ANRITSU 2300-237
Vector Network Analyzer
Performance Verification

Software User's Guide

Software Revision 3.01

490 JARVIS DRIVE
MORGAN HILL, CA 95037-2809

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Chapter 1
General Information

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1 Introduction

This manual supports the ANRITSU 2300-237 VNA Performance Verification Software. This software is used with the ANRITSU 360X/371XXA/372XX(A/B)/373XXA Vector Network Analyzer Systems. The manual is organized into six chapters, as shown below.

General Information—provides an overview of the product.

Required Equipment—describes the test equipment, components, hardware and software required to use this product.

Configuring the System—describes how the equipment is setup and interconnected.

Configuring the Program—describes how to setup the software.

Running the Program—provides step-by-step instructions for running the software.

Troubleshooting—contains troubleshooting suggestions and service information.

2 Format of the Verification Software Media

The Performance Verification Software is offered on IBM compatible CD-ROM's.

3 Capability

This software provides for automating measurements of the test components contained in an ANRITSU Verification Kit.

It compares the measurements made on your VNA with the test component data provided in each verification kit. This will aid in determining if the measurement values are consistent with system specifications.

4 Data Output

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

20db.dat

40db.dat or 50db.dat

airline.dat

beatty.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 1.0 GHz intervals, along with separate start and stop frequencies if the start and stop frequencies do not fall on a 1 GHz spacing.

The test results can be viewed or printed from the "Main Menu" window.

Chapter 2
Required Equipment

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5 Introduction

This section describes the equipment required to use the Performance Verification Software.

6 Computer (System Controller)

Operating System

This software can be used with the following Operating Systems:

Microsoft Windows 95 [Win95]

Microsoft Windows NT 4.0 [WinNT]

Microsoft Windows 3.1X [Win16] is no longer supported

Hardware

IBM-compatible computer with 486 or Pentium microprocessor with a math coprocessor.

7 GPIB Interface Card

Depending upon the Operating System and hardware used to perform the Verification, there are different requirements for possible GPIB hardware configurations. This program has been tested with the following configurations:

Win95: National Instruments PCMCIA for Windows 95, Versions 1.2, 1.3, 1.3 and 1.5

WinNT: GPIB Software for Windows NT (Intel) (NI-488.2M Software) Version 1.2, 1.3, 1.4 and 1.5

Regardless of which GPIB hardware and software is used, the GPIB card needs to be configured as “GPIB0.”

8 **Vector Network Analyzer**

You need an ANRITSU Model 360X/37XXX(A/B) Vector Network Analyzer System, with the appropriate 3650, 3651, 3652, 3653, 3654, 3654B, 36581NNF, 36581KKF or 36582KKF Calibration Kit. A 360X system consists of a 360/360A/360B VNA, a 36XX-Series Test Set, and an ANRITSU RF signal source. Refer to Appendix B if this software is to be used with a 360X system.

9 **Verification Kit**

You need an ANRITSU 3663, 3666, 3667, 3668, 3669, or 3669B Verification Kit with a Version 2 data disk.

NOTE

This program will not work with a "Version 1" Verification Kit data disk.

10 **Printer**

A printer is not required for operation as 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.

11 **Cables**

You need a GPIB cable (ANRITSU PN: 2100-2) and a two-foot RF Test Port Cable (ANRITSU PN: 3670A50-2, 3670K50-2, 3670V50-2, 3671A50-2, 3671K50-2, or 3671V50-2.) If a verification of an AutoCal calibration is to be performed, the ANRITSU AutoCal product has its own list of cable requirements not listed here.

NOTE

The ANRITSU AutoCal product is not compatible with 360, 360A, or 37100A VNAs. Therefore, the verification program will not work in these instances. The ANRITSU AutoCal product is compatible for use with ANRITSU 360B, 372XX(A/B), or 373XXA series VNAs. The 360X/37XXX(A/B) Vector Network Analyzer will be referred to as VNA throughout this Operator's Guide.

12 **AutoCal System Requirements**

Computer:

a. Windows 3.1 or higher, 386, 486 or Pentium microprocessor with a math co-processor.

b. 1.5 MB of RAM in addition to that used by any other programs running.

c. National Instruments GPIB card with Windows software installed.

d. One available serial communications port (COM port).

e. AutoCal properly installed and functioning.

Network Analyzer:

a. ANRITSU 372XX(A/B) or a 373XXA VNA running system software version 1.04 or newer.

b. ANRITSU 360B VNA running system software version 4.04 or newer.

Chapter 3
Configuring the System

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13 Introduction

This chapter describes how the various system elements are interconnected and the preliminary steps required for operation of the verification software.

14 Hardware Interconnection

Connect the computer's GPIB port to the VNA system using the GPIB cable.

If the VNA is a 360X Network Analyzer, connect to the GPIB connector labeled "360 GPIB" ***not*** the one labeled "System Bus."

If the VNA is a 37XXXX Network Analyzer, connect to the GPIB connector labeled "IEEE 488.2 GPIB" ***not*** the one labeled "Dedicated GPIB."

Connect the two-foot test port cable female end to the VNA Port 2.

Connect a female-female Phase Equal Insertable Adapter from the Calibration Kit to the VNA Port 1. This does not apply to GPC-7 Calibrations.

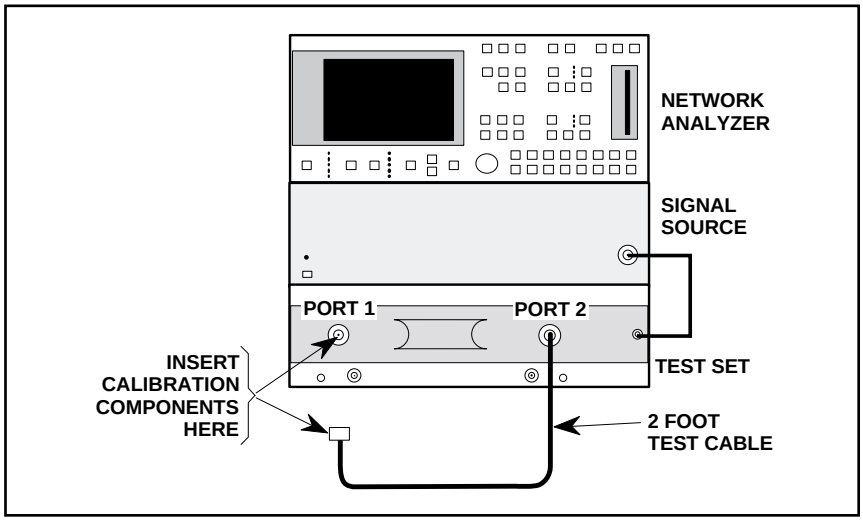

Figure 1. VNA Calibration and Measurement Setup Shown on a 360X VNA

15 **Performance Verification (PV) Software Installation**

Win16

This platform is no longer supported in this version or subsequent versions of the verification software.

CD ROM

Insert the CD-ROM into your CD-ROM Drive. The installation program should run automatically. Follow the instructions on the screen. If the installation program does not start automatically then using *Windows Explorer* or the *My Computer* icon browse to the root directory of the CD-ROM. Double click the *Startup.exe* program to begin the installation process.

Floppy Disk

Put the disk labeled "VNA Verification Setup Disk 1" into the 3.5-inch high-density-floppy drive. From the Task Bar [TB], select the Start—Run command sequence and type `X:\setup.exe`, where `X` is the drive letter of the floppy drive the disk is in. Press the Enter key.

The setup program will copy the files to your PC into the directory of your choice (you will be prompted for the destination directory). Unlike previous versions, this program cannot be run from a floppy disk directly. When the setup program is completed, the program may or may not want to restart Windows, depending if there were any files in use (usually DLLs) at the time of the installation.

NOTE

Refer to Appendix B if this software is to be used with a 360X system.

16 **AutoCal Hardware/Software Installation**

Follow the instructions in the AutoCal manual for these procedures. Refer to Figure 1 when connecting an AutoCal module to the VNA for an AutoCal Calibration.

If an ANRITSU 36581NNF or a 36582KKF AutoCal module is to be used, there are some special considerations that have to be made in order to successfully pass the verification. These are discussed later in the "Running the Program" section. The program will also advise the operator of these considerations at the proper time.

Chapter 4
Configuring the Program

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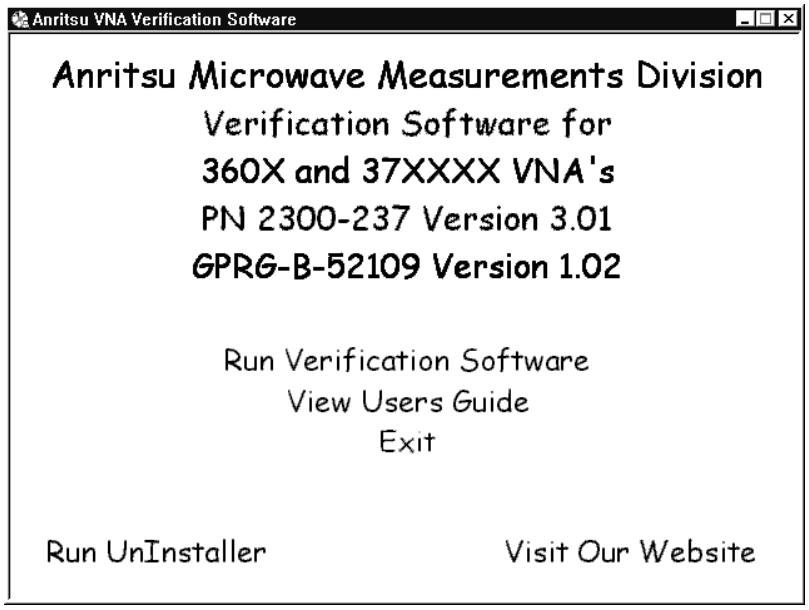
17 Introduction

This Performance Verification software runs in a Windows environment as described below.

18 Starting the Program

With the equipment and software configured as described in Chapter 3, turn on the computer and allow it to boot up to Windows.

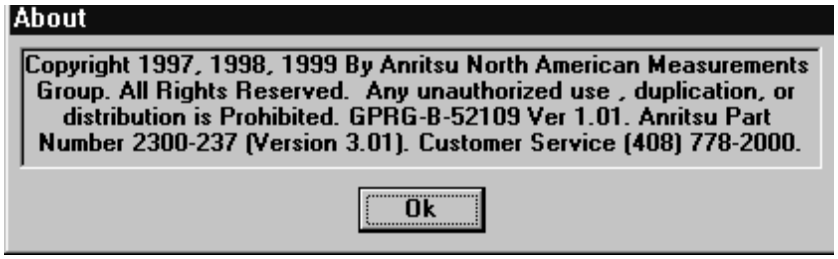
Win32
Locate the RunCoax.exe Icon on the desktop and double-click on it. The program launcher menu will be displayed. The program launcher will allow the user to Run the verification software, view the users guide, remove the program from the pc, go to the Anritsu Web Site, or exit the program launcher.



At this point you can install the 3.5-inch data disk from the Verification Kit into an available floppy drive.

The program will display an Animated Splash Screen.

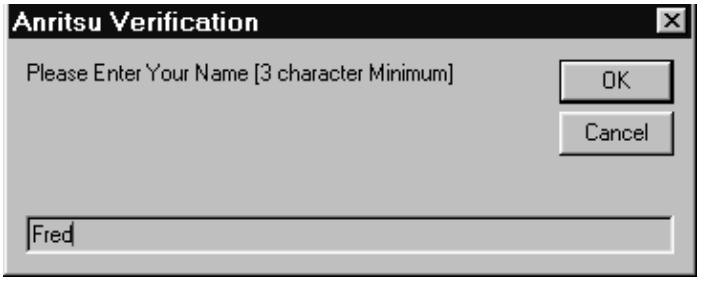
The program will display an About Box.



Press OK or Enter to continue.

19 **Entering Information for the Calibration**

The Operator will be prompted to enter their name.

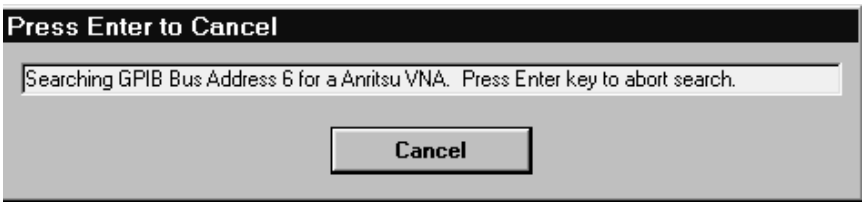


Entering Information for the Calibration

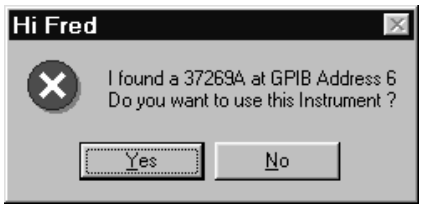
After the Operator enters his or her name, the program will check for a GPIB card at the location GPIB0.

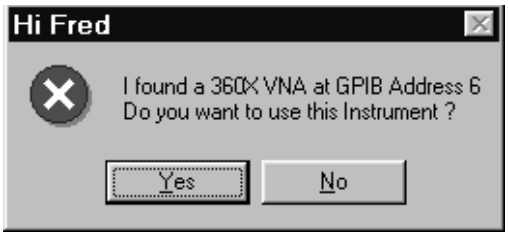
If the program finds a GPIB board at GPIB0 the program will continue. If the program does not find a GPIB Board at GPIB0, or if the operator answers No to the Dialog Box below, the program will terminate. At this point the operator should answer Yes to this question.

Next the program will search the GPIB Bus for an ANRITSU VNA. If the program finds an ANRITSU VNA, the program will respond differently depending upon the VNA type (360X or 37000 series) that is connected to the GPIB Bus.

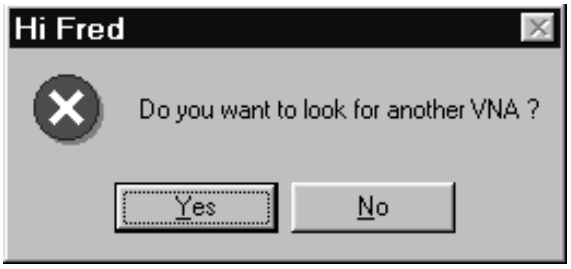


If the program finds a VNA, it will ask the Operator for information about the VNA they want to use for the Verification.





If there are multiple VNA's on the GPIB Bus, and this VNA is not the one the Operator wants to verify, then the Operator should answer No so the program will look for another VNA on the GPIB Bus.



If the Operator answers Yes to any of the above, the program will respond differently depending on which family the VNA belongs to (37000 or 360X). If the program found a 360 series VNA, it will ask the Operator several questions to gather information about the setup that cannot be determined by the program.

First the program prompts for the VNA Model number:

> Is the VNA a '360B' Model?
> There is a 360B on the front panel. (Yes or No)
>
> Is the VNA a '360A' Model?
> Serial Numbers 808XXX thru 032XXX.
> Some VNA's in the 033XX series. (Yes or No)
>
> Is the VNA a '360 Non A'?
> Serial Number 807XXX or earlier. (Yes or No)

then prompts for:

> The VNA Serial Number (minimum 5 characters)
>
> The Source Model Number (minimum 4 characters)
>
> The Source Serial Number (minimum 5 characters)
>
> The Test Set Serial Number (minimum 5 characters)

Since most of the prior information does not pertain to a 37000 Series VNA, the program will not ask those questions when a 37000 Series is found. The information the program needs for a 37000 Series VNA is obtained from the instrument itself.

If the program did not find a VNA on the GPIB Bus, the program will tell the Operator that it did not find one, then exit. If there is indeed a VNA on the GPIB Bus and the program did not find it,

then there is a problem somewhere in the system. Check the cables to make sure they are properly connected and check the GPIB system to verify that it is operating properly. If this does not alleviate the problem, there could be something wrong with the GPIB system on the VNA.

Notes

In this section of the program, items that are determined by the program to be complete enough to continue to the next step will have the Frames Text Label change color from red to green to give the Operator an indication to proceed.

If the next item is a text box that needs to be filled in, the program will automatically move the cursor to that text box.

If the next item is a multiple choice item, the program will enable the choice's frame box and turn the label of the box red to draw the Operators attention to it.

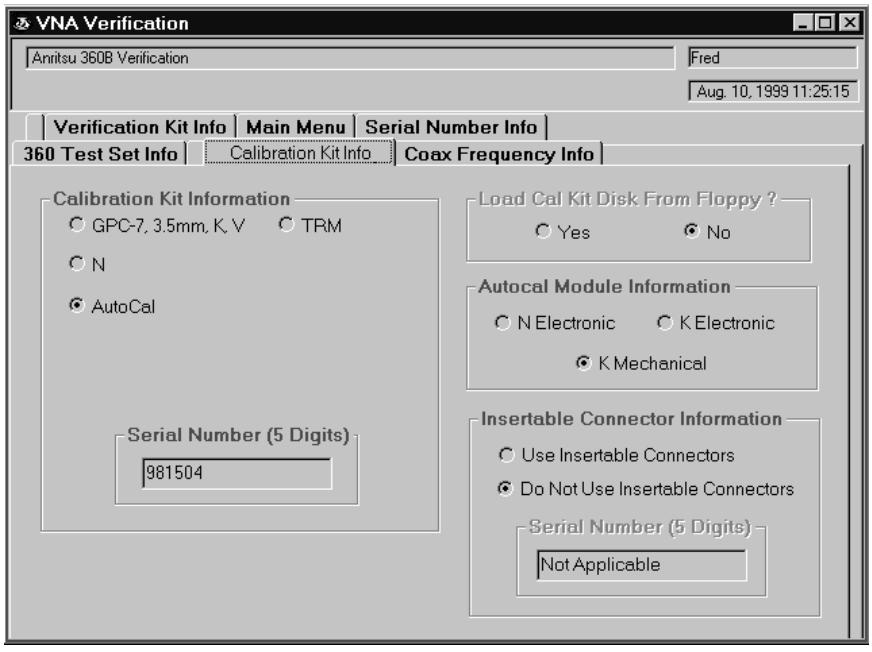
After the Operator makes a selection, the program continues in this fashion until enough information has been entered to perform a calibration. At that point, the "Calibrate VNA" button will be enabled so the Operator can start the actual calibration of the VNA. The Operator will have a chance to confirm the information that was input before proceeding with the calibration. Also, at any time up until the confirmation of the information input, the Operator can go back to any stage of the setup and change items he or she wishes to change.

Please bear in mind that changing some choices may cause some of the information to have to be re-entered. For example, if the Operator selects a different calibration kit, he or she will also have to choose the verification kit as well as the frequency range again since the newest selections may not be valid for the previous information that was entered.

Entering Information for the Calibration

If the program found a 360 Series VNA, the program will first prompt the Operator to input the Test Set's Model Number.

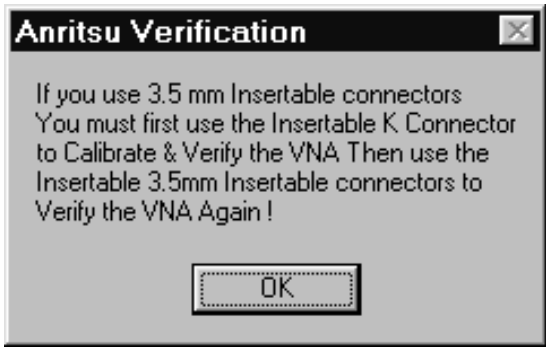
Next, the Operator will enter the information about the Calibration Kit. The Calibration Kit Coefficients disk should be loaded into the VNA. The tight tolerances of this verification program will almost guarantee the VNA WILL NOT PASS IF THIS IS NOT DONE. The Cal Kit Disk is not an absolute necessity for the program to run.



In the picture above, a setup was picked to allow the filling in of the maximum amount of information. If the Operator does not pick an 'AutoCal' Calibration then the two boxes labeled "AutoCal Module Information" and "Insertable Connector Information" would be disabled to help prevent errors.

To increase the probability of passing the verification it is recommended the calibration kit coefficients disk be loaded into the VNA. (The "No" button is a forced condition in this picture because AutoCal does not have such a disk.) Also, if the Operator moves the mouse cursor over a section that has been completed, the message: "This Section is complete. Go to another Red Section" will be displayed informing the Operator that everything is OK so far. The Operator may select another item in a "completed" section at any time but, since some choices may or may not be valid for the new selection, there may be other items that have to redone.

Also, there is an informational note displayed about using the insertable connectors with the AutoCal Module.

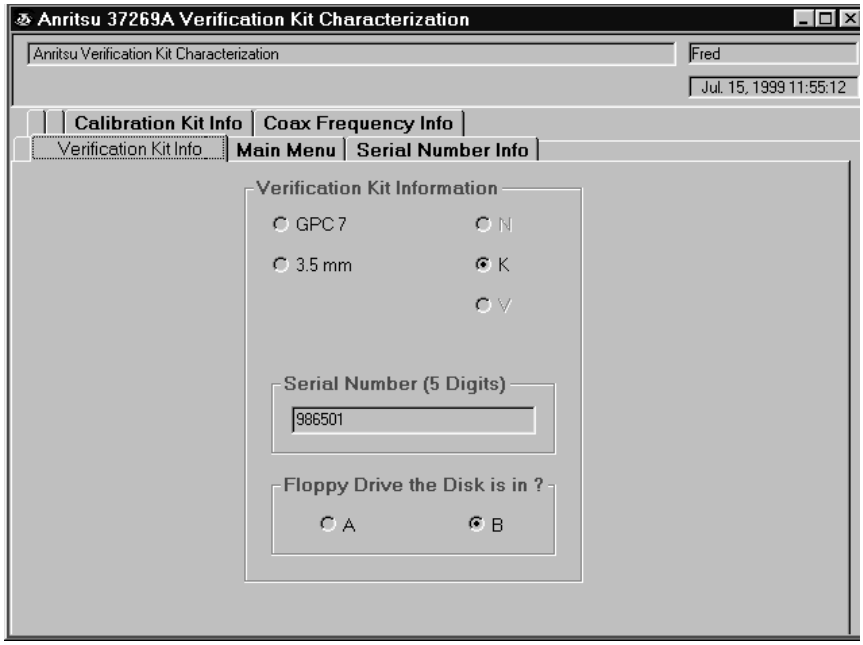


Once the Operator has entered the required information (at a minimum a Cal Kit, the Cal Kit Serial number, and the Cal Kit Disk) the program will proceed to the next step which is gathering the Verification Kit information.

Some items will be disabled depending on the choices that were made in earlier menus.

The Operator picks the Verification Kit type, enters the Verification

Kit serial number, and selects the floppy drive the Verification Kit disk is in.



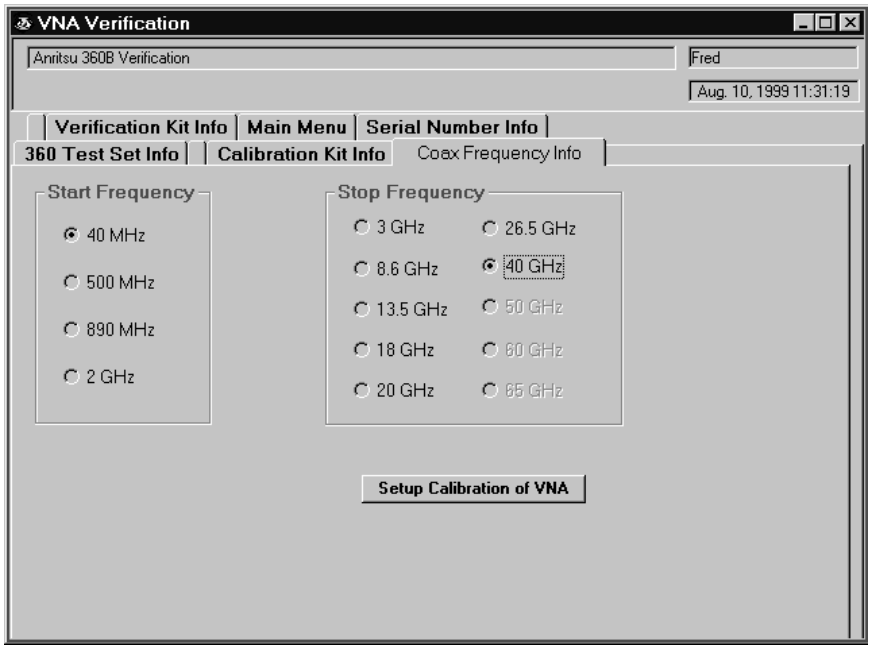
The program will tell the Operator to insert the disk into the disk drive then check to see if the correct disk (a Version 2 disk) is in the floppy drive.

Note

This program WILL NOT WORK with an older Version 1 disk because the tolerances on the Version 1 disk do not conform to the new specifications. If you do not have a Version 2 verification kit disk, you cannot use this program to verify a VNA. Customers that wish to have their verification kit upgraded to Version 2 should contact ANRITSU Customer Service at 408-778-2000 for further information.

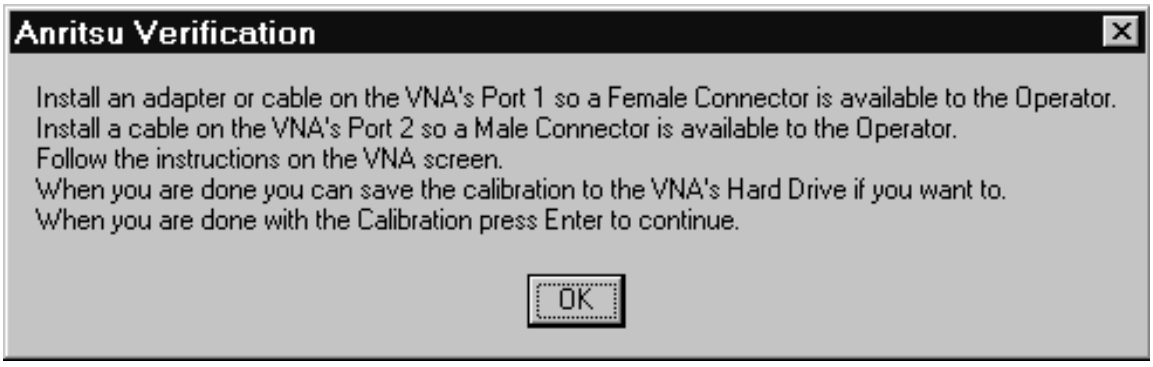
The next item that must be entered is the frequency range for the

verification to be done. Once a start and stop frequency have been selected the "Setup Calibration of VNA" button will be enabled.



When the Operator clicks "Setup Calibration of VNA," the Operator will be asked to confirm if the information entered was correct. If the operator selects No, the program will return to the setup menus so that the operator can check or change items.

If the Operator selects the Yes option, the program will setup the VNA according to the input supplied by the operator. The Operator will be instructed to follow the instructions on the VNA's screen by a dialog box similar to the one shown below.



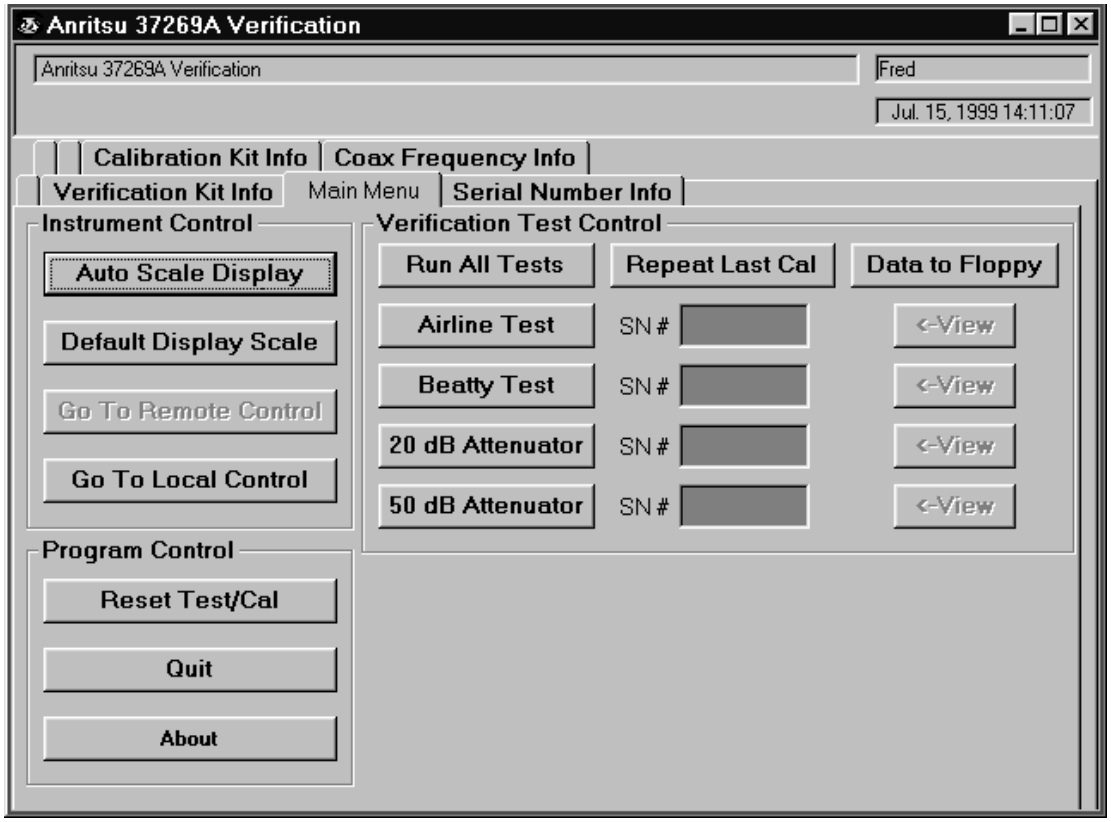
Entering Information for the Calibration

If the Calibration Kit chosen was the AutoCal Module then the operator will see the following text in a dialog box with a scroll bar:

> Please wait for the VNA to reset and setup the calibration. When it is ready, Press Alt & Escape to temporarily exit this program so you can run the AutoCal Program. Or if you want to view these instructions as you setup the AutoCal Program shrink this window so you can view the instructions and the AutoCal Program.
>
> - Important Note -
>
> If the verification to be performed involves the use of an Insertable Connector the VNA MUST BE CALIBRATED WITH THE INSERTABLE K CONNECTOR INSTALLED ON THE AUTOCAL MODULE. Then replace the Insertable K Connector with the Insertable Connector of your choice for the verification.
>
> After the AutoCal Program is finished you can SAVE the calibration. Also, after the AutoCal Program is finished you should exit the AutoCal program before you continue. Failure to do so may cause unexpected results !!
>
> Choose the Following Settings in the System Options Dialog :
> Set the Analyzer's GPIB Address to the address displayed above.
> Calibrator's Serial Port - The COM port it is connected to the VNA
> is an ANRITSU 37000 model then set Analyzer type to ANRITSU 37000
> If the VNA is a ANRITSU 360 model then set Analyzer type to ANRITSU 360 VNA Measurement Averaging Factor - Use Value in VNA
> Video IF BW - Default Value
>
> Choose the following settings in the Setup Dialog :
> type of Calibration - Full 2-Port
> type of Thur - Calibrator or True. {True will give better results.}
> Assurance - OffIsolation Averaging - Off
> Isolation Averaging - No Isolation
>
> If you are using a ANRITSU AutoCal Module 36581NNF or a 36581KKF then set the switch averaging to 1.
>
> If you are using a ANRITSU AutoCal Module 36582KKF then set the switch averaging to 2.
>
> Note : the sex of the connectors on the AutoCal modules 36581NNF and 36582KKF are reversed compared to the 'Normal' way connections are made. Therefore, connect the AutoCal Module's male connector to the VNA's Port 1.
> Connect the AutoCal Module's female connector to the VNA's Port 2.
> Set the Port Configuration - L = Port 2, R = Port 1
>
> otherwise for the AutoCal Module 36581KKF:
> Set the Port Configuration - L=Port 1, R=Port 2

Entering Information for the Calibration

When the operator clicks the OK button in the 'Setup Instructions' dialog box, the program will setup the VNA for running the tests on the verification devices and display the 'Main Menu' shown below.



Chapter 5
Running the Program

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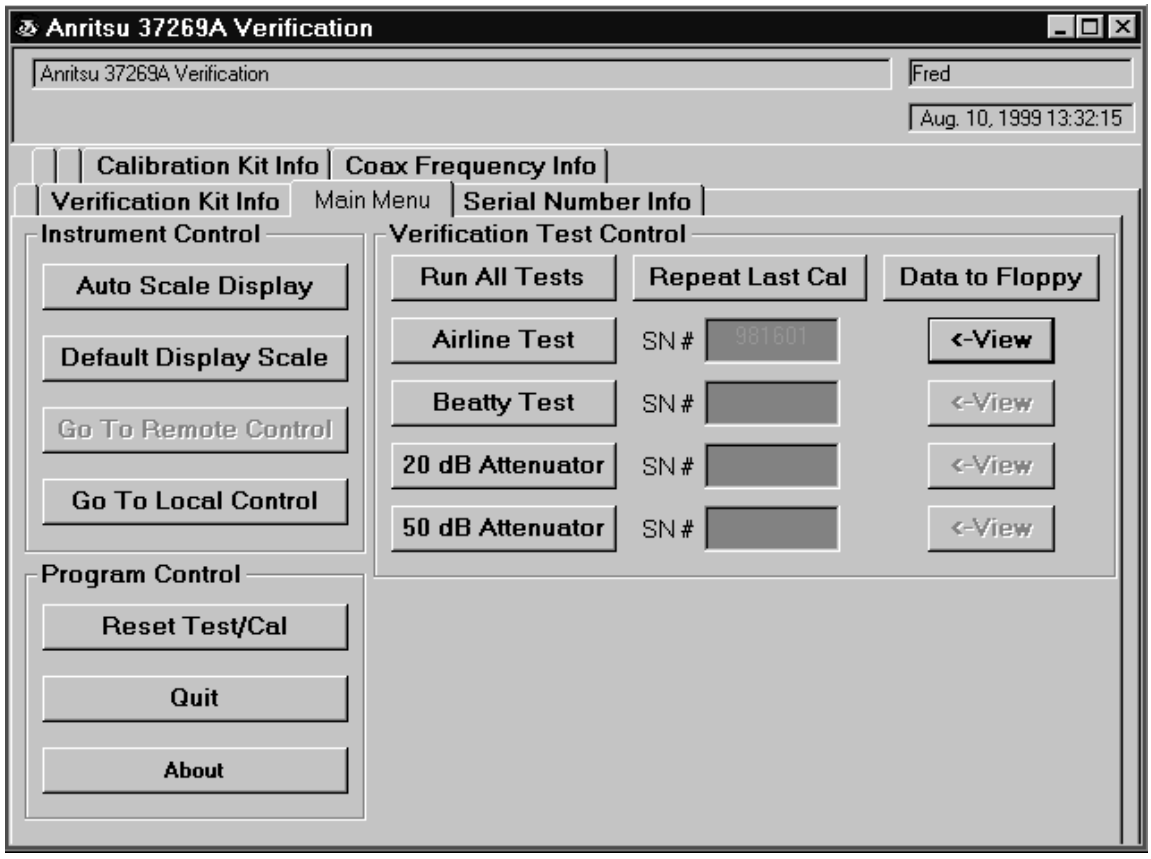
20 Running the Program

Note

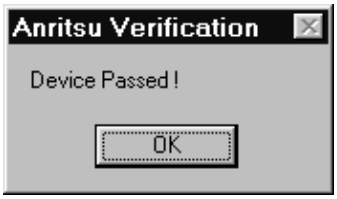
Anytime the program is executing a command from the main menu, the buttons will be disabled until the currently executing command is finished. This is necessary due to the event driven nature of Windows. Also, while a command is being executed, informational messages may be displayed on the screen.

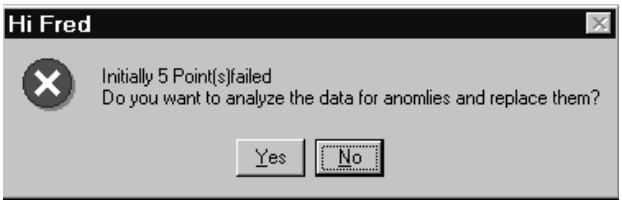
The picture below shows that only the Airline test has been run so far.

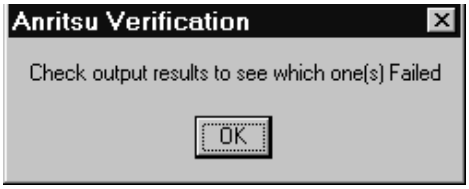


The 50 dB Attenuator test has not yet been run. If a device passes, the serial number text will turn GREEN. If a device fails, the serial number text will turn RED. If a test for a device was canceled before pass-fail status could be established, the serial number text will be BLACK. If a device has not been tested there will be no entry for the serial number. Also, if a 'V' Verification Kit was chosen earlier, the 50 dB Attenuator button would say "40 dB Attenuator".

The test results, pass or fail, will be displayed in dialog boxes and in the 'Verification Test Control' Frame.







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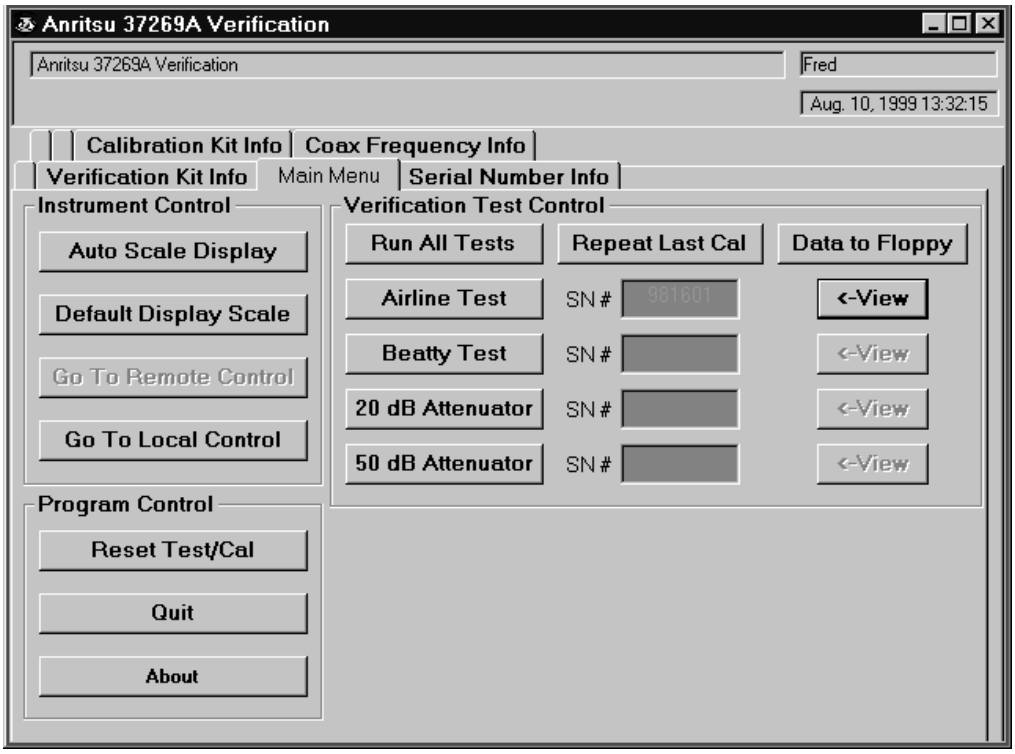
The Commands

The Main Menu consists of three frames: Program Control, Instrument Control, and Verification Test Control. Each frame contains command buttons to control various program operations.



Program Control Frame

About
Displays version information, Copyright and other legal notices as well as Company Contact information.

Quit
Selecting Quit will bring up a confirmation box. Selecting Yes will exit the program; selecting No will return the user to the previous screen.

Reset Test/Cal
This command allows the operator to change the VNA to test, the Frequency Range, or the selected Verification Kit. If the operator wants to change the VNA, Frequency Range, or Verification Kit type, the program will reinitalize back to the begining. If the operator wants to do another like verification kit the program will re-initialize to the point after calibration.

Instrument Control Frame

Auto Scale Display
This command will automatically scale each channel on the VNA. It is the same as selecting a front panel channel button then pushing the front panel Auto Scale button for each channel.

NOTE

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

Default Scale Display
This command sets all four channels to a scale of 15 (dB or Unit/Div for a 37XXXX) or 30 (dB or Unit/Div for a 360X) and the reference value to 0. This will allow the operator to see if any device might be properly connected.

Go to Remote Control
This command is only available after the operator has clicked the 'Go to Local Control' button. When the operator pushes this button, the program takes control of the VNA and restores the VNA to the same state it was in after the instrument was calibrated.

Go to Local Control
This command allows the user 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.

Verification Test Control Frame

Run All Tests
This command button will run all of the tests (Airline, Beatty, 20 dB, 40-50 dB) in order. The operator will be prompted for information as required.

Airline Test
This command button will run an Airline test only, then display the results.

Beatty Test
This command button will run a Beatty Airline test only, then display the results.

20 dB Attenuator
This command button will run a 20 dB Attenuator test only, then display the results.

40-50 dB Attenuator
This command button will run a 40 or 50 dB Attenuator test only, then display the results.

Data to Floppy
This command button will write the data files of the last set of tests that were run to the same floppy disk drive that the Verification Kit Disk is in. The operator will be prompted to remove and reinsert the Verification Kit Disk at the proper times. The program will not write data to the Verification Kit Disk, even if the disk is not write protected.

Repeat Calibration
This command button will recalibrate the VNA according to the CURRENT Calibration. This provides a way to quickly recalibrate the VNA without having to reset the program parameters in case the original calibration was flawed for some reason.

View Buttons
These buttons allow the user to view or print the test results without the use of an external program.

22

Running a Test

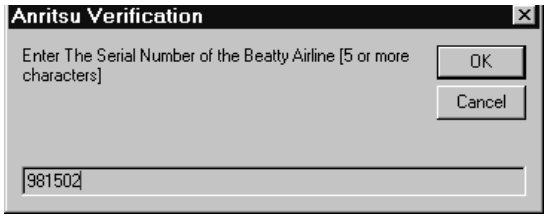
This section presents the typical test scenario.

Note

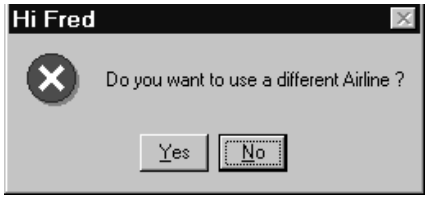
In this section the testing of a Beatty Airline is used as an example. If any other device is tested, the program will respond in a similar manner except the word ' Beatty Airline' will be replaced with 'Airline', '20 dB Attenuator', or '50 dB Attenuator' as appropriate.

When either the Run All Tests, Airline Test, Beatty Test, 20 dB Attenuator, or the 40-50 dB Attenuator command button is pushed the program can respond in one of two ways. If no device has previously

been tested, the program prompts the operator for the serial number of the device to be tested.

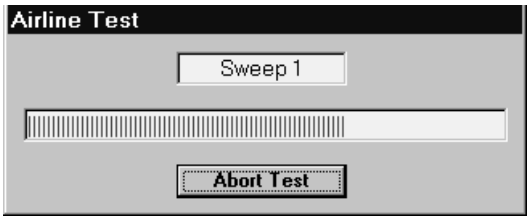


If a device has been previously tested, the program will prompt to determine if the test is to be run on the same or a different device.



Selecting Yes will display the dialog to input the serial number for the new device (above). Selecting No will display the device's connection dialog box (below).

While a test is running, the following dialog box will be displayed:

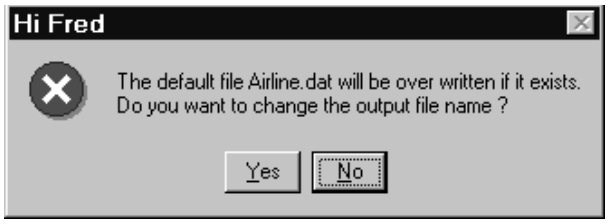


As the test progresses, vertical bars will be inserted, from left to right, into the progress bar. At the end of the first sweep the program will display a "Paused" dialog box. The trace display is autoscaled on the VNA, so that the operator can see how the device is doing. During the second sweep the program will insert vertical bars, from right to left, into the "Sweep2" dialog box. At the end of the second sweep, the program will autoscale the VNA display again. If the operator aborts the test during the first or second

sweep, the program will display an informational “Test Aborted” dialog box.

The VNA will finish the current sweep then return to the “Main Menu.”

When the test is finished, the program will get the test data from the VNA, read in the data from the Verification Kit Disk, calculate the uncertainties, inform the operator if the device passed or failed. If the device failed the program will display the number of points that failed, the test and prompt the operator to retest the specific failed points. Please bear in mind that the larger the number of failed points the longer it will take to recheck them. If there is a large number of failed points, then rechecking those points might be skipped; there is probably something else wrong, such as bad or worn connectors or devices. After this option the program then writes the measurements to the data files. When the program starts to save the data to a file, the program will display the following dialog box.



Select Yes to enter a specific filename to save the data to. Selecting No will cause the program to write the data to the Default File Name for the device under test. After saving the data, the program will return to the Main Menu.

Chapter 6
Troubleshooting

Contents

23 Difficulty Running the Program

If you have difficulty getting the program to run properly:

1. Check your GPIB interconnection cables and addresses. For a 360X VNA the GPIB cable between the computer and instrument should be no longer than two meters.
2. Check to see the Windows GPIB is present on the boot drive, is properly configured, and passes the National Instruments hardware and software tests.
3. This version of the verification software must be installed with the install program on disk one. The program will not run if is just copied from the floppy disks to the hard disk.
4. Ensure that, after starting-up the Performance Verification Software, the Verification Kit data disk (Version 2) is installed in drive A or B and that it contains the following files:

   AIRLINE.S12, AIRLINE.S11, AIRLINE.S21, AIRLINE.S22

   BEATTY.S12, BEATTY.S11, BEATTY.S21, BEATTY.S22

   DB20.S12, DB20.S11, DB20.S21, DB20.S22

   DB4050.S12, DB4050.S11, DB4050.S21, DB4050.S22
5. If you are using a 360X VNA, check that the GPIB settings for the GPIB card and the instrument address is correct. The default instrument address is 6. Setup both the GPIB card and the instrument according to Appendix B.

If, after checking the above, you are still having difficulty, contact ANRITSU Customer Service at (408) 778-2000 (FAX: (408) 778-0239) and ask for the Vector Network Analyzer Support Engineer for further assistance.

24 Difficulty Meeting System Specifications

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

1. Check both the verification kit and calibration kit devices for signs of physical damage. Make sure that the connectors are clean.
2. Ensure that the serial number of the verification kit data disk matches that shown on the verification kit, and that the verification kit disk is a Version 2 disk.

3. Repeat the process with a fresh calibration. Save the results of both measurements as an aid in troubleshooting, if 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.

If, after following the above steps, you still have difficulty, please contact ANRITSU Customer Service at (408) 778-2000 (FAX: (408) 778-0239) and ask for the Vector Network Analyzer Support Engineer for further assistance.

Appendix A
Example of Tabular Test Results

Anritsu VNA Verification Version 3.00
VNA Model : 360B VNA Serial Number : 981501
Test Set Model Number : 3621 A Test Set Serial Number : 981503
Source Model Number: 360ss69 Source Serial Number : 981502
Calibration Kit Model Number : 3652-1 Calibration Kit Serial Number : 981401
Verification Kit Model Number : 3668 Verification Kit Serial Number : 981402
Date :8/19/99 11:52:51 AM Operator : Fred
Airline Serial Number : 981301

	S21 Magnitude					S21 Phase				
Freq GHz	STD (dB)	MEAS (dB)	DIFF S-M	UNC +/-	Pass Fail	STD DEG	MEAS DEG	DIFF S-M	UNC +/-	Pass Fail
.04	-.0072	-.0013	-.0059	.2400		-.7279	-.7375	.0096	1.9160	
1.00	-.0150	-.0150	.0000	.2411		-19.0717	-19.0992	.0275	2.3000	
2.00	-.0270	-.0119	-.0151	.2422		-38.1178	-38.1874	.0696	2.7000	
3.00	-.0230	-.0161	-.0069	.2433		-57.1481	-57.2633	.1152	3.1000	
4.00	-.0207	-.0175	-.0031	.2444		-76.2193	-76.2933	.0740	3.5000	
5.00	-.0245	-.0227	-.0018	.2455		-95.2885	-95.3479	.0594	3.9000	
6.00	-.0244	-.0214	-.0030	.2466		-114.3624	-114.3997	.0373	4.3000	
7.00	-.0390	-.0261	-.0129	.2477		-133.4413	-133.5391	.0978	4.7000	
8.00	-.0323	-.0354	.0030	.2488		-152.4128	-152.5198	.1070	5.1000	
9.00	-.0259	-.0270	.0010	.2499		-171.4536	-171.5839	.1302	5.5000	
10.00	-.0330	-.0268	-.0062	.2510		169.5806	169.3428	.2378	5.9000	
11.00	-.0311	-.0255	-.0055	.2521		150.4675	150.3231	.1445	6.3000	
12.00	-.0270	-.0299	.0028	.2532		131.5260	131.2803	.2456	6.7000	
13.00	-.0414	-.0366	-.0048	.2543		112.3815	112.0439	.3376	7.1000	
14.00	-.0797	-.0774	-.0023	.2554		93.2610	92.9081	.3529	7.5000	
15.00	-.0755	-.0685	-.0070	.2565		74.5050	74.1548	.3501	7.9000	
16.00	-.0534	-.0523	-.0011	.2576		55.7022	55.2081	.4941	8.3000	
17.00	-.0356	-.0394	.0039	.2587		36.5156	36.0877	.4280	8.7000	
18.00	-.0140	-.0192	.0053	.2598		17.1942	16.8801	.3141	9.1000	
19.00	-.0301	-.0331	.0030	.2609		-1.8969	-2.2218	.3249	9.5000	
20.00	-.0377	-.0381	.0004	.2620		-20.8544	-21.2927	.4383	9.9000	
21.00	-.0541	-.0499	-.0041	.2631		-39.8890	-40.1863	.2973	10.3000	
22.00	-.0542	-.0536	-.0006	.2642		-59.0083	-59.4669	.4586	10.7000	
23.00	-.0338	-.0360	.0023	.2653		-78.0750	-78.6411	.5661	11.1000	
24.00	-.0427	-.0286	-.0141	.2664		-96.9958	-97.4680	.4722	11.5000	
25.00	-.0556	-.0405	-.0151	.2675		-116.0769	-116.5969	.5200	11.9000	
26.00	-.0495	-.0506	.0012	.2686		-135.1926	-135.7708	.5782	12.3000	
27.00	-.0524	-.0535	.0010	.2697		-154.2416	-154.8237	.5820	12.7000	
28.00	-.0618	-.0494	-.0124	.2708		-173.3450	-173.8467	.5017	13.1000	
29.00	-.0709	-.0586	-.0123	.2719		167.6730	167.0468	.6262	13.5000	
30.00	-.0615	-.0557	-.0058	.2730		148.6410	148.0708	.5702	13.9000	
31.00	-.0670	-.0626	-.0044	.2741		129.6169	129.1705	.4464	14.3000	
32.00	-.0561	-.0382	-.0179	.2752		110.4867	110.0088	.4779	14.7000	
33.00	-.0867	-.0185	-.0682	.2763		91.3969	90.6197	.7772	15.1000	
34.00	-.0759	-.0628	-.0131	.2774		72.4525	71.6582	.7943	15.5000	
35.00	-.0564	-.0762	.0198	.2785		53.4577	52.7349	.7228	15.9000	
36.00	-.0693	-.0683	-.0010	.2796		34.2709	33.6507	.6203	16.3000	
37.00	-.0811	-.0679	-.0132	.2807		15.2775	14.4831	.7945	16.7000	
38.00	-.0883	-.0648	-.0235	.2818		-3.9279	-4.6249	.6971	17.1000	
39.00	-.1384	-.0934	-.0450	.2829		-23.2664	-24.0578	.7914	17.5000	
40.00	-.1644	-.1409	-.0235	.2840		-41.9571	-42.9153	.9582	17.9000	

Appendix B
GPIB Card and Instrument Settings

Following are the recommended GPIB Card and Instrument Settings

GPIB Board Settings

Primary Address = 0
Secondary Address = NONE or 0
Timeout 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 μseconds
Parallel Poll Duration = Default

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

Use this GPIB Interface = yes or checked
Board Type = your board type (PCIIA, PCI, etc.)
Base I/O Address = consult the GPIB card manual
DMA Channel = consult the GPIB card manual
Interrupt Level = consult the GPIB card manual

Instrument Settings

Primary GPIB Address = 6
Secondary GPIB Address = NONE
Timeout Setting = 10 seconds
Serial Poll Timeout = 1 second

Terminate Read on EOS = no or unchecked
Set EOI on 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

Appendix C
Allowable Calibration Kit VNA, Verification Kit Combinations

This set of tables is to be used as a guide in determining if you can perform verifications on an instrument with a given calibration & verification kit. There are two sets of verification kit tables and two sets of calibration kit tables. The verification kit tables cross-reference verification kits with VNA's. There is one table for 37000 series VNA's and one table for 360X VNA's. The table for 360X VNA's is further broken down into like testset groupings. Each calibration kit has been assigned a Reference Code. This Reference Code is also in the verification kit tables.

One way to use the charts is to start with a verification kit chart. Pick the instrument-testset to be used in the test from the far-left column. Next pick the verification kit to be used in the test from the top row. Scan to the box where the instrument-testset and verification kit intersects. If there is a reference code for a calibration kit in that box then the combination of equipment picked can be verified. If there is not a reference code in that box then the combination of equipment picked can not be verified.

Table C-1. Allowable Calibration Kit - Verification Kit - Instrument Combinations

	Verification Kit					
A or B Models	**N (3663)**	**3.5 mm (3666)**	**GPC7 (3667)**	**K (3668)**	**V (3669)**	**V (3669B)**
37147				A3*		
37169				A3*		
37(2/3)11	A4, B1	A1, B4, B5	A2	A3, B2, B4		
37(2/3)17	A4, B1	A1, B4, B5	A2	A3, B2, B4		
37(2/3)25	A4, B1	A1, B4, B5	A2	A3, B2, B3, B6, B7		
37(2/3)47	A4, B1	A1, B4, B5	A2	A3, B2, B3, B6, B7		
37(2/3)69	A4, B1	A1, B4, B5	A2	A3, B2, B3, B6, B7		

Table C-1. Allowable Calibration Kit - Verification Kit - Instrument Combinations (Continued)

360, 360A, 360B						
Test Sets	**N (3663)**	**3.5 mm (3666)**	**GPC7 (3667)**	**K (3668)**	**V (3669)**	**V (3669B)**
3610, 3620	A4, B1	A1, B4, B5	A2	A3, B2, B6, B7		
3611, 3621	A4, B1	A1, B4, B5	A2	A3, B2, B6, B7		
3612, 3622				A3	A5	A5
3613, 3623				A3	A5	A5
3630						
	Calibration Kit					
	3650-1 (3.5 mm)	3651-1 (GPC7)	3652-1 (K)	3653 (N)	3654 (V)	36581NNF (N Autocal)
Reference Code	A1	A2	A3	A4	A5	B1
	Calibration Kit					
	36581KKF (K Electronic Autocal 20 GHz)	36582KKF (K Mechanical Autocal 40 GHz)	36581KKF with 36583L	36582KKF with 36583L	36581KKF with 36583K	36582KKF with 36583K
Reference Code	B2	B3	B4	B5	B6	B7

Option 3 - Asymetrical testset selection is permitted on 3610, 3611, 3612, 3613 Test Sets only.

* Requires the use of a SM5235 or SM5392 S Parameter Test Set Adapter
36583L and 36583K are Phase Equalized insertable adapters

NOTES

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Anritsu