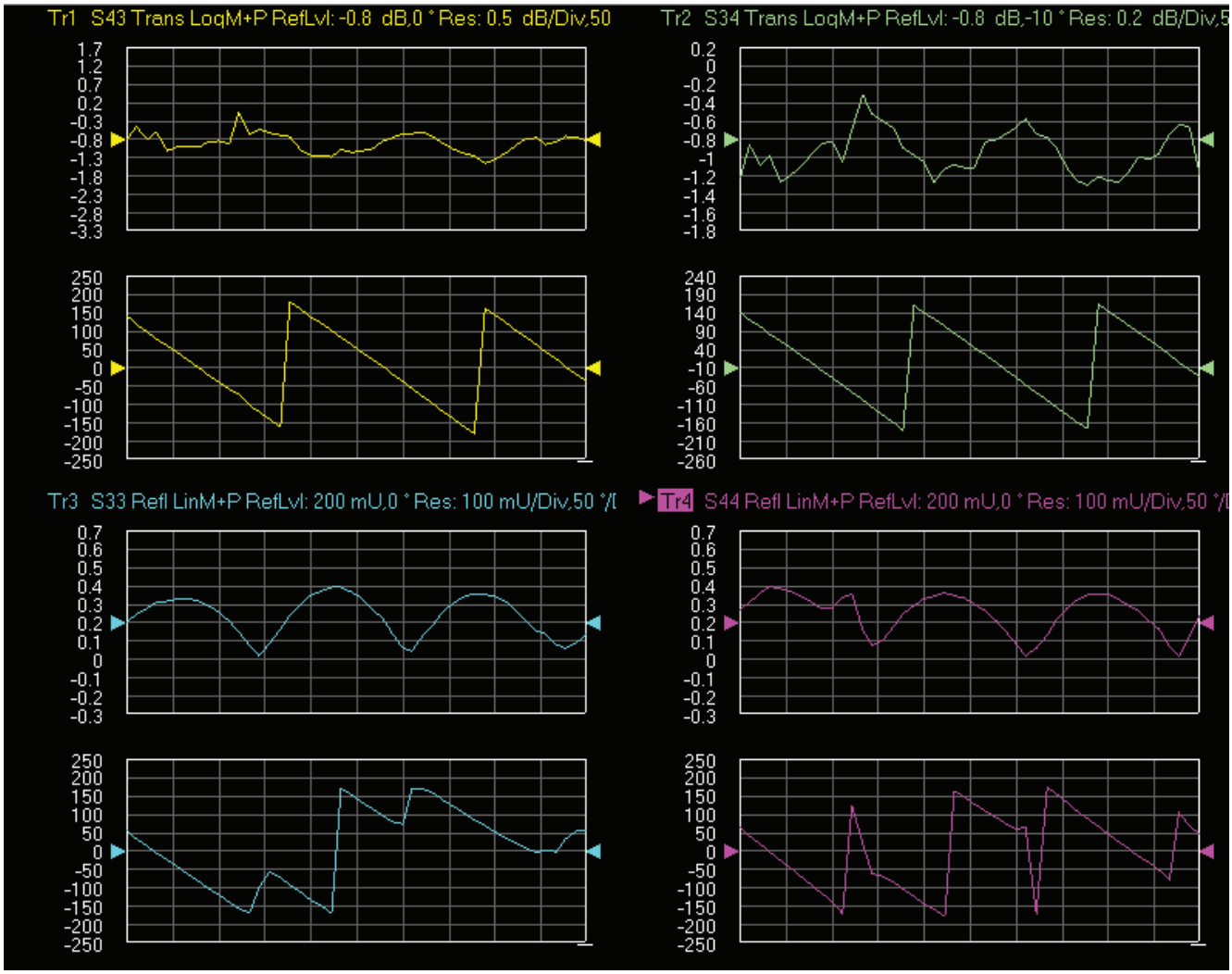


Figure 3-69. MS4640B Series VNA Auto Scale Example Trace Display

Default Display Scale Button

This command sets all four channels to a scale of 5 dB/div for the Magnitude displays and to 40 degrees/div for the Phase displays, and the reference value to 0. This allows you to see if the device is properly connected.

Go To Remote Control Button

This command is only available after you have clicked the Go to Local Control button. When you click this button, the program takes control of the VNA Display type and Display scale settings and sets them to the program default values.

Go To Local Control Button

This command allows you access to the front panel buttons while the program is running. The instrument is in Local Lock Out unless this button is pushed. This prevents an inadvertent front panel button actuation from affecting the proper operation of the program.

Caution	Modifying the VNA settings (such as power level, bandwidth, averaging, etc.) could adversely affect the measurement results. This should only be used to view the data or for using markers.

Restart Button

The Restart button command allows you to change the tested instrument, the frequency range, or the selected verification kit. Selecting Yes causes the program to return to the program initialization stage.

Usually, this button is used to test for second frequency band and program execution continues in Section 3-21 "Restart for Alternate Frequency Band or Alternative Port Pair" on page 3-58 and the Choose The Restart Method dialog box appears.

Quit Button

Selecting Quit brings up a confirmation dialog box shown in Figure 3-70. Selecting Yes exits the program; selecting No returns you to the previous screen.

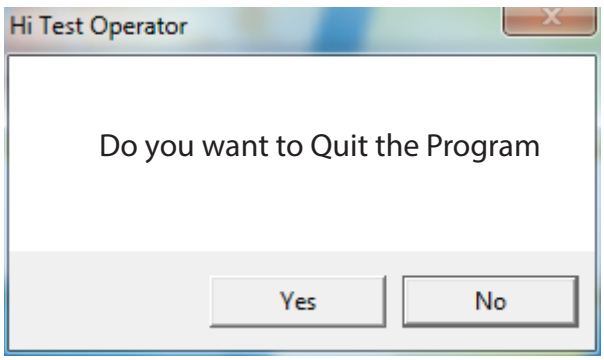


Figure 3-70. Confirmation Dialog

About

Displays version information, copyright, other legal notices, and company contact information.

Run All Tests

This command button runs both the Matched Thru and Mismatched Thru tests. Program execution starts with Section 3-18 "Matched Thru Tests" on page 3-51 and then continues with Section 3-19 "Mismatched Thru Tests" on page 3-54. When both tests are completed, program execution returns to the Main Menu tab shown in Figure 3-71 on page 3-50.

Repeat Last Cal

This command button re-calibrates the VNA according to the CURRENT calibration. This provides a way to recalibrate the VNA without having to reset the program parameters in case the original calibration was flawed for some reason. When the calibration sequence is complete, program execution continues to the Main Menu tab shown previously in Figure 3-68 on page 3-45.

Save Data

This command button writes data files to the PC Controller and stores the files at `C:\mmdcsvc\Data`. The program does not write data to the verification kit USB memory device. If selected, program execution continues as described in Section 3-20 “Saving Verification Data” on page 3-57.

The number of saved files varies depending on the user settings:

- If both the matched and mismatched thru tests are run, two files are written to the PC Controller hard drive.
- If only one of the tests was run, only one file is written to the PC Controller’s hard drive at `C:\mmcsvc\Data`

Matched Thru

This command button only runs the Matched Thru tests. If selected, program execution continues as described in Section 3-18 “Matched Thru Tests” on page 3-51. When the tests are completed, the program returns to the Main Menu tab shown in Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

Matched Thru SN

This field is used to enter the serial number of the matched thru.

Mismatched Thru

This command button only runs the Mismatched Thru tests. If selected, program execution continues in Section 3-19 “Mismatched Thru Tests” on page 3-54. When the tests are completed, the program returns to the Main Menu tab shown in Table 3-71 on page 3-50.

Mismatched Thru SN

This field is used to enter the serial number of the matched thru.

3-17 Application Interface – Serial Number Tabs

The Serial Number Info tab displays a summary of the model number and serial number for the following devices. All screen information is included in the report headers.

- Operator Name
- Calibration Kit
- Test Set
- Verification Kit
- Vector Network Analyzer
- Test Set
- Signal Generator Sources

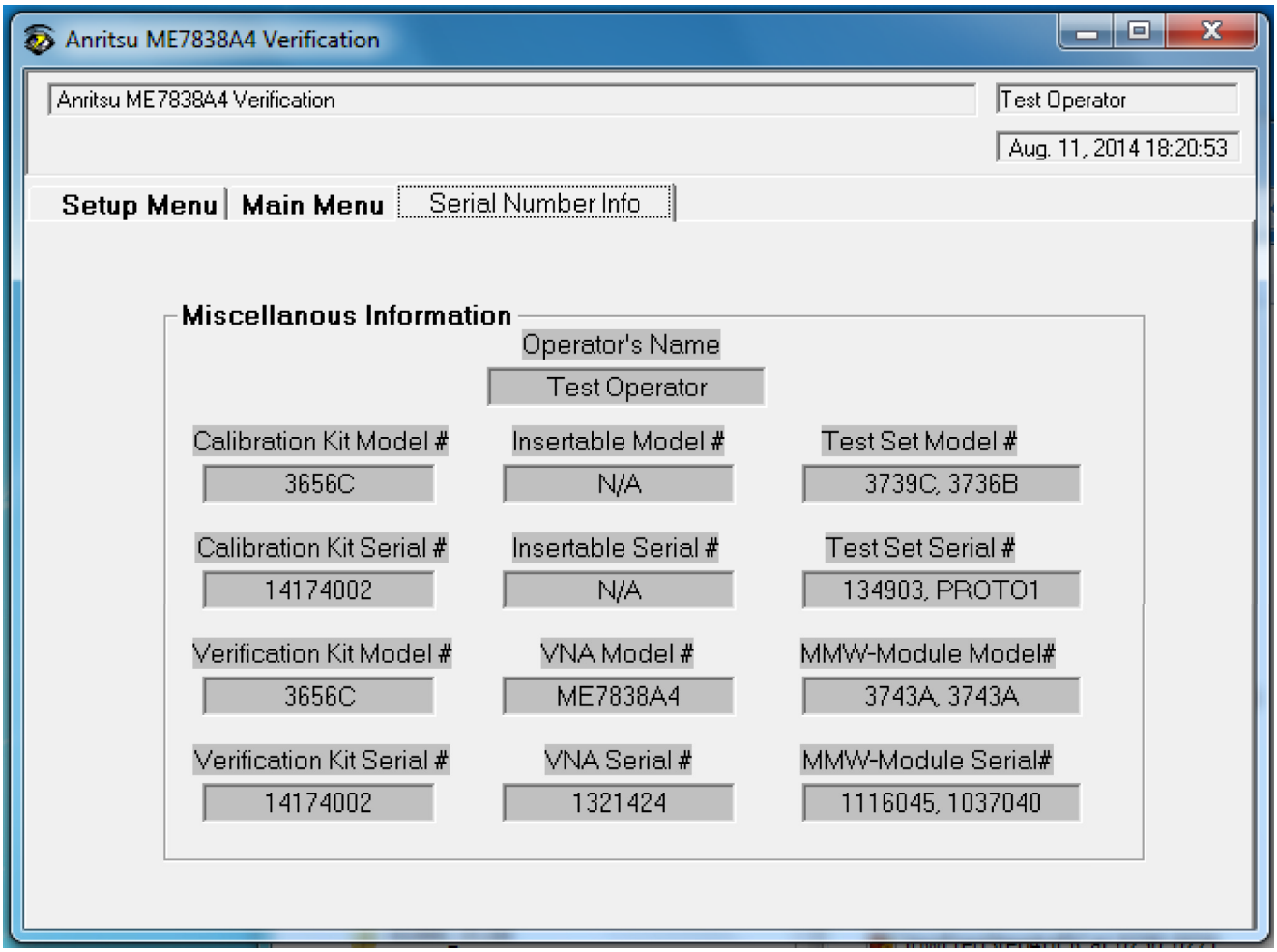


Figure 3-71. ME7838A4 Application Interface – Serial Number Tab

3-18 Matched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests are executed followed by the Mismatched Thru tests described in Section 3-19 “Mismatched Thru Tests” on page 3-54.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

Note	The verification devices must be connected to the W1 Connector Coupler Ports and not to the VNA Ports. Use the torque wrench supplied with the verification kit when tightening the device connections.

Procedure

1. The Enter Serial Number Match Thru dialog box appears.

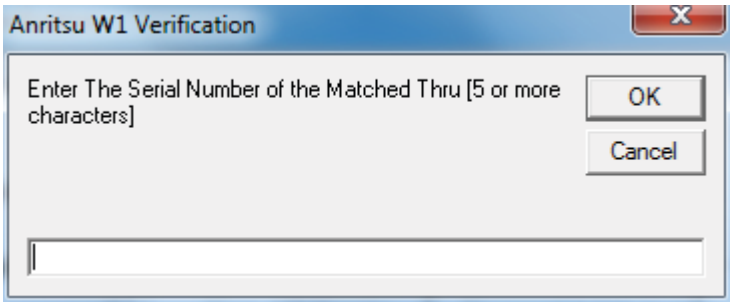


Figure 3-72. Anritsu W1 Verification Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. Enter the serial number of the Matched Thru.
4. When ready to proceed, click OK. The Connect Matched Thru Male Connector dialog box appears.

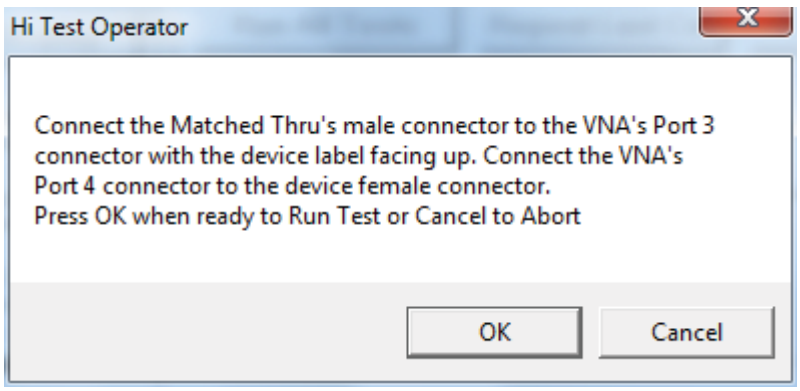


Figure 3-73. Matched Thru Dialog

5. Connect the Matched Thru male connector to VNA Port 3 with the label facing up.
6. Connect the Matched Thru female connector to VNA Port 4.
7. When ready to proceed, click OK. The matched thru test starts and the Matched Thru Test - Sweep 1 dialog box appears. After it completes, the Matched Thru Test - Sweep 2 dialog box appears.

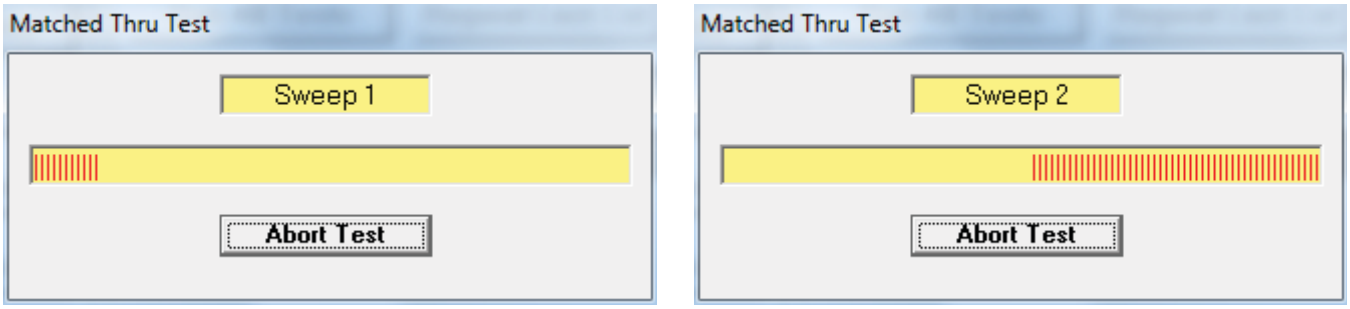


Figure 3-74. Matched Thru Test, Sweep 1 and Sweep 2 Dialog Boxes

8. When the test completes, the next action depends on what the user selected in the Main Menu tab above. The VNA main display should be similar to the one below. This is a typical display immediately after

measuring the Matched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

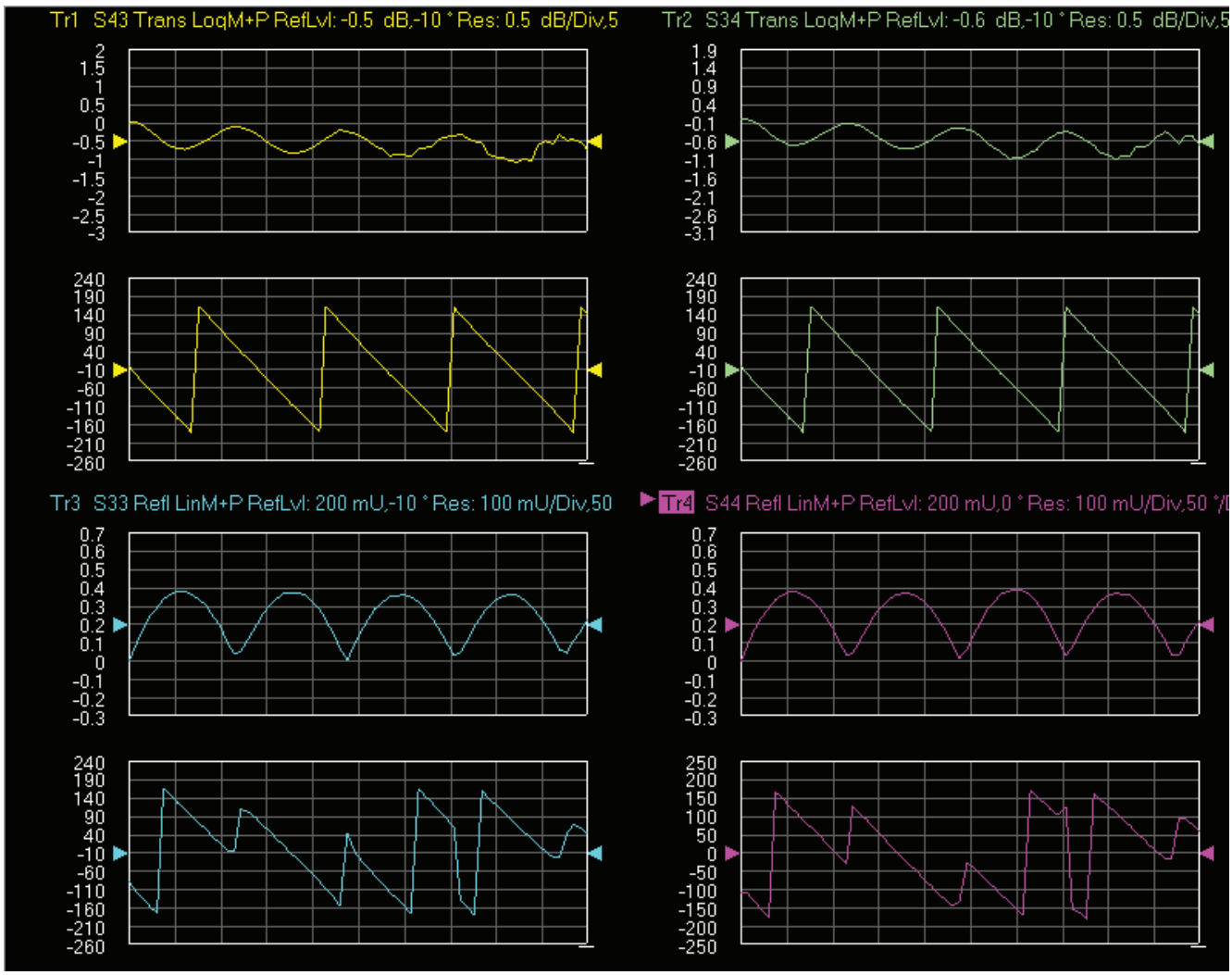


Figure 3-75. MS4640B Series VNA, Typical Matched Thru Data in Low Band
Upper-left quadrant= S43 – Forward Transmission
Upper-right quadrant= S34 – Reverse Transmission
Lower-left quadrant= S33 – Forward Reflection
Lower-right quadrant= S44 – Reverse Reflection

9. If only the Matched Thru button was selected, the program returns to the "Application Interface – Main Menu Tab" on page 3-45. The dialog box is shown in Figure 3-68, "ME7838A4 Application Interface – Main Menu Tab" on page 3-45.

10. If the Run All Tests button was selected, the program execution continues with the following Section 3-18, "Matched Thru Tests".

3-19 Mismatched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests (described in Section 3-18 “Matched Thru Tests” on page 3-51 is executed first, followed by the Mismatched Thru tests described in this section.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

Note	The verification devices must be connected to the **W1 Connector Coupler Ports** and not to the **VNA Ports**. Use the torque wrench supplied with the verification kit when tightening the device connections.

The entry point for this portion of the verification software depends on the user selections made in the Application Interface – Main Menu tab described in Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

The dialog box is shown in Figure 3-68, “ME7838A4 Application Interface – Main Menu Tab” on page 3-45.

If only the Mismatched Thru button was selected above, program execution starts here.

If the Run All Tests button was selected above, program execution continues here after the Matched Thru tests (described in Section 3-19 “Mismatched Thru Tests” on page 3-54) have been completed.

Procedure

1. The Enter Serial Number Offset Set Mismatch Device dialog box appears. Enter the serial number of the offset mismatch device.

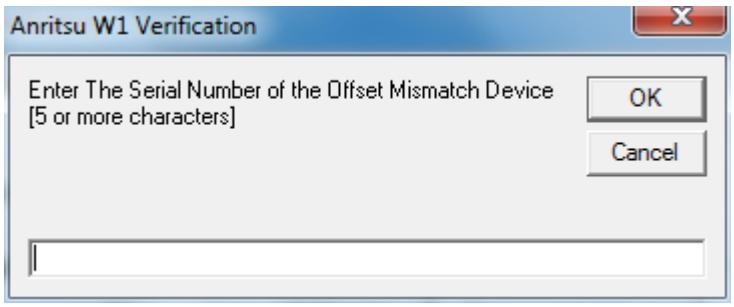


Figure 3-76. Serial Number Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. When ready to continue, click OK. The Connect Mismatched Thru Airline dialog box appears.

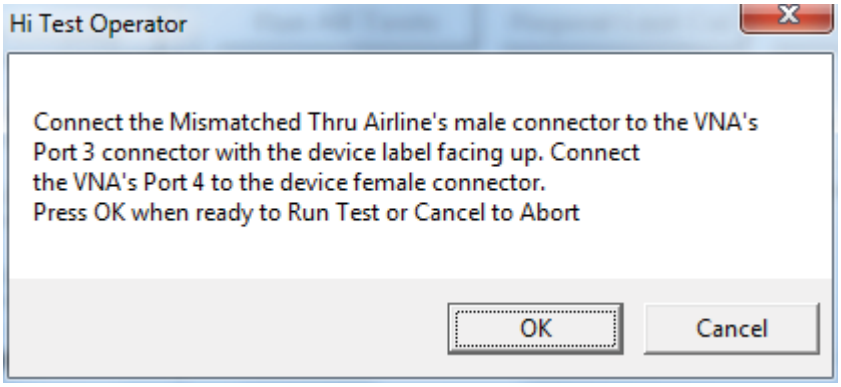


Figure 3-77. Instruction Dialog

4. Connect the Mismatched Thru Airline male connector to VNA Port 3 with the device label facing up.

5. Connect the Mismatched Thru Airline female connector to VNA Port 4.

6. When ready to continue, click OK. The Mismatched Thru Test - Sweep 1 dialog box is displayed first followed by the Mismatched Thru Test - Sweep 2 dialog box.

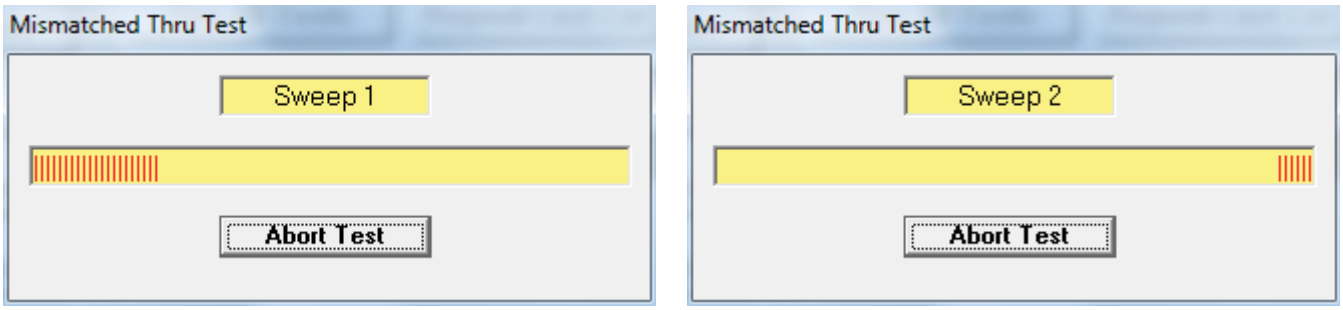


Figure 3-78. Status Dialogs

7. When the test completes, the program returns to the main menu described Section 3-16 “Application Interface – Main Menu Tab” on page 3-45, and the display should look similar to Figure 3-69. This is a

typical display immediately after measuring the Mismatched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

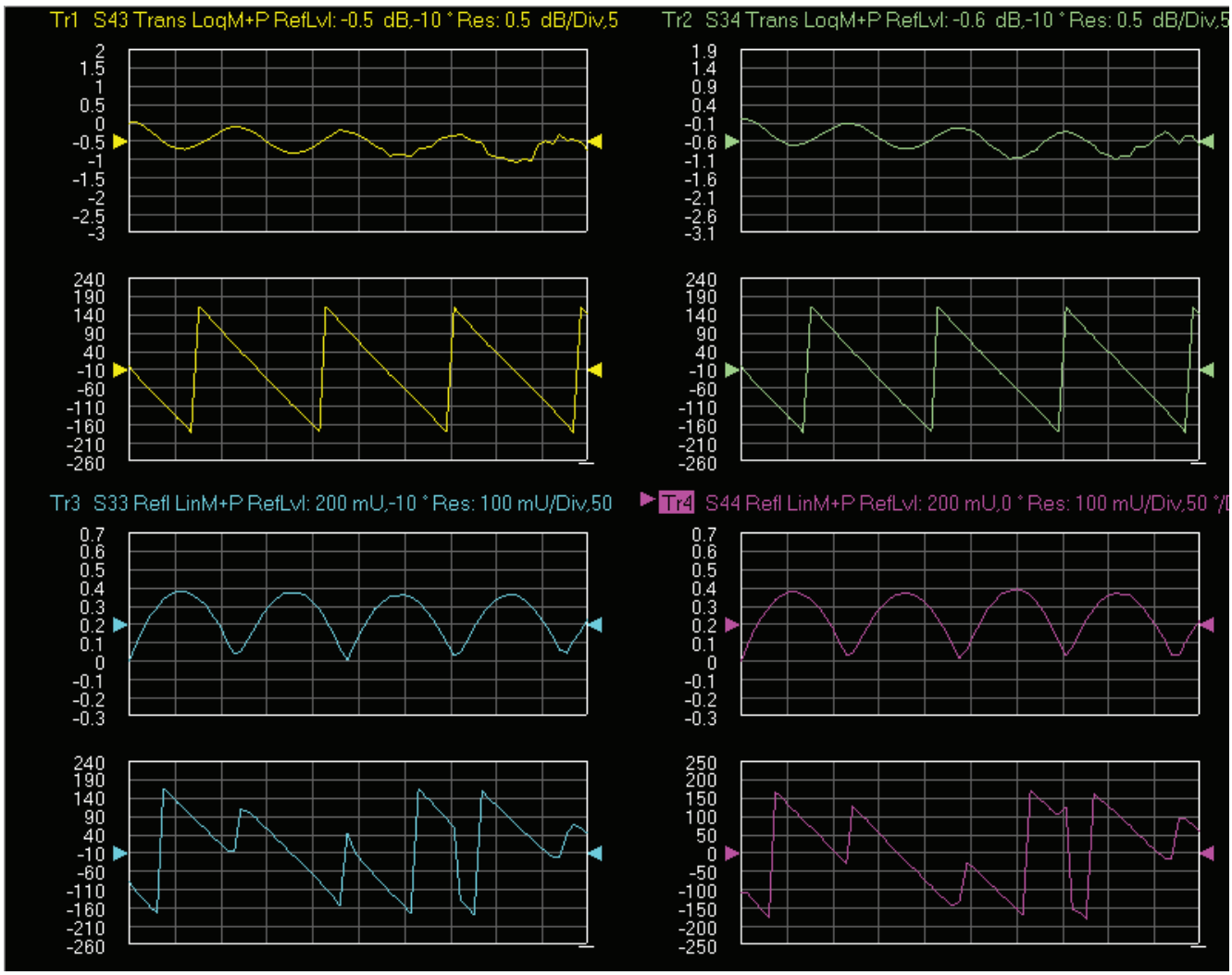


Figure 3-79. MS4640B Series VNA, Typical Mismatched Thru Data in Low Band
Upper-left quadrant= S43 – Forward Transmission
Upper-right quadrant= S34 – Reverse Transmission
Lower-left quadrant= S33 – Forward Reflection
Lower-right quadrant= S44 – Reverse Reflection

3-20 Saving Verification Data

If the Save Data button on the Main Menu tab was selected, the save data dialogs described below appear. When the save data procedure is completed, the program returns to the main menu as described previously in Section 3-16 “Application Interface – Main Menu Tab” on page 3-45.

The default directory path and file names are:

- `C:\mmdcsvc\Data\Matched Thru LowPort3and4.dat`
- `C:\mmdcsvc\Data\Mismatched Thru LowPort3and4.dat`
- `C:\mmdcsvc\Data\Matched Thru HighPort3and4.dat`
- `C:\mmdcsvc\Data\Mismatched Thru HighPort3and4.dat`

If the default file names should be changed, select Yes and enter the new file names. Otherwise, select No.

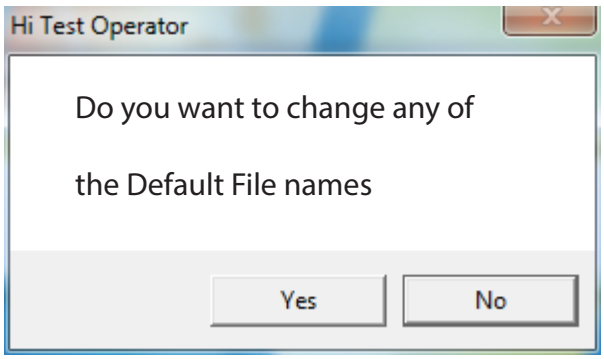


Figure 3-80. Confirmation Dialog

The following dialog is shown when the files are successfully saved to disk.

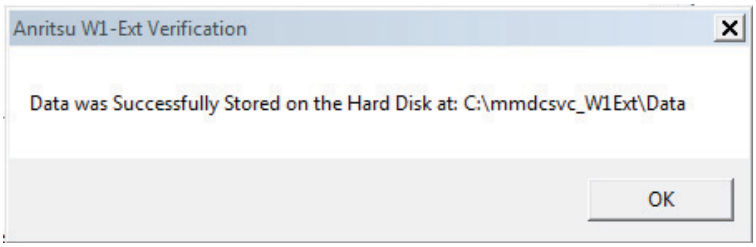


Figure 3-81. Information Dialog

3-21 Restart for Alternate Frequency Band or Alternative Port Pair

After the Matched Thru and Mismatched Thru tests have been successfully completed and the data saved, it is necessary to restart the program and test the other frequency band. For example, if you tested for 40 MHz to 67 GHz Frequency Range on your first calibration pass, on the second pass, select the 67 GHz to 110 GHz Frequency Range. Again, the frequency ranges are slightly different for X systems using the 3656C calibration/verification kit. Once the full verification of a 2-port pair is complete, the Full Restart button is used to select the alternative port pair in a 4-port system.

Procedure

1. Ensure that the verification results of the previous test have been saved to the `C:\mmdscvc\Data`.
2. To perform the verification tests for the second frequency range, on the System Verification Software Main Menu - Main Menu Tab, select the Restart button. The main menu is described in Section 3-16, “Application Interface – Main Menu Tab” on page 3-45.
3. The Choose The Restart Method dialog box appears as shown in Figure 3-82.

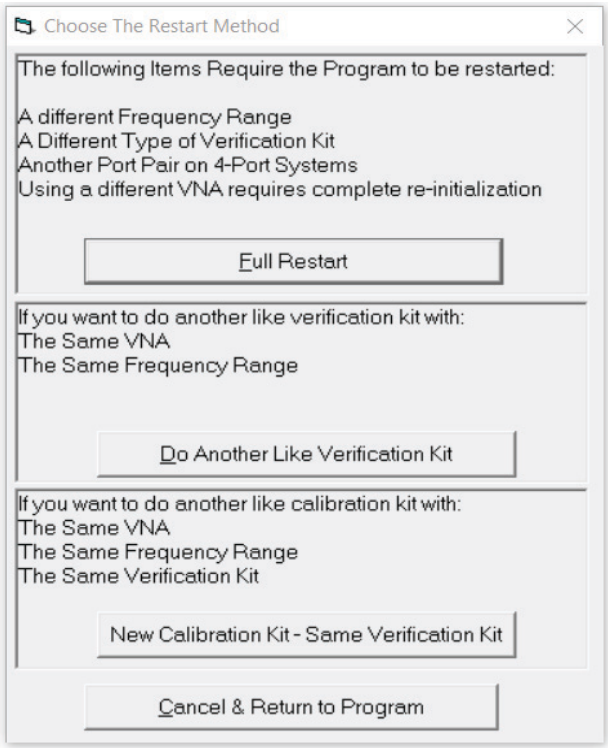


Figure 3-82. Choose The Restart Method Dialog

4. If you selected Full Restart, the calibration process starts again and the procedure steps are the same as described previously starting in Section 3-5, “Running the Verification Software”, Step 6 on page 3-7.
5. The application will go through the process again.

Note	When using the Restart Menu, the system information from the first pass is retained when cycling through the second pass.

6. Dialog boxes will give the option to confirm the module and test set components, or to correct the information.

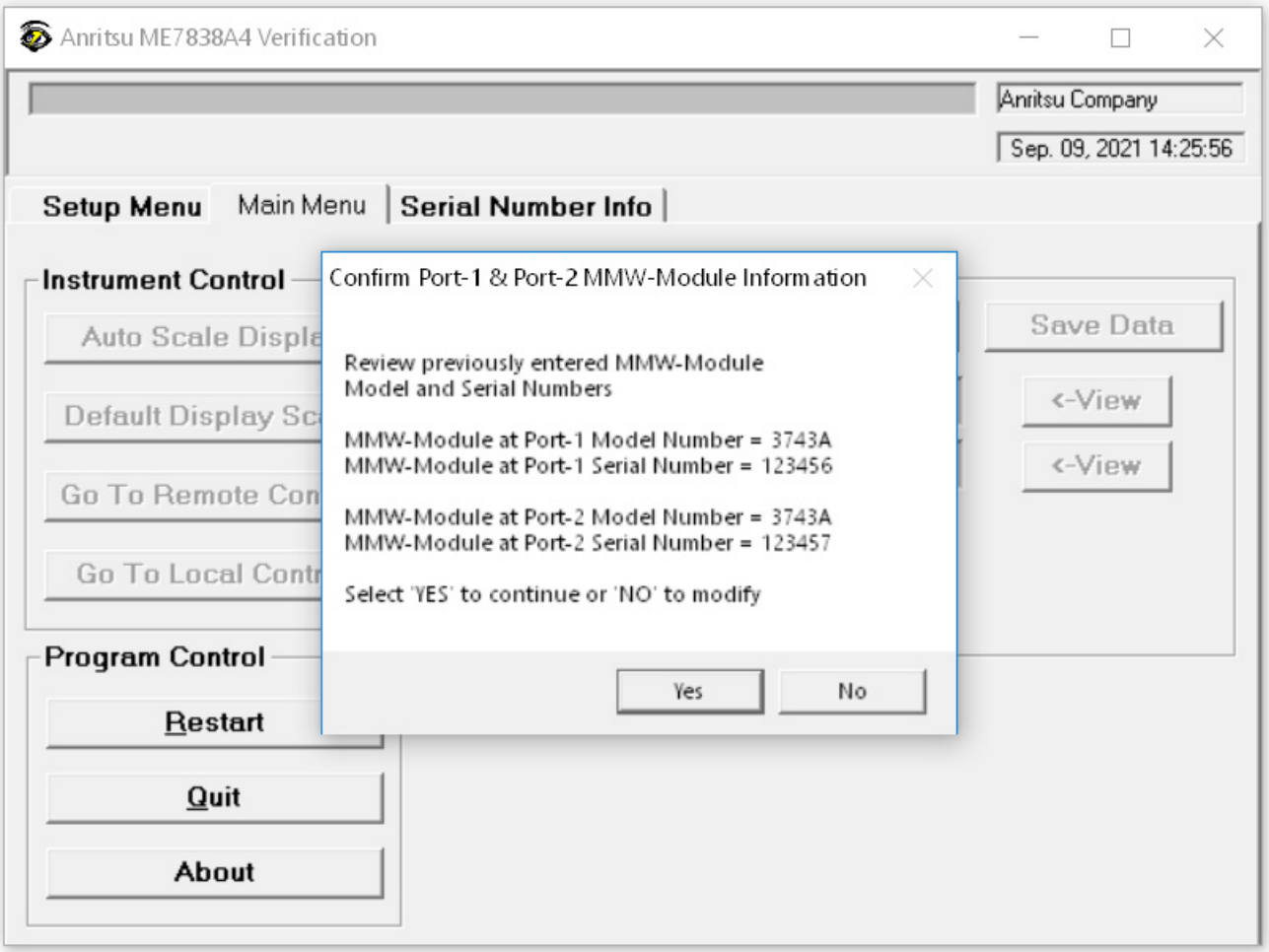


Figure 3-83. Ports 1 and 2 Alternative Frequency Restart Module Dialog

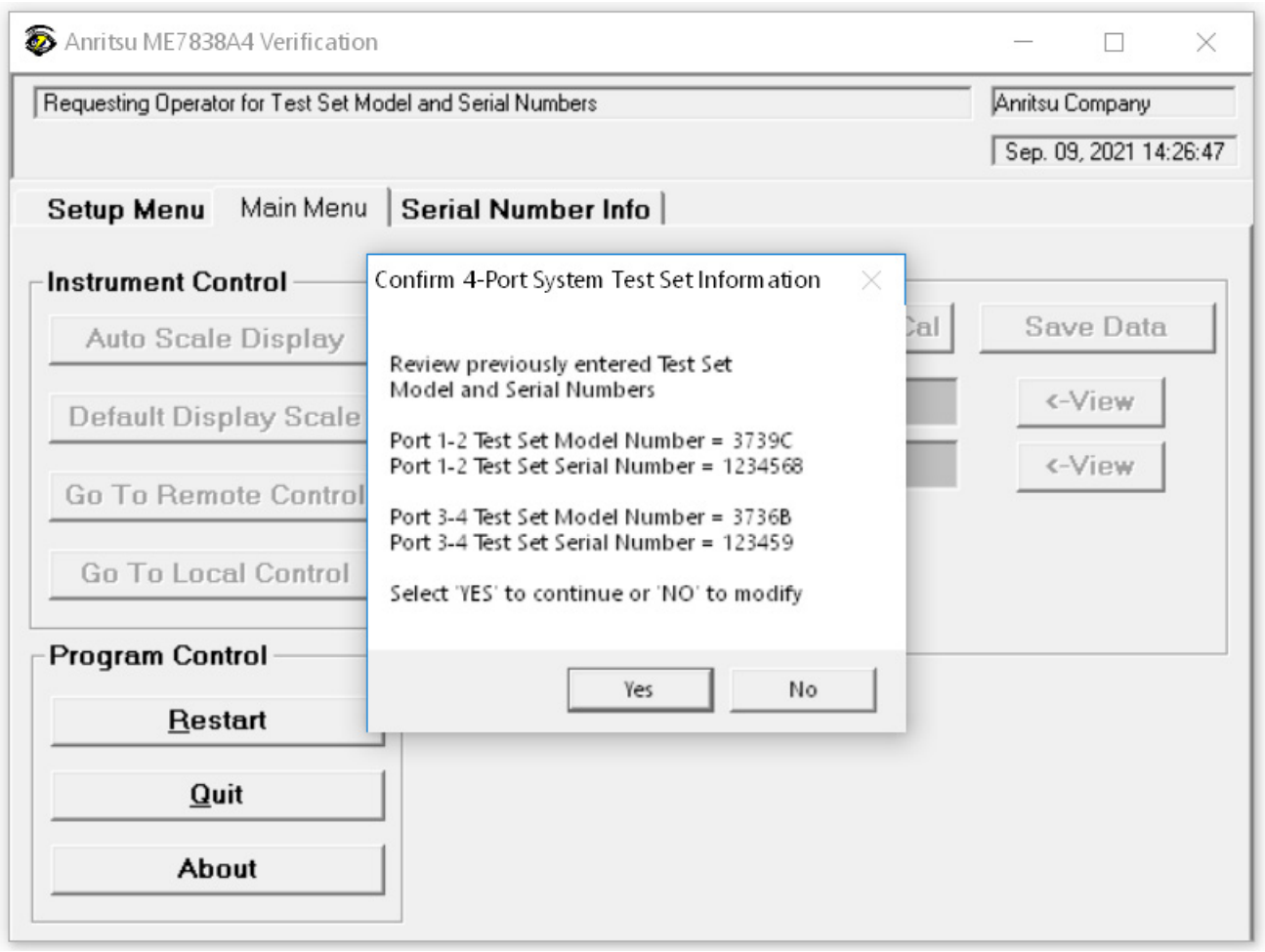


Figure 3-84. Ports 1 and 2 Alternative Frequency Restart Test Set Dialog

7. Complete the calibration and verification of the devices for the second frequency range.
8. Save the second set of calibration data and verification results to `C:\mmdcsvc\Data`.
9. This series of automated tests has verified that the VectorStar ME7838A4/A4X/E4/E4X Broadband S-parameter measurement accuracy meets factory specifications and ends the calibration and verification procedure.
10. The program returns to the main menu described in Section 3-16, “Application Interface – Main Menu Tab” on page 3-45.

3-22 Troubleshooting

Difficulty Running the Program

If you have difficulty getting the program to run properly:

1. Check your GPIB interconnection cables and addresses.
2. Check to see that the Windows GPIB is present on the boot drive, that it is properly configured, and that it passes the National Instruments hardware and software tests.
3. This version of the verification software must be installed with the install program on the USB memory device. The program does not run if it is just copied from the USB memory device to the hard disk.
4. Ensure that, after starting the performance verification software, the verification kit data USB memory device is installed in the correct USB port and that it contains 20 files.

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.

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 USB drive matches that shown on the verification kit.
3. Repeat the process with a fresh calibration. Save the results of both measurements as an aid in troubleshooting, and in case you require factory assistance.
4. 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.
5. Assure all active systems have been powered on at least one hour before the start of the calibrations.

If you still have difficulty after following the above steps, please contact Anritsu customer service and ask for the Vector Network Analyzer support engineer for further assistance.

Chapter 4 – Using the PVS Software with the ME7828A

4-1 Introduction

–

This chapter describes the use of the Anritsu Performance Verification Software (PVS) with the VectorStar ME7828A Standard BB/mmWave VNA Measurement System. The ME7828A is based on the VectorStar MS4640A/B Series Vector Network Analyzers (VNAs).

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. This document supports all software versions 1.2x and above.

4-2 Required Equipment

The VectorStar ME7828A Broadband/Millimeter Wave Measurement System is composed of the following instruments:

- VectorStar MS4647A/B VNA, 10 MHz to 70 GHz, V Connectors
- 3738A Test Set
- 3700C3 Floor Console
- Two 3742A-EW Transmission-Reflection WR-10 Modules, 70 GHz to 110 GHz
- 66670-3 Left WR-10 Combiner Coupler
- 66671-3 Right WR-10 Combiner Coupler
- Two MG37022A Fast-Switching Signal Generators, 2 to 20 GHz, for LO and RF Sources

4-3 Configuring the Hardware

This section describes how the various system elements are interconnected and the preliminary steps required for operation of the verification software. See Section 4-2, "Required Equipment" for a complete equipment list.

1. Ensure that the VNA system is set to “Broadband”.
2. To verify the setting, from the right side MAIN menu, select:
   MAIN | Application | APPLICATION | Rcvr Config | RCVR CONFIG | BB/mmWave (3738 Set up) or BB/mmWave (3739 Set up)
3. Select Broadband in the Rcvr Config section.
4. Connect a GPIB cable between the PC Controller and the VNA Rear Panel GPIB port labeled IEEE 488.2 GPIB.

Note	Do not connect the cable to the VNA Rear Panel GPIB port labeled **Dedicated GPIB**.

4-4 W1 Verification Application Installation

Prior to installation of the W1 Application the National Instruments GPIB card and drivers must be installed in the Windows PC.

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

	In order to correctly install the PVS application, the logged in user must have Administrative rights on the Windows PC Controller.
Note	The PVS application is installed onto the PC Controller on an all-user basis.
	If your organization does not allow for all-user installations, consult your internal PC and network support group on how to best proceed.

1. Turn off all other running applications on the PC Controller.
2. Insert the USB Memory Device into the USB slot.
3. Open Windows Explorer, browse to the USB Drive, and double click on Startup.htm.

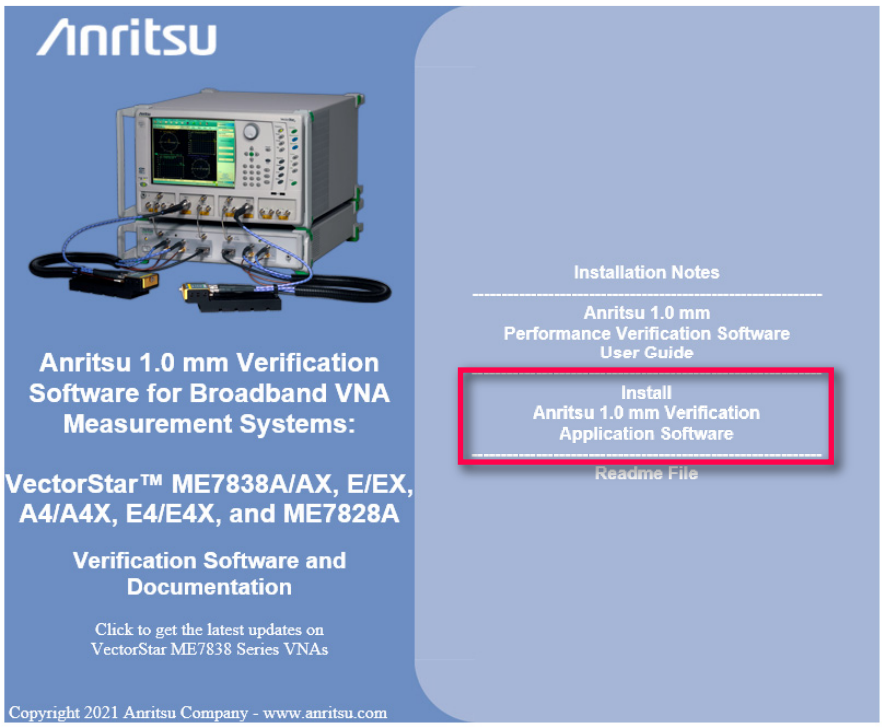


Figure 4-1. PVS Installation and Documentation Screen

4. On the navigation page, click the Install Anritsu 1.0 mm Verification Application Software link.
5. The first of several installation dialog boxes appears.

Note	The dialog box appearance may vary depending on the Operating System being used.

6. Click Run on the two security dialog boxes (Figure 4-2 on page 4-3).

7. If a dialog box appears that displays Error 1321 or Error 1931, follow these instructions:

- Error 1321 – Select Exit Installation and make sure you have Administrator privileges on the PC Controller.
- Error 1931 – Select OK to bypass the error message and continue the installation.

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

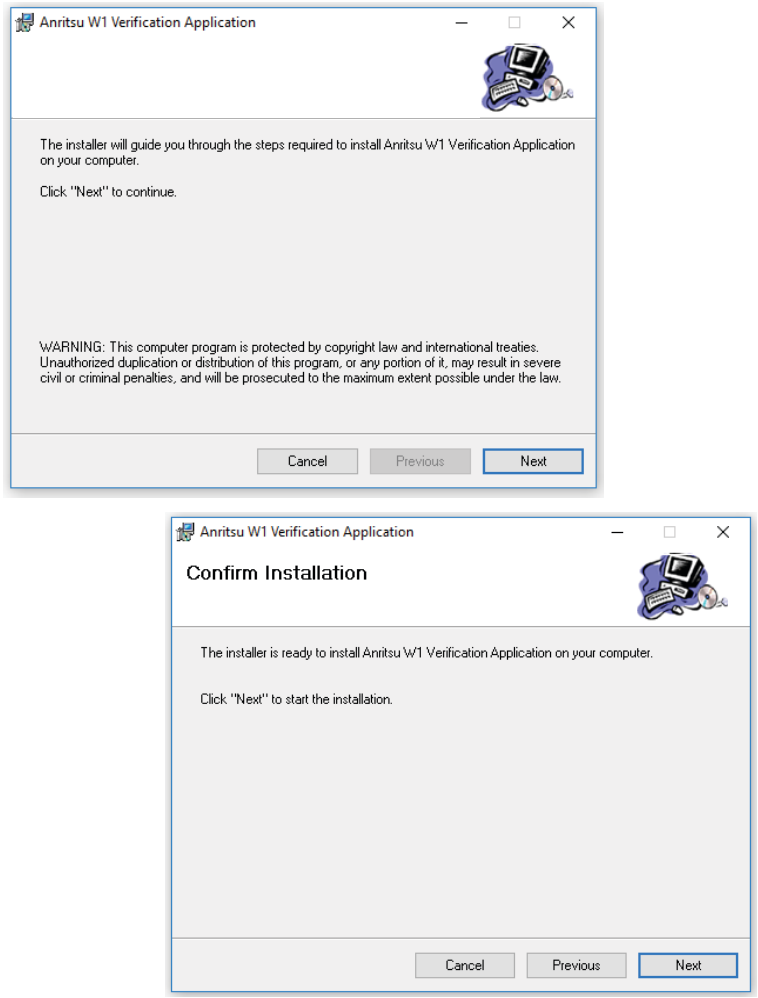


Figure 4-2. Installation Confirmation and Progress Dialog Boxes – Click Next on each

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.

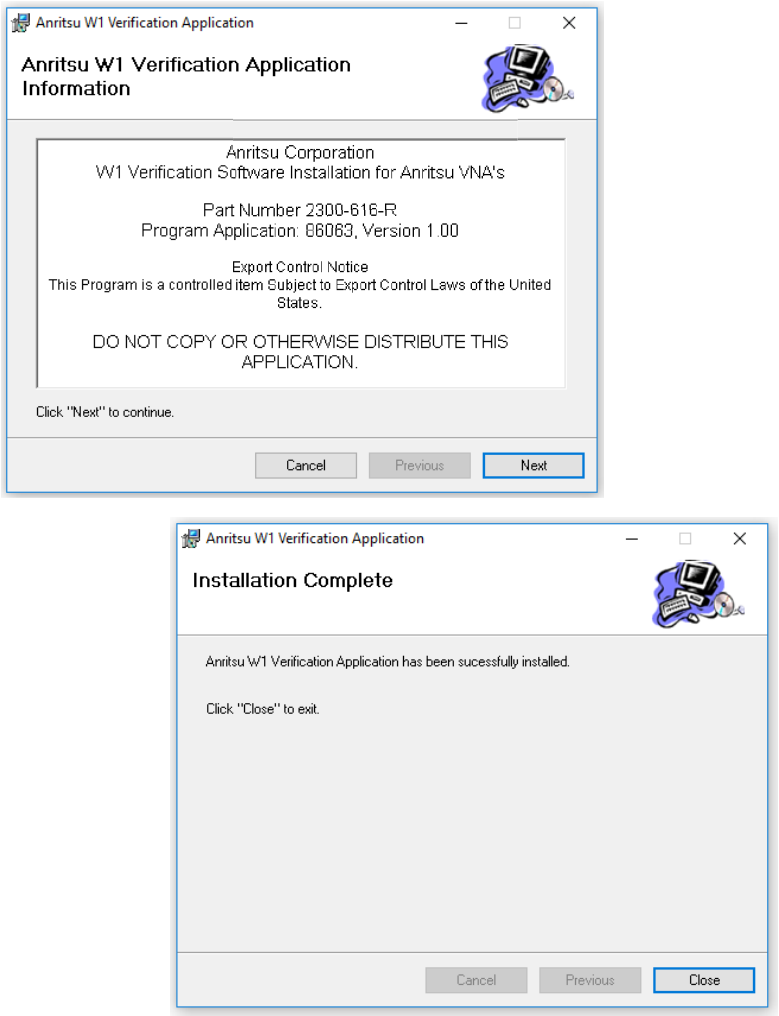


Figure 4-3. Final Application Information and Installation Complete Dialog Boxes

10. The installer adds all required files and makes the necessary registry updates on the PC Controller. When done, the navigation page (Figure 4-1) reappears.

11. If desired, open the User Guide (this document) and save and/or print a copy.

12. The PVS application is available in either the Start or Program menu of the PC Controller.

4-5 Running the Verification Software

After the VNA and PC have been configured as described above, you are ready to run the program and perform the calibration/verification. Make sure you have the following information available:

- Serial number of the 3656C Calibration/Verification Kit
- Serial number of the 3739A Broadband Test Set
- Model number of the LO Source (upper signal generator, usually an MG37022A)
- Serial number of the LO Source (from the upper signal generator's rear panel)
- Model number of the RF Source (lower signal generator, usually an MG37022A)
- Serial number of the RF Source (from the lower signal generator's rear panel)

The application process flow for a full verification of an ME7828A is as follows:

1. Choose your system configuration for Calibration/Verification kit type and system model number.
2. Measure Low Band
   a. Calibrate the low frequency band
   b. Measure verification devices for low frequency band
   c. Save verification data
   d. Restart application for high frequency band
3. Measure High Band
   a. Calibrate the high frequency band
   b. Measure verification devices for the high frequency band
   c. Save verification data
   d. Exit program.

Note	Low-band (step 2) and high-band (step 3) calibration and verification can be performed in any order.

4Note: the process can do the low band and high band in any order.

1. With the equipment and software configured as described in "Configuring the Hardware" on page 4-1, turn on the computer and allow it to boot up to Windows.
2. Locate the W1 Verification Software icon (shown below) on the desktop and double-click on it.

3. The program displays an About dialog box with version information. Click OK to continue.

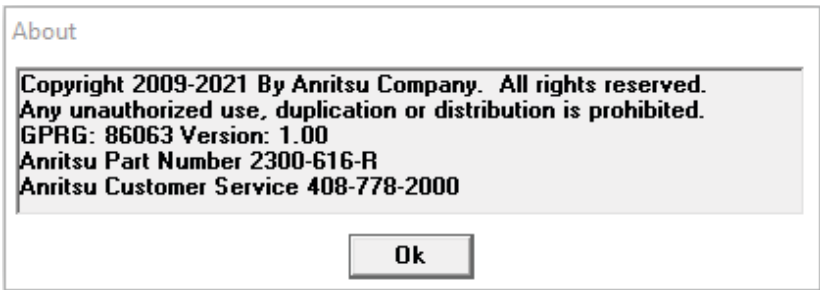


Figure 4-4. About Dialog

4. The Operator Name dialog box appears. Enter a user name or other identification.

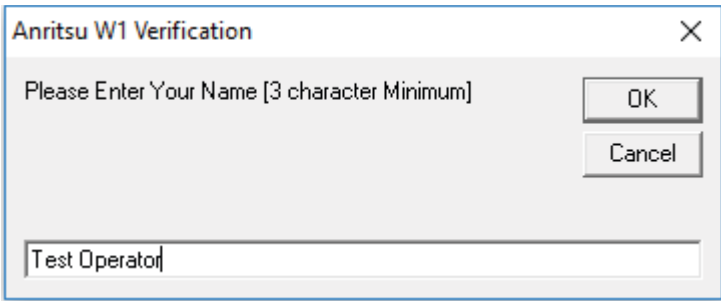


Figure 4-5. Operator Name Dialog

5. Click OK to continue. The program searches for a compatible VNA on the GPIB.

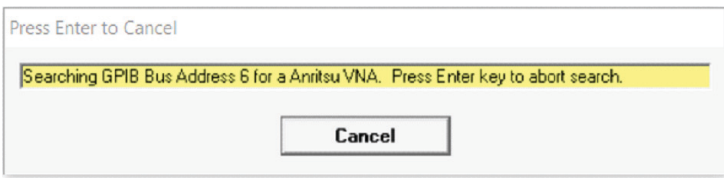


Figure 4-6. Number of Ports Dialog and Progress Tracker

6. When a VNA is found, a VNA confirmation box appears, as shown in Figure 4-7.

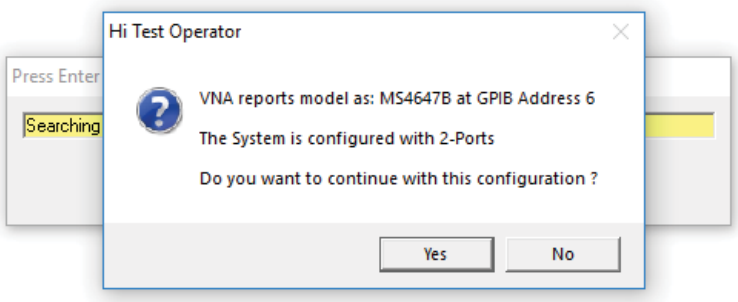


Figure 4-7. VNA Confirmation Dialog Box

7. Click Yes to continue or No to search for another VNA. If yes, then a Configure Application Settings dialog box appears:

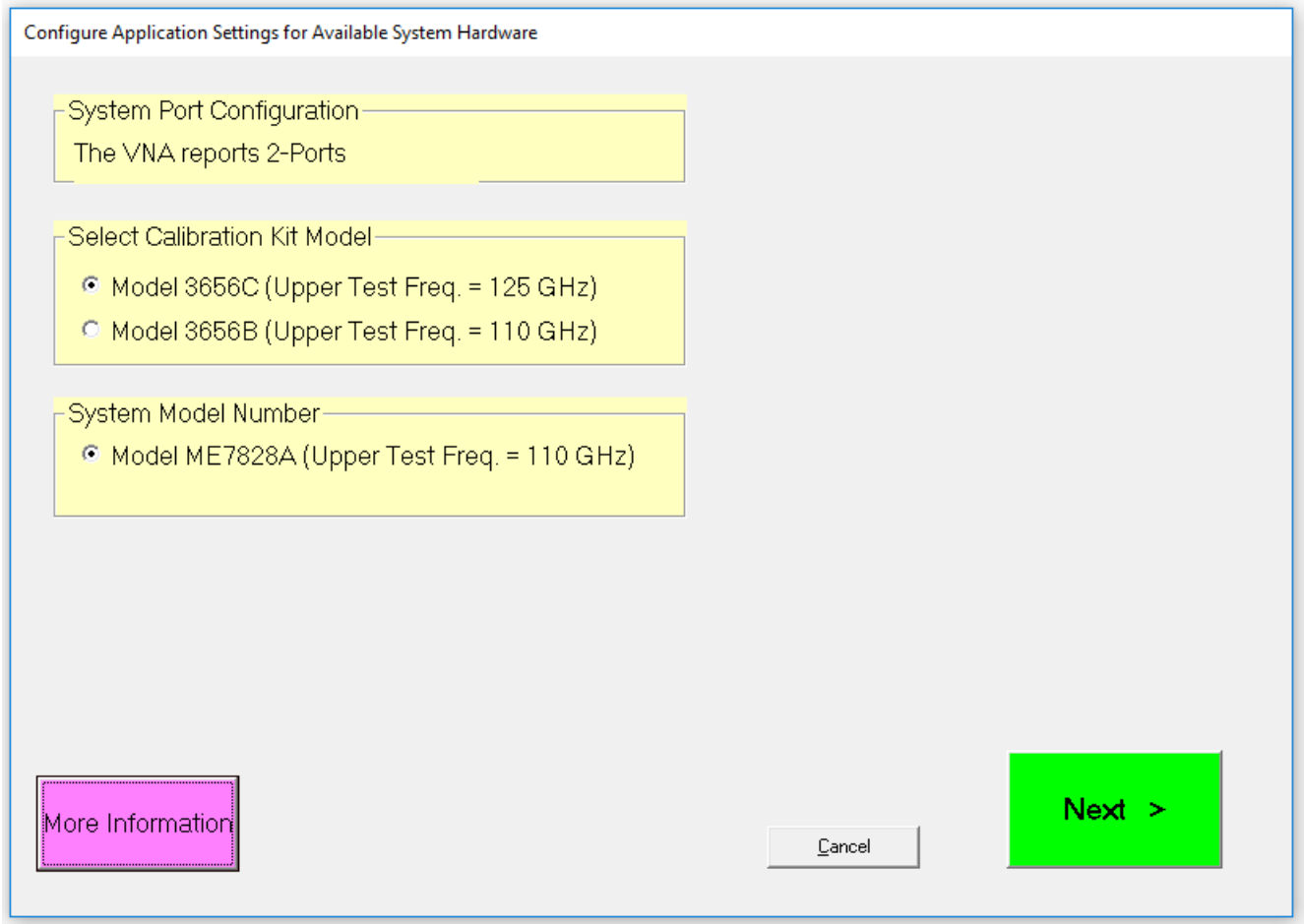


Figure 4-8. Configure Application Settings Dialog Box

8. Select the calibration kit and system model number to be used. When Next is clicked above, the program searches for the Signal Generator LO Source and, when found, the LO Source Model Number dialog box appears.

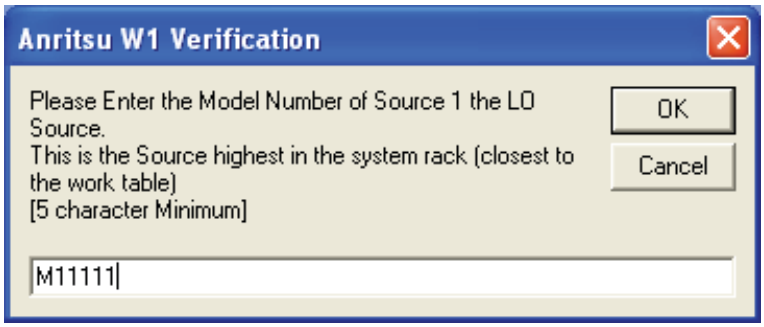


Figure 4-9. Source 1 LO Model Number Dialog

9. Enter the Source 1 LO model number (upper Signal Generator, usually an MG37022A) and click OK.

10. Enter the Source 1 LO serial number (found on the rear panel of the upper Signal Generator) and click OK.

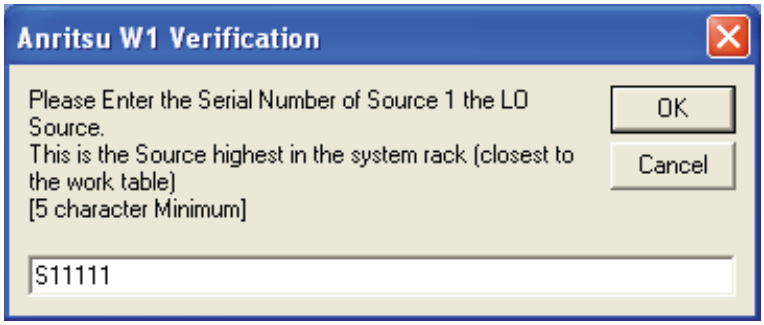


Figure 4-10. Source 1 LO Serial Number Dialog

11. Enter the Source 2 RF model number (lower Signal Generator, usually an MG37022A) and click OK.

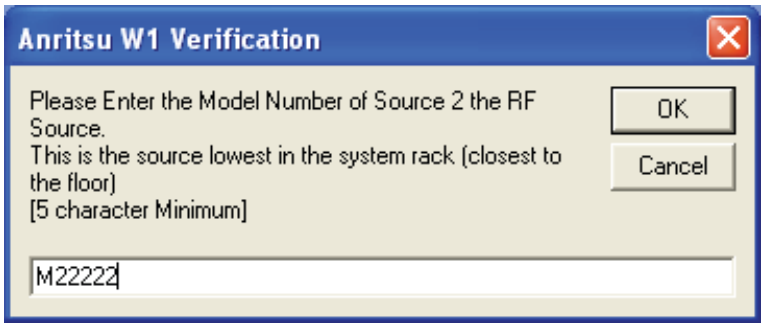


Figure 4-11. Source 2 RF Model Number Dialog

12. Enter the Source 2 RF serial number (found on the rear panel of the lower Signal Generator) and click OK.

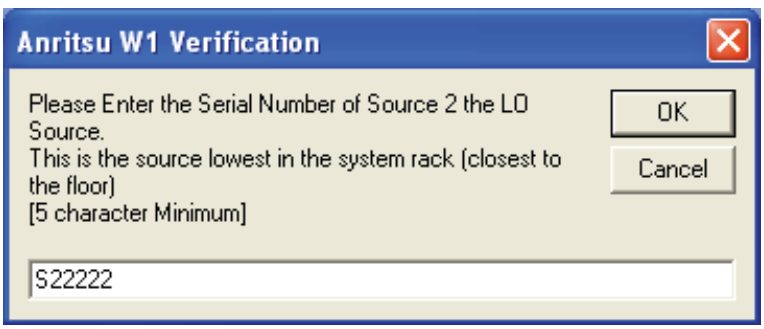


Figure 4-12. Source 2 RF Serial Number Dialog

13. Enter the test set serial number found on the rear panel and click OK.

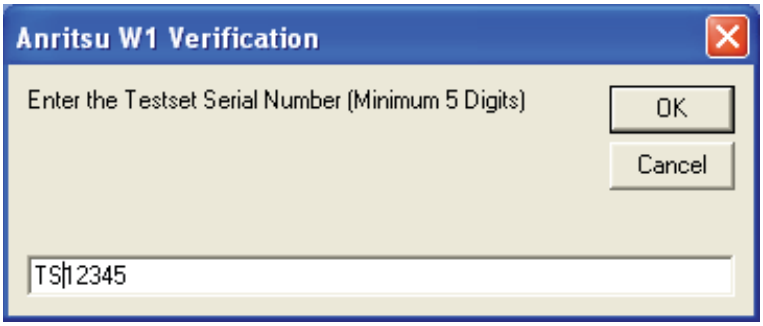


Figure 4-13. Test Set Serial Number Dialog

14. Confirm that the test serial number is correct by clicking Yes.

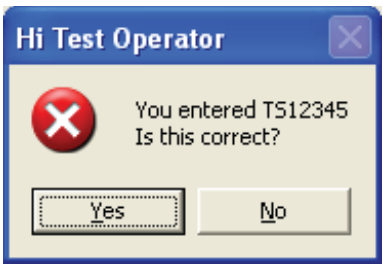


Figure 4-14. Test Set Serial Number Confirmation Dialog

15. The program execution continues to the following Section 4-6 “Application Interface – Setup Menu Tab” on page 4-10.

4-6 Application Interface – Setup Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections:

- The Setup Menu tab is described in this section.
- The Main Menu tab display is described in Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.
- The Serial Number tab is described in Section “Serial Number Tab Functions” on page 4-26.

The following procedure continues the program setup from the previous section:

1. In the Calibration Kit Type area, select W Coax.
2. In the Serial Number (5 Digits) area, enter the serial number for the 3656C Calibration/Verification Kit. At least five (5) digits are required.
3. In the Load Cal-Kit Coefficients to VNA area, select Yes.

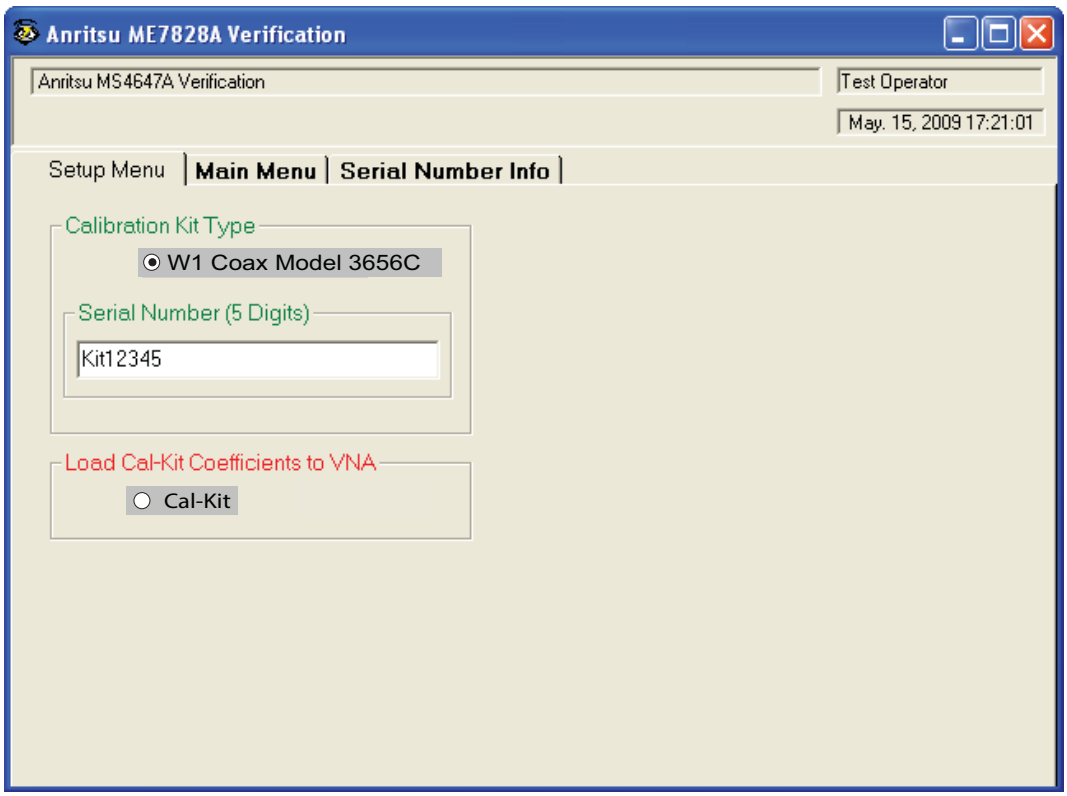


Figure 4-15. ME7828A Application Interface – Setup Menu Tab

4. The Install Calibration-Kit Coefficients to the VNA dialog box appears.

5. Follow the dialog box instructions for installing the 3656C calibration coefficients into the VNA, then click OK.

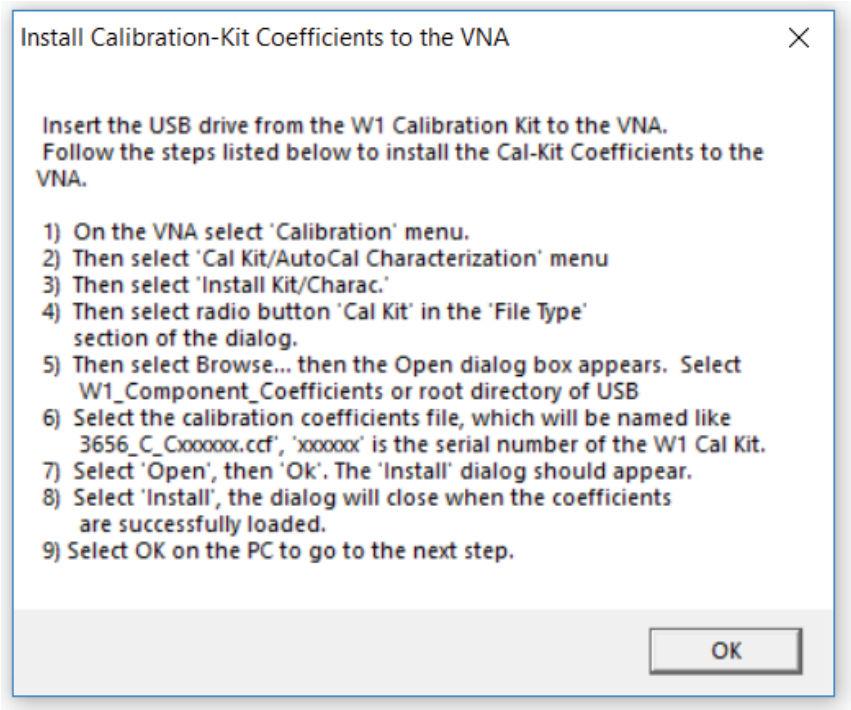


Figure 4-16. Install Calibration Kit Coefficients Dialog

6. The VNA displays an acknowledgment dialog box when the file load is complete, indicating that 10 files were loaded. After the VNA has loaded the 10 Calibration coefficient files, select OK on the PC application. The application will then prompt you to remove the USB drive from the VNA and install the USB drive to the PC.

Figure 4-17. Install USB Drive in PC Dialog

7. The Application Interface dialog box reappears displaying the Setup Menu tab and Frequency Range area. In the Frequency Range area, select either the low range (40 MHz to 67 GHz) or the high range (67 GHz to 110 GHz). For purposes of this document, the low band is done first. The range that is not selected is calibrated during the Restart Procedure described in Section 4-13 "Restart for Alternate Frequency Band" on page 4-35. After selecting the frequency range, click OK. The Verification Kit Information area appears.

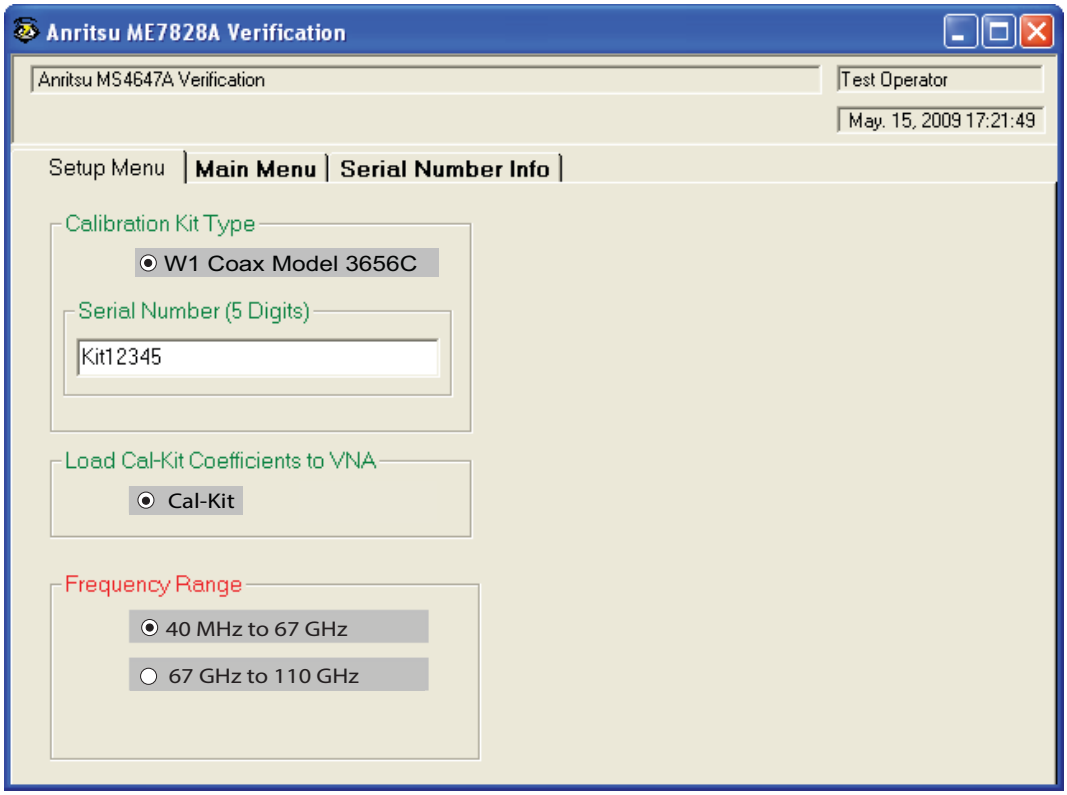


Figure 4-18. ME7828A Application Interface – Setup Menu Tab

8. Select the W Coax type, and then the Verification Kit Serial Number (usually the same as the Calibration Kit). When the Serial Number is complete, the Locate USB Drive Kit Data on PC area appears.

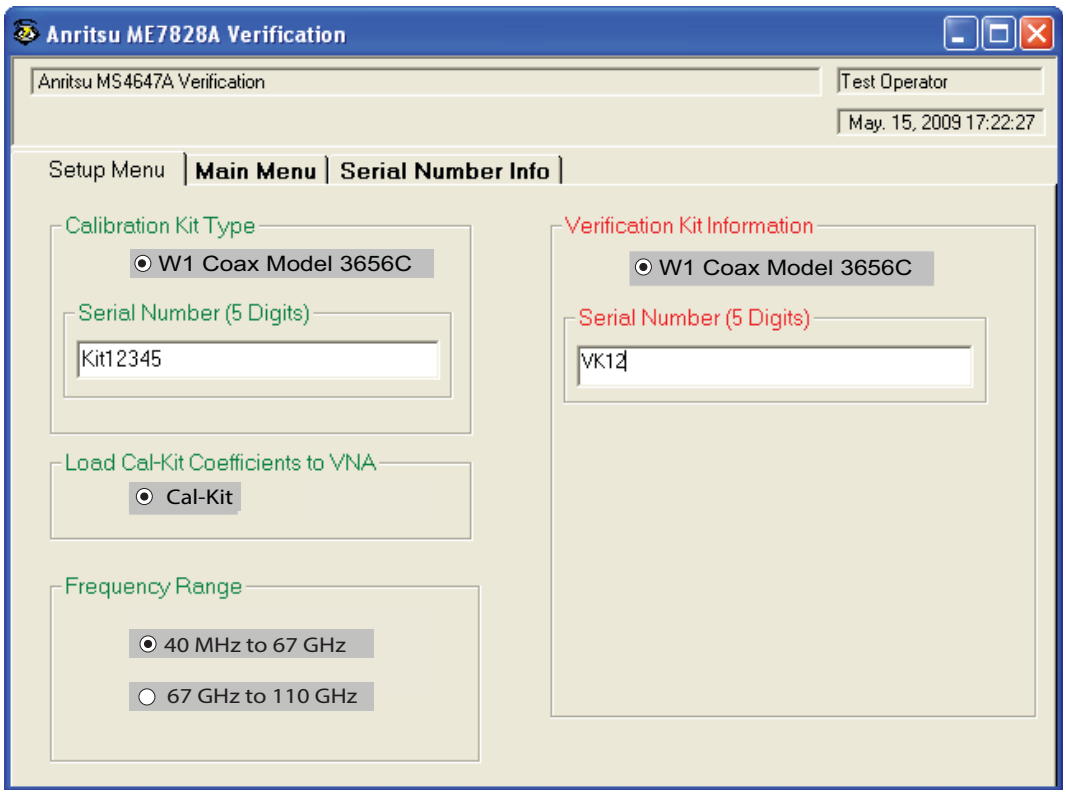


Figure 4-19. ME7828A Application Interface – Setup Menu Tab

9. In the Locate USB Drive Kit Data on PC area, click the Go To USB Drive Locator button.

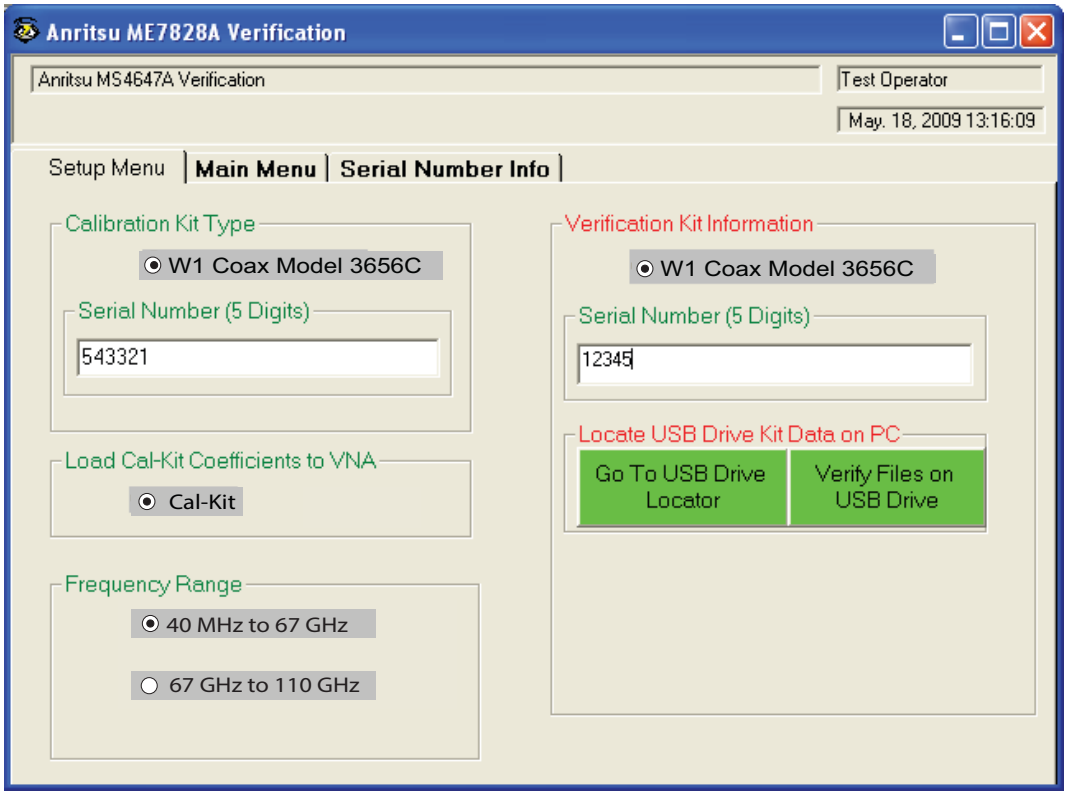


Figure 4-20. ME7828A Application Interface – Setup Menu Tab

10. When the Auto Find Verification Kit Data dialog box first appears, the Verification Kit Data Path text field is blank. Click the Auto-Find USB Drive Verification Kit Data button. The application automatically locates the verification kit data on the USB drive and displays the path in the Verification Kit Data Path text field.

In rare instances, due to PC/USB configurations, the Auto-find function may not be able to locate the verification data on the USB drive. In this case, you may need to use the Manually Locate Verification Data Kit button. This utility allows you to manually select the path where the verification kit data is located. The data path will be on the USB drive shipped with the verification kit. On most PC's, this will be the `E`, `F`, or `G` drive assignments. Navigate to the verification kit data in the file-path location shown in the example below (for this example, the USB drive was at **E:**):

```
E:\W1_Verification_Data\W1_3656C_xxxxxx
```

(where xxxxxx is the serial number of the Kit)

Within each data set on the USB, there is a file named EnableKit.dat. Double click that file to identify the file. This builds the path for the verification kit data and returns back to the Find Verification Kit Data on the removable USB drive. Once the data is found, the Verification Kit Data Path information appears in the text field. Click Next > to return to the Application Interface dialog box.

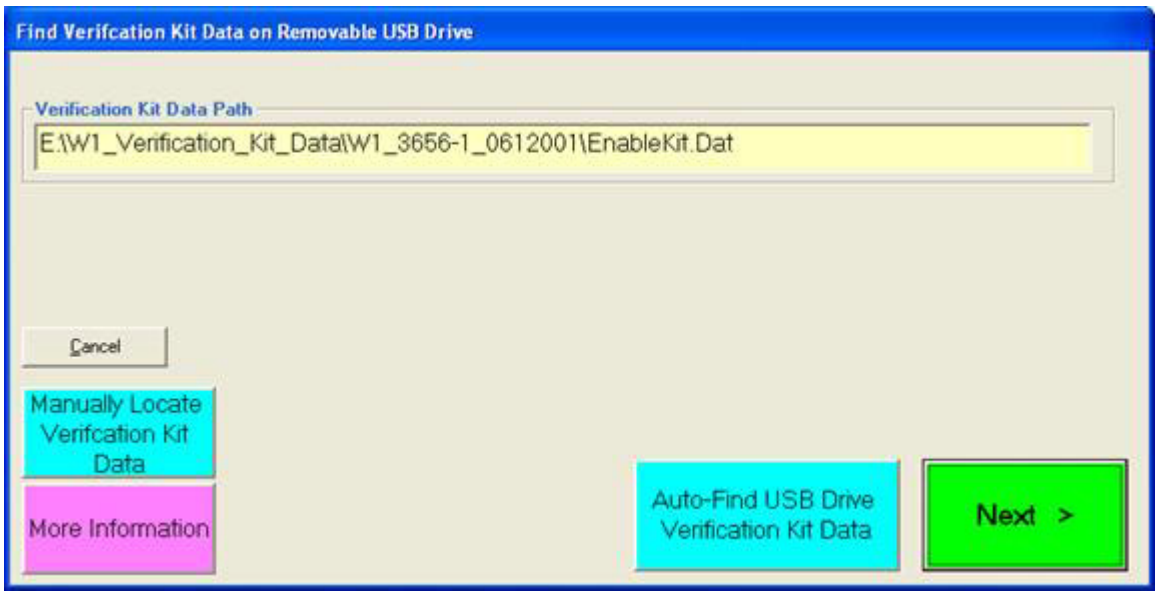


Figure 4-21. USB Drive Locater Dialog

11. Click Verify Files on USB Drive. The application checks the files on the USB drive to verify that all files are present and that each has the proper number of data points.

12. When all information is entered and you are ready to start, click the Setup Calibration of VNA button.

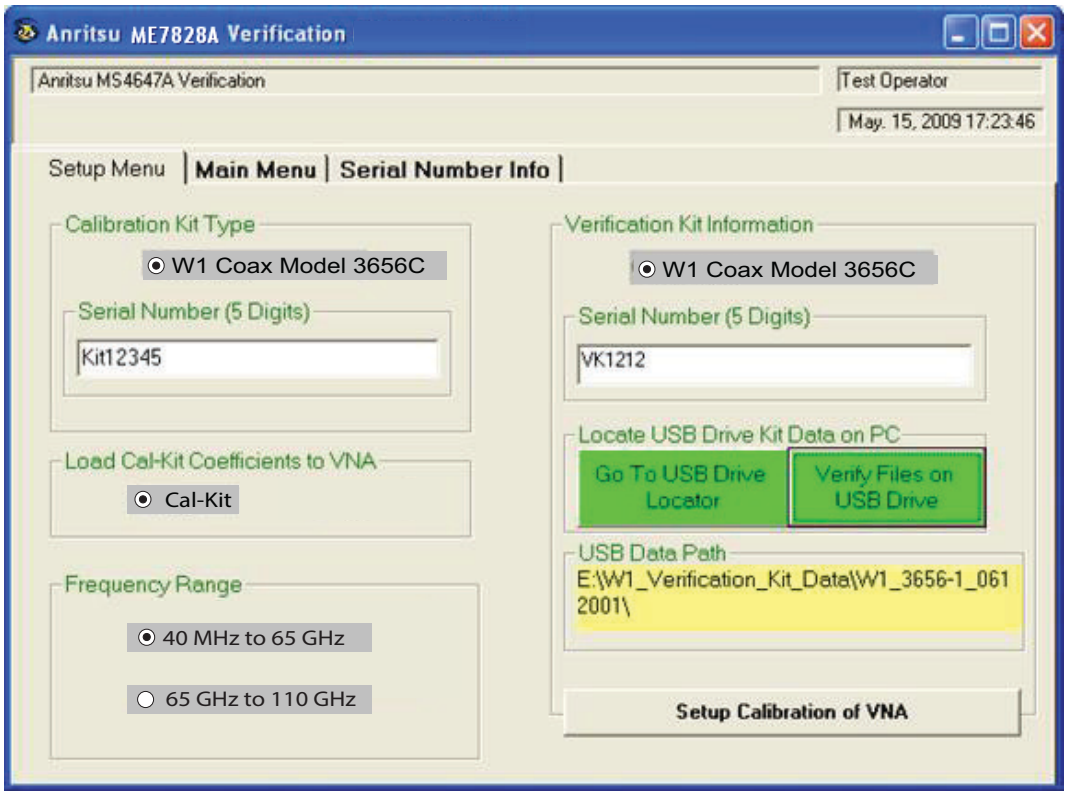


Figure 4-22. ME7828A Application Interface – Setup Menu Tab

13. The program execution continues in either Section 4-7 “Low-Band Calibration” on page 4-17 or Section 4-8 “High-Band Calibration” on page 4-20 depending on the previous band selection.

4-7 Low-Band Calibration

During this procedure, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration. In Section 4-8 “High-Band Calibration” on page 4-20, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 1 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 2 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

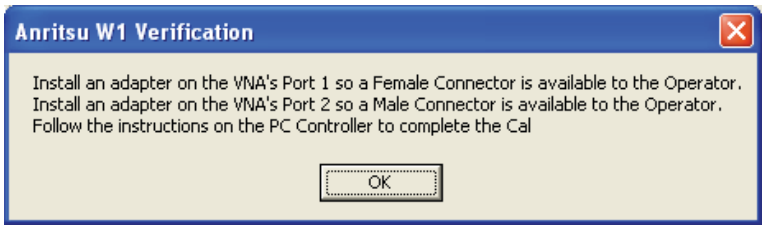


Figure 4-23. Anritsu W1 Verification Dialog

2. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 1.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 2.
   c. When ready to proceed, click OK.

Figure 4-24. VNA Calibration: Step 1 of 5 Dialog

3. The VNA measures the load device data, then the VNA Calibration: Step 2 of 5 dialog box appears.
   a. Connect the Male Cal Kit Broadband Load Device to VNA Port 1.
   b. Connect the Female Broadband Load Device to VNA Port 2.
   c. When ready to proceed, click OK.

Figure 4-25. VNA Calibration: Step 2 of 5 Dialog

4. The VNA measures the broadband load device data, then the VNA Calibration: Step 3 of 5 dialog box appears.
   a. Connect the Male Cal Kit Open to VNA Port 1.
   b. Connect the Female Short #1 (2.02 mm) to VNA Port 2.
   c. When ready to proceed, click OK.

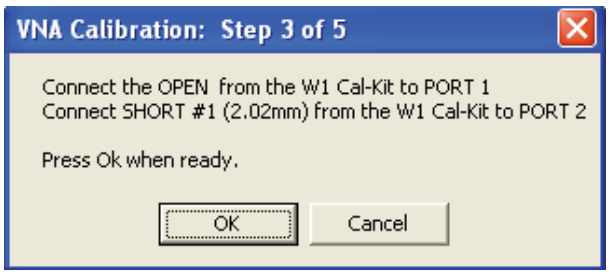


Figure 4-26. VNA Calibration: Step 3 of 5 Dialog

5. The VNA measures the open/short device data, then the VNA Calibration: Step 4 of 5 dialog box appears.
   a. Connect the Male Short #1 (2.02 mm) to VNA Port 1.
   b. Connect the Female Open to VNA Port 2.
   c. When ready to proceed, click OK.

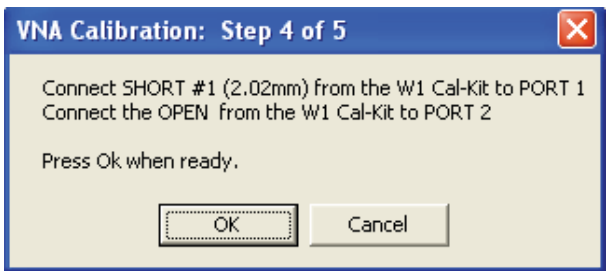


Figure 4-27. VNA Calibration: Step 4 of 5 Dialog

6. The VNA measures the short/open device data, then the VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the Short and the Open from Port 1 and Port 2, respectively.

b. Slide the two T-R modules towards each other and connect the VNA Port 1 (Female) to VNA Port 2 (Male) directly.

c. When ready to proceed, click OK.

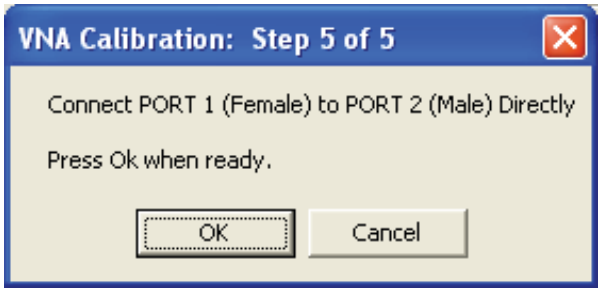


Figure 4-28. VNA Calibration: Step 5 of 5 Dialog

7. The program execution skips to Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

4-8 High-Band Calibration

During this procedure, the high-band portion of the VNA is calibrated with a full 12-term SSST (Short-Short-Short-Thru) calibration. In Section 4-7 “Low-Band Calibration” on page 4-17, the low-band portion of the VNA is calibrated with a full 12-term SOLT (Short-Open-Load-Thru) calibration.

Procedure

1. The W1 Verification Install Adapter dialog box appears.
   a. Install a F-F adapter on VNA Port 1 so that a Female connector is available to the operator.
   b. Install a F-M adapter on VNA Port 2 so that a Male connector is available to the operator.
   c. When ready to proceed, click OK.

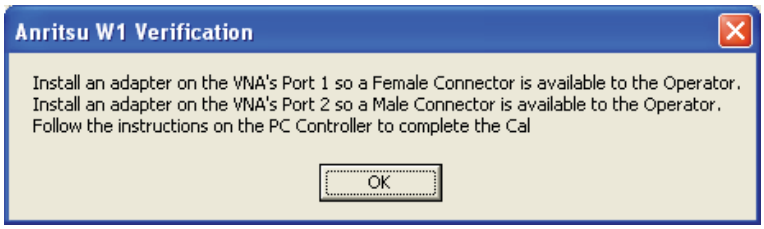


Figure 4-29. Anritsu W1 Verification Dialog

2. When ready to proceed, click OK. The VNA Calibration: Step 1 of 5 dialog box appears.
   a. Connect the Male Cal Kit Isolation Device to VNA Port 1.
   b. Connect the Female Cal Kit Isolation Device to VNA Port 2.
   c. When ready to proceed, click OK.

Figure 4-30. VNA Calibration: Step 1 of 5 Dialog

3. The VNA Calibration: Step 2 of 5 dialog box appears.

a. Connect the Male 2.02 mm Short #1 to VNA Port 1.

b. Connect the Female 2.65 mm Short #2 to VNA Port 2.

c. When ready to proceed, click OK.

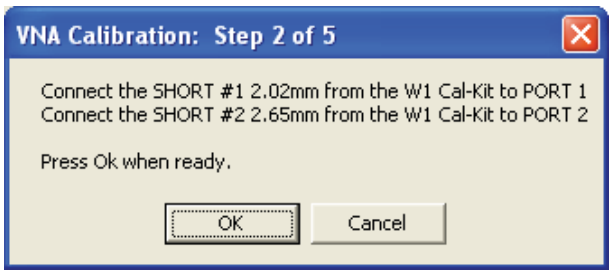


Figure 4-31. VNA Calibration: Step 2 of 5 Dialog

4. The VNA Calibration: Step 3 of 5 dialog box appears.

a. Connect the Male 2.65 mm Short #2 to VNA Port 1.

b. Connect the Female 3.18 mm Short #3 to VNA Port 2.

c. When ready to proceed, click OK.

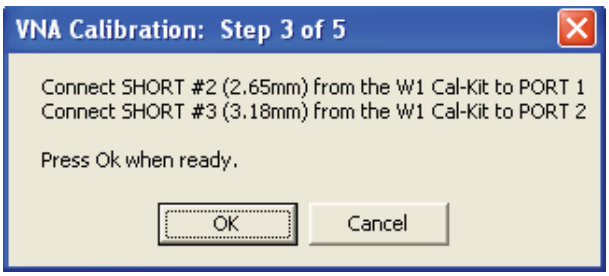


Figure 4-32. VNA Calibration: Step 3 of 5 Dialog

5. The VNA Calibration: Step 4 of 5 dialog box appears.

a. Connect the Male 3.18 mm Short #3 to VNA Port 1.

b. Connect the Female 2.02 mm Short #1 to VNA Port 2.

c. When ready to proceed, click OK.

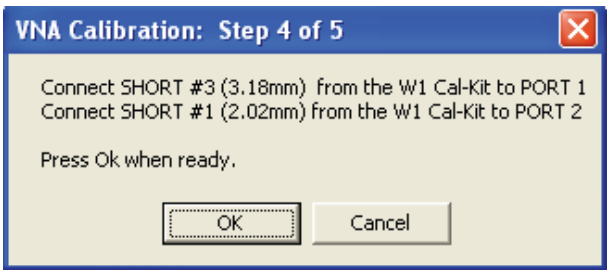


Figure 4-33. VNA Calibration: Step 4 of 5 Dialog

6. The VNA Calibration: Step 5 of 5 dialog box appears.

a. Remove the offset Shorts from Port 1 and Port 2.

b. Slide the two T-R modules towards each other and connect the VNA Port 1 (Female) to VNA Port 2 (Male) directly.

c. When ready to proceed, click OK.

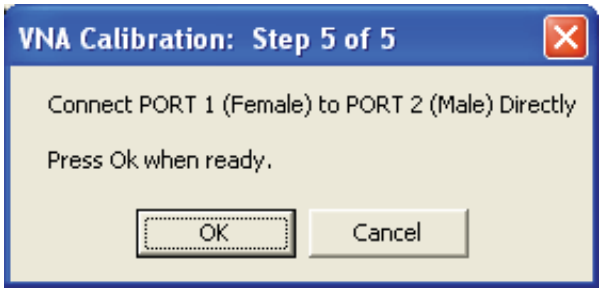


Figure 4-34. VNA Calibration: Step 5 of 5 Dialog

7. The program execution continues to Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

4-9 Application Interface – Main Menu Tab

The PVS Application Interface dialog box displays three tabs with configuration, control, and serial number information. Each tabbed dialog box contains buttons to control program operations as outlined in the following sections.

- The Setup Menu tab is described in Section 4-6 “Application Interface – Setup Menu Tab” on page 4-10.
- The Main Menu tab display is described in the section immediately following and is shown in Figure 4-35, “ME7828A Application Interface – Main Menu Tab” on page 4-23
- The Serial Number tab is described in Section “Serial Number Tab Functions” on page 4-26.

Whenever the program is executing a command from the main menu, the buttons are disabled, due to the event-driven nature of the Windows Operating System, until the current command is finished. While a command is being executed, informational messages are usually displayed on the screen to aid the operator in understanding which steps the application is performing.

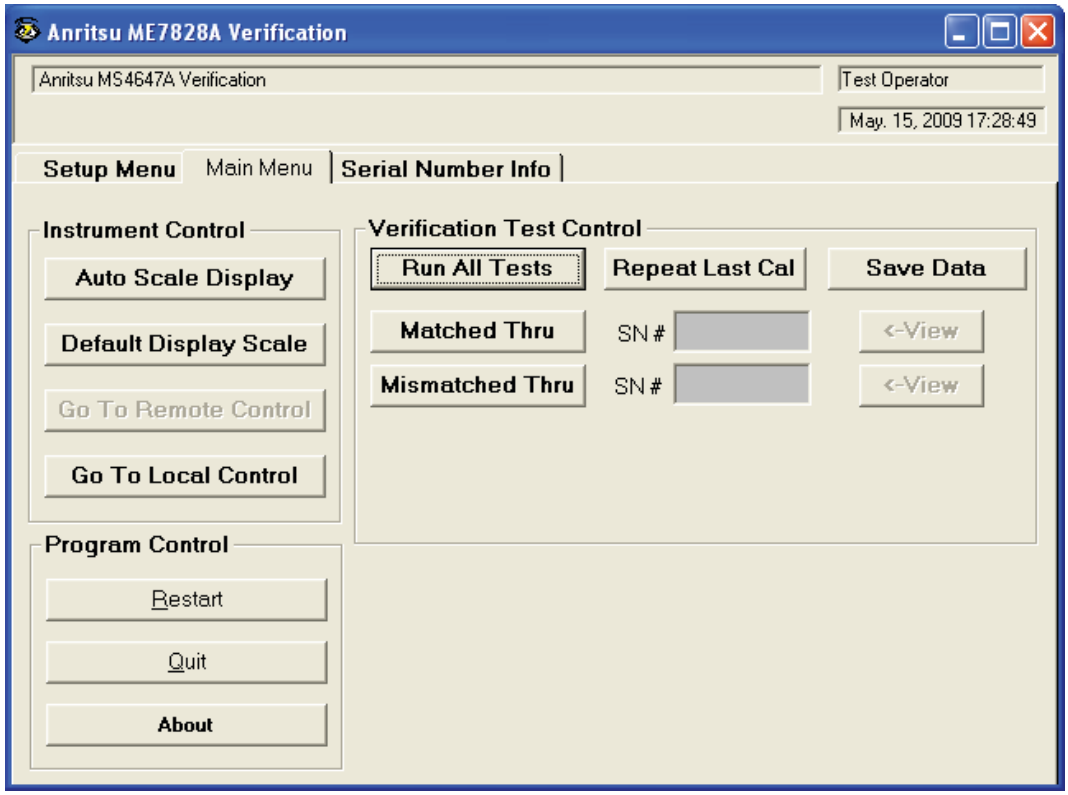


Figure 4-35. ME7828A Application Interface – Main Menu Tab

Auto Scale Display Button

This command automatically scales each channel on the Anritsu Vector Network Analyzer. It is the same as using the VectorStar VNA menus to navigate to and select either the Auto Scale Active Channel or Auto Scale All Channels buttons. The full path to these buttons is:

- MAIN | Scale | SCALE | Auto Scale Active Channel
- MAIN | Scale | SCALE | Auto Scale All Channels

When the program detects the VNA has finished a sweep, the program auto-scales all four channels before continuing.

The VNA display during the calibration and verification tests is set to one Channel and four traces. Each trace displays the following parameters:

- Upper-left quadrant – S21 – Forward Transmissions, Log Mag (top) and Phase (Bottom)
- Upper-right quadrant – S12 – Reverse Transmissions, Log Mag (top) and Phase (Bottom)
- Lower-left quadrant – S11 – Forward Reflections, Lin Mag (top) and Phase (Bottom)
- Lower-right quadrant – S22 – Reverse Reflections, Lin Mag (top) and Phase (Bottom)

See Figure 4-36 for a display example. This is a typical display immediately after performing the High Band calibration. Please note this is for reference only and that the actual data on the VNA display may not be identical.

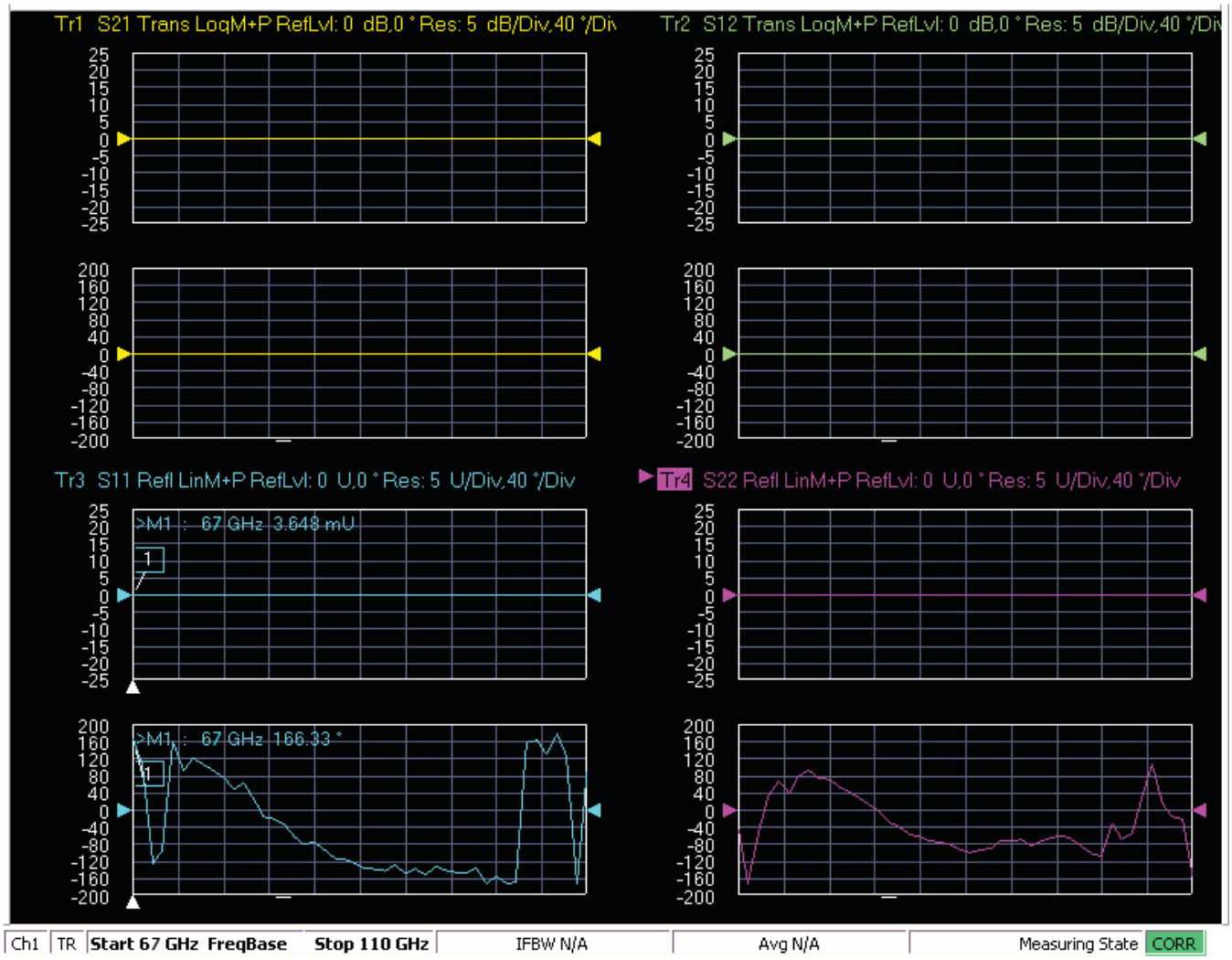


Figure 4-36. MS4640A/B Series VNA Auto Scale Example Trace Display

Default Display Scale Button

This command sets all four channels to a scale of 5 dB/div for the Magnitude displays and to 40 degrees/div for the Phase displays, and the reference value to 0. This allows you to see if the device is properly connected.

Go To Remote Control Button

This command is only available after you have clicked the Go to Local Control button. When you click this button, the program takes control of the VNA Display type and Display scale settings and sets them to the program default values.

Go To Local Control Button

This command allows you access to the front panel buttons while the program is running. The instrument is in Local Lock Out unless this button is pushed. This prevents an inadvertent front panel button actuation from affecting the proper operation of the program.

Caution	Modifying the VNA settings (such as power level, bandwidth, averaging, etc.) could adversely affect the measurement results. This should only be used to view the data or for using markers.

Restart Button

The Restart button command allows you to change the tested instrument, the frequency range, or the selected verification kit. Selecting Yes causes the program to return to the program initialization stage.

Usually, this button is used to test for second frequency band and program execution continues in Section 4-13 “Restart for Alternate Frequency Band” on page 4-35 and the Choose The Restart Method dialog box appears.

Quit Button

Selecting Quit brings up a confirmation dialog box shown in Figure 4-37. Selecting Yes exits the program; selecting No returns you to the previous screen.

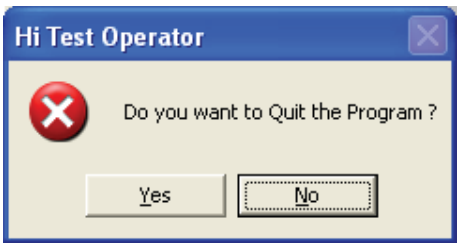


Figure 4-37. Confirmation Dialog

About

Displays version information, copyright, other legal notices, and company contact information.

Run All Tests

This command button runs both the Matched Thru and Mismatched Thru tests. Program execution starts with Section 4-10 “Matched Thru Tests” on page 4-28 and then continues with Section 4-11 “Mismatched Thru Tests” on page 4-31. When both tests are completed, program execution returns to the Main Menu tab shown in Figure 4-35, “ME7828A Application Interface – Main Menu Tab” on page 4-23.

Repeat Last Cal

This command button re-calibrates the VNA according to the CURRENT calibration. This provides a way to recalibrate the VNA without having to reset the program parameters in case the original calibration was flawed for some reason. When the calibration sequence is complete, program execution continues to the Main Menu tab shown previously in Figure 4-35, "ME7828A Application Interface – Main Menu Tab" on page 4-23.

Save Data

This command button writes data files to the PC Controller and stores the files at `C:\mmdcsvc\Data`. The program does not write data to the verification kit USB memory device. If selected, program execution continues as described in Section 4-12 "Saving Verification Data" on page 4-34.

The number of saved files varies depending on the user settings:

- If both the matched and mismatched thru tests are run, two files are written to the PC Controller hard drive.
- If only one of the tests was run, only one file is written to the PC Controller's hard drive at `C:\mmcsvc\Data`

Matched Thru

This command button only runs the Matched Thru tests. If selected, program execution continues as described in Section 4-10 "Matched Thru Tests" on page 4-28. When the tests are completed, the program returns to the Main Menu tab shown in Section 4-9 "Application Interface – Main Menu Tab" on page 4-23.

Matched Thru SN

This field is used to enter the serial number of the matched thru.

Mismatched Thru

This command button only runs the Mismatched Thru tests. If selected, program execution continues in Section 4-11 "Mismatched Thru Tests" on page 4-31. When the tests are completed, the program returns to the Main Menu tab shown in Figure 4-35, "ME7828A Application Interface – Main Menu Tab" on page 4-23.

Mismatched Thru SN

This field is used to enter the serial number of the matched thru.

Serial Number Tab Functions

The Serial Number Info tab displays a summary of the model number and serial number for the following devices. All screen information is included in the report headers.

- Operator Name
- Calibration Kit
- Test Set
- Verification Kit
- Vector Network Analyzer
- Test Set

- Signal Generator Sources

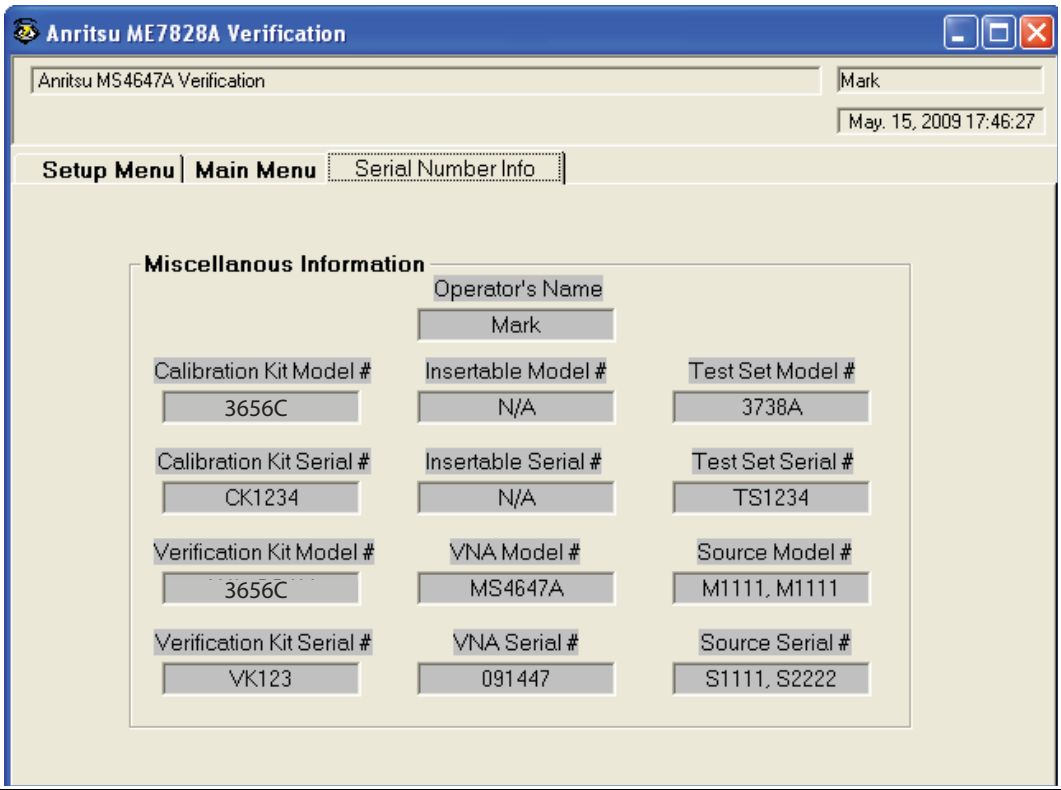


Figure 4-38. ME7828A Application Interface – Serial Number Tab

4-10 Matched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests are executed followed by the Mismatched Thru tests described in Section 4-11 “Mismatched Thru Tests” on page 4-31.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

Note	The verification devices must be connected to the W1 Connector Coupler Ports and not to the VNA Ports. Use the torque wrench supplied with the verification kit when tightening the device connections.

Procedure

1. The Enter Serial Number Match Thru dialog box appears.

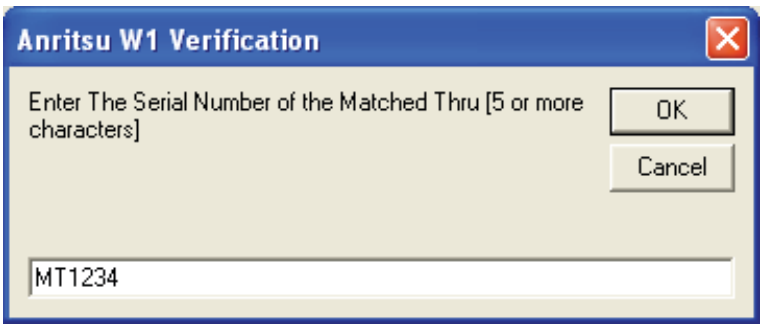


Figure 4-39. Anritsu W1 Verification Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. Enter the serial number of the Matched Thru.
4. When ready to proceed, click OK. The Connect Matched Thru Male Connector dialog box appears.

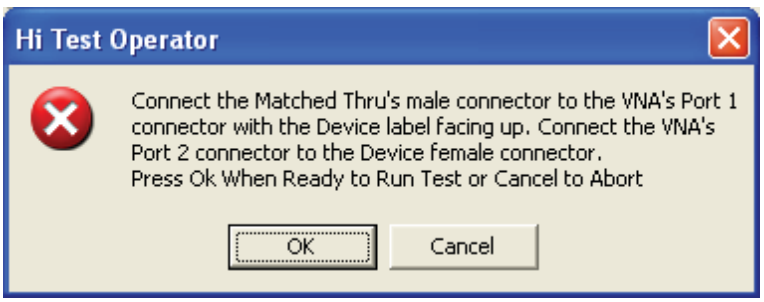


Figure 4-40. Matched Thru Dialog

5. Connect the Matched Thru male connector to VNA Port 1 with the label facing up.
6. Connect the Matched Thru female connector to VNA Port 2.

7. When ready to proceed, click OK. The matched thru test starts and the Matched Thru Test - Sweep 1 dialog box appears. After it completes, the Matched Thru Test - Sweep 2 dialog box appears.

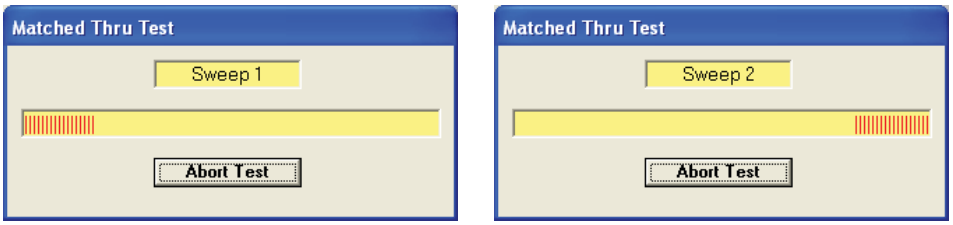


Figure 4-41. Matched Thru Test, Sweep 1 and Sweep 2 Dialog Boxes

8. When the test completes, the next action depends on what the user selected in the Main Menu tab above. The VNA main display should be similar to the one below. This is a typical display immediately after measuring the Matched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

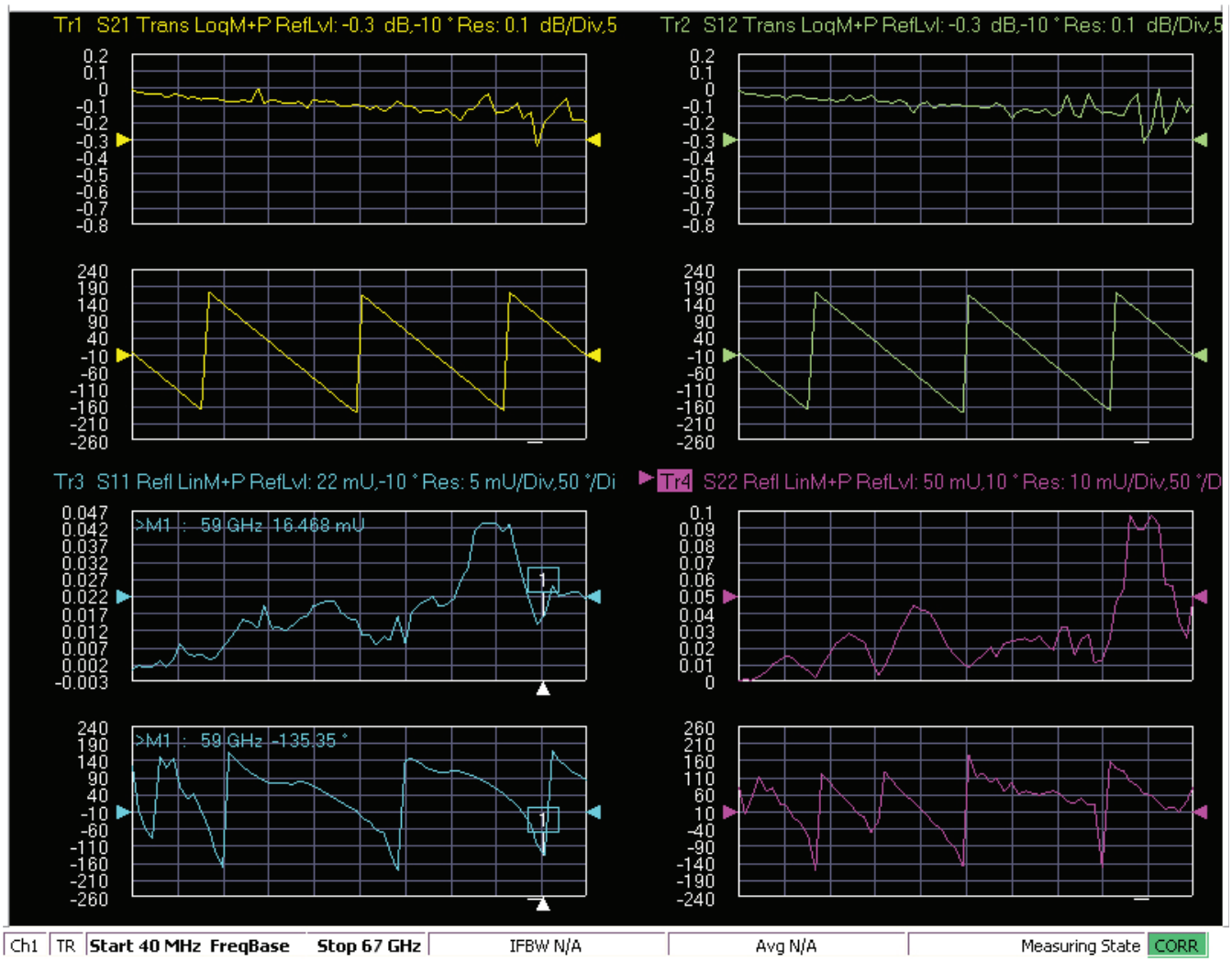


Figure 4-42. MS4640A/B Series VNA, Typical Matched Thru Data in Low Band
Upper-left quadrant= S21 – Forward Transmission
Upper-right quadrant = S12 – Reverse transmission
Lower-left quadrant= S11 – Forward Reflection
Lower-right quadrant= S22 – Reverse Reflection

9. If only the Matched Thru button was selected, the program returns to the “Application Interface – Main Menu Tab” on page 4-23. The dialog box is shown in Figure 4-35, “ME7828A Application Interface – Main Menu Tab” on page 4-23.
10. If the Run All Tests button was selected, the program execution continues with the following Section 4-11, "Mismatched Thru Tests".

4-11 Mismatched Thru Tests

If the Run All Tests button on the Application Interface - Main Menu tab was selected, the Matched Thru tests (described in Section 4-10 “Matched Thru Tests” on page 4-28 is executed first, followed by the Mismatched Thru tests described in this section.

If the Matched Thru test button was selected, only the steps in this section are executed. When this test is complete, the program returns to the main menu described Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

Note	The verification devices must be connected to the W1 Connector Coupler Ports and not to the VNA Ports. Use the torque wrench supplied with the verification kit when tightening the device connections.

The entry point for this portion of the verification software depends on the user selections made in the Application Interface – Main Menu tab described in Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

The dialog box is shown in Figure 4-35, “ME7828A Application Interface – Main Menu Tab” on page 4-23.

If only the Mismatched Thru button was selected above, program execution starts here.

If the Run All Tests button was selected above, program execution continues here after the Matched Thru tests (described in Section 4-10 “Matched Thru Tests” on page 4-28) have been completed.

Procedure

1. The Enter Serial Number Offset Set Mismatch Device dialog box appears. Enter the serial number of the offset mismatch device.

Figure 4-43. Serial Number Dialog

2. Ensure that the correct device is connected.
   - The Matched Thru verification standard is the device with one scribe line.
   - The Mismatched Thru verification standard is the device with two scribe lines.

Note	The verification standards must be connected to the W1 Coupler Ports and not to the VNA ports.

3. When ready to continue, click OK. The Connect Mismatched Thru Airline dialog box appears.

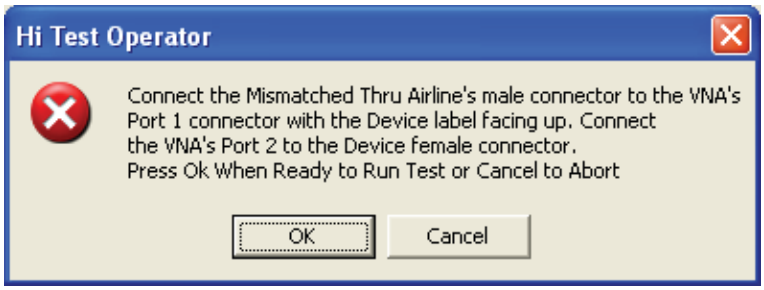


Figure 4-44. Instruction Dialog

4. Connect the Mismatched Thru Airline male connector to VNA Port 1 with the device label facing up.
5. Connect the Mismatched Thru Airline female connector to VNA Port 2.
6. When ready to continue, click OK. The Mismatched Thru Test - Sweep 1 dialog box is displayed first followed by the Mismatched Thru Test - Sweep 2 dialog box.

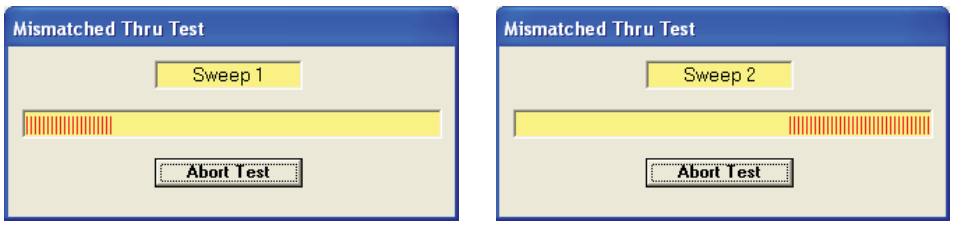


Figure 4-45. Status Dialogs

7. When the test completes, the program returns to the main menu described Section 4-9 “Application Interface – Main Menu Tab” on page 4-23, and the display should look similar to Figure 4-46. This is a typical display immediately after measuring the Mismatched Thru in the Low Band. Please note this is for reference only and that the actual data on the VNA display may not be identical.

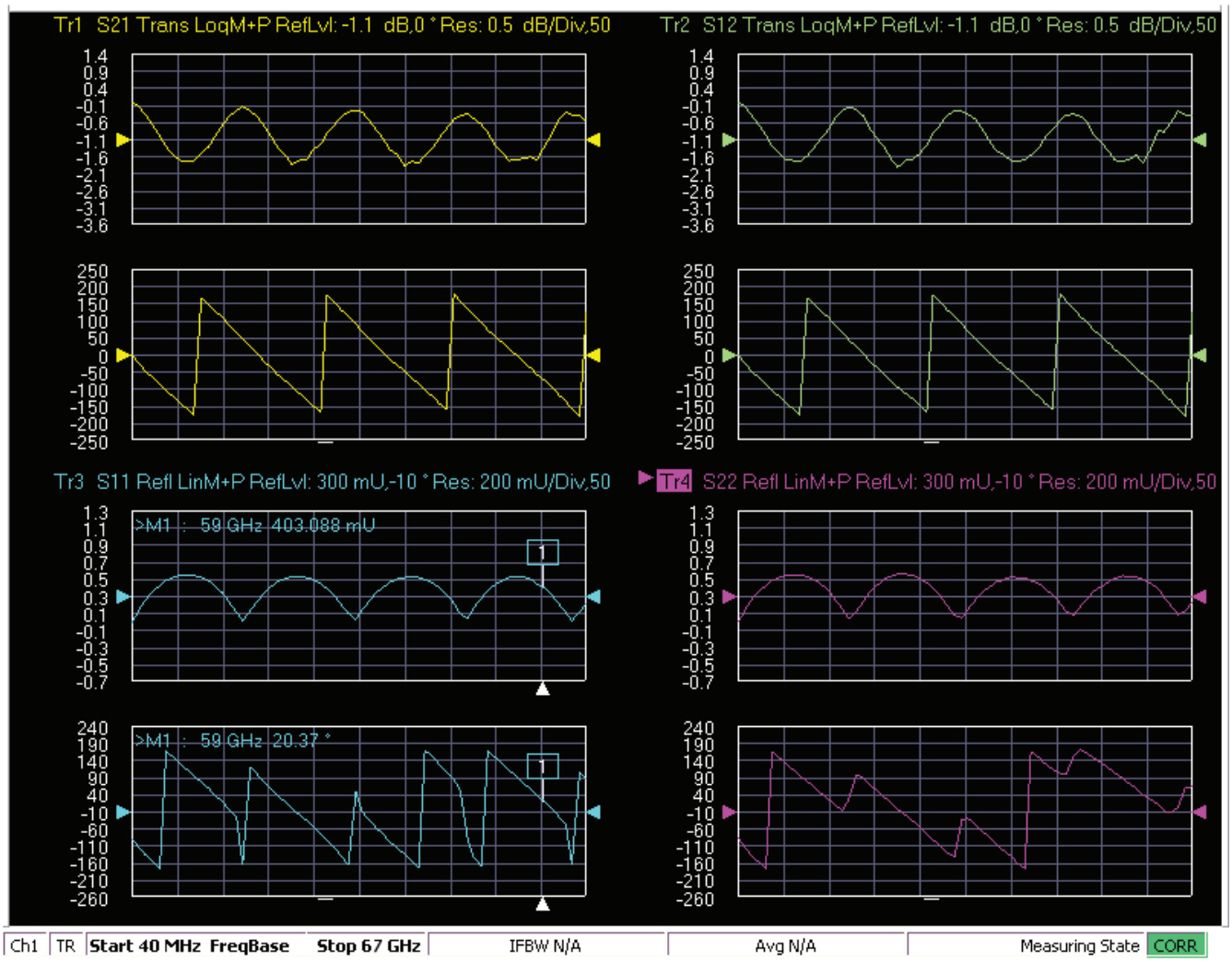


Figure 4-46. MS4640A/B Series VNA, Typical Mismatched Thru Data in Low Band

4-12 Saving Verification Data

If the Save Data button on the Main Menu tab was selected, the save data dialogs described below appear. When the save data procedure is completed, the program returns to the main menu as described previously in Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

The default directory path and file names are:

- `C:\mmdcsvc\Data\Matched Thru Low.dat`
- `C:\mmdcsvc\Data\Mismatched Thru Low.dat`
- `C:\mmdcsvc\Data\Matched Thru High.dat`
- `C:\mmdcsvc\Data\Mismatched Thru High.dat`

If the default file names should be changed, select Yes and enter the new file names. Otherwise, select No.

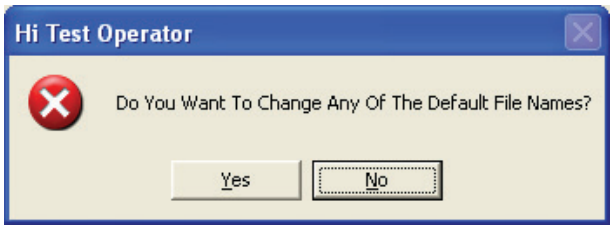


Figure 4-47. Confirmation Dialog

The following dialog is shown when the files are successfully saved to disk.

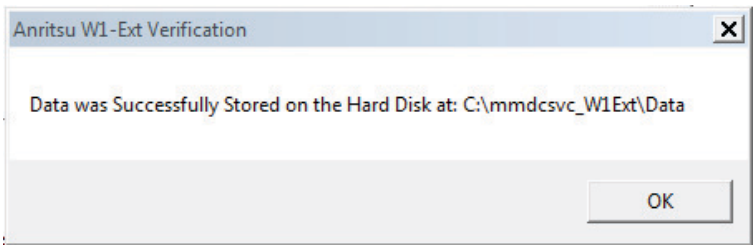


Figure 4-48. Information Dialog

4-13 Restart for Alternate Frequency Band

After the Matched Thru and Mismatched Thru tests have been successfully completed and the data saved, it is necessary to restart the program and test the other frequency band. For example, if you tested for 40 MHz to 67 GHz Frequency Range on your first calibration pass, on the second pass, select the 67 GHz to 110 GHz Frequency Range.

Procedure

1. Ensure that the verification results of the previous test have been saved to the `C:\mmdscvc\Data`.
2. To perform the verification tests for the second frequency range, on the System Verification Software Main Menu - Main Menu Tab, select the Restart button. The main menu is described in Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.
3. The Choose The Restart Method dialog box appears as shown below in Figure 4-49.

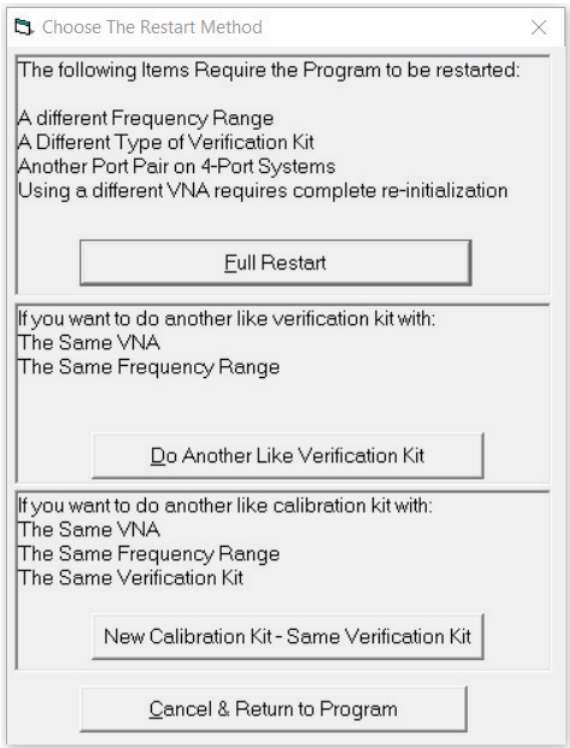


Figure 4-49. Choose The Restart Method Dialog

4. If you selected Full Restart, the calibration process starts again and the procedure steps are the same as the procedures described previously starting in Section 4-5, "Running the Verification Software", Step 5 on page 4-6.
5. The application will go through the process again.

Note	When using the Restart Menu, the system information from the fist pass is retained when cycling through the second pass.

6. Complete the calibration and verification of the devices for the second frequency range.
7. Save the second set of calibration data and verification results to `C:\mmdcsvc\Data`.
8. This series of automated tests has verified that the VectorStar ME7828A Broadband S-parameter measurement accuracy meets factory specifications and ends the calibration and verification procedure.

9. The program returns to the main menu described in Section 4-9 “Application Interface – Main Menu Tab” on page 4-23.

4-14 Troubleshooting

Difficulty Running the Program

If you have difficulty getting the program to run properly:

1. Check your GPIB interconnection cables and addresses.
2. Check to see that the Windows GPIB is present on the boot drive, that it is properly configured, and that it passes the National Instruments hardware and software tests.
3. This version of the verification software must be installed with the install program on the USB memory device. The program does not run if it is just copied from the USB memory device to the hard disk.
4. Ensure that, after starting the performance verification software, the verification kit data USB memory device is installed in the correct USB port and that it contains 20 files.

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.

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 USB drive matches that shown on the verification kit.
3. Repeat the process with a fresh calibration. Save the results of both measurements as an aid in troubleshooting, in case you require factory assistance.
4. 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.
5. Assure all active systems have been powered on at least one hour before the start of the calibrations.

If you still have difficulty after following the above steps, please contact Anritsu customer service and ask for the Vector Network Analyzer support engineer for further assistance.

Chapter 5 — GPIB Card and Instrument Settings

5-1 Introduction

The following sections describe the recommended GPIB Card and GPIB Instrument Settings. These settings apply to the VectorStar ME7838A/AX, ME7838E/EX, ME7838A4/A4X, ME7838E4/E4X, and ME7828A BB/mmWave Measurement Systems.

5-2 GPIB Board Settings

Use these settings for your GPIB controller board.

Table 5-1. GPIB Board Settings

Parameter	Setting
Primary Address	0
Secondary Address	NONE or 0
Time-out Setting	10 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 PCIIA or PCI
Base I/O Address	Consult the GPIB card manual
DMA Channel	Consult the GPIB card manual
Interrupt Level	Consult the GPIB card manual

5-3 Instrument Settings

Table 5-2. 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

Chapter 6 — Maintenance

6-1 Introduction

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

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

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

Common Causes of Connector Failure

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

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

Coaxial Connector Care

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

- Periodic visual inspection
- Routine cleaning
- Proper connection and disconnection techniques using a torque wrench

6-2 Visual Inspection

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

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

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

Magnification

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

Connector Type	Minimum Magnification for Inspection
Type N	2X
3.5 mm	7X
K (2.92 mm)	
V (1.85 mm)	
W1	10X

Figure 6-1. Magnification for Connector Inspection

Outer Conductor and Thread Inspection

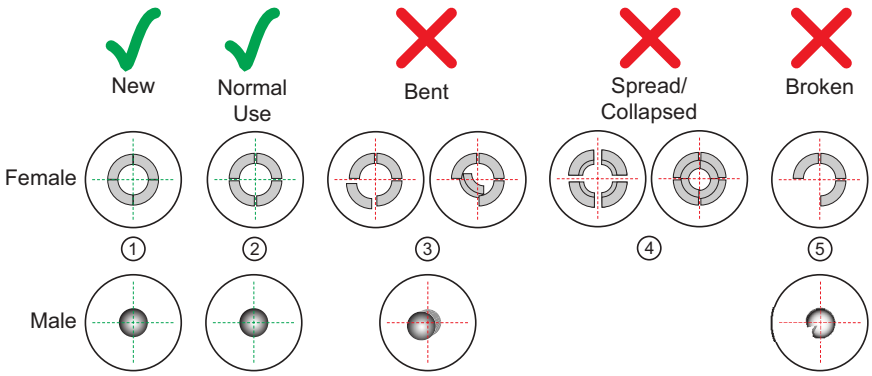
When connector threads are clean and free from defects, coupling nuts should move freely. Inspect for defects such as:

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

Note	Connectors may lose some gloss over time due to normal usage. Light scratches, marks, and other cosmetic imperfections found on the mating plane surfaces are signs of normal wear and should not be considered cause for replacement. Regular cleaning and proper connection techniques will minimize wear on the plating due to abrasion from debris.

Center Conductor Inspection

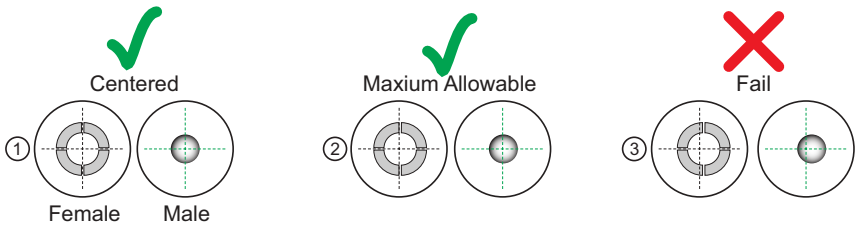
Inspect for bent, broken, or damaged center conductors:



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

Figure 6-2. Example Connector Damage States

Inspect for center pin concentricity:



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

Figure 6-3. Example Connector Concentricity

6-3 Connector Cleaning

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

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

Required Cleaning Items

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

	Teflon Tuning Washers: The center conductor on some RF components contains a small teflon tuning washer located near the point of mating (interface). This washer compensates for minor impedance discontinuities at the interface. The washer's location is critical to the RF component's performance. Be careful not to disturb it with a cotton swab or compressed air and don't apply alcohol to it.
Caution	**Compressed Air:** Do not use compressed air on power sensors. Some power sensors have components internally located near the connector that can be damaged from excessive air pressure.
	Solvents: Do not use industrial solvents or water to clean the connector. Use 90 % Isopropyl Alcohol (IPA) only. Do not spray alcohol directly onto connector surfaces. Do not saturate the swab with alcohol. Instead, lightly dampen it by touching the tip onto a bead of alcohol formed at the bottle tip as shown in Figure 6-4.

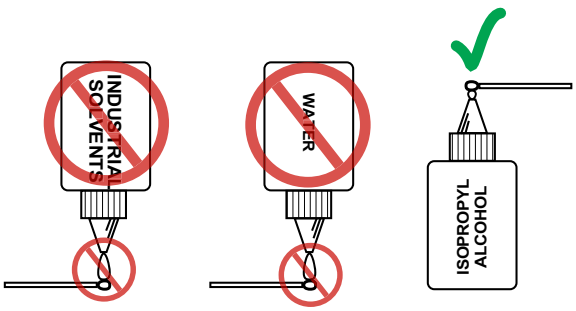


Figure 6-4. Isopropyl Alcohol Only

Procedure

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

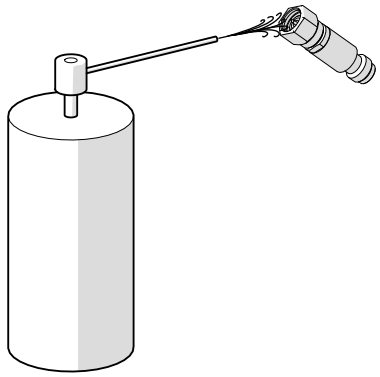


Figure 6-5. Low Pressure Compressed Air Cleaning

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

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

Figure 6-6. Avoid Angled or Large Swab

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

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

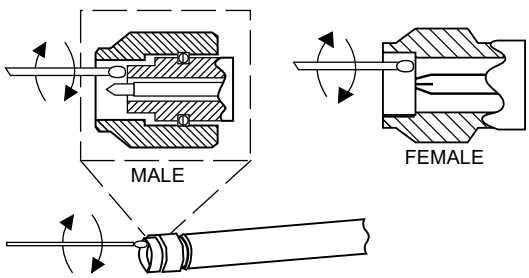


Figure 6-7. Cleaning Connector with Cotton Swabs

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

6-4 Making a Connection

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

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

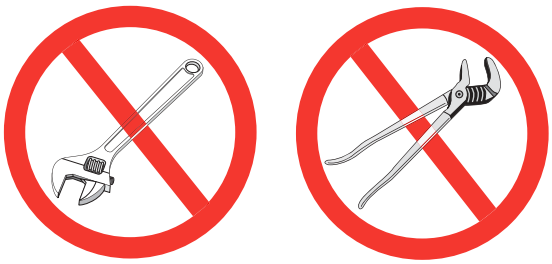


Figure 6-8. Do Not Use Pliers or Adjustable Wrenches

Before Connection

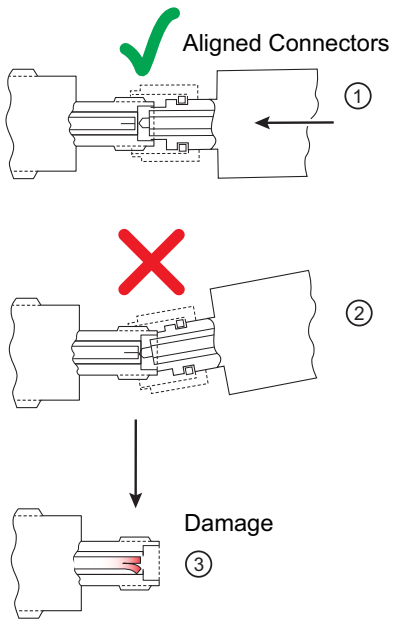
1. Verify the power and voltage levels of the device you are connecting to and the input limits of your test equipment.
2. Visually inspect the connectors for damage, cleanliness, and center pin concentricity as described in Section 6-2

   The coupling nut should move freely. If necessary, clean the connectors
3. Before touching instrument connectors, make sure you have grounded yourself and eliminated all static charge by following proper ESD handling procedures that conform to ANSI/ESD S20.20-2007.

Initial Connection

1. Carefully align the connectors as shown in Figure 6-9 on page 6-7.

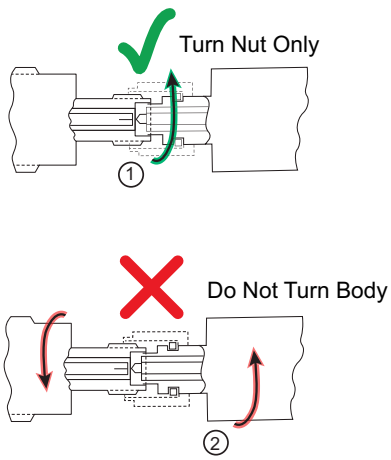
   The male connector center pin must slip concentrically into the contact fingers of the female connector. Never apply excessive force when making a connection.
2. Push the connectors straight together.
3. Do not twist while pushing them together and do not turn the connector body. As the center conductors mate, there is usually a slight resistance. Finger-tighten the connection first by turning the connector nut.
4. Back off the connection by turning the connector nut counter clockwise 1/4 turn.The final tightening is done using the appropriate torque wrench from the kit and as described in Table 6-1



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

Figure 6-9. Avoid Pin Damage Due to Misalignment

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



Index	Description
1	Turn nut only
2	Do not turn body

Figure 6-10. Tightening the Connector Nut

Torquing the Connection

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

1. Select a torque wrench of proper size and rating for the connector and an open end wrench. The open end wrench is used to prevent the body of the connector from turning. Refer to Table 6-1 for torque specifications.
2. Place the two wrenches at an angle of less than 90° as shown in Figure 6-11.

Caution	Using two wrenches with an angle greater than 90° causes the devices to lift up, which tends to misalign and stress the connectors. This becomes more of a problem when multiple devices are connected together. Breaking the handle fully can cause the wrench to kick back which may loosen the connection.

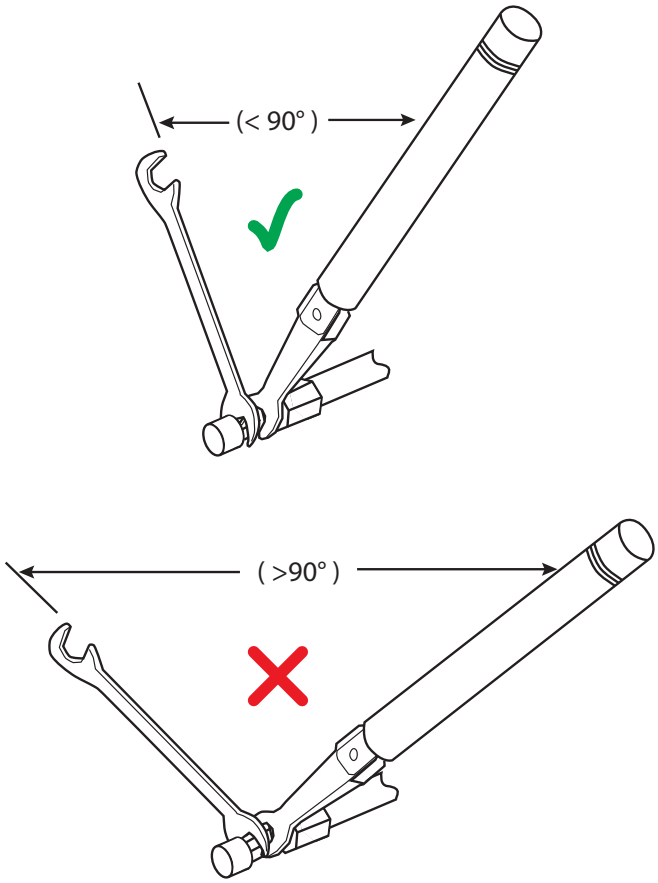
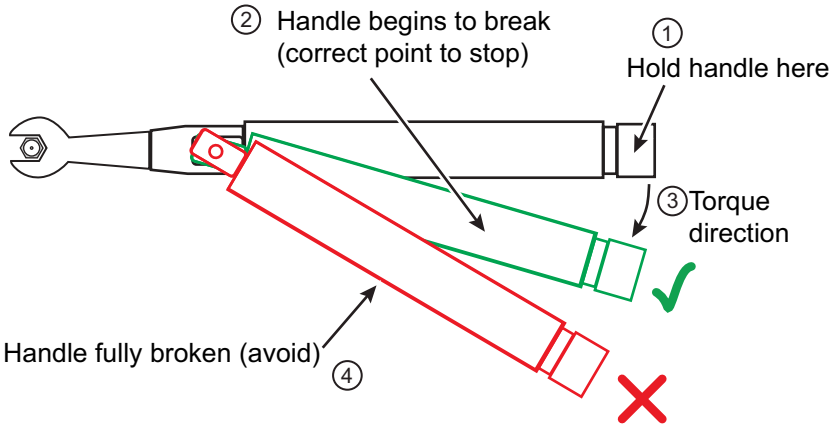


Figure 6-11. Using Wrenches at Proper Angle

3. Hold the torque wrench at the end as shown in Figure 6-12 on page 6-9.

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



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

Figure 6-12. Using a 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. Apply torque to the fitting until the handle begins to break as shown in Figure 6-12.

Torque Specifications and Tools

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

Table 6-1. Connector Torque Settings and Recommended Tools

Connector Type/Size	Wrench Size	Torque Setting	Recommended Tools
3.5 mm[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 or 8 mm Open End Wrench
GPC-7	19 mm 3/4 in	12 lbf·in 1.36 N·m	01-200 3/4 in Torque End Wrench
K (2.92 mm)	8 mm 5/16 in	0.9 N·m 8 lbf·in	01-201 5/16 in. Torque End Wrench 01-204 5/16 in. or 8 mm Open End Wrench
V (1.85 mm)	8 mm 5/16 in	0.9 N·m 8 lbf·in	01-201 5/16 in. Torque End Wrench 01-204 5/16 in. or 8 mm Open End Wrench
W1 (1 mm)	6 mm	0.45 N·m 4 lbf·in	01-504 6 mm Torque End Wrench 01-505 6 mm x 7 mm Combination Open End Wrench

a.3.5 mm, 2.92 mm and K connectors are electrically compatible with SMA and have the same connector nut size (8 mm) and torque requirement. Refer to Table 6-2 for connector compatibility information.

b.Although the 2.4 mm, 1.85 mm, and V connectors have the same connector nut size (8 mm) and torque requirement, they are not mechanically compatible with 3.5 mm. Refer to Table 6-2 for connector compatibility information.

Disconnection

To properly separate an RF connection:

1. Use the same wrench usage technique as shown in Figure 6-11.
2. Use one to prevent the connector body from turning. Use the other to loosen the connector nut.
3. Complete the disconnection by hand, turning *only* the connector nut.
4. Pull the connectors straight apart without twisting or bending.

Connector Types and Cross-Mating Compatibility

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

Table 6-2. RF Connector Characteristics

Connector Type/ Parameter	7/16 DIN	20 GHz Type N	Type N	0.8 mm	GPC 7 (7 mm)	SMA	3.5 mm	K (2.92 mm)	2.4 mm	V (1.85 mm)	W1 (1 mm)
Upper Frequency Limit (GHz)	7.5	20	18	145	18	18	26.5	40	50	67	110
Mating Type	M/F	M/F	M/F	M/F	Sexless	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	.0.8 mm only	7 mm only	3.5 mm, K	K, SMA	3.5 mm, SMA	V	2.4 mm	W 1 (1 mm) only
Dielectric	Air	Air	Air	Air	Air	Teflon	Air	Air	Air	Air	Air
Thread	M29 x 1.5	5/8–24	5/8–24	M3.5 x 0.35	0.6785-24	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	0.8	7	4.2	3.5	2.92	2.4	1.85	1

Adding column

Table 6-3. RF Connector Characteristics

Connector Type/ Parameter	7/16 DIN	20 GHz Type N	Type N	GPC 7 (7 mm)	SMA	3.5 mm	K (2.92 mm)	2.4 mm	V (1.85 mm)	W1 (1 mm)
Upper Frequency Limit (GHz)	7.5	20	18	18	18	26.5	40	50	67	110
Mating Type	M/F	M/F	M/F	Sexless	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	K, SMA	3.5 mm, SMA	V	2.4 mm	W 1 (1 mm) only
Dielectric	Air	Air	Air	Air	Teflon	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	M7 x 0.75	M7 x 0.75	M4 x 0.7
Outer Conductor (mm)	16	7	7	7	4.2	3.5	2.92	2.4	1.85	1

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