Operations Manual

ShockLine™ MS46121A/B Series Compact Vector Network Analyzer

MS46121A/B-006, 150 kHz to 6 GHz, 1-Port

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

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Chapter 1 — General Information

1-1 Introduction

The MS46121A/B 1-Port Compact VNA User Guide provides an overview of the ShockLine™ MS46121A/B Series Vector Network Analyzer (VNA). This guide also provides a description of its major functions, available documentation, a brief summary of available precision component kits including mechanical calibration kits and verification kits.

1-2 ShockLine MS46121A/B Series VNA Description

The MS46121A/B 1-port VNA is a handheld USB powered single-port vector network analyzer, see Figure 1-1. The MS46121A/B has no power supply. A user-supplied computer supplies power and control to the VNA through a Micro USB cable. The ShockLine MS46121A/B 1-Port Compact USB VNA is an instrument that contains a built-in source, test set for signal separation, and analyzer.

Designed for simple engineering, manufacturing, and educational applications, the MS46121A/B series VNA supports manual test programming through the same Graphical User Interface (GUI) available on all the ShockLine family VNAs. Refer to Chapter 4 — User Interface for a description of the ShockLine controlled MS46121A/B Graphic User Interface.

Figure 1-1. MS46121A/B 1-Port Compact VNA with USB cable attached.

Test results are displayed real time on an external PC. Screen captures can easily be printed or saved in common graphic file formats. Measurement files, setup files, and interface screen captures can be saved to and recalled from the controller device.

Additional Features

- ShockLine software can control up to (16) MS46121A/B VNAs simultaneously.
- Each MS46121A/B is assigned a separate software channel.
- Each MS46121A/B has up to (16) trace display graphs.
- Each trace can have up to (12) standard markers and one reference marker.
- Each channel has up to 20001 total test points available.

1-3 ShockLine MS46121A/B VNA Models and Options

The ShockLine VNA is available in two frequency models as shown in Table 1-1.

Table 1-1. ShockLine MS46121A/B Series VNA Models

VNA Model Number	Name	Specifications	Test Port Connectors
MS46121A/B-006	USB 1-Port Vector Network Analyzer	150 kHz – 6 GHz	N(m) Connector Test Port

Options

The MS4612A/B options are listed below.

Option	Descriptions
MS46121A/B-002	Low Pass Time Domain
MS46121A/B-021	Scalar Transmission Measurement

1-4 Operating Environment Requirements

MS46121A/B Environmental Requirements

The ShockLine MS46121A/B Series VNA should be operated within the following environmental limits.

Table 1-2. Operational Environmental and Power Requirements

Parameter	Specification
Environmental Requirements (per MIL-PRF-28800F; class 4)	
Operating Temperature Range:	–10 ºC to 55 ºC
Maximum Relative Humidity:	95 % RH at 40 ºC, non-condensing

1-5 Recommended External PC Configuration and Operating System

The MS46121A/B is a 1-Port Compact USB VNA that is controlled from an external PC running ShockLine software. The recommended external PC configuration and operating system is listed in Table 1-3.

Table 1-3. Recommended External PC Configuration

Equipment	Description
Operating System	Windows® 7, 8, 8.1, or 10; 32- or 64-bit operating systems
CPU	Intel® Core™ i5-6300U Processor
RAM	4 GB
Disk	120 GB
Graphics	3D Hardware Accelerated Graphics Capability
> 1 MS46121A/B USB connection	An externally powered USB hub may also be used

Remote Operation

ShockLine remote operational options are outlined in Table 1-4.

Table 1-4. Remote Operation Options

Communication Type	Description
Drivers	Drivers: IVI-C drivers are available for download from the Anritsu website. The IVI-C package supports National Instruments LabVIEW and LabWindows, C#,.NET, MATLAB, and Python34 programming environments.
SCPI	SCPI Protocol: defines a set of standard programming commands for use by all SCPI compatible instruments. SCPI commands for the MS46121A/B are listed and defined in the *ShockLine Programming Manual* located at the Anritsu Website at: https://www.anritsu.com/test-measurement/products/ms46121b

1-6 ShockLine MS46121A/B VNA Instrument Control

The ShockLine MS46121A/B Series VNA is controlled and operated by an external PC controller loaded with ShockLine Software. See Figure 1-2.

Figure 1-2. MS46121A/B Connected to PC Controller

Operational Requirements

Operating the MS4612A/B requirements include:

- MS46121A/B Series VNA
- An external computer with monitor or touchscreen, keyboard, and mouse
- ShockLine Down-loadable Software
- USB A to a Micro-B Cable

Note	The PC Controller is an External Computer which is provided by the user. Windows 7 or greater is required to run the ShockLine software that controls the MS46121A/B series VNA.

Graphical User Interface

The graphical user interface (GUI) provides a combination of a menu command bar, icon task bar, and right-side navigation menu for most system functions. All of the on-screen navigation elements can be accessed on the user supplied computer.

1-7 Accessories

The MS46121A/B 1-Port VNA accessories are listed below.

Accessory	Part Number
External PC with Windows 7, Windows 8, or Windows 10	Not Included
USB cable with a USB A to Mini-B Connector	3-2000-1498
Flier with instructions on where to download software and documentation	

1-8 Calibration and Verification Kits

Precision-Component and Calibration Kits

Precision calibration kits contain precision-components used to identify and separate error sources inherent in microwave test setups. Certain kits contain a USB memory device that provides coefficient, characterization, or measurement data for each component. Refer to the MS46121B technical data sheet for detailed specifications on automatic calibrators located at: https://www.anritsu.com/test-measurement/products/ms46121b.

Precision-component calibration kits are available on the Anritsu Website located at: the Precision-component Calibration Kit page.

Mechanical Calibration Kits

The mechanical calibration kits provide 50 ohm calibrations for N devices. The mechanical calibration kits for ShockLine VNAs is available on the Anritsu Website located at the Mechanical Calibration Kit page.

1-9 Statement of Volatility

This product has non-volatile memory, but does not store user, set-up, or test data.

1-10 Documentation Conventions

The following conventions are used throughout the entire MS46121A/B Series VNA documentation set.

Instrument Identification

Throughout this manual, the following term definitions are used:

- ShockLine VNA refers to any ShockLine VNA module or system.
- VNA refers to any ShockLine VNA module.
- MS46121A/B 1-Port series VNA refers to any of the VNAs in the MS46121A/B family.
- When specifying a particular VNA model, the specific model number is used, such as MS46121A/B-006 refers to the 6.0 GHz model.

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

Instrument Connectors

Panel connectors are denoted with a bold Sans Serif font such as **10 MHZ IN**.

User Interface, Menus, and Soft Buttons

The ShockLine™ MS46121A/B Series VNA user interface consists of menus, button lists, sub-menus, toolbars, and dialog boxes. All of these elements are denoted with a special font. Generally, the top level menu items are denoted with a SANS SERIF font and capital letters, and the subordinate items are denoted with a regular Sans Serif font, such as **Frequency** menu button.

User Interface Navigation

Elements in navigation shortcuts or paths are separated with the pipe symbol ("|"). Menu and dialog box names are distinctive Sans Serif font in CAPITALS. Button names are in Title Case. For example, the path to the Manual Cal menu is:

- MAIN | Calibration | CALIBRATION | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL

User Input

User input such as entering values or other information is denoted in a mono-spaced font such as:

- `This font denotes a string of user input.`

Additional Documentation

The following ShockLine MS46121A/B Series Vector Network Analyzers documentation is available on the Anritsu web site. For updates to any of the MS46121A/B Series VNA documentation, visit the Anritsu web site at: http://www.anritsu.com.

Document Part Number	Description (Required Option)
10100-00067	ShockLine Product Information, Compliance, and Safety (PICS)
11410-00994	MS46121B Technical Data Sheet (Performance Specifications)
10410-00337	User Interface Reference Manual
10410-00746	Programming Manual
10410-00757	Maintenance Manual

Read the ShockLine VNA Product Information, Compliance, and Safety Guide (PN: 10100-00067) for important safety, legal, and regulatory notices *before* operating the equipment. For additional information and literature covering your product, visit the product page of your instrument and select the Library tab:

http://www.anritsu.com/test-measurement/products/ms46121b

Contacting Anritsu for Sales and Service

To contact Anritsu, visit: https://www.anritsu.com/contact-us and select the services in your region.

Chapter 2 — MS46121A/B Overview

2-1 Introduction

This chapter provides a description of the initial unpacking inspection, MS46121A/B VNA designator and ports description, and connector care.

Initial Inspection

Inspect the shipping container for damage. If the container or cushioning material is damaged, retain until the contents of the shipment have been checked against the packing list and the instrument has been checked for mechanical and electrical operation. If the ShockLine MS46121A/B Series VNA is physically damaged, notify your local sales representative or Anritsu Customer Service. If either the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as Anritsu. Keep the shipping materials for the carrier's inspection.

Output Connector

The output connector is an N(m) connector.

Figure 2-1. MS46121B N(m) Connector

1.	Output Test Port Connector N(m), Damage Input Levels +23 dBm maximum, ±50 VDC maximum

To prevent damage to your instrument, do not use tools such as pliers or wrenches to tighten the output test port connector. Use a recommended torque wrench as suggested in Table 2-1. For a comprehensive connector care instruction, Section 2-2 "Instrument Care and Preventive Maintenance".

Rear Panel

The rear panel provides the LED status connector, input ports for the USB and the 10 MHz MCX input connector.

Figure 2-2. MS46121B Rear Panel

1.	LED Status Indicator: GREEN Solid – Unit is connected and waiting for communication GREEN- Blinking/Flashing – Unit is actively sweeping and is communicating to host application YELLOW – Unit is rebooting OFF – Unit is not connected, or the driver for the device is invalid/unknown
2.	Micro USB Latch Connector Screw Input
3.	Micro USB 2.0 port
4.	10 MHz External Reference Input, MCX(f), 0.89 Vpp, minimum; 50 Ω, nominal

Front and Back

The front and back labels are described in Figure 2-3.

Figure 2-3. MS46121B Front and Back

1.	Rear Panel Designator Silkscreen – These silkscreens indicate rear panel port functions
2.	VNA Model Type and Frequency Range
3.	Anritsu Logo
4.	Caution Indicator – Tighten output connector to 135 N-cm/12 lbf-in. Turn connector without and do not turn body when tightening connector.
5.	Warning Indicator – Damage will occur to internal circuitry of VNA if input levels exceed indicated levels.
6.	Compliance Markings
7.	Serial Number Location
8.	Asset, Cal Cycle, or calibration due date placement location

2-2 Instrument Care and Preventive Maintenance

MS46121A/B VNA care and preventive maintenance consists of cleaning the unit and inspecting and cleaning the RF connectors on the instrument and all accessories. Clean the MS46121A/B with a soft, lint-free cloth dampened with water or water and a mild cleaning solution.

Connector Care

Visually inspect the connectors for general wear, cleanliness, and for damage such as bent pins or connector rings regularly. Repair or replace damaged connectors immediately. Dirty connectors can limit the accuracy of your measurements. Damaged connectors can harm the instrument.

Clean the RF connectors and center pins with a cotton swab dampened with denatured alcohol. The center pins of the N(m) connectors and the N(f) connectors of the device under test should be uniform in appearance.

Visually inspect the USB cable(s) for wear. The USB cable should be uniform in appearance, and not stretched, kinked, dented, broken, or display any damage. Connection of cables carrying an electrostatic potential, excess power, or excess voltage can reduce USB connectivity, damage the connector and the instrument. See Section "ESD Caution" on page 2-5 for ESD awareness.

To prevent damage to your instrument, do not use pliers or unconventional tools other than a torque wrench to tighten the Type-N connector. Inadequate torque settings can affect measurement accuracy. Over-tightening connectors can damage the cable, the connector, the instrument, or all of these items. See Table 2-1 for the proper torque wrench and proper torque requirements.

Table 2-1. Torque Wrench

Torque Wrench Part Number	Description
01-203	Torque End Wrench, 20.6 mm (13/16 in), 0.9 N·m (8 lbf·in), The recommended torque is (8 lbf·ft). For tightening the MS46121A/B VNA test ports to female devices.

Connecting Procedure

1. Carefully align the connectors.

   The male connector center pin must slip concentrically into the contact fingers of the female connector.
2. Push connectors straight together. Do not twist or screw them together.
3. To tighten, turn the connector nut, not the connector body. Major damage can occur to the center conductor and to the outer conductor if the connector body is twisted.
4. When you use a torque wrench, initially tighten by hand so that approximately 1/8 turn or 45 degrees of rotation remains for the final tightening with the torque wrench.

   Relieve any side pressure on the connection (such as from long or heavy cables) in order to assure consistent torque. Use an open-end wrench to keep the connector body from turning while tightening with the torque wrench.

   Do not over torque the connector.

Disconnecting Procedure

1. If a wrench is needed, use an open-end wrench to keep the connector body from turning while loosening with a second wrench.
2. Complete the disconnection by hand, turning only the connector nut.
3. Pull the connectors straight apart without twisting or bending.

ESD Caution

The MS46121A/B VNA, like other high performance instruments, is susceptible to electrostatic discharge (ESD) damage. Coaxial cables and antennas often build up a static charge, which (if allowed to discharge by connecting directly to the ShockLine VNA

Caution	Operators must be aware of the potential for ESD damage and take all necessary precautions.

Operators should exercise practices outlined within industry standards such as JEDEC-625 (EIA-625), MIL-HDBK-263, and MIL-STD-1686, which pertain to ESD and ESDS devices, equipment, and practices. Because these apply to the ShockLine VNA products, Anritsu recommends that any static charges that may be present be dissipated before connecting to other devices and PC ports. It is important to remember that the operator may also carry a static charge. Following the practices outlined in the above standards will ensure a safe environment for both personnel and equipment.

Chapter 3 — Software Installation

3-1 Introduction

This section provides information for loading the startup software, as well as controlling the MS46121A/B through GUI applications.

Preparation for Software Installation

All instrument functions are performed from:

- An external PC controller running Windows 7 or higher
- USB 2.0
- SCPI or IVI-C programming and interfacing

There are two ways that the MS46121A/B can be controlled:

1. Locally through the Graphical User Interface (GUI)
2. Remotely, via USB controlled SCPI or IVI-C.

When using more than two MS46121A/B VNAs, an externally powered USB Hub is recommended. Follow the steps below to prepare the external PC to control and operate the MS46121A/B:

1. Locate and connect the USB-A to Micro-B with latch cable from the MS46121A/B VNA to the PC controller USB port. Refer to Figure 3-1.

Figure 3-1. MS46121A/B Connected to the PC Controller

2. Download and install the MS46121A/B ShockLine latest Software onto the PC from the Anritsu Website: https://www.anritsu.com/test-measurement/support/downloads?model=MS46121B
3. Run the ShockLine software installer as Administrator and follow the instructions displayed on the monitor to complete the installation of the software into the PC.

Note	By default the ShockLine application is designed to run in Admin mode. To change the default, one can right-click on the ShockLine application icon and then select Properties. In Properties, select the Shortcut tab and the Advance button. In the Advanced Properties dialog, uncheck the Run as administrator box and then OK. Now users with standard access to the PC will be able to log into the PC and access the ShockLine application.

4. Use SCPI, TCP/IP protocol with SOCKETS. The user will have to download a development tool to setup the socket and there are many open source development tools for this purpose. Sockets will run SCPI with or without NI VISA.
5. Download the IVI-C driver from the ShockLine website: https://www.anritsu.com/test-measurement/support/downloads?model=MS46121B

3-2 Running the ShockLine Software Application

If you have not done so, refer to Section "Preparation for Software Installation" on page 3-1 to prepare the ShockLine software installation before continuing to this section.

The following simple step-by-step procedure will setup the ShockLine VNA for use with ShockLine software.

1. Launching the ShockLine software without plugging in the VNAs Micro USB cable to the controller first will result in the software asking the user if they want to run in simulation mode. See Figure 3-2. If you want to run in Simulation mode, go to Section 3-3 "Simulation Mode" on page 3-4.

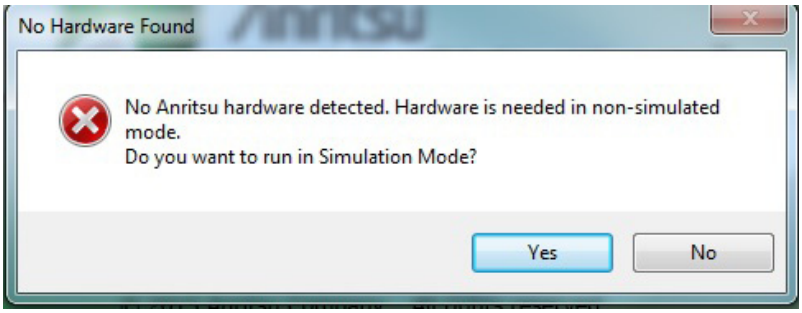


Figure 3-2. No Hardware Prompt

2. After the USB cable from the MS46121A/B has been plugged into the computer, the status indicator light will be orange. Do not issue commands remotely or through the GUI while the indicator light is orange. See Figure 2-2 on page 2-2 for LED color descriptions. The Status LED light turns green in approximately 10-15 seconds and the VNA is ready for use.
3. Open the ShockLine software.

Note	By default the ShockLine application is designed to run in Admin mode. To change the default, one can right-click on the ShockLine application icon and then select Properties. In Properties, select the Shortcut tab and the Advance button. In the Advanced Properties dialog, uncheck the Run as administrator box and then OK. Now users with standard access to the PC will be able to log into the PC and access the ShockLine application.

- The ShockLine software will come up with the serial number of the MS46121A/B displayed in the channel label.

4. Each MS46121A/B will have a dedicated channel and the respective serial number will be labeled to make keeping track of each VNA easier.
5. If a new VNA is added and there is no response on the channel, before unplugging and re-plugging, the following steps are suggested to verify connection:
   - Navigate from the GUI menu
     - Main Menu | SWEEP | Hold Functions | Hold
   - Press the Hold button and wait 5 seconds
   - Press Sweep button
6. Check to see if the VNA is sweeping. If not, then try un-plugging and re-plugging the VNA.

7. When multiple MS46121A/Bs are in use and one is removed, the channel of the removed VNA will stay on the ShockLine software and the other channels will not re-arrange or shift. If all VNAs are removed, the ShockLine software will shut down. Prior to exiting, the software will ask the user if the setup should be saved. See Figure 3-3

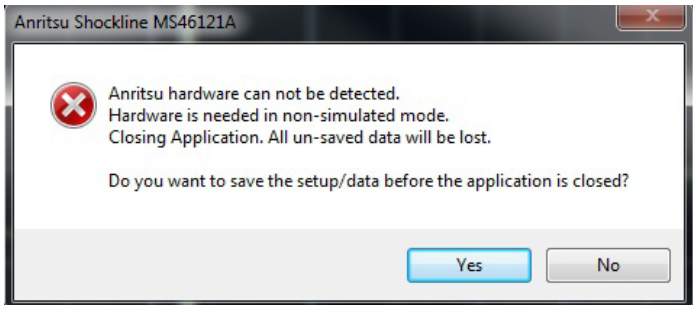


Figure 3-3. ShockLine warning when a MS46121A/B is removed from the port

3-3 Simulation Mode

When the ShockLine VNA software is being initiated, the program will provide the user a choice to select Simulation Mode when there is no hardware detected. The program will prompt “No hardware is detected” when the Micro USB is not connected from the ShockLine MS46121A/B to a PC or when the user is using the software on a standalone PC for simulation only.

Simulation Mode provides the same ShockLine VNA GUI as when hardware is detected. Simulation Mode provides the user testing scenarios with the benefits of real testing, except there are no real measurements resulting from a hardware test setup.

Benefits of Simulation Mode include:

- Import .SnP files to manipulate waveforms to be differential or time domain.
- Rework programming scenarios to check commands or setups
- Gain familiarity with the ShockLine GUI menus.

The following simple step-by-step procedure will setup the ShockLine VNA software in Simulation Mode.

Launch the ShockLine Program from the icon on your PC, or download the program from the Anritsu ShockLine VNA Software library located at:
https://www.anritsu.com/test-measurement/support/downloads?model=MS46121B

1. Download the ShockLine VNA Software.

- Once the ShockLine Software is loaded onto your PC, the initial startup screen will appear as shown in Figure 3-4.

Figure 3-4. ShockLine GUI Initialization Screen

2. From the No Hardware Found dialog box, Figure 3-5, select yes to run in Simulation Mode.
   - No hardware will be detected if running the software on an independent computer for simulation or if the USB micro cable is not connected or has been disconnected from the controller.

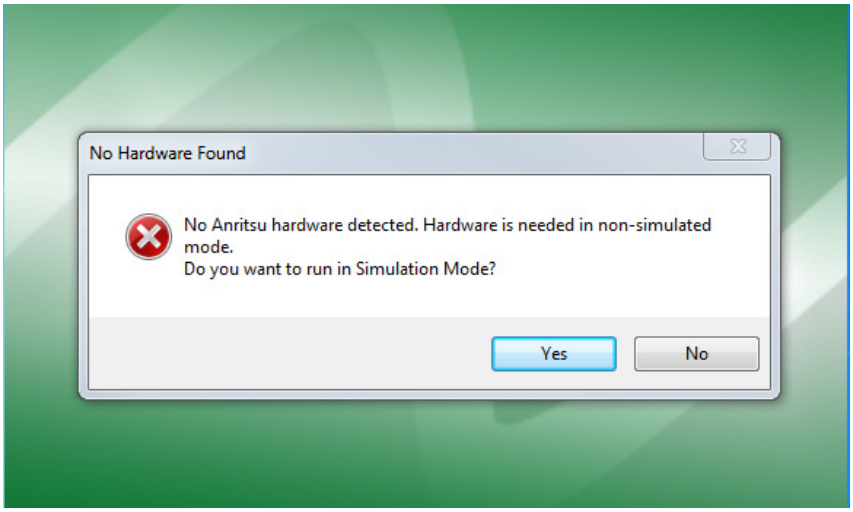


Figure 3-5. ShockLine GUI Initialization Screen

3. Once Simulation Mode is selected, the default menu screen appears, see Figure 3-6.
4. Select the menu/option configuration that you wish to simulate.

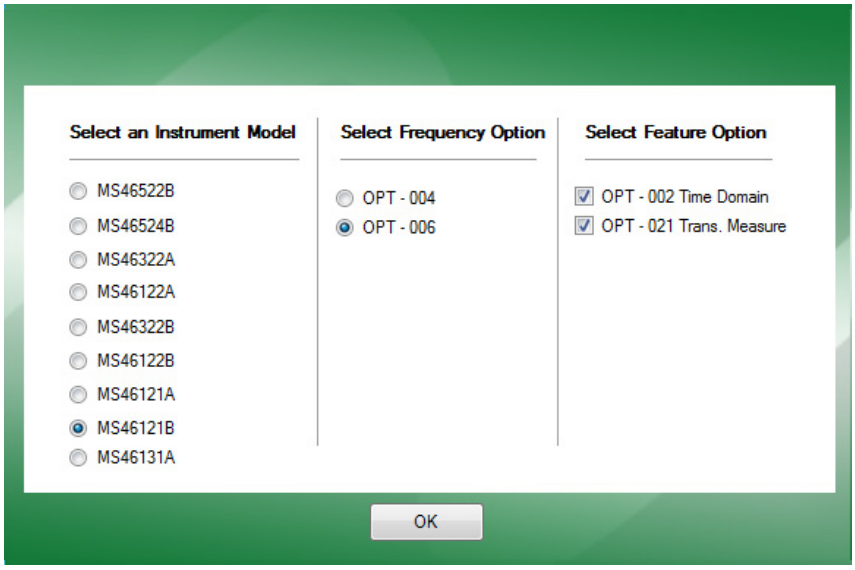


Figure 3-6. Simulator Select Instrument

5. Once the ShockLine VNA model/configuration has been selected, press OK. The menus within the simulated program will provide the appropriate menu screens for the selected model/option configurations selected.

To learn more about the User Interface, see Chapter 4, “User Interface”.

3-4 Automation Interface

This section describes the setup for automation interface to the MS46121A/B.

Communication Setup

The MS46121A/B configuration accepts one to sixteen 1-Port VNAs to be connected at a time to the ShockLine software application. The ShockLine software will set up the channels depending on the number of MS46121A/Bs that are plugged in. The software will show an even number of displays as in Figure 3-7. If an odd number of single port VNAs are connected, one channel will be displayed as unused.

Figure 3-7. Display with Multiple 1–Ports

Once the MS46121A/B has been connected and initialized, setup the automation interface to the instrument.

Network interface

To access the IP address and TCP port number, view the MS46121A/B display screen on the PC. Refer to Figure 3-8, "Network Interface Menu". To navigate, select:

- Main Menu | SYSTEM | Network Interface

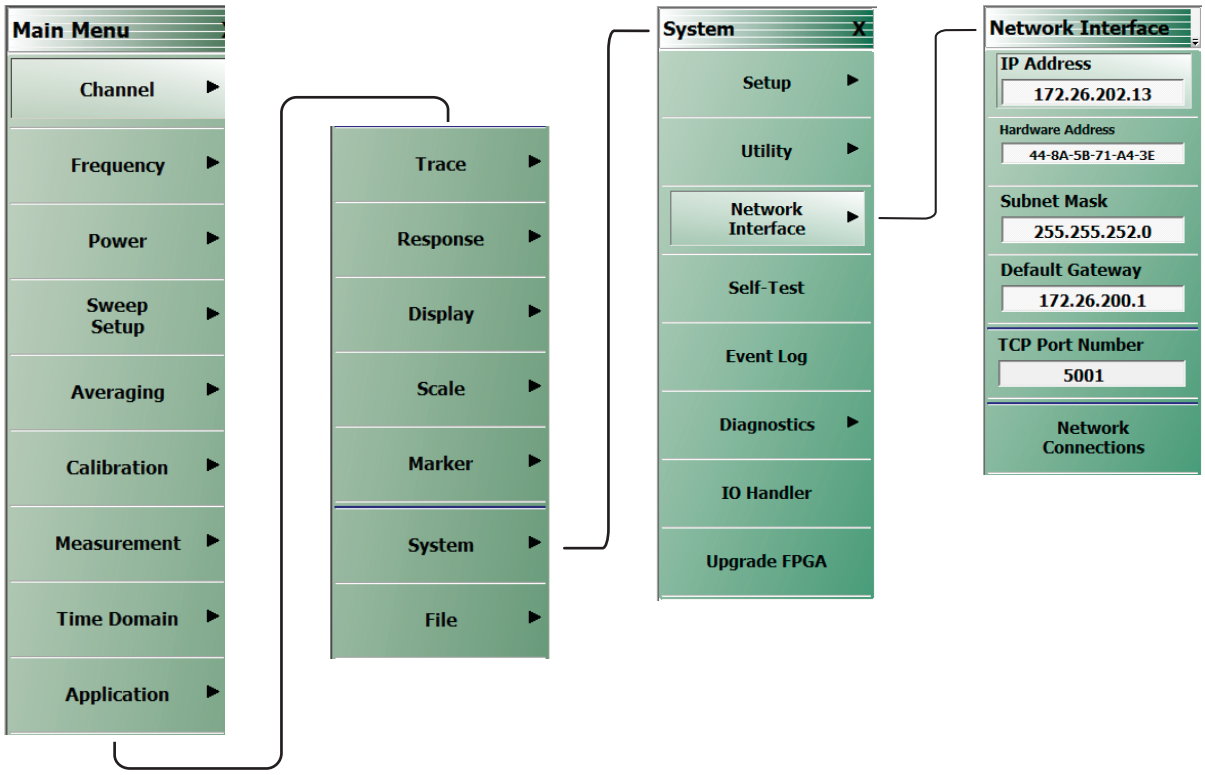


Figure 3-8. Network Interface Menu

SCPI Usage

The IP address and TCP port number will be used for SCPI to declare the instruments address for communication.

Note	Launch ShockLine GUI software on the controller PC to enable SCPI communication. GUI menus will turn gray and the GUI interface will be locked out when remote communications are active.

IVI Installation and usage

If the user is working with IVI-C, there are some necessary steps to get started with remote programming. The IVI-C drivers come standard in the ShockLine software package. Remote communication is successful once the IVI-C sends commands and the ShockLine GUI exits. Unlike SCPI, the ShockLine GUI does not run while IVI-C is in use.

Note	IVI software has been deprecated as of version V2022.3.2. IVI package V2022.3.2 is still included in the current and future ShockLine software releases, but the development has ceased with the minimal supports.

Chapter 4 — User Interface

4-1 Introduction

The chapter provides orientation to the ShockLine application user interface for the MS46121A/B Series VNAs. It also provides general descriptions and procedures for trace graph setup, marker setup, and limit line setup.

4-2 User Interface Main Screen

The main screen is shown below in Figure 4-1. The key areas of the main screen are the Menu bar, Icon toolbar, and MAIN MENU right-side function menus. These are identified in Figure 4-2 on page 4-2.

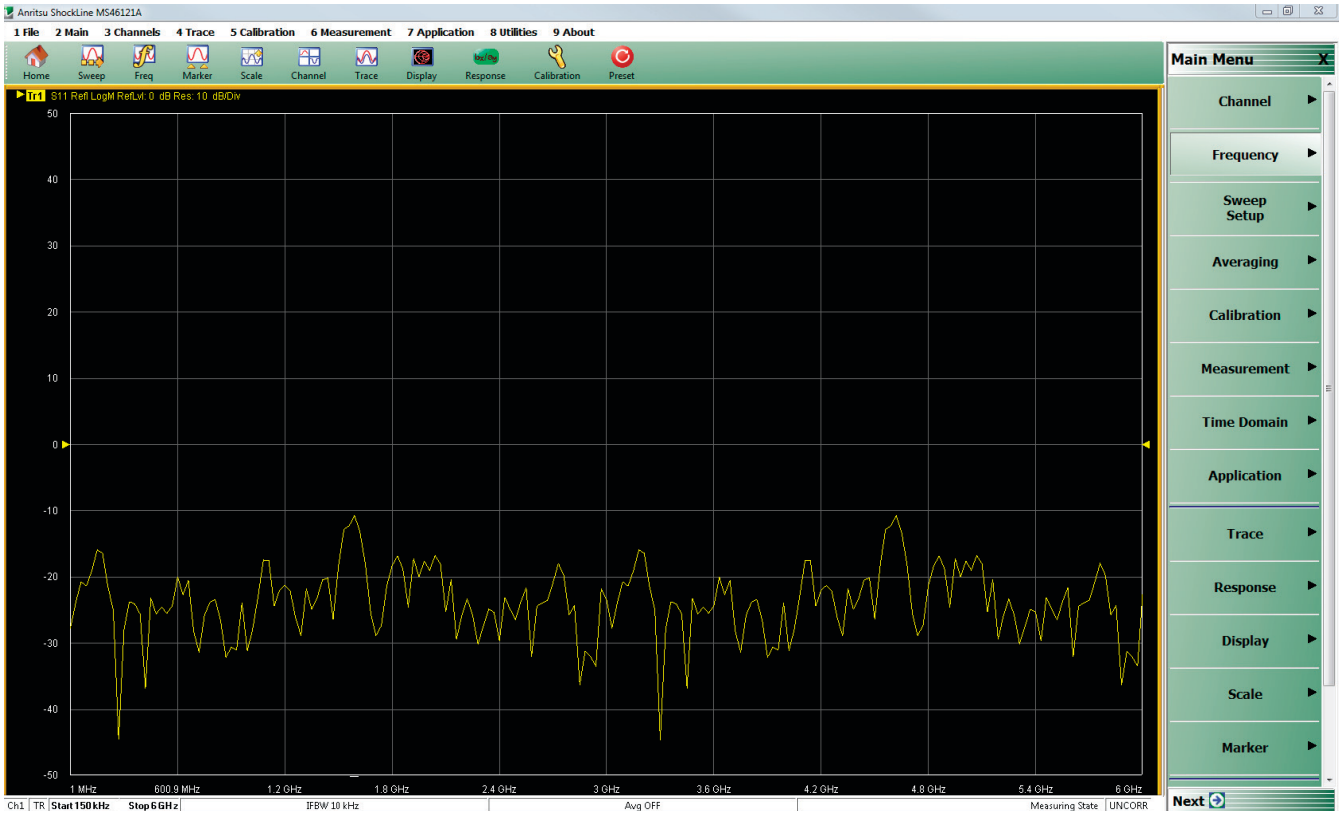


Figure 4-1. User Interface Initial Screen

User Interface Control and Display Areas

Mouse clicks are the main way to control the instrument main display, though the keyboard can also be used for some items. Figure 4-2 below illustrates the general display areas and shows a single channel setup.

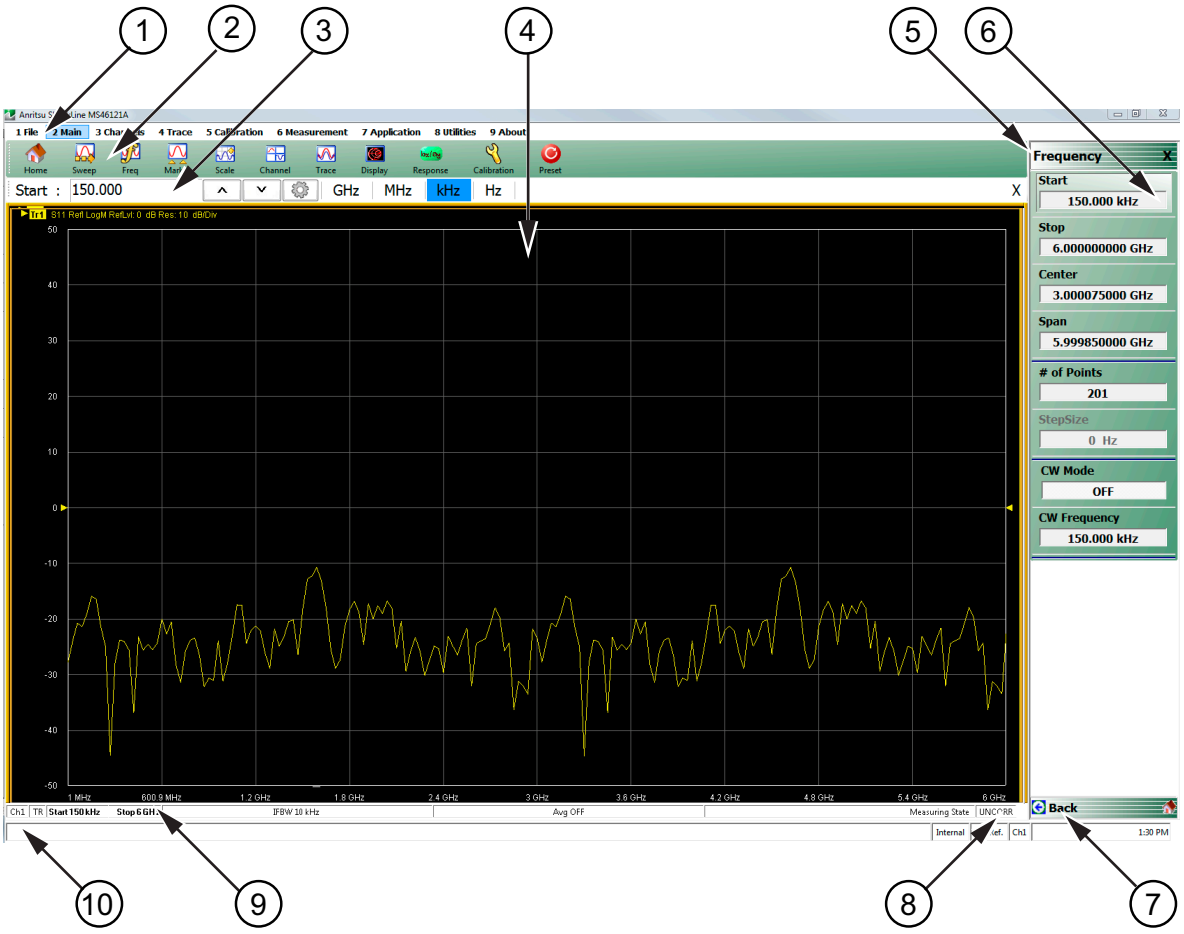


Figure 4-2. User Interface Display Areas

1.	Menu Bar – Displays nine (9) drop down menus: FILE, MAIN, CHANNELS, TRACE, CALIBRATION, MEASUREMENT, APPLICATION, UTILITIES, and HELP.
2.	Icon Toolbar – User-configured with up to 120 user-selected quick access icons.
3.	Field Toolbar – Appears only when field button is clicked for input. Display field for value, with one or more units (such as dB, dBm, or Hz), an Enter button, and an X close button.
4.	Display Area – Displays from one to 16 trace display graphs. Each trace display can optionally have from one to 12 markers, a reference marker, and an upper and lower limit line.
5.	Menu Title – Displays the name of the displayed right-side menu. Menu titles are unique to each menu.
6.	Menu Buttons – Allow the user to set parameters, make configuration selections, read result values, start processes, toggle between two or more values, display sub-menus, and display dialog boxes.
7.	Menu Navigation Buttons – The navigation buttons always appear at the bottom of the right-side menu and allow forward and backward navigation through the user's menu history. Back returns to previous selected higher-level menu, Next returns to a previously selected lower-level menu, and Home returns to the MAIN MENU.
8.	System Status Bar – Displays status messages, and configuration status that affects the entire instrument.
9.	Trace Status Bar – Provides status for active trace near the bottom of the screen.
10.	Tableau Data Display/Input Area – The tableau area only appears when the appropriate menu button is selected. When selected, the display shrinks upwards and the tabular data area expands.

Figure 4-3 shows an instrument setup with two displayed windows, each with two traces resulting from two 1-port MS46121A/Bs connected simultaneously. The displayed trace display layout shown below is user-defined as a 2 × 2 configuration trace display.

Figure 4-3. User Interface - 2 Traces (simulated data)

1.	Two Traces per screen (2 Screens / 2 Traces)
2.	Active Trace
3.	Trace Menu
4.	Number of Traces Selected for Viewing

Functional Access

The ShockLine MS46121A/B Series VNA software user interface provides the access to menus and functions. A keyboard and mouse can be used to control the instrument through five major user interface areas on the main display:

- The top Menu bar with its drop-down menus and menu commands.
- The Icon toolbar with up to 20 single-click functions, available as a default configuration or as a user-definable configuration of icon functions.
- The right side MAIN MENU provides access to function menus, sub-menus, dialog boxes, and configuration options.
- For some parameters, selecting a button displays a Field toolbar that appears just below the icon toolbar allowing input of parameter values and units.
- For some parameters, selecting a button displays a Configuration or Setup tableau below the main display area for input of complex parameter sets such as segmented frequency or power sweeps.

Instrument setup begins at the CHANNEL menu. where the user can choose how many channels to use and designate their screen layout. Next, select a channel for operation and configure it. The following explains how to do basic channel setup. Once that is done, you can select sweep type and other parameters for each channel.

To Select a Channel

1. Select a channel in a multi-channel display by doing one of the following:

- Click anywhere inside the desired channel box.
- From the keyboard, enter **ALT + 3**, then **3** to view the previous channel or **ALT + 3**, then **4** to view the next channel.
- On the top menu bar, select MENU BAR | Channels | Channel Prev or MENU BAR | Channel | Channel Next.
- On the right side menu, select MAIN | Channels | CHANNELS | Chan Next or Chan Previous.

2. The selected channel border changes from gray to white. (Figure 4-3, "User Interface - 2 Traces (simulated data)" on page 4-3 shows Channel 2 (Ch2) selected.)

Note	The **Ch->Max**, **Ch->Next**, and **Ch-Prev** icons are available for the icon toolbar. These icons provide one click access to channel maximum, channel next, and channel previous functions. They can be added to the icon toolbar for a custom configuration and saved as part of a preset configuration.

To Maximize a Channel Display

1. Use one of the methods above to select the desired channel.

2. Do one of the following to maximize the selected channel:

- From the keyboard, enter **CTRL + 1** or **ALT + 3**, then **2**.
- On the main display, double-click the channel border box.
- On the top menu bar, select Menu Bar | Channel | Channel Max.
- On the right side menu, select MAIN | Channel | CHANNEL | Chan. Max.

3. The selected channel now fills the display area.

- Maximize a channel display to review the channel status information at the bottom of its screen.

To Make the Display Area Larger

1. The top Icon toolbar can be hidden to make the display area larger.

2. Hide the Icon toolbar by doing one of the following:

- From the keyboard, select **ALT + 6** then **2**.
- On the top Menu bar, select Utilities | Toolbar Off.

3. The Icon toolbar disappears. Repeat **Step 2** to make the Icon toolbar re-appear.

To Select Traces

1. To select a trace in a multi-trace display, do one of the following:

- With a mouse, single click the trace title.
  - If you double-click either the trace title or anywhere within the trace, the trace is both selected and maximized.
- From the keyboard, enter **ALT + 2** then **7** to view the previous trace or **ALT + 3** then **8** to view the next trace.
- On the top menu bar, select Menu Bar | Trace | Trace Prev or Menu Bar | Trace | Trace Next.
- On the right side menu, select MAIN | Trace | TRACE | Trace Previous or Trace Next.
- The selected trace number is highlighted and a left arrow appears.

Trace 1 Selected	Trace 1 Not Selected

Figure 4-4. Trace Selection Indicator

Note	The **Tr->Max**, **Tr->Next**, and **Tr->Previous** icons are available for the icon toolbar. These icons provide one click access to trace maximum, trace next, and trace previous functions. They can be added to the icon toolbar for a custom configuration and saved as part of a preset configuration.

To Maximize a Trace Display

1. Use one of the methods above to select the desired trace.

2. For a maximum display, make sure the trace's channel is maximized.

3. Do one of the following to maximize the selected trace:

- From the keyboard, select **ALT + 2,** then **6**.
- On the main display, double-click anywhere in the trace display.
- On the top menu bar, select Menu Bar | Trace | Trace Max.
- On the right side menu, select MAIN | Trace | TRACE | Trace Max.

4. The selected trace now fills the display area.

- Maximize a trace display to review the trace status information at the bottom of trace screen.

5. Repeat the actions above to return the trace to its normal size.

4-3 Using the Menu Bar Interface

Menu Bar Overview

The menu bar at the top of the screen provides drop-down menus for access to major ShockLine VNA functions and dialogs. The figure below shows all of the available Menu bar functions and command menus.

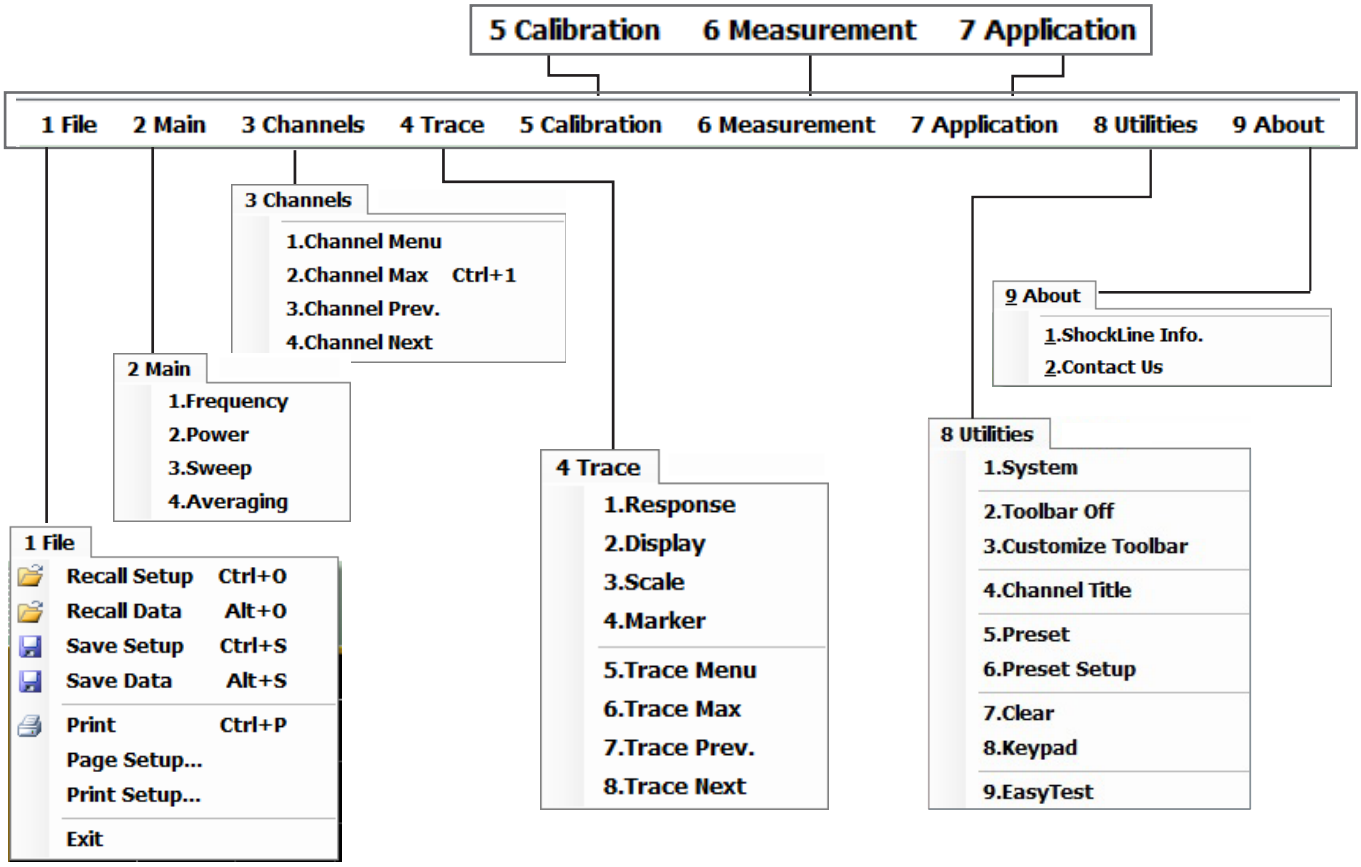


Figure 4-5. Menu Bar Major Functions, Drop-Down Menus, and Commands

Menu Bar General Operation

The Menu bar drop-down menus and commands can be accessed by clicking on the menu bar and required command.

The keyboard can be used to enter the menu and/or command short cut, most of which use the **ALT (ALTERNATE)** key. To access a menu from the keyboard, press and hold the **ALT (ALTERNATE)** key and the number in front of the menu name.

- For example, **ALT + 1** opens the FILE menu.
- For example, **ALT + 8** opens the UTILITY menu.

To access most commands listed on the drop-down menus, follow the **ALT +** sequence with the menu command number.

- For example, to access the Preset command on the UTILITIES menu, enter **ALT + 8,** then **5**.
- For example, to access the right side SYSTEM menu, enter **ALT + 8,** then **1**.

Some Menu bar commands can also be accessed by using the keyboard **Control (CTRL)** key. Press and hold the **CTRL** key and then the letter key.

- For example, to recall a previously saved setup, enter **CTRL + O** (letter O).
- For example, to print the current display screen, enter **CTRL + P**.

Menu Bar Drop-down Menus and Commands

The Menu bar appears at the top of the instrument display and provides direct access to system menus and some button functions.

The table below summarizes all Menu bar drop down commands. The **MS46121A/B, MS46122A/B, MS46131A, MS46322A/B User Interface Reference Manual** describes the resultant menus or commands in greater detail.

Table 4-1. Menu Bar Drop-Down Menu Descriptions (1 of 10)

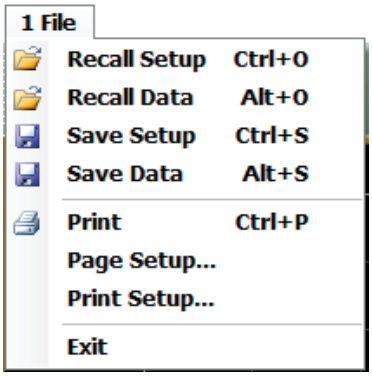
Menu and Command Name	Menu and Command Descriptions
FILE Drop-Down Menu	 • Keyboard: ALT + 1 • Menu Bar | File • MAIN | File | FILE
Recall Setup Command	Select displays the RECALL SETUP dialog box and allows the recall of previously saved setup and/or calibration files: – Active Channel Setup and Calibration (.chx) File – Active Channel Setup (.stx) File – All Channel Setup (.sta) File • Keyboard: CTRL + O (letter O) • Menu Bar | File | Recall Setup • MAIN | File | FILE | Recall Setup | RECALL SETUP Dialog Box
Recall Data Command	Select displays the RECALL DATA dialog box and allows the recall of a previously saved active channel and/or active trace data file of these types: – Active Channel S1P (.s1p), S2P (.s2p), S3P (.s3p), S4P (.s4p) Files – Formatted Data into Active Trace (.tdf) File – Unformatted Data into Active Trace (.tdu) File – Formatted Data into Active Trace Memory (.tdf) File – Unformatted Data into Active Trace Memory (.tdu) File • Keyboard: ALT + O (letter O) • Menu Bar | File | Recall Data • MAIN | File | FILE | Recall Data | RECALL DATA Dialog Box

Table 4-1. Menu Bar Drop-Down Menu Descriptions (2 of 10)

Menu and Command Name	Menu and Command Descriptions
Save Setup Command	Select displays the Save Setup dialog box and allows the user to save the currently applied system presets configuration file. • Keyboard: CTRL + S • Menu Bar | File | Save Setup • MAIN | File | FILE | Save Setup | SAVE SETUP Dialog Box
Save Data Command	Select displays the SAVE DATA (Active Channel.txt) dialog box. Use this dialog to save the current channel data file. • Keyboard: ALT + S • Menu Bar | File | Save Data • MAIN | File | FILE | Save Data | SAVE DATA Dialog Box
Print Command	Select displays the Windows PRINT dialog box to print the current main display. • Keyboard: CTRL + P • Menu Bar | File | Print • MAIN | File | Print | PRINT Dialog Box
Exit Command	Select displays a confirmation dialog box. Click OK to exit the ShockLine application and return to the Windows desktop. Click Cancel to remain in the ShockLine application. • Menu Bar | File | Exit

Table 4-1. Menu Bar Drop-Down Menu Descriptions (3 of 10)

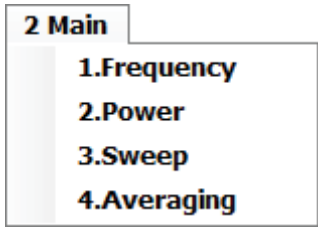
Menu and Command Name	Menu and Command Descriptions
MAIN Drop-Down Menu	 • Keyboard: ALT + 2 • Menu Bar | Main
Frequency Command	Select displays the right-side FREQUENCY menu. • Front Panel Key: **Frequency** • Keyboard: ALT + 2, then 1 • Menu Bar | Channel | Frequency • MAIN | Frequency | FREQUENCY
Power Command	Select displays the right-side POWER menu. • Front Panel Key: **Power** • Keyboard: ALT + 2, then 2 • Menu Bar | Channel | Power • MAIN | Power | POWER
Sweep Command	Select displays the right-side SWEEP SETUP menu. • Front Panel Key: **Sweep** • Keyboard: ALT + 2, then 3 • Menu Bar | Channel | Sweep • MAIN | Sweep Setup | SWEEP SETUP
Averaging Command	Select displays the right-side AVERAGING menu. • Front Panel Key: **Avg** (Average) • Keyboard: ALT + 2, then 4 • Menu Bar | Channel | Averaging • MAIN | Averaging | AVERAGING

Table 4-1. Menu Bar Drop-Down Menu Descriptions (4 of 10)

Menu and Command Name	Menu and Command Descriptions
CHANNELS Drop-Down Menu	 • Keyboard: ALT + 3 • Menu Bar | Channels • MAIN | Channels | CHANNELS
Channel Menu Command	Select displays the right-side CHANNEL menu. • Keyboard: ALT + 3, then 1 • Menu Bar | Channels | Channel Menu • MAIN | Channels | CHANNELS
Channel Max Command	Select maximizes the display of the active channel. Select again returns to the previous multi-channel display. • Keyboard: ALT + 3, then 2 • Keyboard: CTRL + 1 • Menu Bar | Channels | Channel Max • MAIN | Channels | CHANNELS | Chan. Max
Channel Previous Command	Selects the next lower channel number. If channel 1 was previously selected, selects the highest numbered channel. • Keyboard: ALT + 3, then 3 • Menu Bar | Channels | Channel Prev. • MAIN | Channels | CHANNELS | Chan. Previous
Channel Next Command	Selects the next higher channel number. If the highest numbered channel was previously selected, selects channel 1. • Keyboard: ALT + 3, then 4 • Menu Bar | Channels | Channel Next • MAIN | Channels | CHANNELS | Chan. Next

Table 4-1. Menu Bar Drop-Down Menu Descriptions (5 of 10)

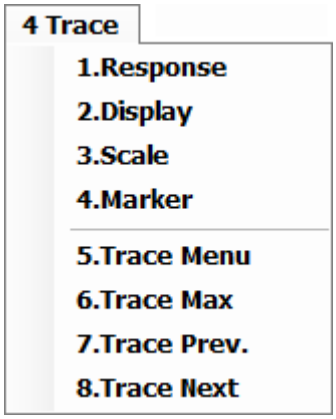
Menu and Command Name	Menu and Command Descriptions
TRACE Drop-Down Menu	 • Keyboard: ALT + 4 • Menu Bar | Trace • MAIN | Trace | TRACE
Response Command	Select displays the right-side RESPONSE menu. • Keyboard: ALT + 4, then 1 • Menu Bar | Trace | Response • MAIN | Response | RESPONSE
Display Command	Select displays the right-side DISPLAY menu. • Keyboard: ALT + 4, then 2 • Menu Bar | Trace | Display • MAIN | Display | DISPLAY
Scale Command	Select displays the right-side SCALE menu. The name of the SCALE menu (and the buttons on it) depend on the display type selected such as: – Scale (Log Mag) – Scale (Lin Mag) – Scale (Phase) – Scale (Real) – Scale (Imag) – Scale (SWR) • Keyboard: ALT + 4, then 3 • Menu Bar | Trace | Scale • MAIN | Scale | SCALE
Marker Command	Select displays the right-side MARKERS [1] menu. • Keyboard: ALT + 4, then 4 • Menu Bar | Trace | Marker • MAIN | Marker | MARKER [1]
Trace Menu Command	Select displays the right-side TRACE menu. • Keyboard: ALT + 4, then 5 • Menu Bar | Trace | Trace Menu • MAIN | Trace | TRACE

Table 4-1. Menu Bar Drop-Down Menu Descriptions (6 of 10)

Menu and Command Name	Menu and Command Descriptions
Trace Max Command	Select maximizes the active trace to full screen display. Selecting again, returns the trace to the standard multi-trace display. • Keyboard: ALT + 4, then 6 • Menu Bar | Trace | Trace Max • MAIN | Trace | TRACE | Trace Max
Trace Previous Command	Selects the next lower trace number on the active channel. If Trace 1 is currently selected, the highest numbered trace is selected. If the current trace is not maximized, the previous trace will not be maximized. If the current trace is maximized, the previous trace will be maximized. • Keyboard: ALT + 4, then 7 • Menu Bar | Trace | Trace Prev. • MAIN | Trace | TRACE | Trace Previous
Trace Next Command	Selects the next higher trace number on the active channel. If the highest numbered trace is currently displayed, the Trace 1 is displayed. If the current trace is not maximized, the next trace will not be maximized. If the current trace is maximized, the next trace will be maximized. • Keyboard: ALT + 4, then 8 • Menu Bar | Trace | Trace Next • MAIN | Trace | TRACE | Trace Previous
CALIBRATION Drop-Down Menu	**5 Calibration** The CALIBRATION drop-down menu has one command that selects the right-side CALIBRATION menu • Keyboard: ALT + 5 • Menu Bar | Calibration • MAIN | Calibration | CALIBRATION
MEASUREMENT Drop-Down Menu	**6 Measurement** Select displays the right-side MEASUREMENT menu. • Keyboard: ALT + 6 • Menu Bar | Measurement • MAIN | Measurement | MEASUREMENT
APPLICATION Drop-Down Menu	**7 Application** The APPLICATION menu/command selects the right-side APPLICATION menu. • Keyboard: ALT + 7 • Menu Bar | Application • MAIN | Application | APPLICATION

Table 4-1. Menu Bar Drop-Down Menu Descriptions (7 of 10)

Menu and Command Name	Menu and Command Descriptions
UTILITIES Drop-Down Menu	 • Keyboard: Alt + 8 • Menu Bar | Utilities
System Command	Select displays the right-side SYSTEM menu. • Keyboard: Alt + 8, then 1 • Menu Bar | Utilities | System • MAIN | System | SYSTEM
Toolbar Off Command	Toggles the ICON TOOLBAR, immediately below the Menu bar, on and off. • Keyboard: Alt + 8, then 2 • Menu Bar | Utilities | Toolbar Off
Customize Toolbar Command	Select displays the CUSTOMIZE TOOLBAR dialog box and allows the user to select which icons are to be displayed in the toolbar. Up to 20 icons can be displayed at one time. The Icon toolbar configuration is saved when a Preset Save is completed. • Keyboard: Alt + 8, then 3 • Menu Bar | Utilities | Customize Toolbar
Channel Title Command	Select displays the DISPLAY SETUP menu and allows a user-defined title to be applied to and displayed above the active channel. Each channel can have a different or the same title. • Keyboard: Alt + 8, then 4 • Menu Bar | Utilities | Channel Title • MAIN | Display | DISPLAY | Display Area Setup | DISPLAY SETUP | Edit Chan. Title | EDIT CHANNEL TITLE Dialog Box

Table 4-1. Menu Bar Drop-Down Menu Descriptions (8 of 10)

Menu and Command Name	Menu and Command Descriptions
Preset Command	• Returns the instrument to its prior saved state which can be either the factory-default preset, or a user-defined setup. The PRESET SETUP menu selection defines which is used. • Keyboard: Alt + 8, then 5 • Menu Bar | Utilities | Preset • No right-side menu available to preset the instrument: – Use the Menu Bar Function above.
Preset Setup Command	Select displays the PRESET SETUP menu and allows user-defined preset parameters to be applied during a preset command. • Keyboard: Alt + 8, then 6 • Menu Bar | Utilities | Preset Setup
Clear Command	Select toggles the displayed right-side menu off and on. When toggled back on, the previously selected menu is displayed. For example, if the CALIBRATE function menu was displayed when the display was cleared, the CALIBRATE function menu is again displayed when Clear is selected a second time. • Keyboard: Alt + 8, then 7 • Menu Bar | Utilities | Clear Command
KeyPad Off Command	Select toggles the display of the keypad dialog window off and on. The keypad allows for easier entry of input parameters. • Keyboard: Alt + 8, then 8 • Menu Bar | Utilities | KeyPad Off Command

Table 4-1. Menu Bar Drop-Down Menu Descriptions (9 of 10)

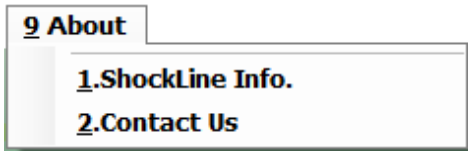
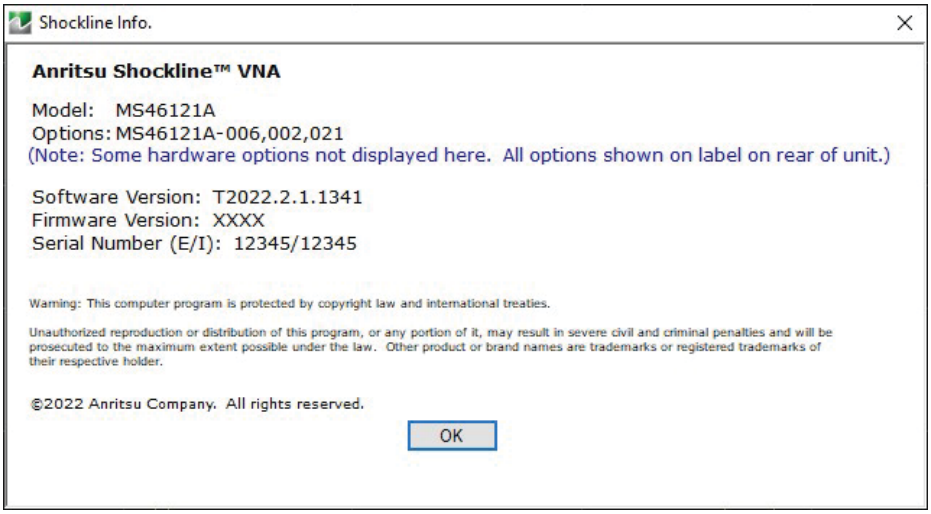
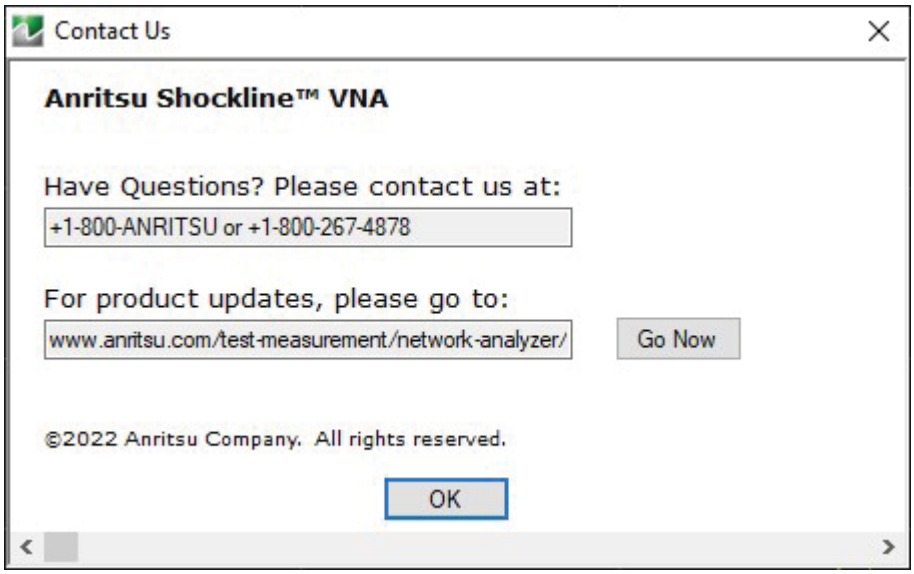
Menu and Command Name	Menu and Command Descriptions
About Drop-Down Menu	 • Keyboard: ALT + 9 • Menu Bar | Help
ShockLine Info Command	Select displays the SHOCKLINE INFO dialog box with typical information as shown below.  The dialog box provides instrument configuration information. Click **OK** to close the dialog box. The following information is provided: – Copyright Statement – Software Version – Firmware Version – Model Number – Serial Number – Options Installed

Table 4-1. Menu Bar Drop-Down Menu Descriptions (10 of 10)

Menu and Command Name	Menu and Command Descriptions
Contact Us Command	Select displays the CONTACT US dialog box with typical information as shown below. 

4-4 Icon Toolbar

Overview

The Icon toolbar is located immediately below the Menu bar and allows single-click access to many menus and functions. The Icon toolbar is user-configurable and up to 10 icons can be displayed in any configuration.

Using the Icon Toolbar Interface

The default Icon Toolbar is shown below:

The definitions and functions of the default icons are (from left to right):

- **Home Icon –** Select displays the right side MAIN MENU. Does not reset or lose previously set values.
- **Sweep Icon –** Select displays the right-side Sweep menu.
- **Freq Icon** – Select displays the right-side FREQUENCY menu.
- **Power Icon** – Select displays the right-side POWER menu.
- **Marker Icon** – Select displays the right-side MARKERS [1] menu.
- **Scale Icon** – Select displays the right-side SCALE menu.
- **Channel Icon –** Select displays the right-side CHANNEL menu.
- **Trace Icon** – Select displays the right-side TRACE menu.
- **Display Icon** – Select displays the right-side DISPLAY menu.
- **Response Icon** – Select displays the right-side RESPONSE menu.
- **Calibration Icon** – Select displays the right-side CALIBRATION menu.
- **Preset Icon** – Select returns the system to its prior preset status at the time of the last preset save.

All available icons are described in the in Table 4-2.

Figure 4-6. Icon Toolbar with Factory Default Function Icons

Available Icon Functions

The available icon functions that can be added to a user-defined icon toolbar are listed in table below. Once configured, a preset save allows the toolbar configuration to be recalled at any time.

The procedures for changing the icon toolbar are described following the icon table and uses the "CUSTOMIZE TOOLBAR Dialog Box" on page 4-24 below. When a user-defined toolbar is configured, the first selected icon goes to the left-most position on the toolbar. Subsequent selected icon are added to the right-most position on the toolbar.

Table 4-2. Icon Descriptions - Listed Alphabetically (1 of 6)

Icon Name	Icon	Description
Icon Description Definitions	**Default Icons** – These are one of the 11 default icons and are provided after a return to the factory standard configuration. **Keyboard** – If available, the keyboard shortcut to access this menu or function. **Menu Bar** – If available, navigation path to access this menu or function. **Navigation** – To navigate to this menu or function from the MAIN menu. **Description** – If available, where this menu, dialog box, or function is described in greater detail in this document.	
Application Icon	 Application	Select displays the right-side APPLICATION menu. • Front Panel Key: **Application** • Keyboard: ALT + 6 • Menu Bar: MENU BAR | 6 Application | 6 APPLICATION • MAIN | Application | APPLICATION
Average Icon	 Average	Default Icon. Select displays the right-side AVERAGING menu. • Front Panel Key: **Avg (Average)** • Keyboard: ALT + 2, then 4 • MENU BAR | Channel | Averaging • MAIN | Averaging | AVERAGING
Calibration Icon	 Calibration	Default Icon. Select displays the right-side CALIBRATION menu. • Keyboard: ALT + 5 • Menu Bar | Calibration • MAIN | Calibration | CALIBRATION
Continue Icon	 Continue	After a system pause or hold with the Hold icon, the Continue icon resumes operation with all prior settings in effect. • MAIN | Sweep Setup | SWEEP SETUP | Hold Functions | HOLD FUNCTIONS | Continue
Channel Icon	 Channel	Default Icon. Select displays the right-side CHANNEL menu. • Front Panel Key: **Channels** • MAIN | Channels | Channels Menu
Ch->Max Icon	 Ch->Max	When multiple channels are used, select activates and displays the channel with the maximum trace value. • MAIN | Channels | CHANNELS | Channel Max

Table 4-2. Icon Descriptions - Listed Alphabetically (2 of 6)

Icon Name	Icon	Description
Icon Description Definitions	**Default Icons** – These are one of the 11 default icons and are provided after a return to the factory standard configuration. **Keyboard** – If available, the keyboard shortcut to access this menu or function. **Menu Bar** – If available, navigation path to access this menu or function. **Navigation** – To navigate to this menu or function from the MAIN menu. **Description** – If available, where this menu, dialog box, or function is described in greater detail in this document.	
Ch->Next Icon		When multiple channels are used, select activates and displays the next higher channel number. If the highest channel number is currently active, channel 1 (one) is activated and displayed. • MAIN | Channels | CHANNELS | Channel Next
Ch->Prev Icon		When multiple channels are used, select activates and displays the next lower channel number. If channel 1 (one) is currently active, the highest numbered channel is activated and displayed. • MAIN | Channels | CHANNELS | Channel Prev.
Custom Icon 1		Select performs the action defined for Custom Icon 1 using the right-side context menu. After definition, custom-action icons are displayed in the Icon Bar. The steps to define a Custom-action Icon are described in the *MS46121, MS46122, MS46131, MS46322 User Interface and Reference Manual* (10410-00337).
Custom Icon 2		Select performs the action defined for Custom Icon 2 using the right-side context menu. After definition, custom-action icons are displayed in the Icon Bar. The steps to define a Custom-action Icon are described in the *MS46121, MS46122, MS46131, MS465322 User Interface and Reference Manual* (10410-00337).
Custom Icon 3		Select performs the action defined for Custom Icon 3 using the right-side context menu. After definition, custom-action icons are displayed in the Icon Bar. The steps to define a Custom-action Icon are described in the *MS46121, MS46122, MS46131, MS46322 User Interface and Reference Manual* (10410-00337).
Custom Icon 4		Select performs the action defined for Custom Icon 4 using the right-side context menu. After definition, custom-action icons are displayed in the Icon Bar. The steps to define a Custom-action Icon are described in the *MS46121, MS46122, MS46131, MS46322 User Interface and Reference Manual* (10410-00337).
Custom Icon 5		Select performs the action defined for Custom Icon 5 using the right-side context menu. After definition, custom-action icons are displayed in the Icon Bar. The steps to define a Custom-action Icon are described in the *MS46121, MS46122, MS46131, MS46322 User Interface and Reference Manual* (10410-00337).

Table 4-2. Icon Descriptions - Listed Alphabetically (3 of 6)

Icon Name	Icon	Description
Icon Description Definitions		**Default Icons** – These are one of the 11 default icons and are provided after a return to the factory standard configuration. **Keyboard** – If available, the keyboard shortcut to access this menu or function. **Menu Bar** – If available, navigation path to access this menu or function. **Navigation** – To navigate to this menu or function from the MAIN menu. **Description** – If available, where this menu, dialog box, or function is described in greater detail in this document.
Display Icon	 Display	Default Icon. Select displays the right-side DISPLAY menu. • Keyboard: Alt + 4, then 2 • Menu Bar | Trace | Display • MAIN | Trace | TRACE
Easy Test Icon	 Easy Test	Select displays the Easy Test dialog box used to load Easy Test scripts. A separate easyTest Tools PC application is used to generate the easyTest work instruction (ETT) files that are loaded by this icon. To get the easyTest tools PC application, download the installer from the Anritsu website. • Keyboard ALT + 8 then 9 • Menu Bar | Utilities | EasyTest
File Icon	 File	Select displays the right-side FILE menu. • Keyboard: ALT + 1 • MAIN | File | FILE
Freq Icon	 Freq	Default Icon. Select displays the right-side FREQUENCY menu. • MAIN | Frequency | FREQUENCY
Hold Icon	 Hold	Select pauses the system operation, retaining all system presets and current configuration settings. • MAIN | Sweep Setup | SWEEP SETUP | Hold Functions | HOLD FUNCTIONS | Hold
Home Icon	 Home	Default icon. Select displays the right-side main menu. Does not reset or lose previous set values. • MAIN
Marker->Max Icon	 Marker->Max	Displays marker with maximum value. • MAIN | Marker | MARKER [1] | Marker Search | MARKER SEARCH | Max

Table 4-2. Icon Descriptions - Listed Alphabetically (4 of 6)

Icon Name	Icon	Description
Icon Description Definitions	**Default Icons** – These are one of the 11 default icons and are provided after a return to the factory standard configuration. **Keyboard** – If available, the keyboard shortcut to access this menu or function. **Menu Bar** – If available, navigation path to access this menu or function. **Navigation** – To navigate to this menu or function from the MAIN menu. **Description** – If available, where this menu, dialog box, or function is described in greater detail in this document.	
Marker->Min Icon	 Marker->Min	Select displays the marker with minimum value. • MAIN | Marker | MARKER [1] | Marker Search | MARKER SEARCH | Min
Marker->Off Icon	 Marker->Off	Select turns all marker displays off. • MAIN | Marker | MARKER [1] | Marker Setup | MARKER SETUP | All Markers Off
Marker->Peak Icon	 Marker->Peak	Select displays marker with the highest peak value. • MAIN | Marker | MARKER [1] | Marker Search | MARKER SEARCH | Peak | PEAK | Search Peak
Marker->Pk Lft Icon	 Marker->Pk Lft	Select displays the next peak value marker to the left of current selected marker. • MAIN | Marker | MARKER [1] | Marker Search | MARKER SEARCH | Peak | PEAK | Search Left
Marker->Pk Rt Icon	 Marker->Pk Rt	Select moves the current active marker to the next trace peak value to the right of its current position. • MAIN | Marker | MARKER [1] | Marker Search | MARKER SEARCH | Peak | PEAK | Search Right
Marker Icon	 Marker	Default Icon. Select displays the right-side MARKERS [1] menu. • Keyboard: Alt + 4, then 4 • MENU BAR | Trace | Marker • MAIN | Marker | MARKER [1]
Measurement Icon	 Measurement	Select displays the right-side MEASUREMENT menu. • Keyboard: ALT + 6 • MENU BAR | Measurement | MEASUREMENT • MAIN | Measurement

Table 4-2. Icon Descriptions - Listed Alphabetically (5 of 6)

Icon Name	Icon	Description
Icon Description Definitions	**Default Icons** – These are one of the 11 default icons and are provided after a return to the factory standard configuration. **Keyboard** – If available, the keyboard shortcut to access this menu or function. **Menu Bar** – If available, navigation path to access this menu or function. **Navigation** – To navigate to this menu or function from the MAIN menu. **Description** – If available, where this menu, dialog box, or function is described in greater detail in this document.	
Power Icon	 Power	Default Icon. Select displays the right-side POWER menu. • MAIN | Power | POWER
Preset Icon	 Preset	Default Icon. Select returns the system to its prior preset status which is the status at the time of the last preset save. • Keyboard: Alt + 8, then 5 • MENU BAR | Utilities | Preset
Print Icon	 Print	Select displays the PRINT dialog box, usually to print a copy of the main display. Once the dialog box appears, click OK to print; click Cancel to abort. • Keyboard: ALT + 1, then P • MENU BAR | File | Print • MAIN | File | FILE | Print | PRINT Dialog Box
Response Icon	 Response	Default Icon. Select displays the right-side RESPONSE menu. • Keyboard: Alt + 4, then 1 • MENU BAR | Trace | Response • MAIN | Response | RESPONSE
Scale Icon	 Scale	Default Icon. Select displays the right-side SCALE menu. • Keyboard: Alt + 4, then 3 • MENU BAR | Trace | Scale • Main | Scale | SCALE
Sweep Icon	 Sweep	Select displays the right-side SWEEP SETUP menu. • MAIN | Sweep Setup | SWEEP SETUP
System Icon	 System	Select displays the right-side SYSTEM menu. • Keyboard: Alt + 8, then 1 • MENU BAR | Utilities | System • MAIN | System | SYSTEM

Table 4-2. Icon Descriptions - Listed Alphabetically (6 of 6)

Icon Name	Icon	Description
Icon Description Definitions	**Default Icons** – These are one of the 11 default icons and are provided after a return to the factory standard configuration. **Keyboard** – If available, the keyboard shortcut to access this menu or function. **Menu Bar** – If available, navigation path to access this menu or function. **Navigation** – To navigate to this menu or function from the MAIN menu. **Description** – If available, where this menu, dialog box, or function is described in greater detail in this document.	
Time Domain Icon		Select displays the right-side Time Domain menu. • MAIN | Time Domain
Trace Icon		Default Icon. Select displays the right-side TRACE menu. • Keyboard: Alt + 4, then 5 • MENU BAR | Trace | Trace Menu • MAIN | Trace | TRACE
Tr->Max Icon		Select maximizes the display with the currently active trace. • Keyboard: Alt + 4, then 6 • MENU BAR | Trace | Trace Max • MAIN | Trace | TRACE | Trace Max
Tr->Next Icon		Select displays the next higher trace number. When the highest number is reached, next click displays lowest trace number. • Keyboard: Alt + 4, then 8 • MENU BAR | Trace | Trace Next • MAIN | Trace | TRACE | Trace Next
Tr->Previous Icon		Select displays the next lower trace number. When the lowest number is reached, next click displays the highest numbered trace. • Keyboard: Alt + 4, then 7 • MENU BAR | Trace | Trace Prev. • MAIN | Trace | TRACE | Trace Previous

CUSTOMIZE TOOLBAR Dialog Box

Use the CUSTOMIZE TOOLBAR dialog box to setup the Icon toolbar with the icons you need for quick access to commands and functions. Once configured, and after a Preset Configuration save, the Icon toolbar settings can be recalled with the other preset configuration parameters.

Previous

- "UTILITIES Drop-Down Menu" on page 4-13

Keyboard

- **ALT + 8, then 3**

Navigation

- MENU BAR | Utilities | Customize Toolbar | CUSTOMIZE TOOLBAR Dialog Box

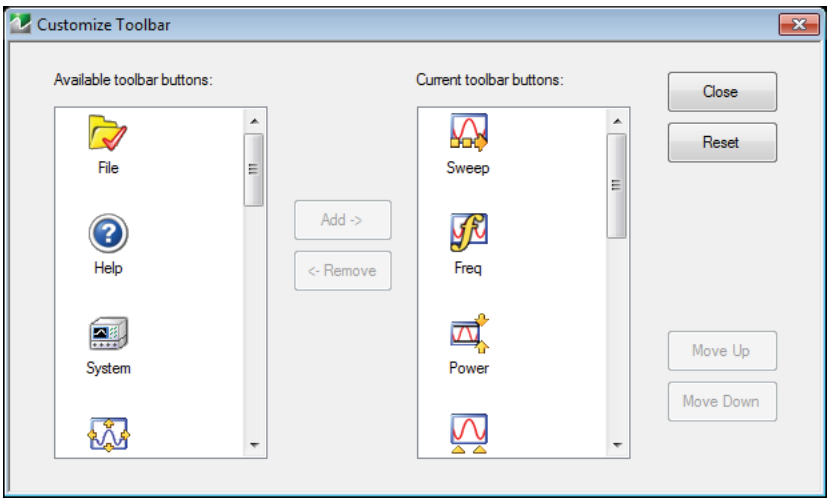


Figure 4-7. CUSTOMIZE TOOLBAR Dialog Box

Procedure

With the CUSTOMIZE TOOLBAR dialog box open, the left-side Available Toolbar Buttons area shows icons that are not in use on the current toolbar, while the right-side Current Toolbar Buttons area shows the current in-use icons.

Removing Icons

1. To change the icons in the current icon toolbar, in the right side Current Toolbar Buttons area, select an icon to remove. When selected, the Add-> and <-Remove buttons become available.
2. Remove unwanted icons as required by selecting the icon and then clicking the <-Remove button.
3. Removed icons appear at the bottom of the Available Toolbar Buttons list.

Adding Icons

1. Scroll through the Available Toolbar Buttons list and select an icon to add, then click the Add-> button. The selected icon appears in the right side Current Toolbar Buttons area.
2. Repeat the selection process until all required icons listed in the right side Current Toolbar Buttons area or you have reached the maximum of 20 icons.
3. In the Current Toolbar Buttons display, the icon displayed at the top of the list will appear on the extreme list of the toolbar. The last icon displayed, at the bottom of the list, will appear on the extreme right of the toolbar.

Moving Icons

To change the left to right sequence of the current icons, select an icon, and click the Move Up/Move Down buttons until the icons are correctly positioned left to right.

Saving the Configuration

When the icons are in the correct sequence. Click the Close button to apply the icons to the icon toolbar. It is recommended that a Preset Save be performed to save the icon toolbar configuration. If the icon toolbar needs adjustment, re-open the Customize Toolbar dialog box and repeat the steps above.

Reset to Factory Default

To return the icon toolbar to its factory default state, click the Reset button.

4-5 MAIN Menu and Application Menus

This section summarizes the MAIN MENU which is the home menu for all right-side menu interface menus, dialog boxes, and functions.

Note that the height of the MAIN MENU exceeds that of your monitor display, a scroll bar appears to provide vertical navigation of the MAIN MENU.

MAIN Menu

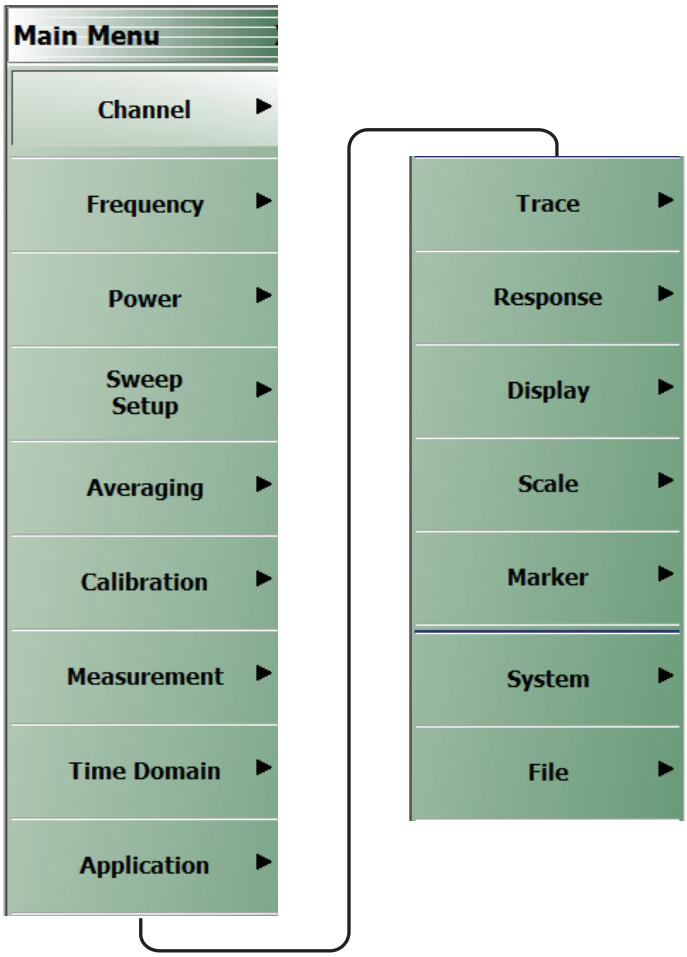


Figure 4-8. MAIN Menu

Channels

Select displays the CHANNELS menu. See the **User Interface Reference Manual** for descriptions of the CHANNEL menu.

Frequency

Select displays the FREQUENCY menu. The name, appearance, and available buttons on the FREQUENCY menu varies depending on the sweep type set and if CW frequency is selected.

Transmission measurements (option -021) IFBW is limited to 10 KHz with internal reference. With external reference IFBW can go all the way down to 10 Hz. Reflections measurements are limited in an IFBW/point-count sense as shown in Table 4-3 and Table 4-4.

Table 4-3. With CW Frequency Setting

IFBW (KHz)	Minimum Point Count
100	23
70	23
50	19
30	18
20	13
10	8
7	7
5	4
3	3
2	2
1	1

Table 4-4. With Sweep Frequency Setting

IFBW (KHz)	Minimum Point Count
100	7
70	7
50	7
30	7
20	6
10	5
7	4
5	3
3	3
2	2
1	1

Power

Select displays the POWER menu.

Sweep Setup

Select displays the SWEEP SETUP menu.

Averaging

Select displays the AVERAGING menu.

Calibration

Select displays the CALIBRATION menu.

Measurement

Select displays the MEASUREMENT menu.

Time Domain

Select displays the TIME DOMAIN menu

Application

Select displays the APPLICATION menu.

Trace

Select displays the TRACE menu.

Response

Select displays the RESPONSE menu.

Display

Select displays the DISPLAY menu.

Scale

Select displays the SCALE menu which allows the user to change the scaling and other attributes of a trace display.

SCALE menu variants are dependent on selections made from TRACE FORMAT menu options.

Marker

Select displays the MARKER [1] menu.

System

Select displays the SYSTEM menu.

File

Select displays the FILE menu.

4-6 Using the Main Menu Interface

Types of Menus, Menu Buttons, and Menu Toolbars

The MAIN MENU (or MAIN) is the right-side navigation function for the instrument. The MAIN MENU has multiple types of menus, menu buttons, and menu toolbars that allow the user to configure and control the operation of the VNA. Each menu consists of the elements shown in the figure below.

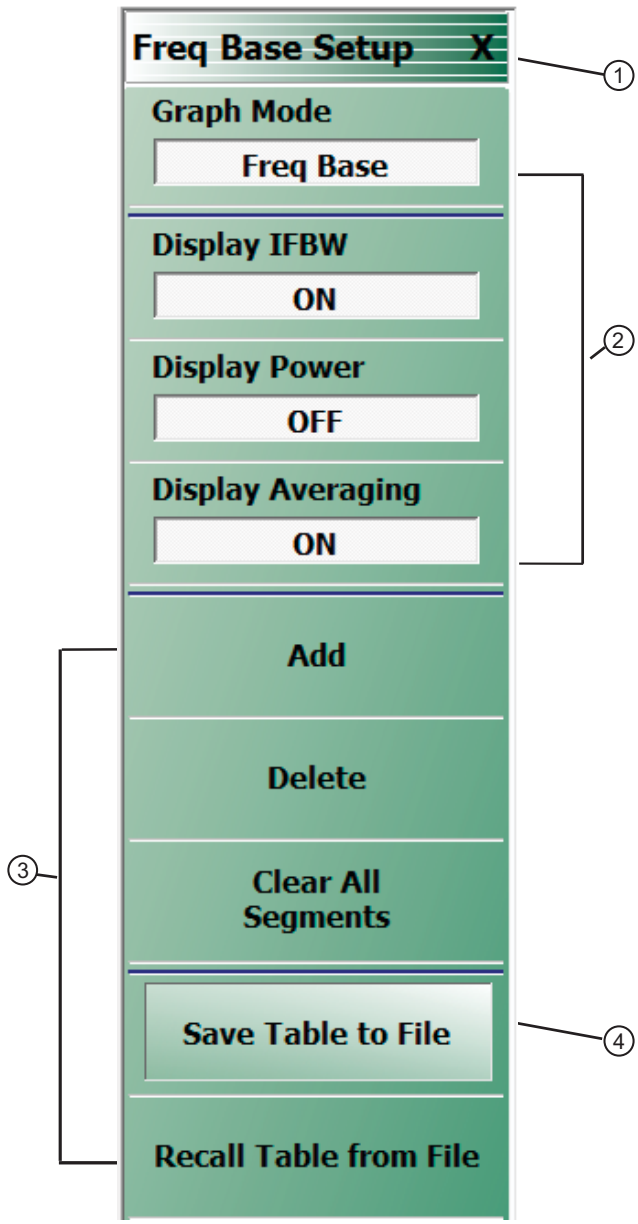


Figure 4-9. Menu and Button Components

1.	Menu Title – Each menu title is unique.
2.	Field Buttons – The button shows the currently selected value. Selecting the button displays a field toolbar.
3.	Menu Command Buttons – Performs selected menu choice
4.	Active Selection

Menu Title

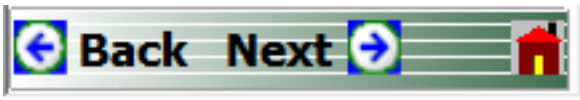
At the top of the menu, a unique menu title, which is not repeated on any other menu. For space reasons, menu names are often abbreviated.

Menu Buttons

One or more menu buttons that either call a sub-menu, allow for a field value to be specified, toggle a function off or on, or allow a selection to be made from a group of choices. If the menu is longer than one screen, a scroll box and scroll arrows appear on the right side of the menu.

Menu Navigation Buttons

The menu navigation area buttons appear at the bottom of each menu.



Back Button

The Back button returns the menu display to last selected higher-level menu.

Next Button

The Next button returns the menu display to the next deeper sub-menu that has already been selected. The availability of the Back and Next buttons (above) depends on the user's navigation path. The Home button (below) always appears.

Home Button

The Home button returns the menu display to the MAIN menu.

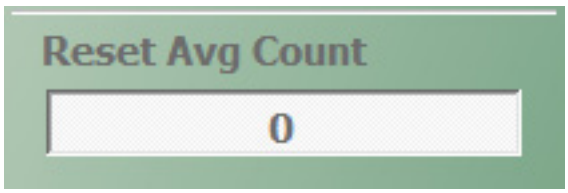
Menu Buttons

Select Menu buttons provide lower-level menus.

For example, the Averaging button on the MAIN menu calls the AVERAGING menu.

Read-Only Buttons

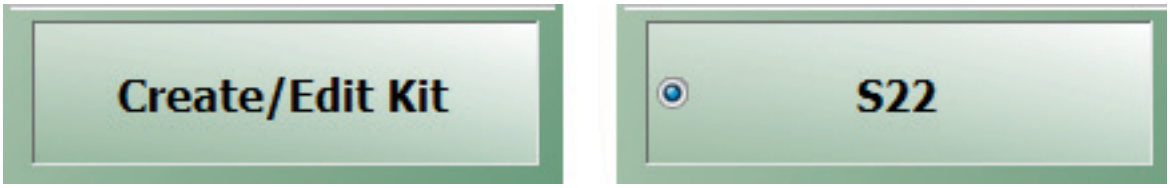
Select read-only buttons display system values based on other settings and parameters.



For example, the Reset Avg Count button is in a read-only state because the Averaging button is set to OFF.

Function Buttons

Function buttons are used to start a process or to select an option. The buttons are highlighted to indicate selection. Selected options display a radio button icon.



Toggle Buttons

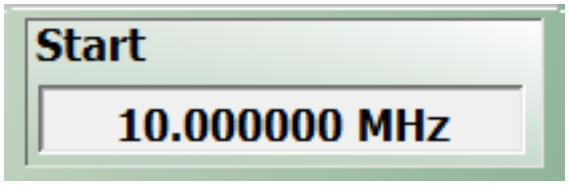
Toggle buttons toggle through two or more values with each click of the button and display their current setting in the button field. For example, in the MAIN MENU | Response | RESPONSE | User Defined | USER DEFINED menu, the Driver Port button displays the default Port 1 setting.

Clicking the Driver Port button toggles to the Port 2 setting.

Clicking the Driver Port button a second time toggles back to the Port 1 setting.

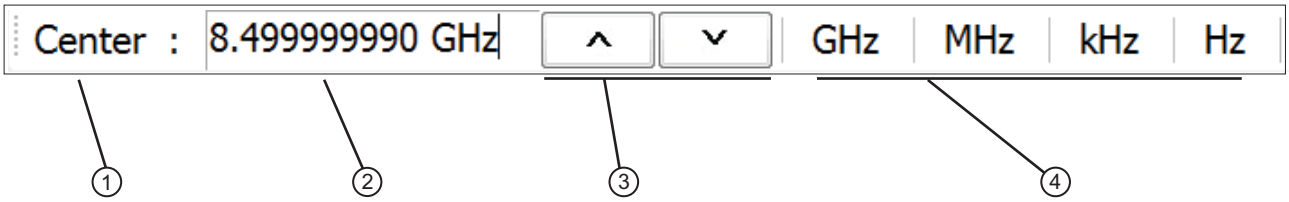
Field Selection Buttons

Field selection buttons display a user-defined parameter or value. Clicking a field selection button such as the Start button on the FREQUENCY menu displays a field toolbar (described below) that allows the user to specify parameter values and units.



Field Toolbars

Field toolbars appear under the Icon Toolbar after the associated field button has been selected. The field toolbar displays its name, a value field, up/down arrows to increment the value, and one or more unit select buttons.



1. Toolbar Name – The toolbar name usually is based on the name of the button that called the toolbar. 2. Value Field – Entry area for parameter value. Entry can be from the front panel Number Keys, or from an attached USB keyboard, or by clicking the Up/Down arrows (below).	3. Up/Down Arrows – Increments the value field up or down to quickly enter values. The same effect from the front panel Up/Down Arrow Keys, or from the keyboard Up/Down arrow keys. 4. Available Units Selection – If available (shown in the upper toolbar), allows the selection of units from two or more values. If not available (shown in the lower toolbar), the units are fixed and not selectable.

Figure 4-10. Field Toolbar Selections

For example, clicking the Start button on the FREQUENCY menu displays the Start (Frequency) field toolbar, with multiple frequency options.

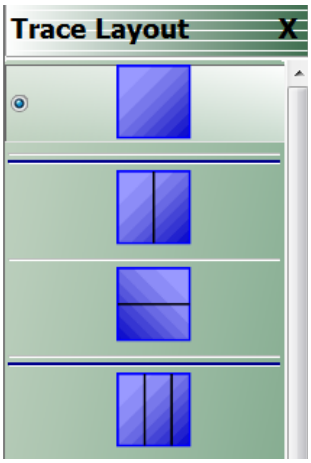
Some field toolbars display a single unit with no options. For example, in the MAIN MENU | Scale | SCALE menu, clicking the Reference Value button displays the Reference Value toolbar with a single dB unit value option.

The system limits for each toolbar are defined in the System Limits section in the Programming Manual Supplement. The appendix lists the default, minimum allowable, and maximum allowable values and whether the toolbar changes apply on a per-trace, per-channel, or per-system basis.

Button Selection Icon

The button select icon identifies a selected option.

In the example below, the TRACE LAYOUT menu shows that the Single Screen option has been selected.



After selection, depending on the menu, the user either clicks the Back button navigation icon to return to the prior menu, or once selected, the system auto-returns to the prior menu.

Navigation

- MAIN | Trace | TRACE LAYOUT | Trace Layout

Completion Checkmark Button

In the **Calibration** menus, some buttons list the required tasks for each calibration type. The completion checkmark icon indicates that a calibration task has been completed.

For example, in a Full 2 Port Reflection Calibration, one of the required steps is a Port 1 Short test.

The button above left shows the test has not been started. The user makes the necessary physical connections between the VNA and the required connector/adapter, and then clicks the button to begin the test. The button dims while the test is performed. After the test is successfully completed, the completion icon appears on the left side of the button as shown above right.

4-7 Using Dialog Boxes

Most dialog boxes are standard Microsoft dialog boxes and appear in the center of the display area.

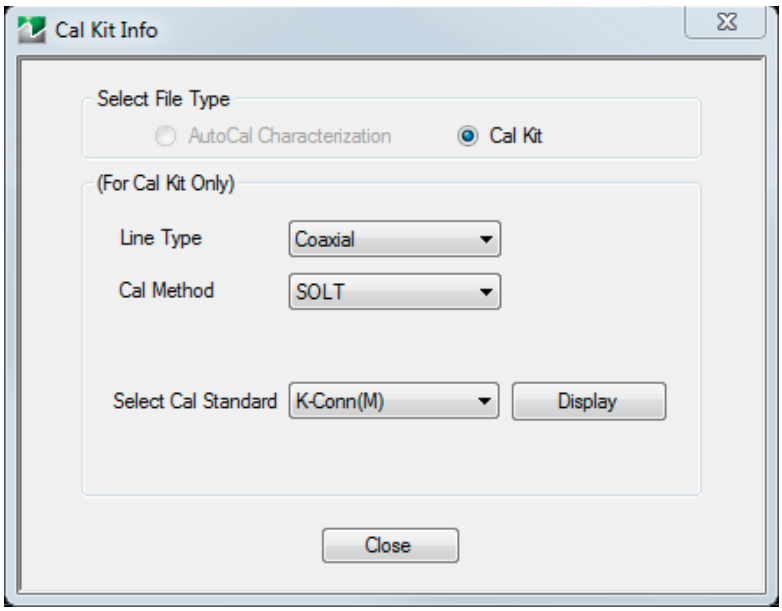


Figure 4-11. CAL KIT INFO Dialog Box Example

Standard Dialog Box Buttons

Most dialog boxes also have some combination of standard buttons for OK, Cancel, and Save. Other buttons and types of buttons may be present. Within dialog boxes are Dialog Box Areas that are usually named for the options that can be selected or the information that is displayed. For example, in the figure above, test status and completion messages are displayed in the Self Test Message area. Most Dialog Box Areas are delimited by a line, box, or shadowbox that contains the information or settings for a series of common attributes. If the area is named in the dialog box, that name is used in any related procedures. If the area is not named, the area is named for the first data or input field. Some dialog boxes have links that call sub-dialog boxes.

4-8 Instrument Status Display Area

At the bottom of the instrument display is the status bar where instrument states and conditions are reported.

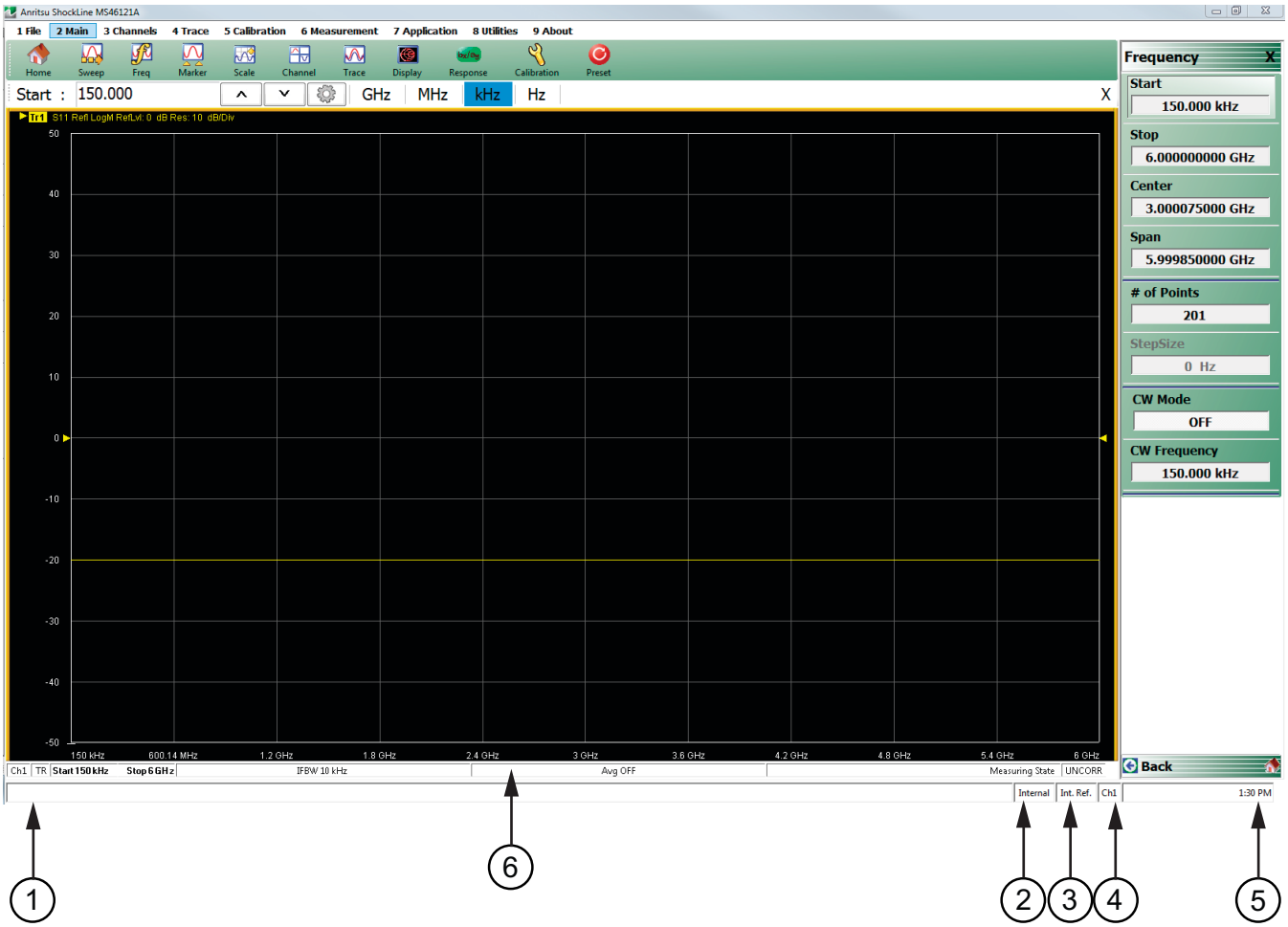


Figure 4-12. Instrument Status Area

Instrument Status Data

Table 4-5. Instrument Status Display Abbreviations

Status Display	Description
1. Warning Messages	Displays warning messages.
2. Internal / External / Manual	Displays status of system triggering.
3. Int. Ref. / Ext. Ref.	Indicates usage of internal or external reference.
4. Port 1 / Port 2 / Port 3 / Port 4	Highlights the port being driven: • 2-Port VNAs cycle between Port 1 and 2. • 4-Port VNAs cycle between 1 and 4.
5. Time	Displays system time.
6. Channel Status bar	See “Channel Status Display Area”.

4-9 Channel Status Display Area

At the bottom of the display, above the instrument status bar, is the Channel Status bar where the following information is reported. The displayed parameters are context and setting dependent. Not all parameters are displayed all the time. In a multi-channel display, the display may be truncated. To maximize the channel display, select any of the following:

- Keyboard: **CTRL + 1**
- Keyboard: **ALT + 3, then 2**
- MAIN | Channels | CHANNELS | Chan. Max

Figure 4-13. Trace Status Bar

Table 4-6. Trace Status Bar Abbreviations

	Status Display	Description
1	Ch#	Displays the channel number. For example, Ch2 means that the display is for Channel 2.
2	TR	Displays the measurement mode as transmission/reflection.
3	[Start] Start # Units	In general, the left-side parameters define the starting position of distance, frequency, time, or power. From the FREQUENCY menu, if CW Mode is set to off, displays the current Start Frequency value with units of kHz, MHz, or GHz.
4	CW Frequency # Units	From the FREQUENCY menu, if CW Mode is set to on, displays the current CW Frequency value with units of kHz, MHz, or GHz.
5	[End] Stop # Units	In general, the right-side parameters define the ending position of distance, frequency, time, or power. From the FREQUENCY menu, if CW Mode is set to off, displays the current Stop Frequency value with units of kHz, MHz, or GHz.
6	IFBW # Units	From the AVERAGING menu, reports the IF Bandwidth Frequency setting with units of Hz, kHz, or MHz.
7	Avg OFF Avg # # / #	From the AVERAGING menu, reports that Averaging is off, or if values are present, Averaging is on. If Averaging is on, and the Averaging Type is Per-Point, reports the Averaging factor. If Averaging is on, and the Averaging Type is Per-Sweep, the left-side number reports the number of average sweeps; the right-side number displays the Averaging Factor.
8	Measuring State Calibrating State	Indicates whether the instrument is measuring or being calibrated.
9	UNCORR CORR EDE E/O	UNCORR indicates that a calibration is not being applied. CORR (with a green background) indicates that the calibration for the active channel is being applied (corrected). EDE (with green background) Indicates Embedding or De-embedding is being applied. E/O, O/E, or O/O (with a green background) indicates an optical measurement state.

4-10 Working with Channels

Each VNA channel is like a separate VNA, with its own frequency list, calibrations, power setup and other parameters. Each channel can display up to 16 individual trace graph displays. The number of VNA channels is user-definable up to a maximum of 16 channels.

Channel Menu

Navigation to the CHANNEL menu:

MAIN MENU | Channel | CHANNEL |

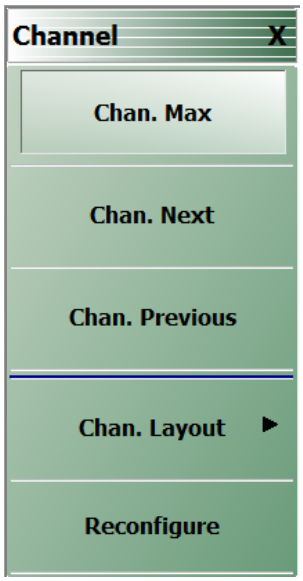


Figure 4-14. Channel Menu

To Select a Channel

1. Select a channel in a multi-channel display by doing one of the following:
   - Click anywhere inside the desired channel box.
   - From the keyboard, enter **ALT + 3**, then **3** to view the previous channel or **ALT + 3**, then **4** to view the next channel.
   - On the top menu bar, select MENU BAR | Channels | Channel Prev or MENU BAR | Channel | Channel Next.
   - On the right side menu, select MAIN | Channels | CHANNELS | Chan Next or Chan Previous.
2. The selected channel border changes from gray to white. Figure 4-3, "User Interface - 2 Traces (simulated data)" on page 4-3 shows Channel 2 (Ch2) selected.)

Note	The **Ch->Max**, **Ch->Next**, and **Ch-Prev** icons are available for the icon toolbar. These icons provide one click access to channel maximum, channel next, and channel previous functions. They can be added to the icon toolbar for a custom configuration and saved as part of a preset configuration.

To Maximize a Channel Display

1. Use one of the methods above to select the desired channel.
2. Do one of the following to maximize the selected channel:
   - From the keyboard, enter **CTRL + 1** or **ALT + 3**, then **2**.
   - On the main display, double-click the channel border box.

- On the top menu bar, select MENU BAR | Channel | Channel Max.
- On the right side menu, select MAIN | Channel | CHANNEL | Chan. Max.

3. The selected channel now fills the display area.

- Maximize a channel display to review the channel status information at the bottom of its screen.

To Make the Display Area Larger

1. The top icon toolbar and the right side menus can be removed to make the display area larger.

2. Remove the icon toolbar by doing one of the following:

- From the keyboard, select **ALT + 8**, then **2.**
- On the top menu bar, select MENU BAR | Utilities | Toolbar Off.

3. The icon toolbar disappears. Repeat **Step #2** to make the icon toolbar reappear.

4. Remove the right side menus by doing one of the following:

- From the keyboard, enter **ALT + 8**, then **7**.
- On the top menu bar, select MENU BAR | Utilities | Clear.

5. The right side menu disappears. Repeat **Step #4** to make the menu reappear.

4-11 Working with Traces

For each channel defined above, from 1 (one) to 16 trace graphs (called “traces”) can be defined where each trace is a data display within a specific channel. Each trace is defined by a response parameter (such as S11), a graph type display (such as a rectilinear graph, a polar display or Smith chart), a scale, and possibly post-processing elements such as time domain and smoothing.

Trace Menu

Navigation to the TRACE Menu:

MAIN MENU | Trace | TRACE |

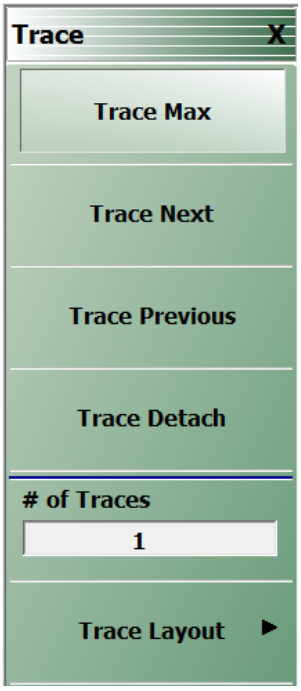


Figure 4-15. Trace Menu

To Select Traces

1. Use one of the methods above to maximize the channel display.
2. Select a trace in a multi-trace display by doing one of the following:
   - With a mouse, single click the trace title.
     - If you double-click either the trace title or anywhere within the trace, the trace is both selected and maximized.
   - From the keyboard, enter **ALT + 4**, then **7** to view the previous trace or **ALT + 4,** then **8** to view the next trace.
   - On the top menu bar, select MENU BAR | Trace | Trace Prev or MENU BAR | Trace | Trace Next.
   - On the right side menu, select MAIN | Trace | TRACE | Trace Previous or Trace Next.
   - The selected trace number is highlighted and a left arrow appears.

Figure 4-16. Trace Selection Indicator

Trace 1 Selected	Trace 1 Not Selected

Figure 4-16. Trace Selection Indicator

Note	The **Tr->Max**, **Tr->Next**, and **Tr->Previous** icons are available for the icon toolbar. These icons provide one click access to trace maximum, trace next, and trace previous functions. They can be added to the icon toolbar for a custom configuration and saved as part of a preset configuration.

To Maximize a Trace Display

1. Use one of the methods above to select the desired trace.
2. For a maximum display, make sure the trace's channel is maximized.
3. Do one of the following to maximize the selected trace:
   - From the keyboard, select **ALT + 4,** then **6**.
   - On the main display, double-click anywhere in the trace display.
   - On the top menu bar, select MENU BAR | Trace | Trace Max.
   - On the right side menu, select MAIN | Trace | TRACE | Trace Max.
4. The selected trace now fills the display area.
   - Maximize a trace display to review the trace status information at the bottom of trace screen.

Repeat the actions above to return the trace to its normal size.

Types of Trace Displays

There are four general graph types available and within each general type are multiple sub-types:

- Rectilinear single graph
- Rectilinear dual graph
- Smith chart
- Polar plot graph

Trace Data Types

The data types generated by the VNA (real, imaginary, magnitude, phase) are used in the display graph to show the possible ways in which S-Parameter data can be represented. For example, complex data, that is data in which both phase and magnitude are graphed, may be displayed in any of the following ways:

- **Complex Impedance**

  Displayed on a Smith chart graph as impedance or as admittance.
- **Real and Imaginary**

  If simultaneous displays are required, displayed on a real and imaginary rectilinear (a Cartesian plot) graph. If only one type is required, a single rectilinear real graph or single rectilinear imaginary graph.
- **Phase and Magnitude**

  Displayed on a single rectilinear graph, as paired rectilinear graphs, or as a polar graph.
- **Group Delay**

  Defined as the frequency span over which the phase change is computed at a given frequency point. The quantity group delay is displayed using a modified rectilinear-magnitude format. In this format, the vertical scale is in linear units of time (either ps, ns, us, or ms). With one exception, the reference value and reference line functions operate the same as they do with a normal magnitude display.

Trace Display Graphs

A separate graph can be assigned to each active channel and display area. The following available display graph types are listed in Table 4-7 below.

Table 4-7. Available Trace Display Types (1 of 2)

Menu Name	Definition and Display Options	Y-Axis Dependent Variable	X-Axis Independent Variable	Measurement Applications
Rectilinear Single Graphs				
Log Mag	Log magnitude rectilinear format graph Magnitude		Y = dB	Return loss measurement Insertion loss measurement Gain measurement
Linear Mag	Linear magnitude rectilinear format graph	Magnitude	Linear units	Reflection coefficient measurement
Phase	Phase rectilinear format graph	Phase displayed in range from -180 to + 180 degrees	Degrees	Linear phase deviation measurements
Imaginary	Imaginary rectilinear format graph	Imaginary part of measured complex parameter	Linear units	
Real	Real rectilinear format graph	Real part of measured complex parameter	Linear units	
SWR	Standing Wave Ratio rectilinear format graph	$SWR = \frac{1+\rho}{1-\rho}$ where ρ = Reflection Coefficient	Linear units	Standing wave measurements Antenna analysis
Impedance	Impedance rectilinear format graph Four options are: • Real • Imaginary • Magnitude • Real & Imaginary • Inductance • Capacitance			
Rectilinear Paired Graphs				
Log Magnitude and Phase	Paired graphs with Log Magnitude on top and Phase on bottom	As above	As above	Same as having one trace with a Log Magnitude display and a second trace with a Phase rectilinear display.

Table 4-7. Available Trace Display Types (2 of 2)

Menu Name	Definition and Display Options	Y-Axis Dependent Variable	X-Axis Independent Variable	Measurement Applications
Linear Magnitude and Phase	Paired graphs with Linear Magnitude on top and Phase on bottom	As above	As above	Same as having one trace with a Linear Magnitude display and a second trace with a Phase rectilinear display.
Real and Imaginary	Paired graphs with Real on top and Imaginary on bottom	As above	As above	Same as having one trace with a Real rectilinear display and a second trace with an Imaginary rectilinear display.
Polar Graphs				
Linear Polar	Linear polar plot graph The polar graph format traces are used to display one magnitude value and phase on the same chart. Plot options: • Lin/Phase • Real/Imag.		Chart mode options: • Magnitude/Phase • Magnitude/Swap Position	
Log Polar	Plot options: • Log/Phase • Real/Imag.		Chart mode options: • Magnitude/Phase • Magnitude/Swap Position	
Smith Chart Graphs				
Smith (R + jX)	Smith Chart graphs with impedance (circuit resistance and reactance) Four read out style options are available: • Lin/Phase • Log/Phase • Real/Imag. • Impedance		The impedance is the measure of a circuit's opposition to alternating current which consists of the circuit resistance and the circuit reactance, together they determine the magnitude and phase of the impedance.	• Reflection measurements

Trace Labels

Each trace (i.e. each graph display) is labeled with information such as its trace number, the graph type, scaling, reference delay, and S-parameter associated with that trace. Depending on the trace settings and the graph type, other information may be displayed. The Trace number field can be edited for a custom trace name.

The general format of trace label consists of the following parameters and their associated abbreviations appearing from left to right in the trace label. Some parameters may not appear depending on the instrument settings.

- Trace Number
- Measurement Type
- Time Domain
- Graph Type
- Reference Level
- Resolution Units
- Trace Memory Statistics

Trace Label Abbreviations

The trace label abbreviations are described in the tables below:

- Table 4-8, "Trace Labels - Trace Number, Measurement Type"
- Table 4-9, "Trace Labels - Abbreviation, Type and Name, Reference Level Units, Resolution Units"

Table 4-8. Trace Labels - Trace Number, Measurement Type

Abbreviation	Definition	Description
Trace Number Abbreviation		
Tr#	Trace number	Trace 1 through Trace 16.
Measurement Type Abbreviations		
S11 Refl	S11 Port 1 forward reflection	S-parameters are selected on the RESPONSE menu.
S12 Trans	S12 Port 1 reverse transmission	S-parameters are selected on the RESPONSE menu.
S21 Trans	S21 Port 2 forward transmission	S-parameters are selected on the RESPONSE menu.
S22 Refl	S22 Port 2 reverse reflection	S-parameters are selected on the RESPONSE menu.
NN / DD | Port #	NN is user-defined numerator value. DD is user-defined denominator value. Port number	User-defined numerator, denominator, and driver port are selected on the RESPONSE | User-defined | USER-DEFINED menu. Numerator and denominator options are A1, B1, A2, B2, or 1. Port number selection options are Port 1 or Port 2.

Table 4-9. Trace Labels - Abbreviation, Type and Name, Reference Level Units, Resolution Units

Graph Abbreviation	Graph Name and Type	Reference Level (RefLvl)	Resolution Units (Res)
Rectilinear Single Graph			
LogM	Log Mag (Log Magnitude) rectilinear	dB	dB / Div
LinM	Linear Mag (Linear Magnitude) rectilinear	U	U / Div
Phase	Phase rectilinear with units in degrees (º)	º	º / Div
Real	Real rectilinear	U	U / Div
Imag	Imaginary rectilinear	U	U / Div
SWR	SWR rectilinear	U	U / Div
Imped Real	Impedance Real rectilinear with units in Ohms (Ω)	Ω	Ω / Div
Imped Imag	Impedance Imaginary rectilinear	Ω	Ω / Div
Imped Mag	Impedance Magnitude rectilinear	Ω	Ω / Div
Imped R + I	Impedance Real and Imaginary rectilinear. A rectilinear paired graph.	Ω	Ω / Div
Rectilinear Paired Graphs			
LogM + P	Log Magnitude and Phase rectilinear paired graphs.	dB	º Res: dB/Div, º/Div
LinM + P	Linear Magnitude and Phase rectilinear paired graphs	dB	º Res: dB/Div, º/Div
R + I	Real and Imaginary rectilinear paired graphs	U	Res: U/Div, U/Div
Smith Charts with Impedance			
Smith Imped	The display can be one of four possible Smith Chart with impedance displays: • Smith (R+jX) Linear/Phase Smith Chart • Smith (R+jX) Log/Phase Smith Chart • Smith (R+jX) Real/Imaginary Smith Chart • Smith (R+jX) Impedance Smith Chart	—	U / Div
Polar Graphs			
Lin Pol	Linear Polar, Linear/Phase polar	U	U/Div
Lin Pol, RI	Linear Polar, Read/Imaginary polar	U	U/Div
Log Pol	Log Polar, Log/Phase polar	dB	dB/Div
Log Pol, RI	Log Polar, Real/Imaginary polar	dB	dB/Div
Group Delay and Power Rectilinear Graphs			
Grp Dly	Group Delay rectilinear with units of seconds	s	Res: s/Div

Rectilinear Single Graph

A rectilinear graph is a display of a Cartesian coordinate system or plan consisting of an X-axis and a Y-axis. The X-axis displays the independent variable (such as frequency or time) and the Y-axis displays the dependent value.

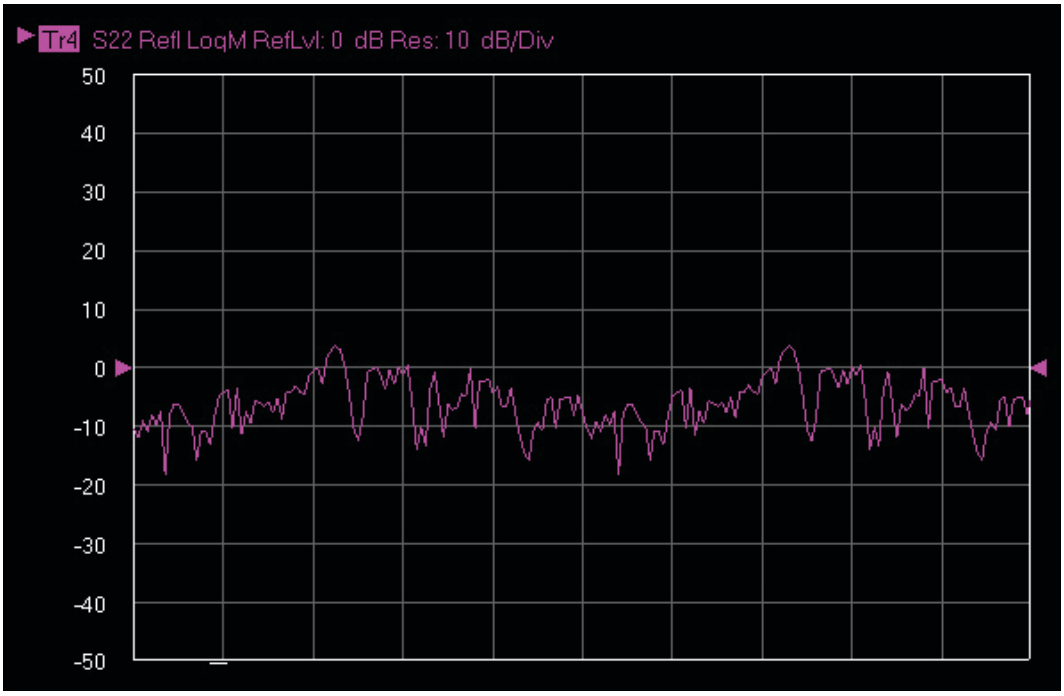


Figure 4-17. Trace Graph - Rectilinear Single - Log Magnitude (Log Mag) Trace Display Graph

Rectilinear Paired Graphs

As above, but paired with a phase rectilinear graph below. Useful to provide immediate comparison with a function value and its phase.

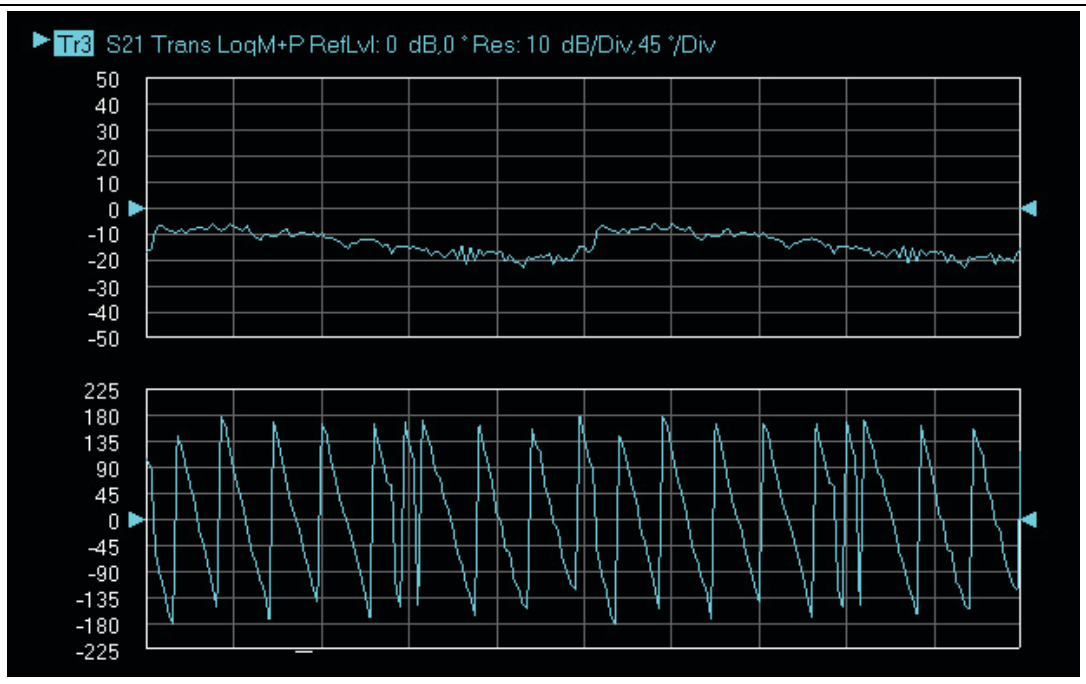


Figure 4-18. Trace Graph - Rectilinear Paired - Trace Log Magnitude and Phase Trace Display

Smith Charts

The power reflected from a DUT has both magnitude and phase because the impedance of the device has both a resistive and a reactive term of the form $r+jx$. We refer to the r as the real or resistive term, while we call x the imaginary or reactive term. The j, which we sometimes denote as i, is an imaginary number. It is the square root of –1. If x is positive, the impedance is inductive, if x is negative the impedance is capacitive. The size and polarity of the reactive component x is important in impedance matching. The best match to a complex impedance is the complex conjugate which means an impedance with the same value of r and x, but with x of opposite polarity. This term is best analyzed using a Smith Chart, which is a plot of r and x.

To display all the information on a single S-parameter requires one or two traces, depending upon the format we want. A very common requirement is to view forward reflection on a Smith Chart (one trace) while observing forward transmission.

Smith Chart with Impedance (Circuit Resistance and Reactance)

The Smith Chart with impedance (Smith R + jX) has four display options:

- Lin/Phase
- Log/Phase
- Real/Imag.
- Impedance

The impedance is the measure of a circuit's opposition to alternating current which consists of the circuit resistance and the circuit reactance, together they determine the magnitude and phase of the impedance.

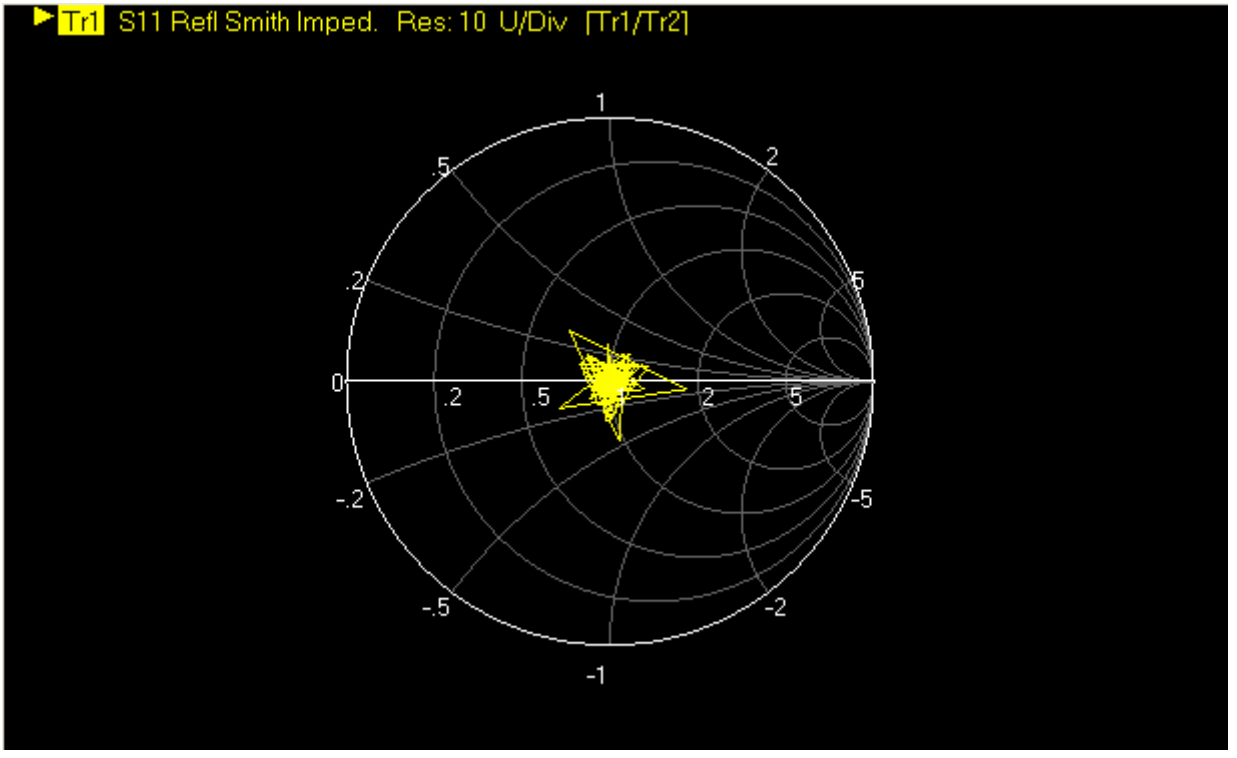


Figure 4-19. Smith Chart with Impedance (R+jX)

Polar Graphs

A polar graph represents a two-dimensional coordinate system where each point is determined by an angle and a distance. The polar coordinate system is especially useful in situations where the relationship between two points is most easily expressed in terms of angles and distance such as in phase relationships in antenna and feedline design. The magnitude parameter can use either a linear or log scale. As the coordinate system is two-dimensional, each point is determined by two polar coordinates: the radial coordinate (distance from the center) and the angular coordinate (degrees counterclockwise from the right edge). Polar displays are used for transmission measurements, especially for cascaded devices in series. The transmission result is the addition of the phase and log magnitude (dB) information in the polar display of each device.

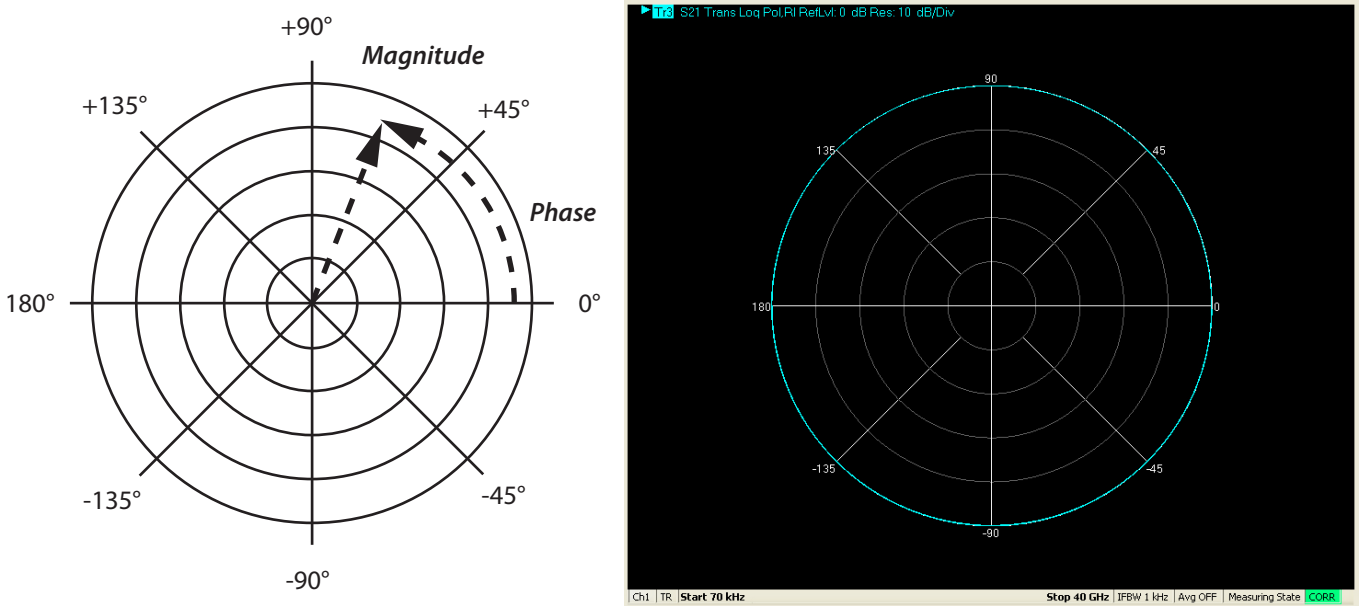


Figure 4-20. Log Polar Diagram and Trace Graph Example

Group Delay Graphs

The quantity group delay is displayed using a modified rectilinear-magnitude format. In this format the vertical scale is in linear units of time (ps, ns, us, ms). With one exception, the reference value and reference line functions operate the same as they do with a normal magnitude display. The exception is that they appear in units of time instead of magnitude.

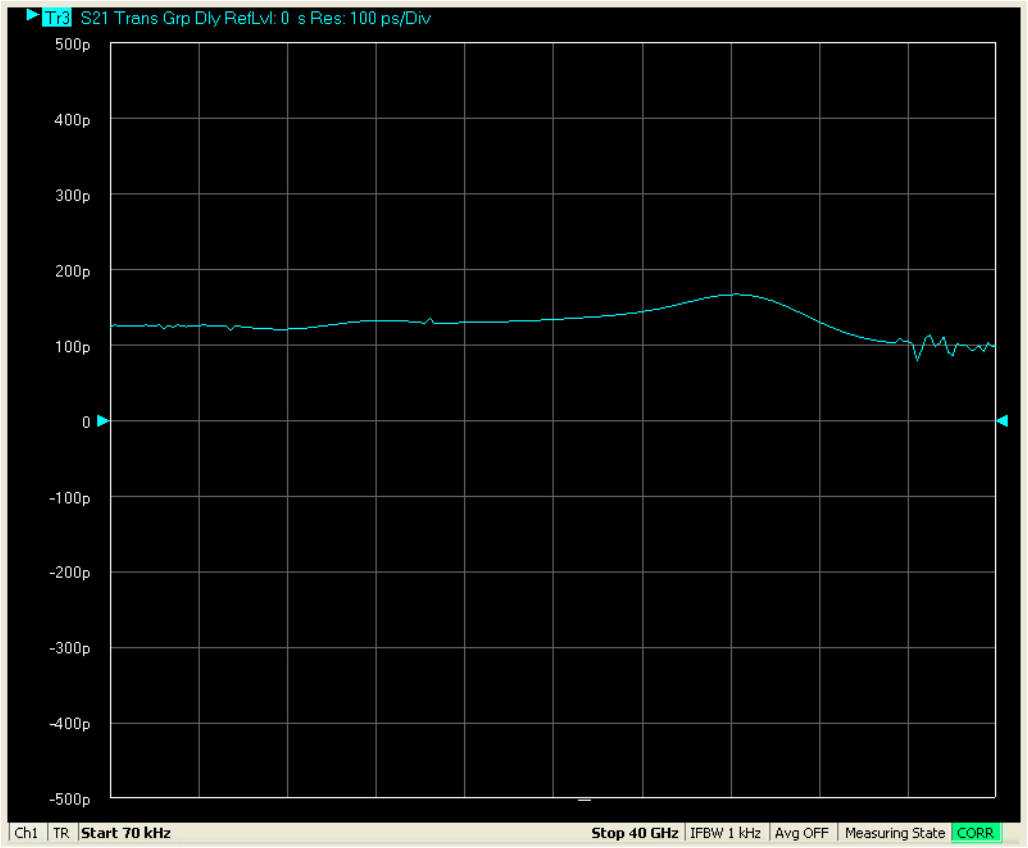
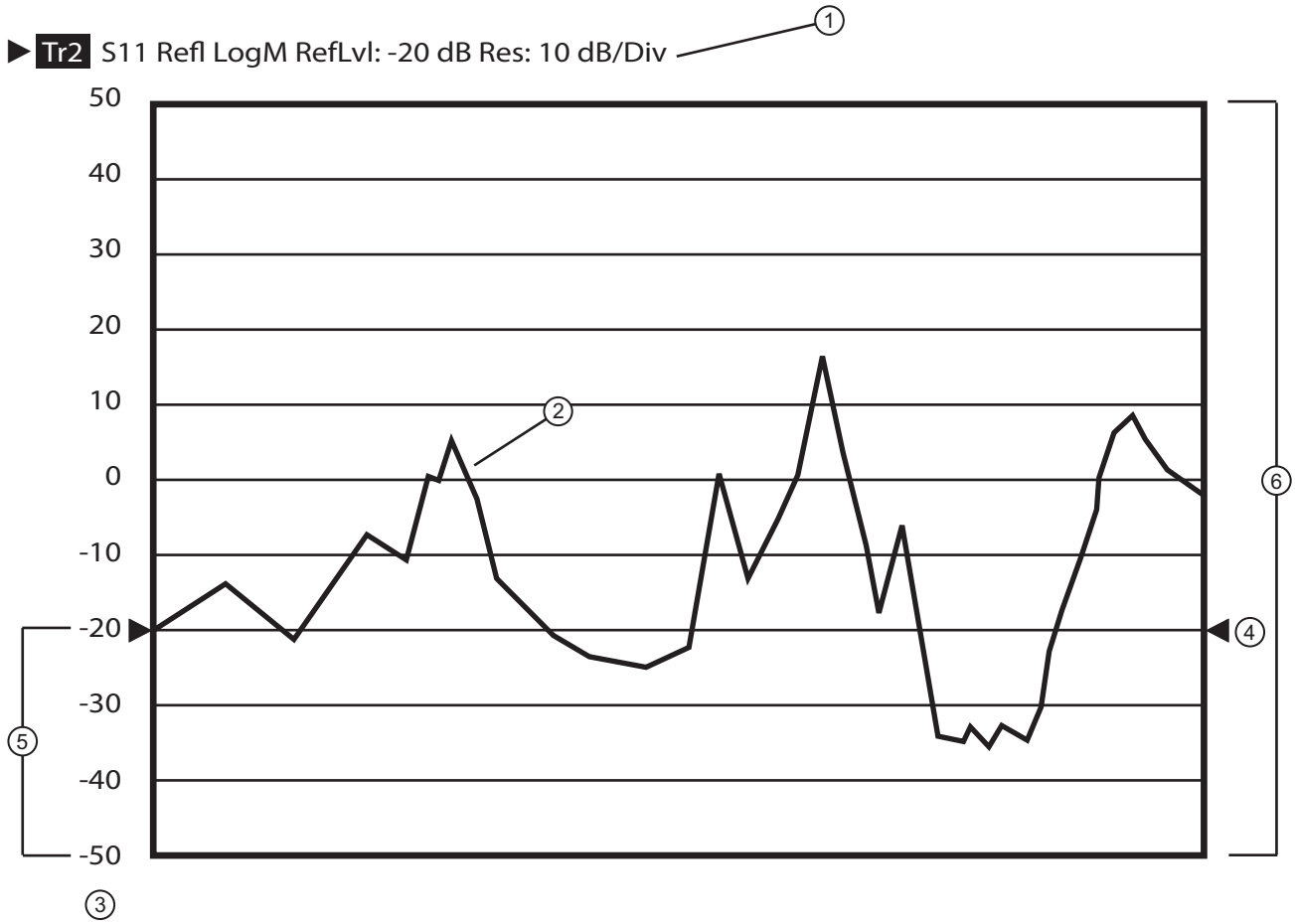


Figure 4-21. Group Delay Trace Graph Example

4-12 Working with Reference Lines and Reference Position

You can manipulate the display elements in a rectilinear trace graph from either the trace itself or from the right-side menus.



1. Trace Label – The trace label appears above the trace graph. The example above shows Trace 2 measuring S11, displayed on a Log Magnitude graph, with a Reference Level of -20 dB, and a graph resolution of 10 dB per vertical division.
2. Response Graph – A typical S11 response graph.
3. Resolution in Units per Division – The example shows 10 dB per division.
4. Reference Line Pointers – Reference lines are only available in rectilinear trace graphs and are indicated by the paired arrows on the trace graph display and show the position of the reference value on the Y-axis scale. The example Reference Value is set to -20 dB. Click-hold-and-drag the line pointers to change the reference line value.
5. Reference Position – The example Reference Position is set to 3. Click-hold-and-drag the reference position scale to change the position of the graph on the Y-axis up or down. The value of the Reference Line Points does not change.
6. Number of Vertical Divisions – The example number of vertical divisions is set to 10.

Figure 4-22. Trace Display Controls and Settings

4-13 Working with Markers

The ShockLine VNA GUI display provides up to thirteen markers per trace of which twelve are direct markers and one a reference marker. Each marker data array can be repositioned by a drag/drop anywhere within the signal response trace display. Each marker can be individually controlled on/off and positioned as required on the signal response display.

If the reference marker is off, each marker provides measurement data based on its display position. If the reference marker is on, each marker provides differential measurement data based on its position relative the reference. Figure 4-23, is an overview of the marker menu.

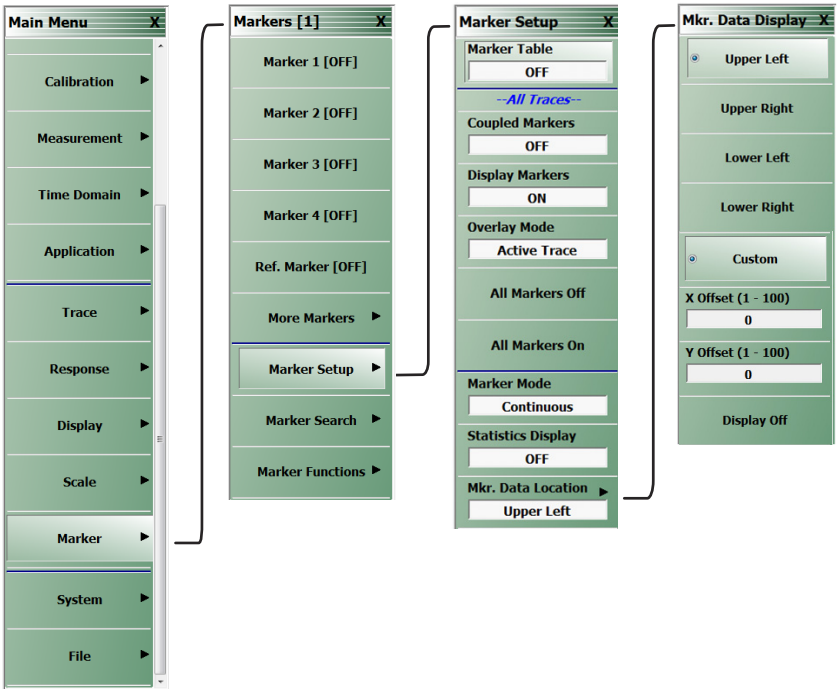
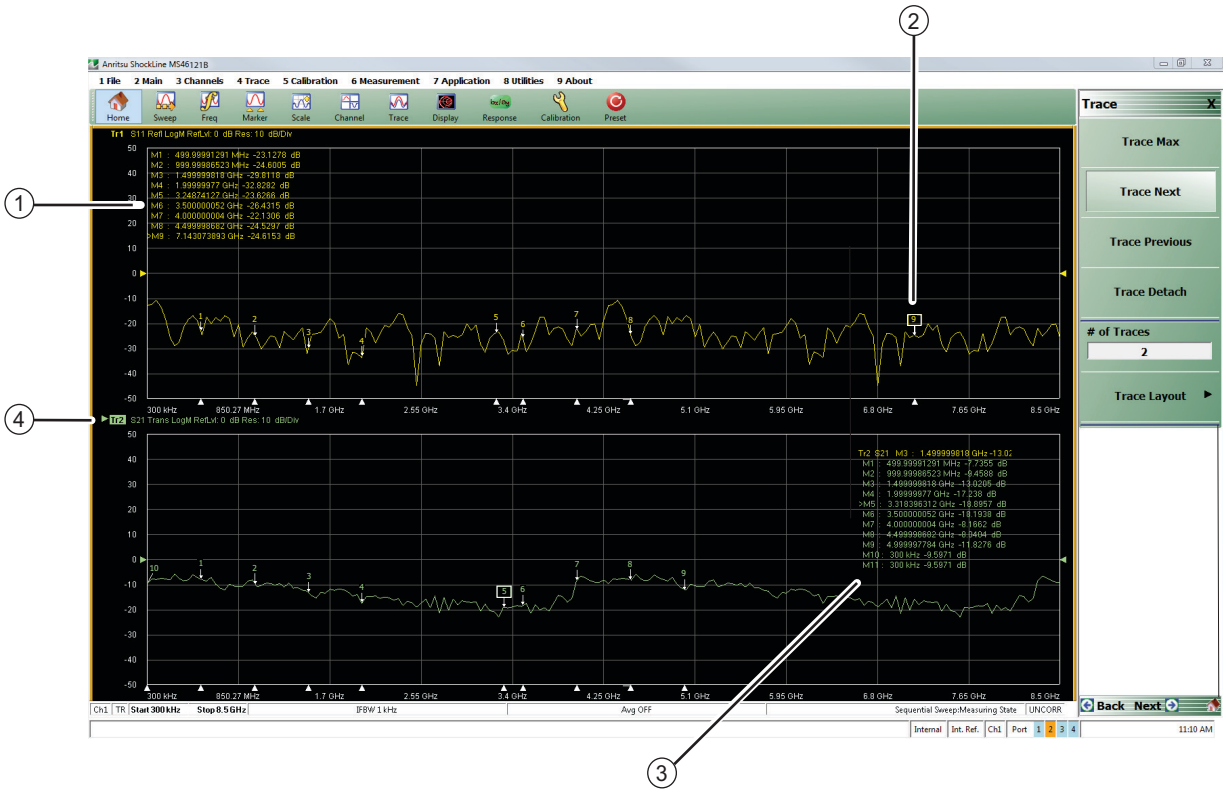


Figure 4-23. Marker Menus

Markers

- Can be set between Discrete and Continuous Modes
- Can be set to Statistics Display.
- Can be set to Coupled mode on or off.
- Can be set to be repositioned within the display.
- Can be set to search Bandwidth Loss field and Notch Loss field.
- Can set Tableau Display to view all active markers.
- Can set Marker Labels.
- Can search Target Markers.
- Can search range units depending on the Sweep Types selected.

The example below Figure 4-24, depicts a two trace display. On the top trace display, the individual marker [9] is selected, and repositioned. In the bottom trace, the marker data display is repositioned. The marker(s) can be repositioned while using any parameter setup menu. Note that the marker data display placement area on the main display window may be limited if the detachable trace view windows in use are smaller in size than then the main display window.



1. Trace 1 marker data display with nine active markers	3. Trace 2 marker data display with 11 active markers repositioned by click-drag-drop
2. Trace 1 marker with a single selected marker [9] repositioned by click-drag-drop	4. Highlighted active trace.

Figure 4-24. Marker Data Display Drag-Drop

4-14 Working with Limit Lines

Limit lines are a powerful tool to help compare a set of measured DUT data against specifications or expectations. Figure 4-25 shows basic menu navigation to reposition markers through the Marker Display Menu.

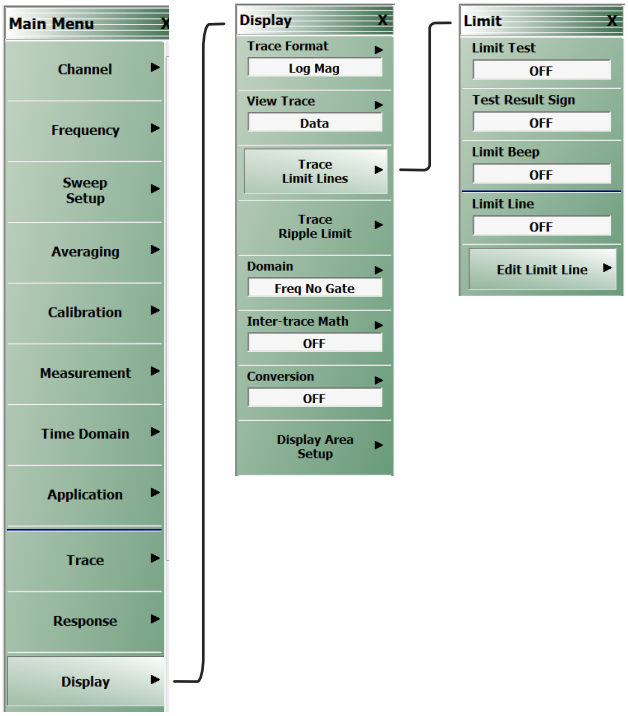


Figure 4-25. Display Trace Limit Line Menu

Limit lines

- Can be configured as settable maximum and/or minimum indicators for the value of displayed data on a per-trace basis.
- Can be rescaled automatically and maintains their correct value if the trace display is rescaled.
- Are settable in the basic units of each trace.
- Are limited to a total of 50 segments (upper and lower combined) per-trace.
- Are available only for ShockLine rectilinear and polar displays.
- Are not available for ShockLine Smith charts.
- For dual displays, such as the Log Mag And Phase display, the segment limit is 50 segments for the top display and 50 segments for the bottom display.

4-15 Working with Ripple Limit Lines

Limit lines are a powerful tool to help evaluate the ripple of a DUT against specifications or expectations. Figure 4-26 shows basic menu navigation to reposition markers through the Marker Display Menu.

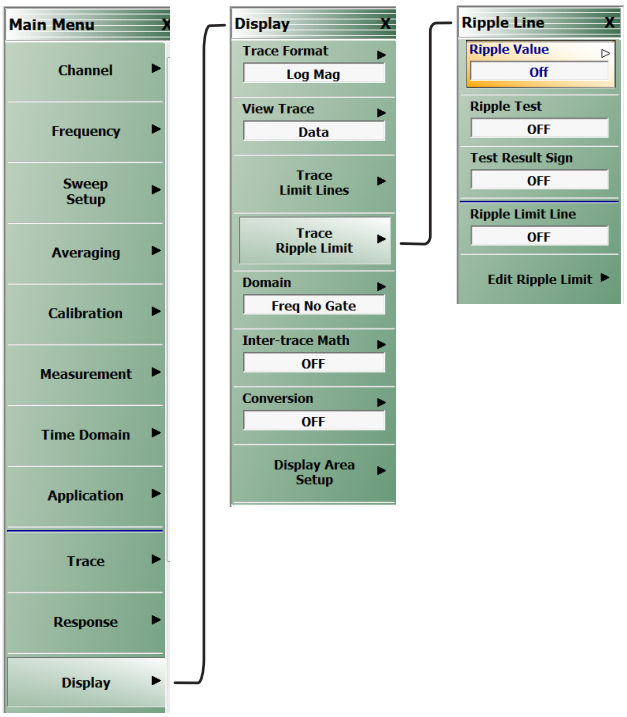


Figure 4-26. Display Trace Ripple Lines Menu

Ripple Limit lines

- Are settable tolerance indicators for the specified ripple value based on Absolute Value or Margin of displayed data on a per-trace basis.
- Are settable in the basic units of each trace.
- Are limited to a total of 50 segments (upper and lower combined) per-trace.
- Are available only for ShockLine rectilinear and polar displays.
- Are not available for ShockLine Smith charts.
- Can be used simultaneously with trace limit lines.
- Can be rescaled automatically and maintain their correct value if the trace display is rescaled.
- When used with trace limit lines and the Test Result sign functions, a logical OR is used as the result.

For dual displays, such as the Log Mag And Phase display, the segment limit is 50 segments for the top display and 50 segments for the bottom display.

Chapter 5 — Calibration

5-1 Chapter Overview

This chapter provides information for the manual and automatic calibration of the MS46121A/B VNA. The calibrations will include:

- 1-port Open-Short-Load (OSL) calibration.
- Scalar transmission calibration.

Information for the manual and automatic calibration of the MS46121A/B VNA will include:

- 1-port measurement setup
- Scalar transmission measurement setup

Standards Calibration

Before starting the calibration of the MS46121A/B for S11, the user must have the Open, Short and Load (OSL) standards to perform the calibration. The standards must be characterized and their respective coefficients loaded into the ShockLine software. If the user has an Anritsu calibration tee, loading or creating cal kit coefficients will not be necessary. Some older Anritsu OSL calibration kits may need to have their coefficients loaded into the software. For information about Anritsu cal kits, see https://www.anritsu.com/search/default?q=calibration%20kits%20for%20vna

Before starting the scalar transmission between two or more MS46121A/Bs, the user must have a Thru that connects between each MS46121A/B. Scalar transmission does not require an electrical length for the Thru as phase information is not shared between MS46121A/Bs.

1-Port S11 Manual Calibration

To calibrate the 1-Port VNA manually, refer to Figure 5-1.

Calibration | Calibrate | Manual Cal | 1 Reflection Only | Port Reflective Devices | Refl. Device(s)

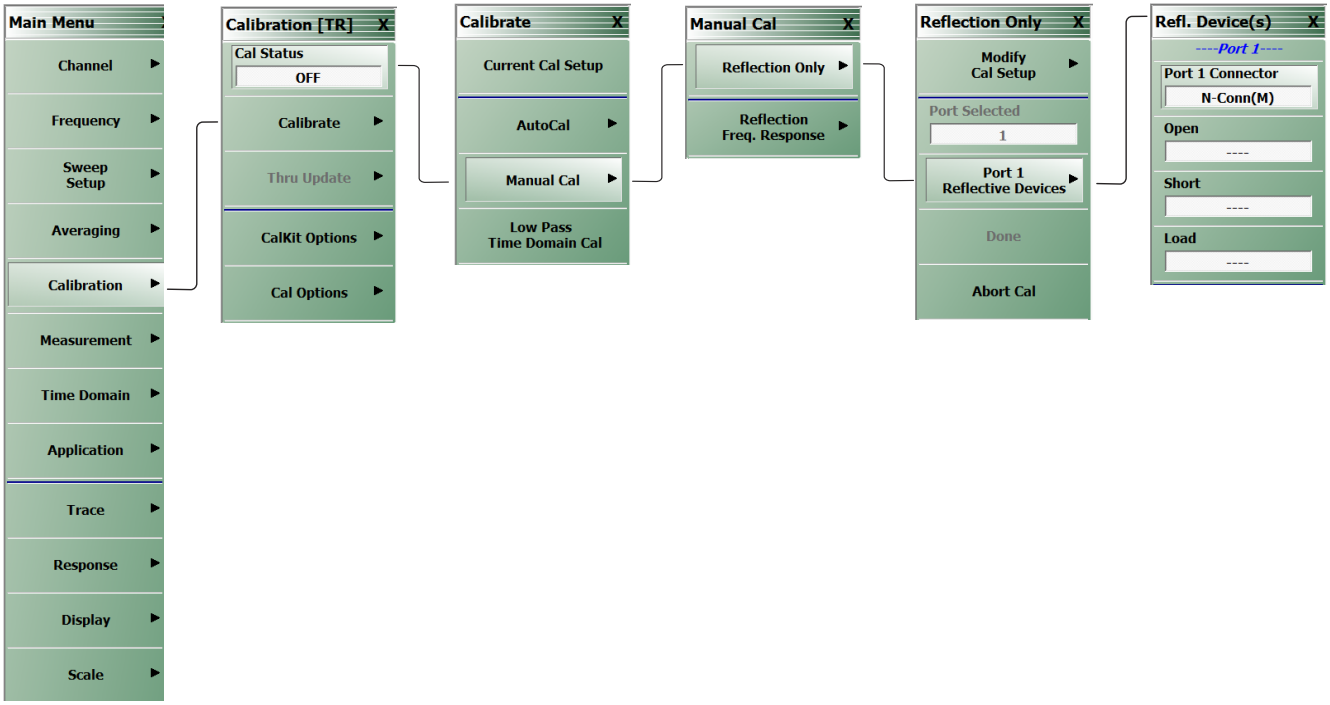


Figure 5-1. Reflection Calibration

Note	The default calibration standard is TOSLNF50A

The user will choose Port 1 Reflective Devices and connect all three standards (Open Load Short) until calibration is complete. Select the “Done” button after the prompt. This will complete the calibration and accurate S11 measurements can now be done.

5-2 Making a 1-Port Measurement

This section describes how the user can make a simple one port measurement. There are many types of trace displays to choose from including:

- log mag
- linear mag
- real impedance
- complex impedance
- phase
- magnitude.

The basic measurement will be outlined and can be changed, with minimal effort, to make all types of S11 measurements.

Note	Each S11 parameter for the various MS46121A/Bs will have the reflection parameter match the channel position. For example, S11 for an MS46121A/B on channel 3 will be called S33.

Setting Up the Instrument

The MS46121A/B is a 1-Port Vector Network Analyzer, so the MS46121A/B must be calibrated using the Open, Short and Load for accurate measurements. The default for the MS46121A/B is a single screen with a log magnitude display.

Navigation

One channel in the software is assigned to each of the four MS46121A/B VNAs. See Figure 5-2.

Channel | CHANNEL | # of Channels | 4

Figure 5-2. 4 Channel View

5-3 Scalar Thru Only

To perform scalar transmission measurements, two or more MS46121A/Bs must have Option 21.

Note	IFBW default is 10 kHz. This value can be lowered with a 10 MHz external reference.

Response | XY, where X is the receiver and Y is the source. Scalar Thru can be used for (1 to 1) or (1 to n) configuration. See Figure 5-3.

This section describes how the user can make both reflection and transmission measurements between MS46121A/Bs. The calibration sequence is multi-step as there two calibration methods that are used to get both measurement capabilities.

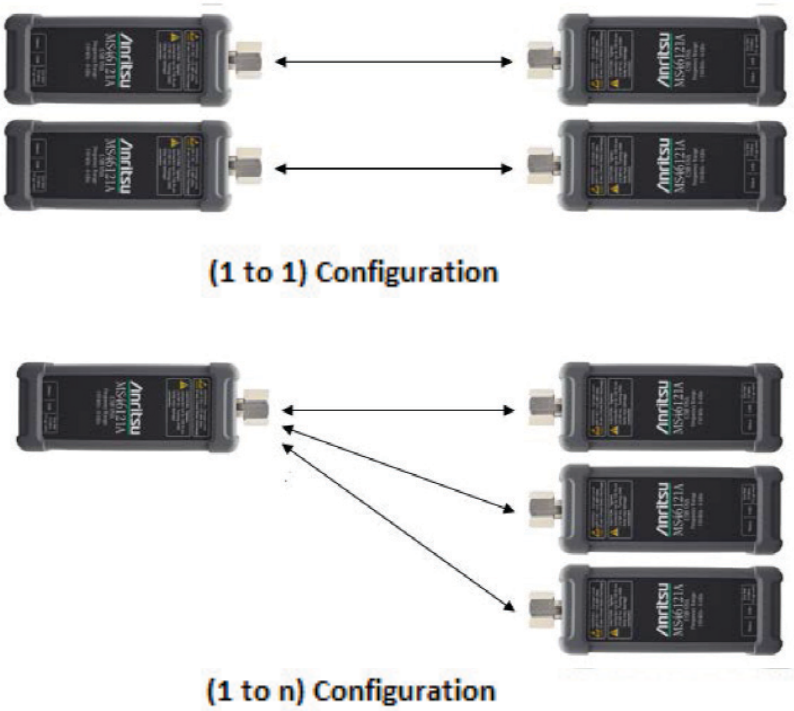


Figure 5-3. MS46121A/B with option 21 configurations

The user can proceed with the Scalar Thru Only calibration when the desired configuration has been determined. To perform a scalar transmission thru calibration, the user must follow the below navigation to appropriately select the assigned source and receiver parameters:

Navigation

Main Menu | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL |Scalar Thru Only | SCALAR THRU ONLY | Modify Cal Setup | CAL SETUP | Edit Cal params.

The Edit Cal params must be performed before calibration so that the source and number of receivers can be declared. The source will automatically be declared depending on the software channel being used. For example, in Figure 5-4, the source is on Port 1 (channel 1) and the receivers are on ports 2 and 3.

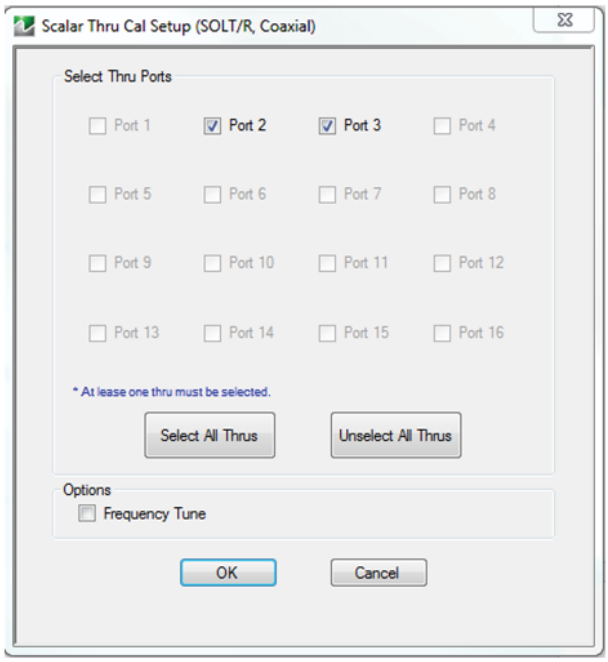


Figure 5-4. Edit Cal Params menu with declared receivers on ports 2 and 3

When the configuration has been setup in the Edit Cal Params dialog box, press “OK” and proceed through calibration menu. See Figure 5-5. Once this setup has been completed, select “OK” and return back to the Reflection Scalar Thru calibration window. Select the Scalar Thru button and a list of the Thru paths will appear. In this example, the paths chosen were 1-2, 1-3 and 1-4. In Figure 5-6, the list for these Thru paths can be seen.

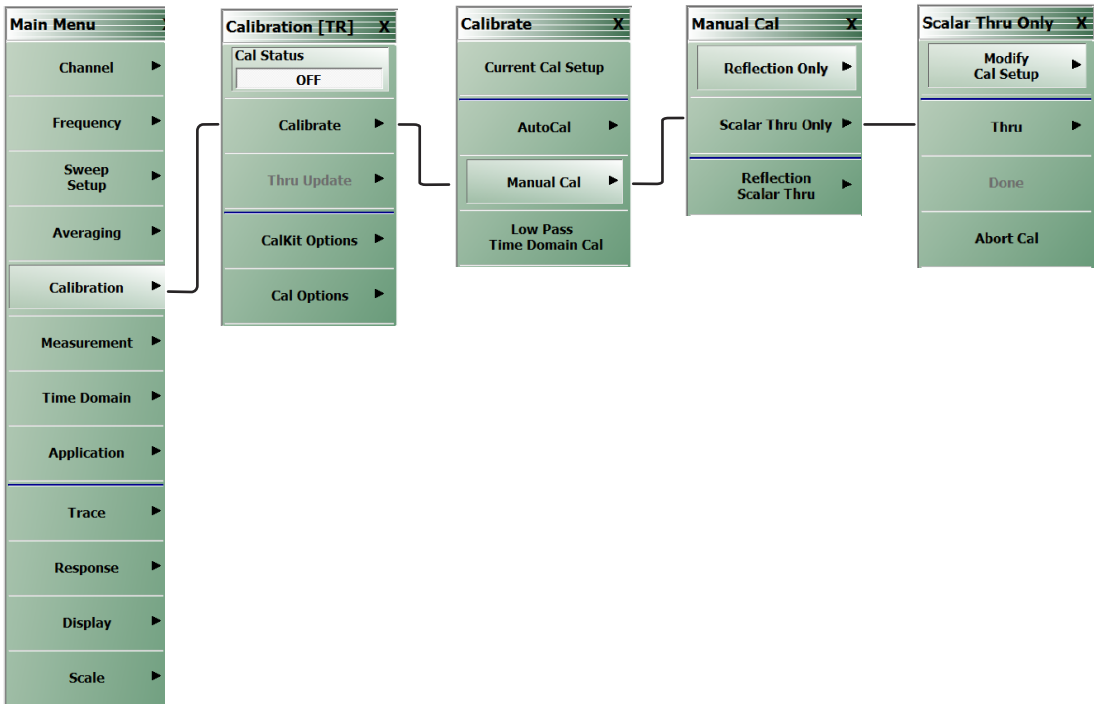


Figure 5-5. Scalar Thru Only Calibration

The user must connect the Thru between all MS46121A/Bs selected in different channels and perform scalar Transmission calibration. The transmission calibration will take about 1 minute. A prompt will indicate the calibration is done and to press the “Done” button. Press the “Done” button and the two MS46121A/Bs are ready to make measurements. Place a Thru standard between the VNA on channel 1 and 2 and select Thru 1-2. Repeat this process for Thrus 1-3 and 1-4.

Note	The Thru standard does not have to be defined by electrical length in the software. When selecting the Thru path, the trace for the Thru path must be present on the active channel. Thru calibration must be done in sequence from the top of the list to the bottom.

5-4 Reflection Scalar Thru Calibration

This section describes how the user can make both reflection and transmission measurements between MS46121A/Bs. The calibration sequence is multi-step as there are two calibration methods that are used to get both measurement capabilities. The two calibrations are the sum of the reflection and scalar thru and follow exactly the same procedure.

Calibration

Main Menu | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Scalar Thru | REFL. SCALAR THRU | Modify Cal Setup | CAL SETUP | Edit Cal params.

This step is identical to the reflection and scalar thru steps. The Thru paths and reflective calibration kit have to be defined here. This calibration will enable the VNAs to see both the reflective and scalar transmission properties of the DUT. For setting up this calibration, the dialog menu in Figure 5-6 will be necessary and is available after the user follows the navigation.

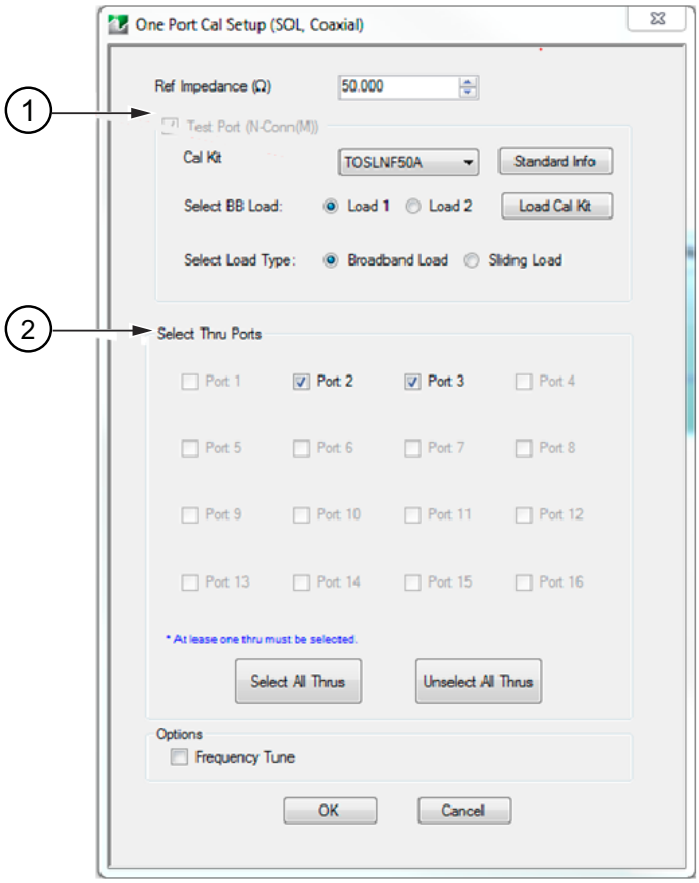


Figure 5-6. Edit Cal Params Dialog Box

1.	Reflection Parameters
2.	Transmission Parameters

When the configuration has been setup in the Edit Cal Params dialog box, press “OK” and proceed through calibration menu. See Figure 5-7

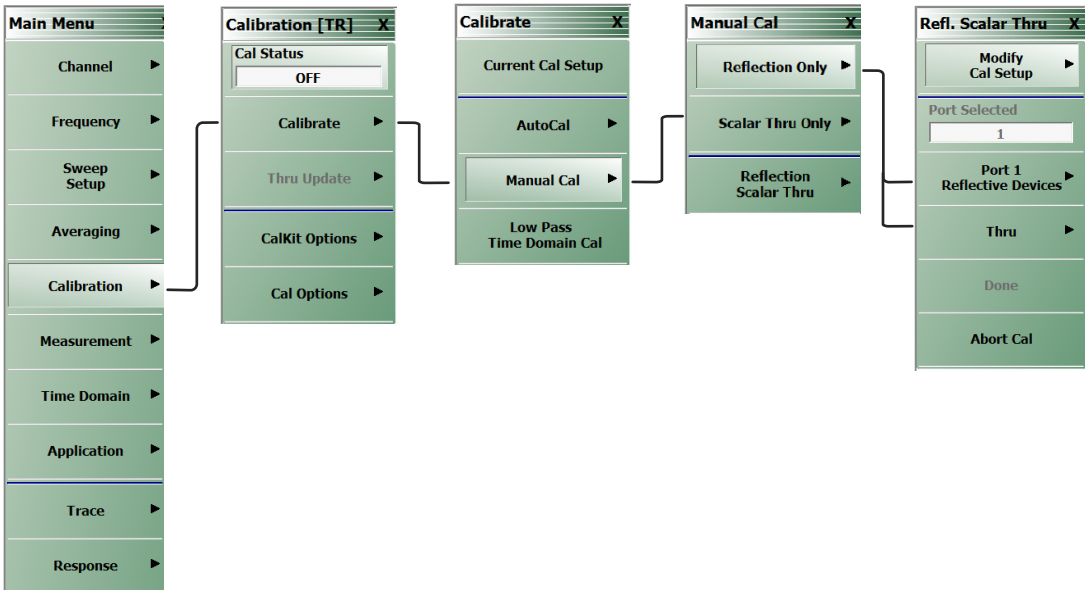


Figure 5-7. Reflection and Scalar Thru Calibration

The flow chart in Figure 5-7 has the navigation to both Reflective and Thru calibrations. The user must perform an Open-Short-Load measurement in the Reflective devices menu. This must be followed by connecting the Thru between all MS46121A/Bs in the Thru menu. A prompt will indicate the calibration is done and to press the “Done” button. Press the “Done” button and the two MS46121A/Bs are ready to make measurements.

An example of a real Reflection and Scalar Thru measurement can be seen below. The user must follow the calibration procedure for making a (1 to 2) calibration where there is 1 source and 2 receivers. Once the calibration is finished, the MS46121A/Bs are now setup to test a 3 port device. Below in Figure 5-8 a picture of a 3 port DUT can be seen.

Figure 5-8. MS46121A/Bs Setup Up to Measure a 3 Port Device

Once the devices are setup, the measurement can take place. In Figure 5-9 the reflection and scalar transmission measurements of a real duplexer are shown.

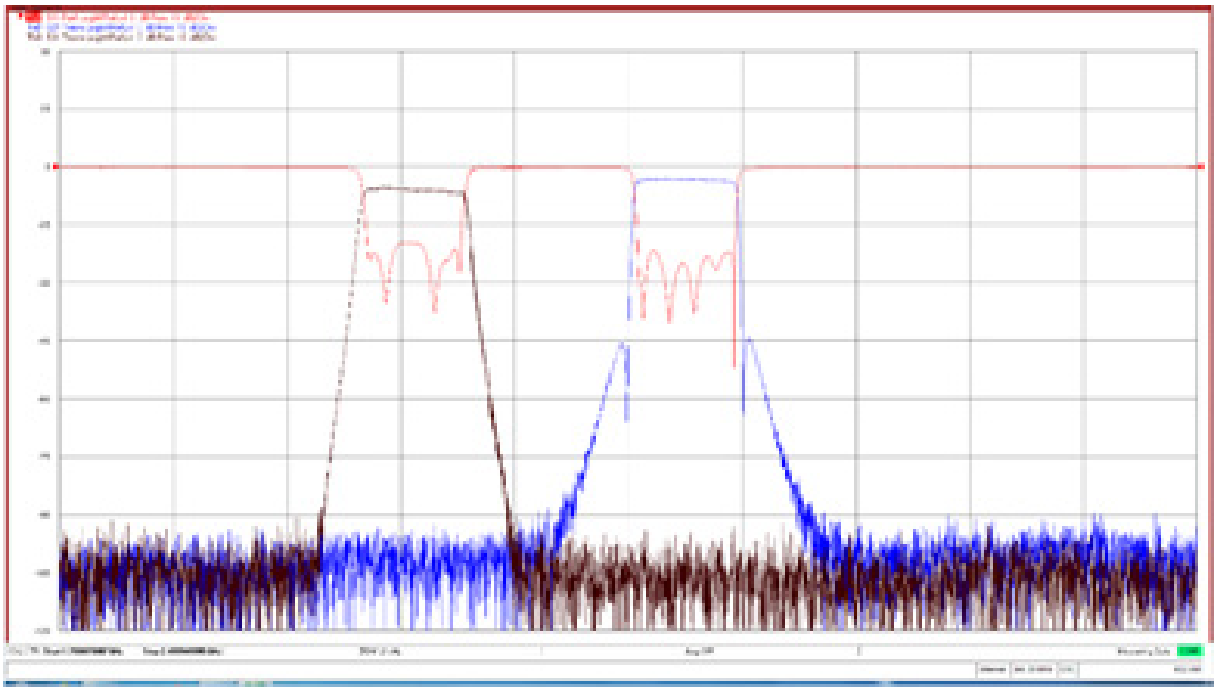


Figure 5-9. MS46121A/Bs measurement of a 3 port duplexer

5-5 Multi-Channel Setup

ShockLine software supports multi-channel functionality for the MS46121A/B. The MS46121A/B can be configured to show reflection and scalar measurements depending on the number of MS46121A/Bs that are in operation. This section describes how to the user can set up multi-channel functionality with the MS46121A/B. When multiple one-port instruments are connected, all channel frequency plans must be identical for scalar transmission measurements to function properly.

Navigation

Channel | Channel | Reconfigure | Channel Reconfigure

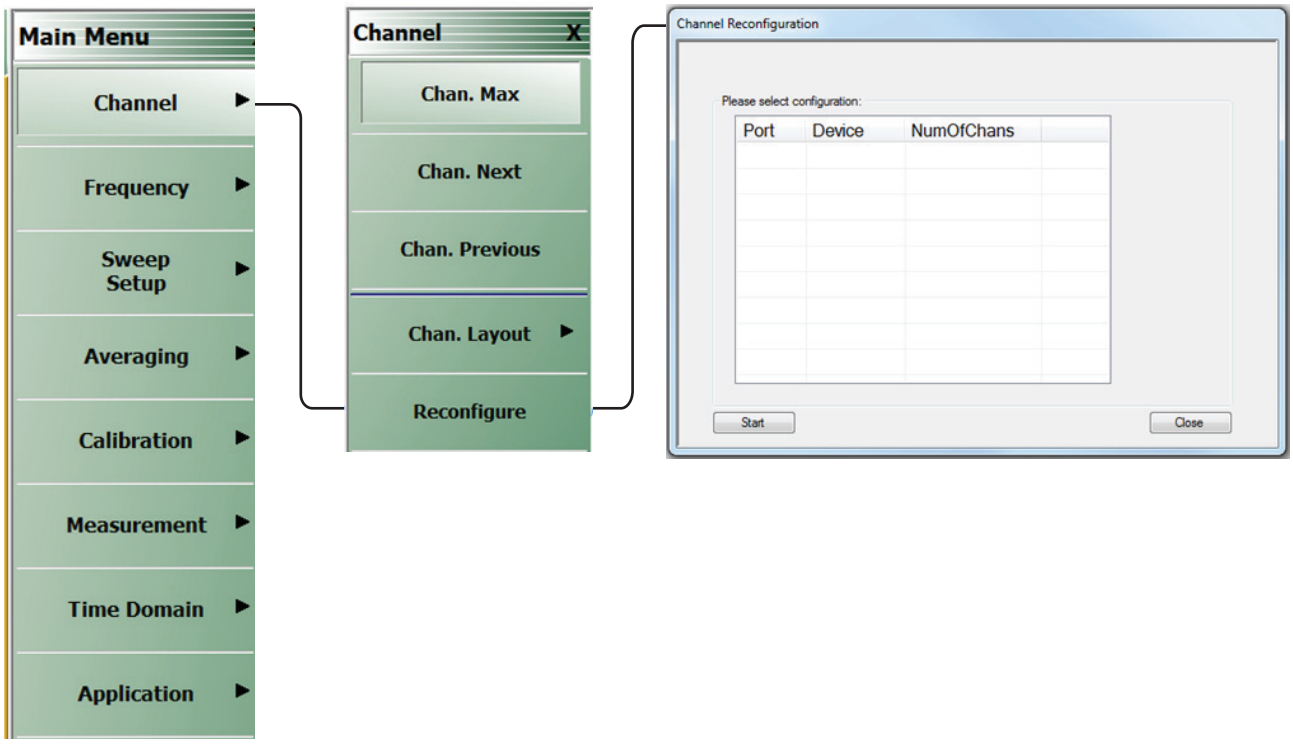


Figure 5-10. Multi-Channel Setup

The multi-channel setup takes place in the channel reconfiguration dialog box. This dialog box will only allow the user to set the number of channels on each MS46121A/B.

Note	Only 16 channels can be created in total between all MS46121A/Bs in use.

Definition of Dialog Terms

Refer to Figure 5-11.

Port

This provides the assignment of channels for a given device.

Device

This is the MS46121A/B device and is listed by serial number. The serial number is detected once the MS46121A/B is connected.

NumOfChans

This field is used to add or delete the number of channels per device. When inputting NumOfChans, each entry requires the user to press “Enter” on the keyboard or the value will reset to a default of 1.

Multi-Channel Example

In this example, two MS46121A/Bs will be used. One MS46121A/B will be used to make a reflection and scalar measurement of a bandpass filter while another MS46121A/B will make a reflection only measurement. The dialog box below is setup to have two channels on MS46121 with serial number 1603413 and one channel on MS46121A/B with serial number 1602402.

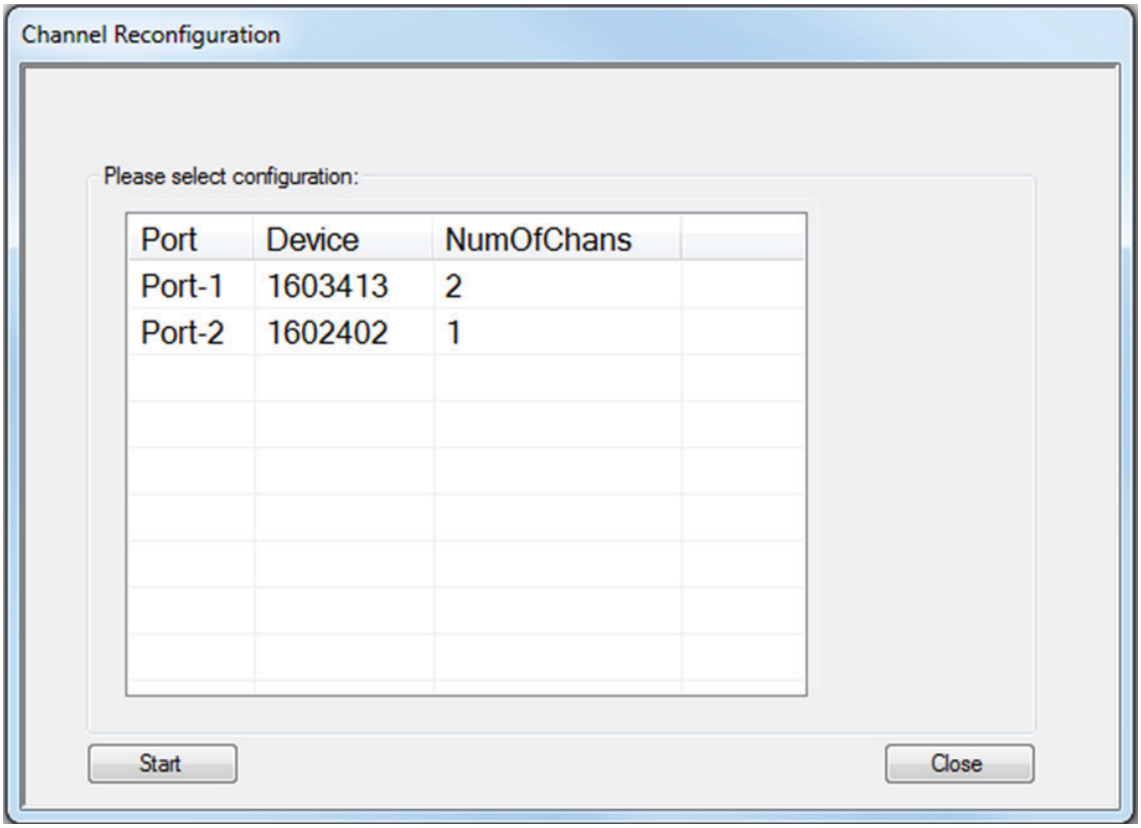


Figure 5-11. Channel Reconfiguration Setup Dialog Box

When the user selects the “Start” button after the number of channels are set, the following pop-up will appear.

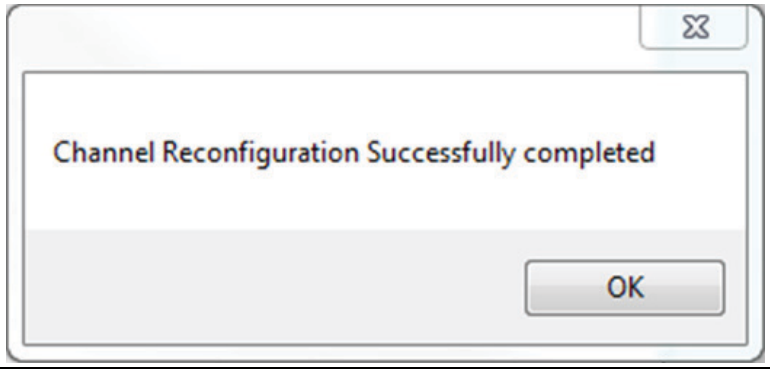


Figure 5-12. Channel Reconfiguration Completion Pop-Up

The channels have now been set for multi-channel functionality on MS46121A/B with device number 1603413. The user will now enter the various responses into each channel: Channel 1: 163413-1 (S11), Channel 2: 163413-2 (S21) and Channel 3: 1602402 (S22).

Note	Each channel will annotated with a device number and a hyphen signifying the channel number as a subset of the device.

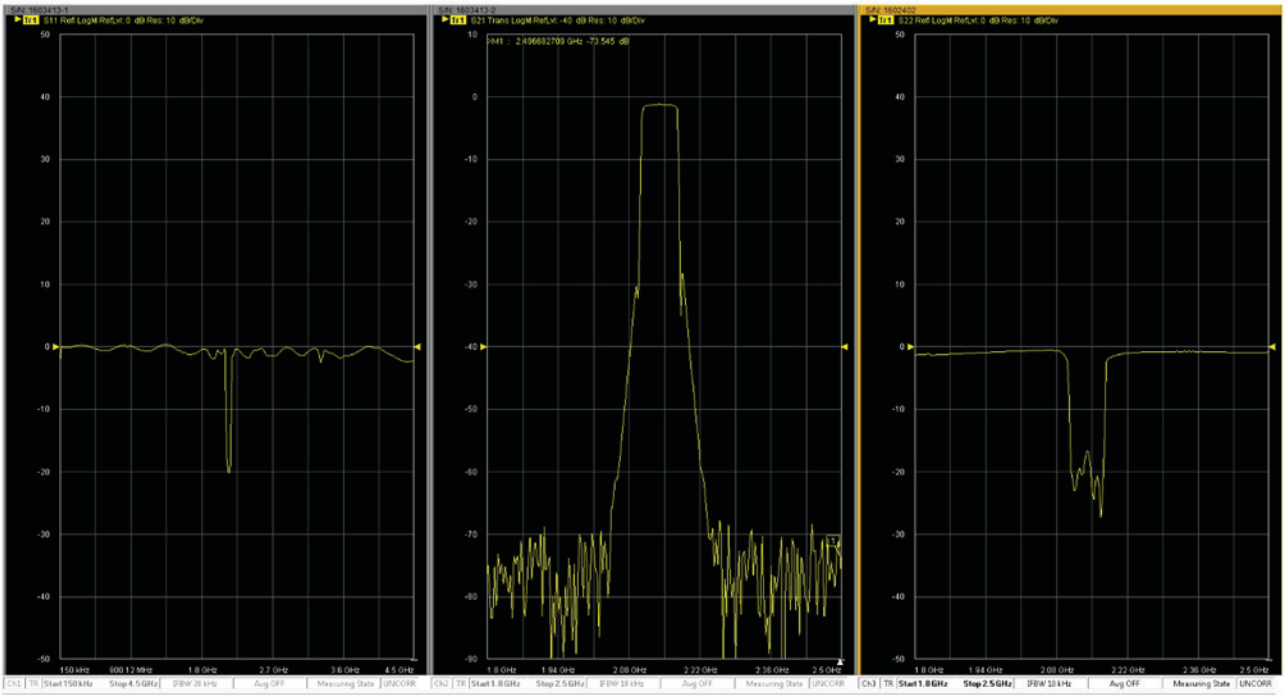


Figure 5-13. Filter Response using MS46121A/B Multi-Channel Functionality

Appendix A — Maintenance and Security

A-1 Security and Memory Overview

The MS46121A/B is a secure device and can be moved in and out of the secure facilities as there are no user accessible locations on the MS46121A/B.

The MS46121A/B USB 1-Port VNA has the following memory devices:

- Non-Volatile 500 kB FLASH. This contains FPGA configuration data. This memory is not accessible by the user.
- Non-Volatile 4 MB Data FLASH. This contains device configuration and calibration data. This memory is not accessible by the user.
- Volatile 2 MB RAM. This memory is for programming data and completely cleared during power down. This memory is not accessible by the user.

A-2 Preparation for Storage or Shipment

Use the following information for preparing the ShockLine MS46121A/B Series VNA for storage or shipment.

Preparation for Storage

Preparing the VNA for storage consists of cleaning the unit, packing it inside of the storage container with moisture-absorbing desiccant crystals, and storing the unit in a temperature-controlled environment that is maintained between –40 °C and +75 °C.

Preparation for Shipment

To provide maximum protection against damage in transit, the VNA should be repackaged in the original shipping container. If not available, instructions for packaging and shipment are given below:

Dimensions

The instrument body dimensions are:

- **Height:** 36 mm
- **Width:** 52 mm
- **Depth:** 144 mm

1. Remove any user-supplied connectors or adapters.
2. Obtain a corrugated cardboard carton with at least 125 kg test strength. This carton should have inside dimensions of no less than 15 cm (6.0”) larger than the instrument unit dimensions to allow for cushioning.
3. Surround the unit with polyethylene sheeting to protect the finish. A sealed bag is recommended as a best practice.
4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the unit. Provide at least 8 cm (3.0”) of dunnage on all sides.
5. Seal the carton by using either shipping tape or an industrial stapler.
6. If the instrument is being returned to Anritsu for service, mark the address of the appropriate Anritsu service center and your return address on the carton in one or more prominent locations.

Appendix B — Troubleshooting

B-1 Introduction

This section provides troubleshooting tips when operating the MS46121A/B.

Tips include:

- Section B-2 "No Hardware Detected"
- Section B-3 "Anritsu Hardware is Unavailable"
- Section B-4 "Driver Initialization Error"
- Section B-5 "Application Launch Failure"
- Section B-6 "EEPROM Does Not Match (Firmware Update)"
- Section B-7 "Updating EEPROM Unsuccessful (Firmware Update Failed)"
- Section B-8 "Updating Firmware Manually"
- Section B-9 "Text Size Too Large"

B-2 No Hardware Detected

If the ShockLine installation download results in a "No Hardware Detected" message, check the PC Device Manager. If installed successfully, the device should be present under Universal Serial Bus controllers as "Anritsu Programmed USB", or under Other devices as MS46121A/B. See Figure B-1.

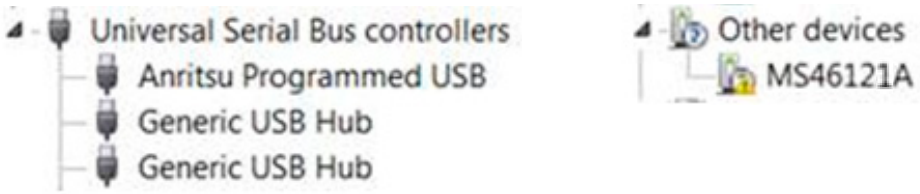


Figure B-1. USB Controller or Other Devices

If it is displayed as “Anritsu Programmed USB” with an exclamation mark on it, perform an uninstall and delete the drivers until it is removed under USB controllers. See Figure B-2. You might have to do this several

Figure B-2. Confirm Device Uninstall

times. However, if “No Hardware Detected” still appears in the PC Device Manager, for assistance, please contact Anritsu Customer Service at:

https://www.anritsu.com/test-measurement/contact-us

Once it is installed successfully, it will appear in the Device Manager or Other Devices folder as in Figure B-1.

Then you can install the latest ShockLine software (if it’s not installed) and it will automatically install the drivers or install the drivers from “C:\Program Files (x86)\Anritsu Company\ShockLine\Application”.

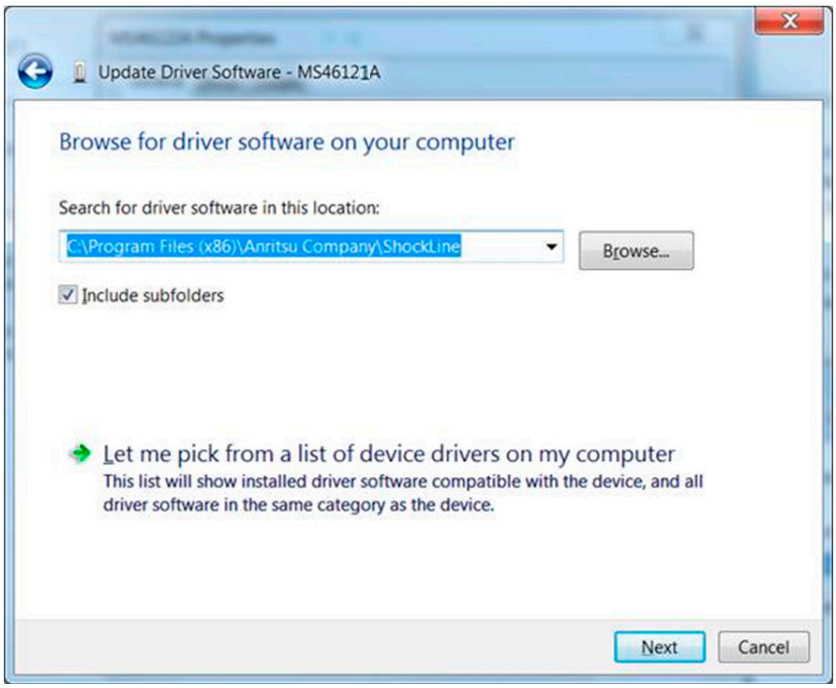


Figure B-3. Update Driver Software

B-3 Anritsu Hardware is Unavailable

ShockLine software and IVI Clients cannot run simultaneously on the same PC. If ShockLine software is running and an IVI client is being started, then the ShockLine GUI will be automatically stopped. But if an IVI client is running, the ShockLine GUI will not be able to start and the following error message will be displayed as shown in Figure B-4. If this occurs, wait until the IVI client finishes and retry after to run ShockLine GUI.

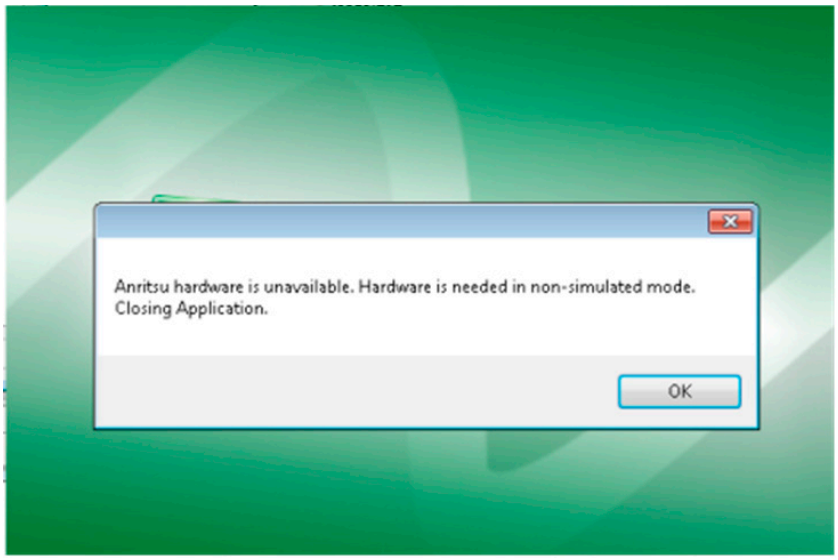


Figure B-4. Anritsu Hardware Is Unavailable

Or if the IVI client was not properly closed, then the IVI Server has to be manually restarted because the hardware was not released.

Restart IVI Server

The ShockLine Tray Daemon provides the Start IVI Server and Stop IVI Server user interface.

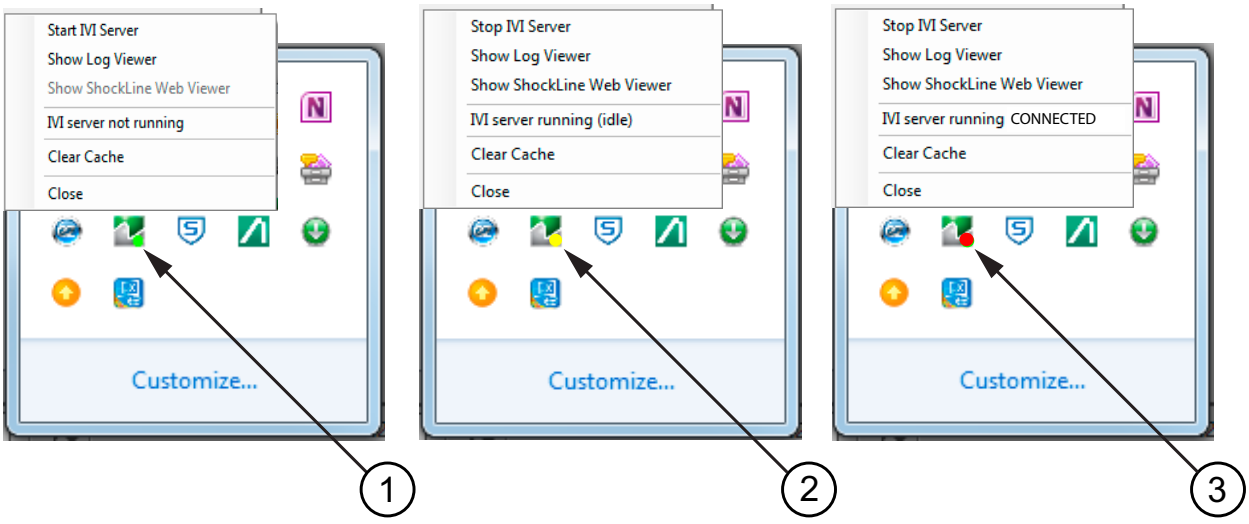


Figure B-5. ShockLine Tray Daemon

1. Green Indicator
2. Yellow Indicator
3. Red Indicator

Figure B-5. ShockLine Tray Daemon

Indicator Color Definitions

Green

When ShockLine Tray Daemon is green – the IVI Server is not running and that no IVI connections are available. Only ShockLine GUI can be used.

Yellow

When ShockLine Tray Daemon is yellow – the IVI Server is running. The IVI Clients or ShockLine GUI can be run.

Red

Note the tray menu provides two status states when Red.

- If the state is “CONNECTED” – currently an IVI Client is connected and the hardware is busy; therefore, ShockLine GUI could not be used.
- If the state is “WAITING” – waiting for an IVI Client, but the hardware is not busy; therefore, ShockLine GUI nor an IVI Client can be run.

B-4 Driver Initialization Error

If an error occurs when trying to initialize an IVI Client as in Figure B-6, then the IVI Server has to be restarted as described in “Anritsu Hardware is Unavailable” on page B-3.

```
C:\Program Files\IVI Foundation\IVI\Drivers\ANVNA\CSHARP\Examples\Debug>IVI-CSHARP-EXAMPLE.exe
Error 1101 while initialising the driver!
```

Figure B-6. Driver Initialization Error

B-5 Application Launch Failure

In order to fix Application Launch Failure, perform the following.

1. Download the MVC++ 2015 package
   - https://www.microsoft.com/download/confirmation.aspx?id=52685
2. Install the package
   - If it returns an error saying that the same package is already installed, you might have to uninstall the current version of MVC++ 2015 first.
3. Download the ShockLine VNA Software from the Download Library located at:

   https://www.anritsu.com/test-measurement/support/download

B-6 EEPROM Does Not Match (Firmware Update)

Note	Firmware updates only work properly if only one Anritsu ShockLine instrument is connected.

ShockLine software will poll the firmware version (EEPROM) on the MS46121A/B, and if the software has an updated firmware version it will ask the user if they would like to update the firmware on the VNA, as shown in Figure B-7. Users are recommended to always update firmware to the latest revision. Users must be in administrator mode in order to program the firmware.

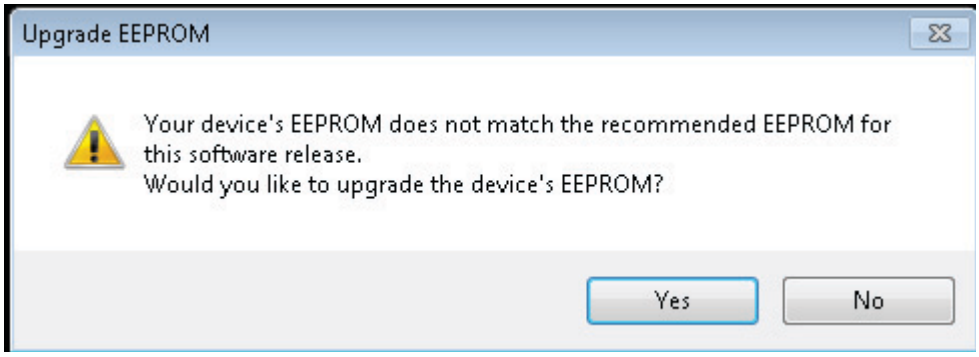


Figure B-7. EEPROM Does Not Match Warning Message

While the firmware update is proceeding, the message shown in Figure B-8 will be displayed. Do not cycle the power or close the application while the firmware update is in process.

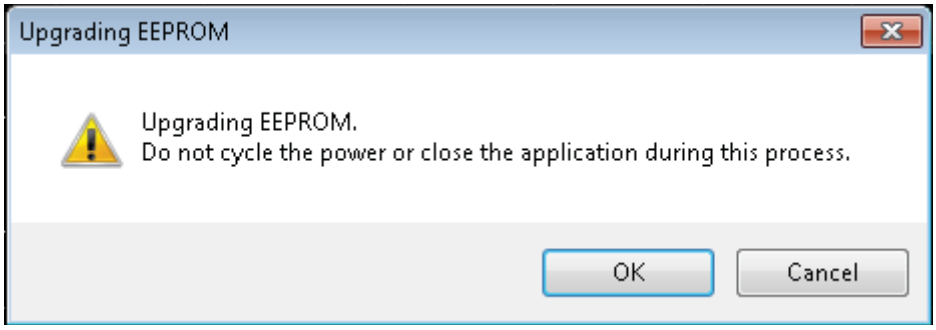


Figure B-8. Upgrading EEPROM (Firmware) Message

If the firmware update fails (see Figure B-9), but the display is active, proceed to the trouble-shooting tip: "Updating EEPROM Unsuccessful (Firmware Update Failed)".

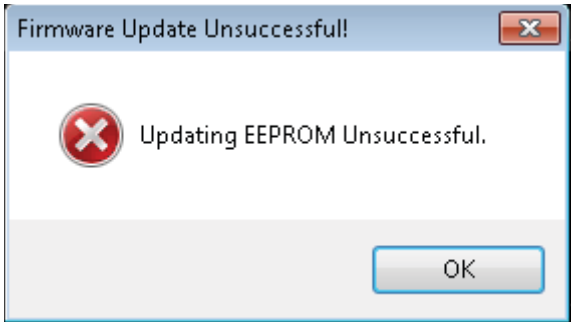


Figure B-9. Firmware Update Unsuccessful Message

B-7 Updating EEPROM Unsuccessful (Firmware Update Failed)

If the firmware update fails (see Figure B-9), either:

- Exit ShockLine, disconnect all USB devices but keyboard/mouse and Anritsu ShockLine instrument, then try again.

Note	Firmware updates only work properly if only one Anritsu ShockLine instrument is connected.

- Make sure the user is running ShockLine as Administrator.

or

- Try to update the firmware manually (see the trouble-shooting tip "Updating Firmware Manually").

Caution	Updating the firmware manually could result in an inoperable instrument, requiring assistance from Anritsu Customer Service.

B-8 Updating Firmware Manually

If the firmware update fails repeatedly, perform the following steps:

1. Launch ShockLine as Administrator.
2. Click No if prompted to update firmware on startup.
3. Navigate to UTILITIES > System.
4. Click Update FPGA (if ShockLine is not run as Administrator, this button will be disabled).
5. Navigate to C:\Program Files (x86)\Anritsu Company\ShockLine\Application\Firmware in the Updating Firmware dialog.
6. Select the folder that matches the attached instrument.

Caution	Attempting to load firmware for a non-matching instrument can render the instrument inoperable, and require a call to Anritsu Customer Service to get it working again.

7. Load the .rbf/.rbf2 file from the selected folder.
8. Follow the prompts (may require closing the ShockLine application and/or rebooting).

Caution	If done incorrectly, manually updating the firmware can result in an inoperable instrument that will require help from Anritsu to get working again. Contact Anritsu Customer Service at: https://www.anritsu.com/test-measurement/contact-us

B-9 Text Size Too Large

Note	What is displayed on different versions of Windows may vary.

1. Exit the ShockLine application.
2. Navigate to where the ShockLine executable is located:
   a. Right click on the ShockLine application icon on the desktop.
   b. Select Open file location (`C:\Program Files (x86)\Anritsu Company\ShockLine\Application`).
3. Right-click on `AC_GUI_Main.exe` and select Properties.
4. Navigate to the Compatibility tab. Depending on your Windows version, this tab may vary.
   a. For Windows 7, the Compatibility tab looks like this. Uncheck Disable display scaling on high DPI settings:

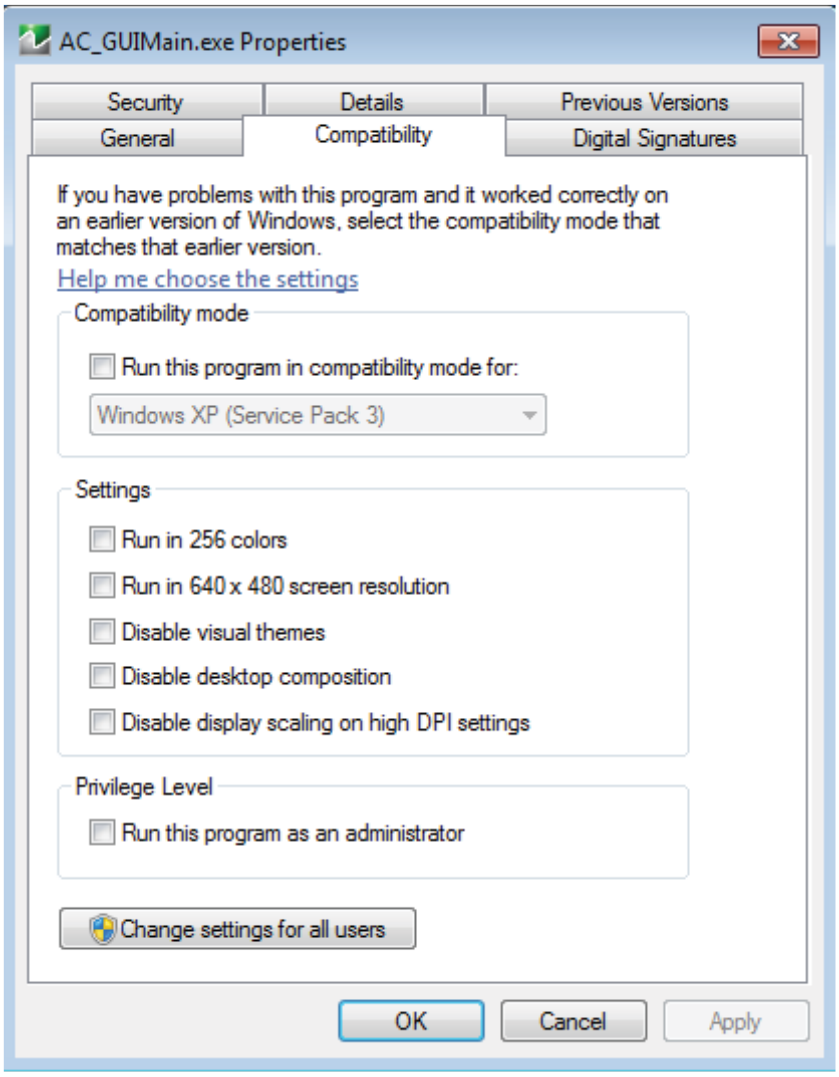


Figure B-10. Compatibility Tab: Windows 7 and Windows 10 version 1607 and prior

b. For Windows 10, the Compatibility tab looks like this:

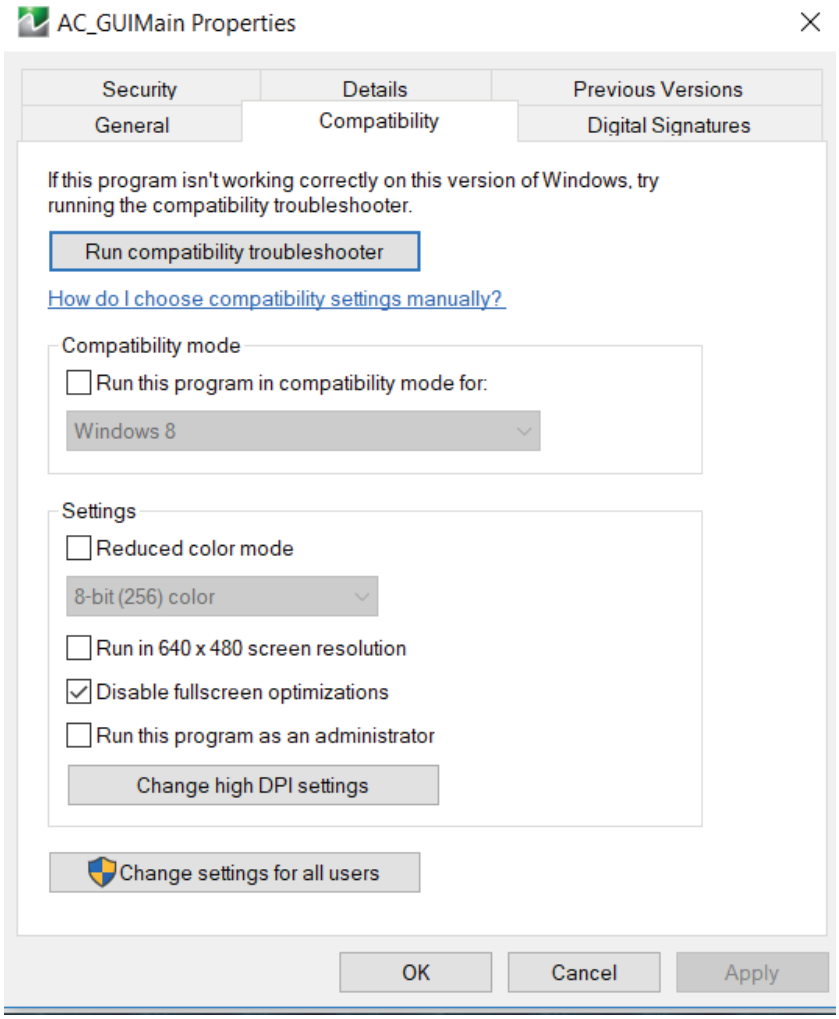


Figure B-11. Compatibility Tab: Windows 10 version 1703 and later

i. Click Change high DPI settings, which will display the following dialog:

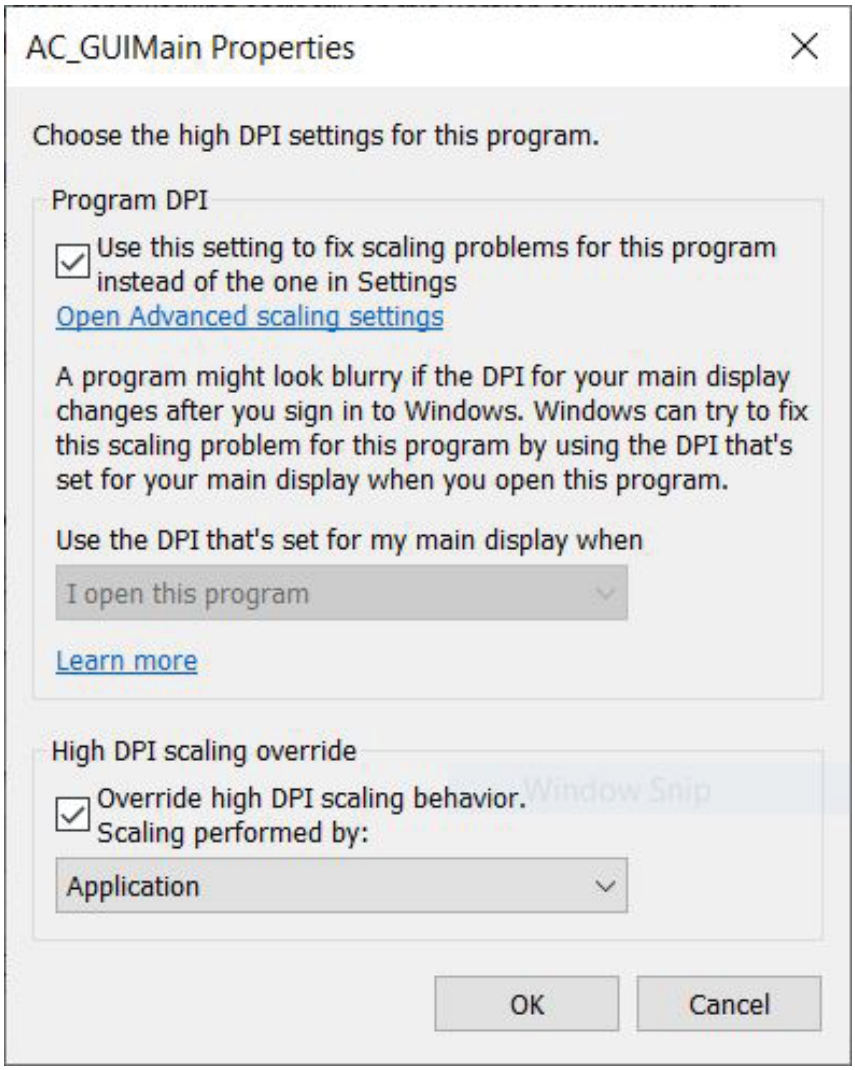


Figure B-12. Change High DPI Settings Dialog

ii. Select "Use this setting to fix scaling problems for this program instead of the one in Settings".

iii. For "Use the DPI that's set for my main display when", select "I open this program".

iv. Select "Override high DPI scaling behavior. Scaling performed by Application".

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10410-00344

T

Anritsu utilizes recycled paper and environmentally conscious inks and toner.

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