User Interface Reference Manual

ShockLine™ MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series Vector Network Analyzers

MS46121A/B, 150 kHz to 6 GHz, 1-port
MS46122A/B, 1 MHz to 43.5 GHz, 2-port
MS46131A, 1 MHz to 43.5 GHz, 1-port
ME7868A, 1 MHz to 43.5 GHz, 2-port
ME7869A, 1 MHz to 43.5 GHz, 2-port
MS46322A/B, 1 MHz to 43.5 GHz, 2-port

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Chapter Descriptions

Chapter 1 — Overview

Chapter 2 — Initial Configuration, Menu Bar, Icon Bar, and Main Menu

This chapter describes the user interface for all of the ShockLine VNAs listed on the title page. Section 2-2 is specific to the MS46131A, ME7868A, and ME7869A, but all the other sections apply to all of the ShockLine VNAs in this manual.

Chapter 3 — Channel Menus

This chapter describes how to set the number of channels used and how they are displayed on the instrument. Up to 16 channels can be configured, each with up to 16 traces per channel. For the MS46121A/B only, each channel is dedicated to an individual 1-port VNA. Only those channels associated with VNA hardware will have active trace displays.

Chapter 4 — Frequency Menus

This chapter covers the FREQUENCY menu which allows the user to set frequency start, stop, span, number of points, and CW mode parameters for the currently active (selected) channel. The FREQUENCY menu has several variants; the one that is displayed depends on the Sweep Types setting for the current channel. The sweep type is set on the SWEEP SETUP menu.

Chapter 5 — Power Menus

This chapter provides information on port power control in MS461xx series and MS463xx series VNAs. Power conditions for sweeps are set in different places in the ShockLine application, depending on the sweep type: 1) for frequency-based sweeps, the POWER menu is used to set power parameters, and 2) for segmented and indexed sweeps, the power setup controls are in segment or index setup characteristics areas of the sweep table (see Chapter 6 — Sweep Menus for details).

Chapter 6 — Sweep Menus

This chapter describes sweep types supported by the VNA and how to set and configure them.

Chapter 7 — Averaging Menu

The AVERAGING menu allows users to turn averaging on or off, set the averaging factor, and select whether the averaging type is per point or per sweep. Control is also provided for IFBW and trace smoothing.

Chapter 8 — Calibration Menus: 1-Port and 2-Port VNAs

This chapter describes the menus used when calibrating 1- and 2-port ShockLine VNAs. It is organized to follow the flows in the progressions of menus and dialog boxes for calibration control. Though it provides representative examples of dialogs, it does not show all the possible dialog contents. This is because their appearance changes dynamically based on combination of instrument calibration ports, AutoCal™, manual calibration, calibration methods, line types, and connectors. However, basic elements in the combinations are explained. The calibration menus for MS46121A/B with Option 21 are also explained.

Chapter 9 — Measurement Menus

This chapter provides information for the measurement menu system which controls the embed/de-embed functions, the impedance transformations, reference plane location, post-processing order functions, and dielectric parameters along with their related configuration dialog boxes. Impedance transformation and post-processing order functions do not apply to the MS46121A/B.

Chapter 10 — Time Domain Menu

The Time Domain (TDOMAIN) menu provides a convenient way to access all time domain-related parameter setup items. Although these parameters are also accessible in other places throughout the ShockLine application, the user must shift among menus to reach them. Here, the Measurement Setup dialog collects all of them for access on one screen.

Chapter 11 — Application Menu

This chapter provides information for the APPLICATION menu that is used for Receiver Configuration. The default measurement mode setting is for Standard S-Parameters.

Chapter 12 — Trace Menus

This chapter provides information on traces. You can set the number of traces that appear for each channel and how those traces are arranged on the main display. Up to 16 traces can be defined and there are 22 available trace layouts. Traces can be detached as free-floating windows.

Chapter 13 — Response Menus: 1-Port and 2-Port VNAs

This chapter provides information on the 1- and 2-port VNA Response menus used to configure S-Parameters using standard options, or to configure user-defined parameters. Only 1-port-related Response menu items apply to the MS46121A/B, MS46131A, ME7868A, and ME7869A VNAs.

Chapter 14 — Display Menus

This chapter provides information for setup and configuration for the instrument displays. Selections provide control over the trace formats, with over nine different major display types. Each display type can be further modified with parameters applicable to that display format. The control also provides control for trace memory and trace math modifications. The trace limit functions allow maximum/minimum parameters to be set for each trace and provide visual and/or programmatic indications of pass/fail.

Chapter 15 — Scale Menus

This chapter provides information about the button controls for the SCALE menu variants. SCALE menus provide trace display control of settings such as resolution, reference value, and the scale of units. The number of buttons on a SCALE menu depends on the settings on the TRACE FORMAT menu.

Chapter 16 — Marker Menus

This chapter provides information for configuring and controlling the marker functions. The instrument provides up to thirteen markers per trace of which twelve can be direct markers and one a reference marker. Each marker can be individually controlled on/off and positioned as required. 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. Other functions for display options and various types of single-peak search are available.

Chapter 17 — System Menus

This chapter provides information for various system and instrument management and configuration functions including initial setup, power-on options, preset options, network interface, self-test, and diagnostics.

Chapter 18 — File Management Menus

This chapter provides information for management of various system output and configuration files including Active channel TXT files, Active channel S2P files, Active channel CSV files, Active trace data (Formatted), and Active trace data (Unformatted).

Appendix A — File Specifications

This appendix defines the file directory structure used on default-configuration ShockLine Series VNAs and provides the general file extensions and specifications used in the instrument.

Appendix B — Error Messages

This appendix lists, describes, and provides corrective action for error messages that appear on the instrument display. Messages that require action by a service representative are also listed. The tables herein describe the name of the message, the typical reason for its occurrence, and recommended error correction methods.

Appendix C — Anritsu easyTest Tools™

This appendix outlines using easyTest Tools with ShockLine VNAs. The easyTest Tools application is used to create easyTest .ett files having step sequences that can be run (displayed) on the instrument.

Appendix D — Glossary of Terms

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Chapter 1 — Overview

1-1 Introduction

This manual is a reference document for the Anritsu ShockLine™ VNA user interface (UI) menus and dialog boxes. This chapter describes the document conventions used in this manual and lists related ShockLine VNA documentation.

Maintenance manuals are available by contacting Anritsu Customer Service. Refer to other MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B VNA documentation for detailed explanations and procedures in Section 1-4 “User Documentation” on page 1-2.

This document assumes readers have reviewed the introduction to the ShockLine application User Interface presented in the Operation Manual or User Guide.

1-2 ShockLine MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA Models

Table 1-1 lists the basic models:

Table 1-1. ShockLine MS46121A/B, MS46122A/B, MS46131, MS46322A/B Series VNA Models

VNA Model-Frequency Option	Name	Specifications	Test Port Connectors
MS46121A/B-004[a]	Economy Vector Network Analyzer	40 MHz to 4 GHz	N Connector Test Port (1)
MS46121A[a]/B-006		150 kHz to 6 GHz	
MS46122A[a]/B-010	Economy Vector Network Analyzer	1 MHz to 8 GHz	N Connector Test Ports (2)
MS46122A[a]/B-020		1 MHz to 20 GHz	K Connector Test Ports (2)
MS46122A/B-040[a]		1 MHz to 43.5 GHz	
MS46122B-043		1 MHz to 43.5 GHz	
MS46131A-010	Modular Vector Network Analyzer	1 MHz to 8 GHz	N Connector Test Port (1)
MS46131A-020		1 MHz to 20 GHz	K Connector Test Port (1)
MS46131A-043		1 MHz to 43.5 GHz	
ME7868A	The ME7868A is a modular 2-port VNA consisting of two ShockLine MS46131A 1-port VNAs synchronized with PhaseLync™ technology.		
ME7869A	The ME7869A is a modular 2-port VNA consisting of two ShockLine MS46131A 1-port VNAs synchronized with PhaseLync™ technology.		
MS46322A-004[a]	Economy Vector Network Analyzer	1 MHz to 4 GHz	N Connector Test Ports (2)
MS46322A/B-010		1 MHz to 8 GHz	
MS46322A-014[a]		1 MHz to 14 GHz	K Connector Test Ports (2)
MS46322A/B-020		1 MHz to 20 GHz	
MS46322A-030		1 MHz to 30 GHz	
MS46322A/B-040[a]		1 MHz to 43.5 GHz	
MS46322B-043		1 MHz to 43.5 GHz	

a.Not available for purchase.

1-3 Documentation Conventions

The following conventions are used throughout the entire ShockLine VNA Series documentation set.

Instrument Identification

Throughout this manual, the following term definitions are used:

- ShockLine VNA or VNA refers to any ShockLine VNA module.

When identifying a frequency option for a VNA model, that option number is appended after the model number; example: MS46322A/B-010.

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

User Interface

The ShockLine VNA user interface consists of menus, sub-menus, buttons, toolbars, and dialog boxes.

User Interface Navigation

In ShockLine VNA documentation:

- Regular text uses a Serif font (example: this is Serif text).
  - All references to UI elements use Sans Serif font (example: this is a Sans Serif font)
  - Menu and dialog box names are formatted in ALL CAPITALS
  - Button names are in Initial Capitals

  For example, “on the MAIN MENU, click the Calibration button.”
- Elements in navigation paths are separated with a vertical bar or “pipe” symbol (“|”). For example, the path to the CALIBRATE menu is:

  MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE |

  which means: MAIN menu -> Calibration button -> CALIBRATION [TR] MENU -> Calibrate button -> CALIBRATE Menu

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.
```

1-4 User Documentation

The following ShockLine MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA documentation is provided on the Anritsu website:

Product Information, Compliance, and Safety

- ShockLine Product Information, Compliance, and Safety (PICS) – 10100-00067

ShockLine MS46122A/B Vector Network Analyzers

- MS46122A Series VNA Technical Data Sheet – 11410-00822
- MS46122B Series VNA Technical Data Sheet – 11410-00995
- MS46122A/B Series VNA Operation Manual – 10410-00340
- MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA Measurement Guide – 10410-00336
- MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA ShockLine User Interface Reference Manual – 10410-00337
- ShockLine Programming Manual – 10410-00746
- MS46122A/B Series VNA Maintenance Manual – 10410-00341

ShockLine MS46131A Vector Network Analyzers

- MS46131A Series VNA Technical Data Sheet – 11410-01146
- MS46131A Series VNA Operation Manual – 10410-00780
- MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA Measurement Guide – 10410-00336
- MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA ShockLine User Interface Reference Manual – 10410-00337
- ShockLine Programming Manual – 10410-00746
- MS46131A Series VNA Maintenance Manual – 10410-00781

ShockLine MS46322A/B Vector Network Analyzers

- MS46322A Series VNA Technical Data Sheet – 11410-00751
- MS46322B Series VNA Technical Data Sheet – 11410-00996
- MS46322A/B Series VNA Operation Manual – 10410-00335
- MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA Measurement Guide – 10410-00336
- MS46121A/B, MS46122A/B, MS46131A, ME7868A, ME7869A, MS46322A/B Series VNA ShockLine User Interface Reference Manual – 10410-00337
- ShockLine Programming Manual – 10410-00746
- MS46322A/B Series VNA Maintenance Manual – 10410-00342

Updates to Manuals

For updates to any of the ShockLine Series VNA documentation, visit Anritsu's Web site at:
http://www.anritsu.com/en-US/test-measurement/rf-microwave/vector-network-analyzers

1-5 Contacting Anritsu

To contact Anritsu, please visit:

http://www.anritsu.com/contact.asp

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

Updated product information can be found on your product page:

http://www.anritsu.com/en-US/test-measurement/rf-microwave/vector-network-analyzers

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

Chapter 2 — Initial Configuration, Menu Bar, Icon Bar, and Main Menu

2-1 Chapter Overview

This chapter describes the user interface for all of the ShockLine VNAs listed on the title page. Section 2-2 is specific to the MS46131A, ME7868A, and ME7869A, but all the other sections apply to all of the ShockLine VNAs in this manual.

Because the Menu Bar and Icon Bar are fully covered in the Operations Manual, these topics are only summarized here. For full discussions, see the Operation Manual.

Installing the ShockLine Application Software

1. Search for the MS46131A product at www.Anritsu.com and open the Downloads information.
2. Download and install the MS46131A ShockLine latest software onto the PC from the Anritsu website.
3. If the download is successful, a ShockLine icon will appear on your PC screen.
4. 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.

Note	When placing the ShockLine MS46131A Series VNAs in operation, allow at least 30 minutes of warm-up time in the operate mode before using the VNA to assure stable operation and the highest possible accuracy.

Note	Refer to the *MS46131A Operation Manual and Measurement Guide* for more detailed information regarding using the application and making measurements.

Running the ShockLine Application

To start the ShockLine Application, double click the ShockLine Icon on the PC desktop. A ShockLine splash screen will appear when the application is launching as shown in Figure 2-1

Figure 2-1. ShockLine Splash Screen

One MS46131A VNA Connected

Open the ShockLine application with only one MS46131A connected will display the main menu as shown in Figure 2-2.

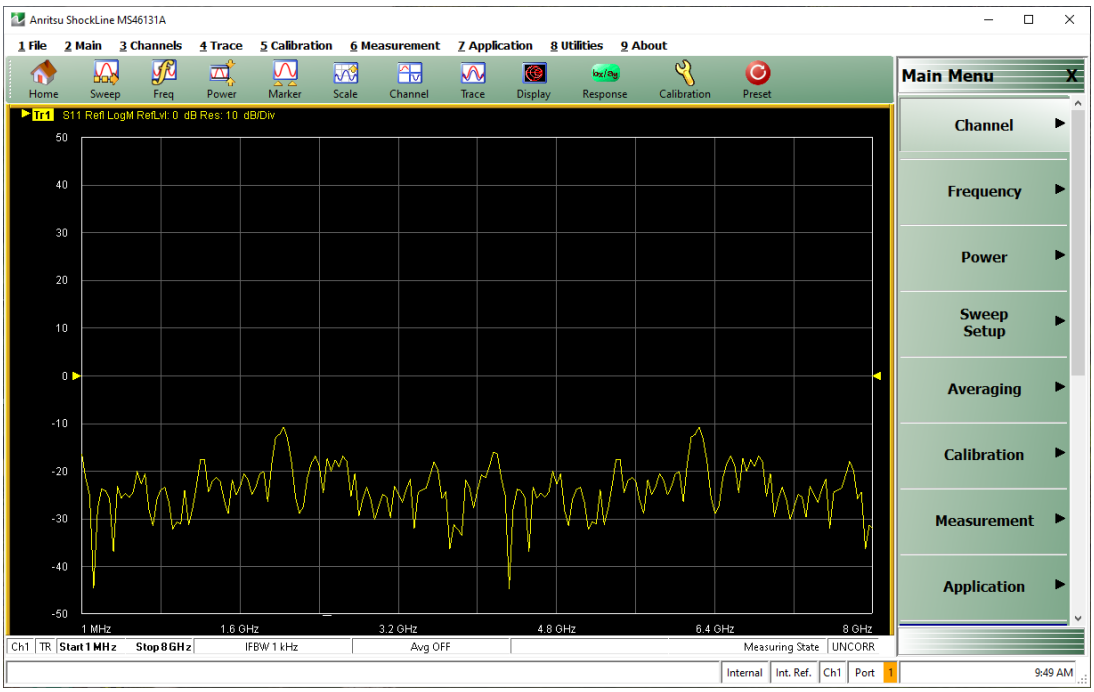
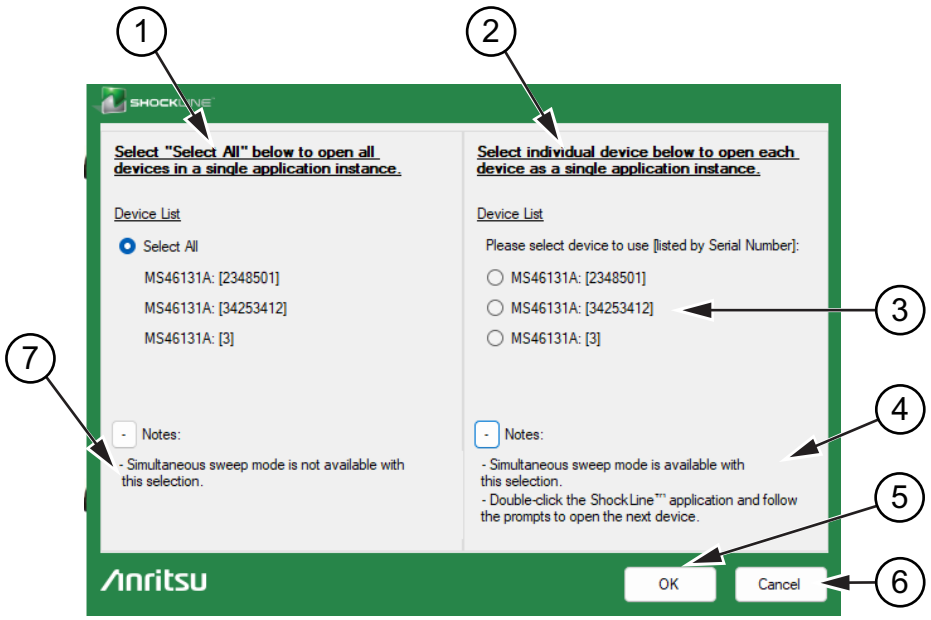


Figure 2-2. Single MS46131A Connected Display

Two to Four MS46131A VNAs Connected

Open the ShockLine application with two to four MS46131As connected with the ShockLine software application displays the dialog shown in Figure 2-4.



1. See “Select All”
2. See “Select Individual” on page 2-4
3. Select and Click the MS46131A VNAs to Open
4. Notes that apply to “Individual” MS46131A VNAs Section
5. Click OK to accept selection
6. Click Cancel to reject selection and close dialog
7. Notes that apply to “Select All” MS46131A VNAs Section

Figure 2-3. MS46131A Display Configuration Dialog

Select All

Click “Select All” mode displays the dialog shown in Figure 2-4. The user can assign any MS464131A in an ME7868A or ME7869A system to any port, and to set any MS46131A as the Base unit for the system. The Base unit distributes the system’s reference clock. Select the appropriate port for each MS46131A VNA and select which VNA will be the Base unit (the Base unit module is the one that will supply the frequency reference for the system). The port selection refers to the serial number of each MS46131A and is important to confirm the port orientation in your setup. It is also important to maintain that configuration over time to make sure the measurements are consistent for recalled setups.

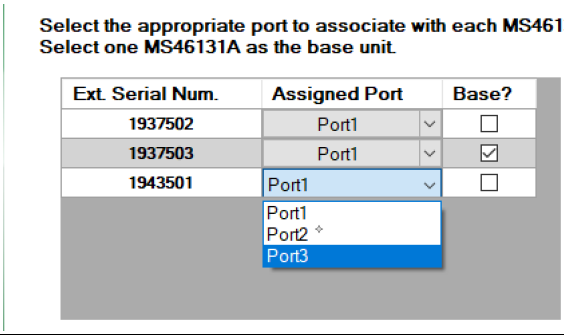


Figure 2-4. Set Port and Base Unit Configuration

Using the connected MS46131A VNAs in a single application provides control of all devices using a single Main Menu control. In operate mode, the computer controlling the ShockLine MS46131A Series VNAs displays the main trace display with the application menus on the right side as shown in Figure 2-5. Note that all three MS46131A devices are controlled by the single Main Menu and will respond simultaneously to parameter settings.

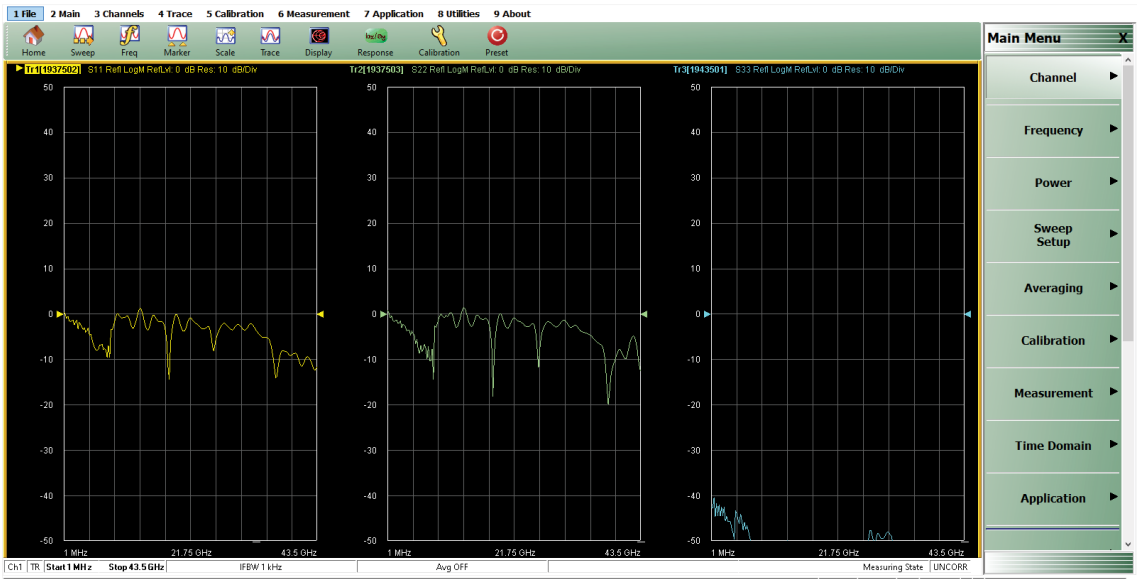
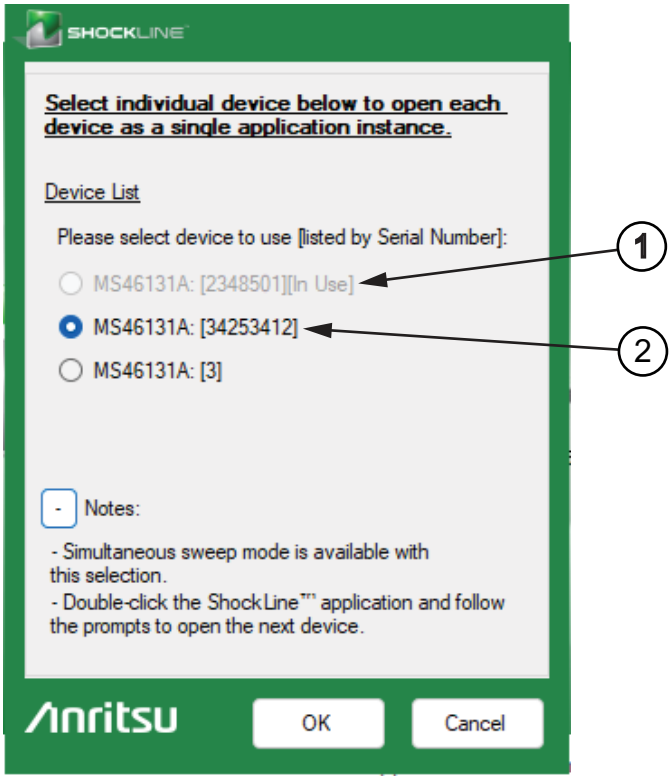


Figure 2-5. “Select All” Mode Display

Select Individual

Open the ShockLine Software application using the “Select individual” device mode dialog shown in Figure 2-3 on page 2-3 provides control of each MS46131A individually. The dialog shown in Figure 2-6 provides the status of each individual MS46131A. The MS46131A s/n 2348501 is grayed and indicates it is opened and in use. The other two devices shown are available to open using the radio buttons. Press OK to connect the MA46131A selected. Press Cancel to reject the selection and close the dialog.



1. Indicates MS46131A in use
2. Select next MS46131A to connect

Figure 2-6. Select Individual MS46131A Dialog

Opening each MS46131A individually provides the user interface for each MS46131A as shown in Figure 2-7. Note each MS46131A device is controlled by its own Main Menu and is displayed independently.

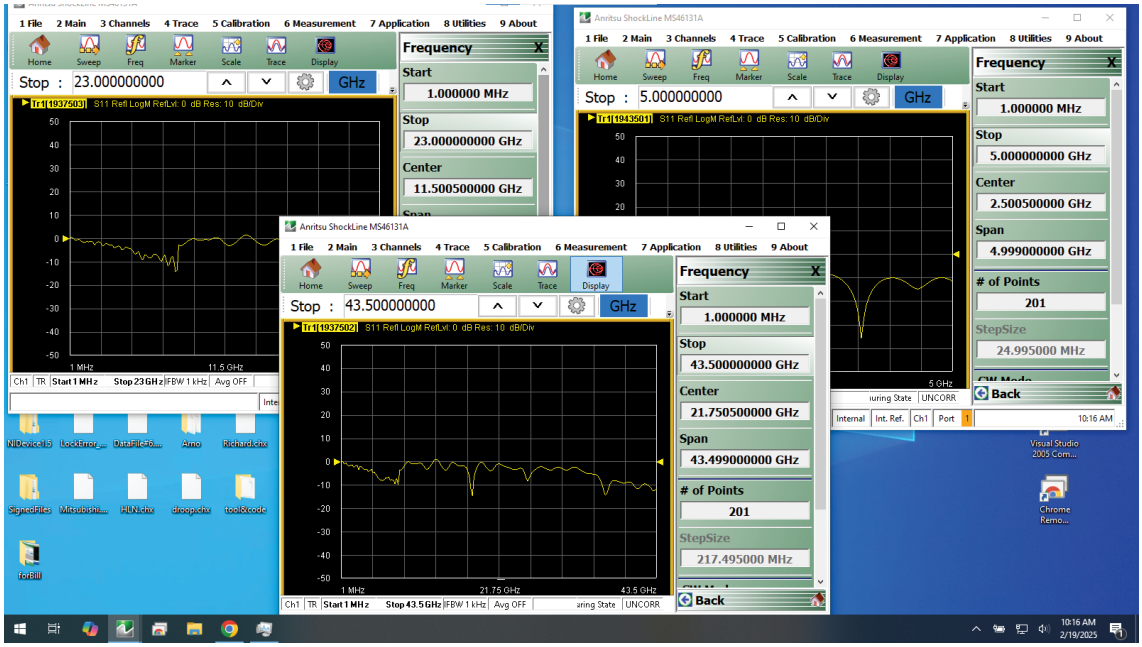


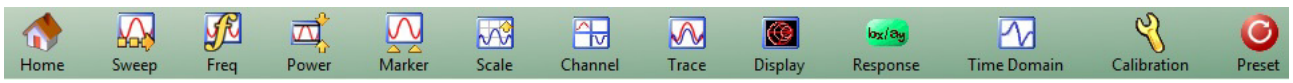
Figure 2-7. Select Individual Device Mode Display

2-2 Menu Bar

The menu bar at the top of the screen provides drop-down menus for access to major ShockLine VNA functions and dialogs. The bar is shown below.

2-3 Icon Bar

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 20 icons can be displayed in any configuration.



2-4 Main Menu

MAIN MENU

The MAIN MENU allows navigating to all functions of the software application. It is located at the right side of the ShockLine screen. The split/collapsed view in the diagram below shows all of what is seen when the MAIN MENU is scrolled down.

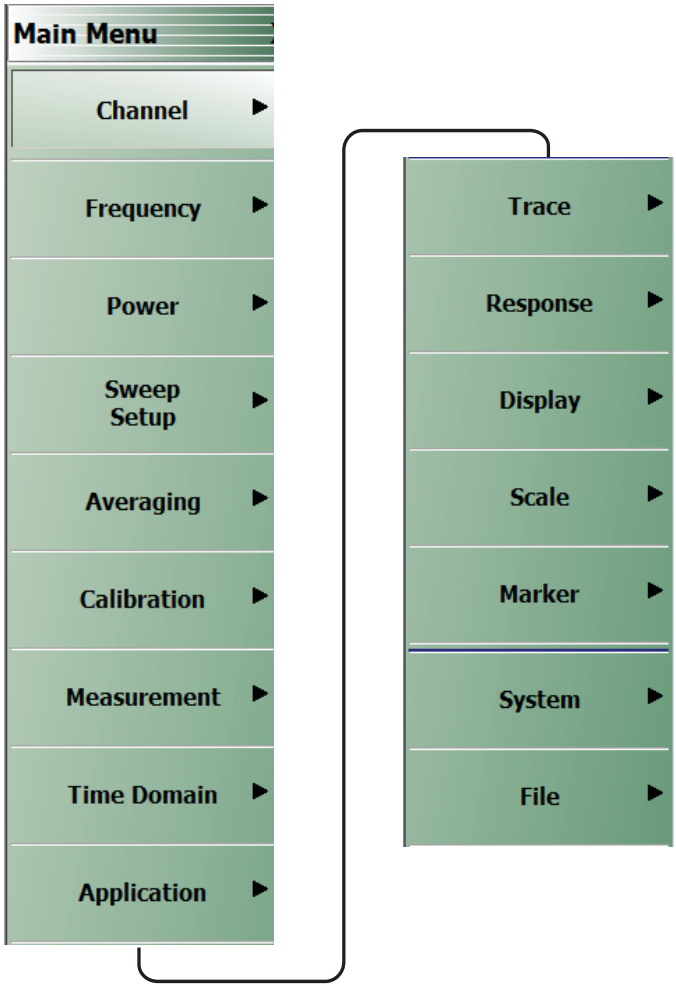


Figure 2-8. MAIN MENU – 2-Port VNAs

Channel

Selection displays the CHANNEL menu.

- "Channel Menus" on page 3-2

Frequency

Selection displays the FREQUENCY menu.

- "Overview of Frequency Menus" on page 4-1

Power

Select displays the POWER menu. 2-port VNAs only.

- "MS46322A/B Maximum and Minimum Power Settings" on page 5-1

Sweep Setup

Select displays the SWEEP SETUP menu.

- “Sweep Setup Menu” on page 6-2

Averaging

Select displays the AVERAGING menu.

- “Overview of the Averaging Menu” on page 7-1

Calibration

Select displays the CALIBRATION menu.

- “CALIBRATION [TR] Menu” on page 8-6

Measurement

Select displays the MEASUREMENT menu.

- “MEASUREMENT Menu” on page 9-3

Time Domain

Selection displays the TIME DOMAIN menu.

- Section 10-2 “Overview of the Time Domain Menu” on page 10-1

Application

Select displays the APPLICATION menu.

- “APPLICATION Menu (for Receiver Configuration)” on page 11-1

Trace

Select displays the TRACE menu.

- “TRACE Menu” on page 12-2

Response

Select displays the RESPONSE menu.

- “Response Menu” on page 13-3

Display

Select displays the DISPLAY menu.

- “DISPLAY Menu” on page 14-3

Scale

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

- “Overview of Scale Menu Variants” on page 15-4

The available SCALE menu buttons change based on the settings on the DISPLAY Menu’s submenu TRACE FORMAT.

- “TRACE FORMAT Menu” on page 14-8

Marker

Select displays the MARKERS [1] menu.

- "MARKERS [1] Menu" on page 16-4

System

Select displays the SYSTEM menu.

- "SETUP Menu" on page 17-3

File

Select displays the FILE menu.

- "FILE Menu" on page 18-2

2-5 Context (Right-Click) Menus

The ShockLine Series VNA provides three context menus, which can be accessed by right-clicking in the designated areas:

- Main Display Area, Menu Bar, and Icon Toolbar
- Right-Side Menu
- Right-Side Menu Scroll Bar

Main Display Area, Menu Bar, and Icon Toolbar

- Context menu displays the Active Channel Number and Active Trace Number.
- The active channel's Hold state is indicated by a check mark in the context menu.
- Right-clicking to activate the context menu will not change the active channel.

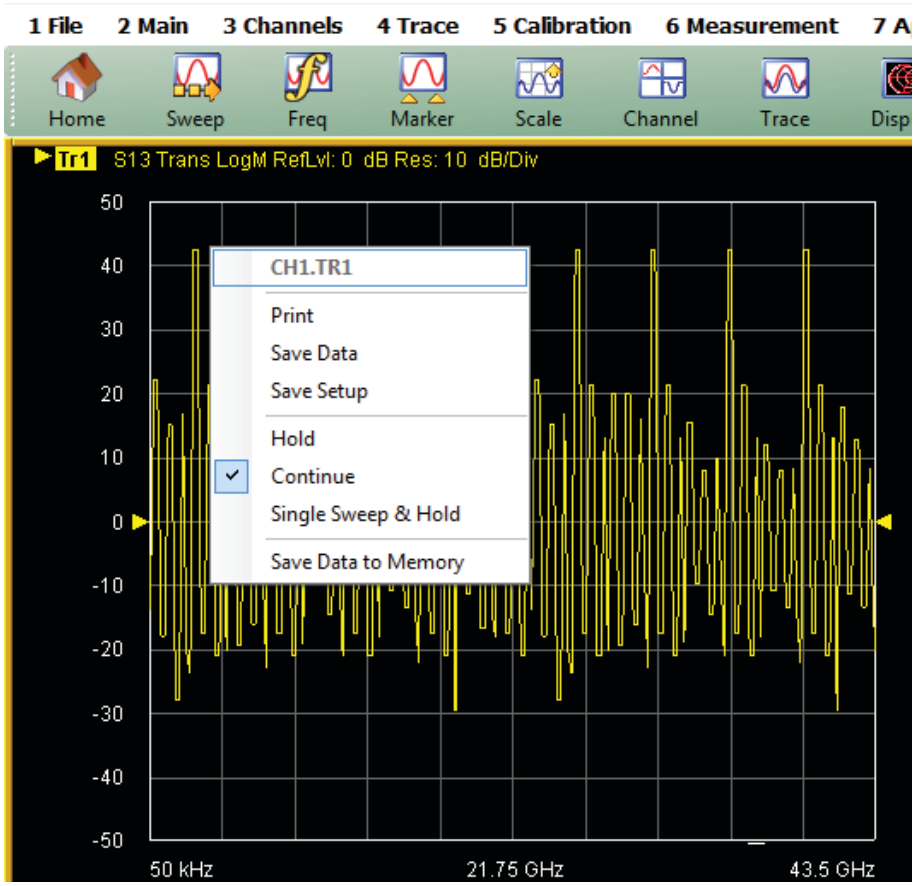


Figure 2-9. Main Display Area Context Menu

Right-Side Menu

- Context menu allows definition of up to five custom icon functions using the Right-side Menu context menu. The actual icon symbols are predefined.

  a. Click Set as Icon X to display the Custom Icon dialog.

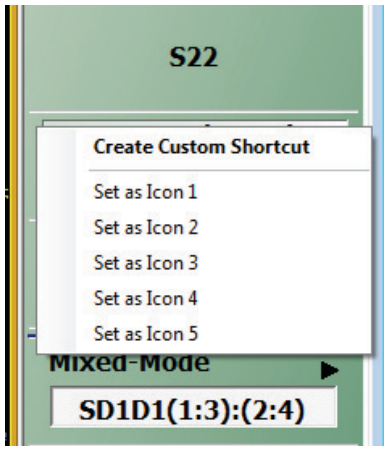


Figure 2-10. Right-side Menu Context Menu—Initial State

b. Enter a Display Name of between 1 and 15 characters and click Save.

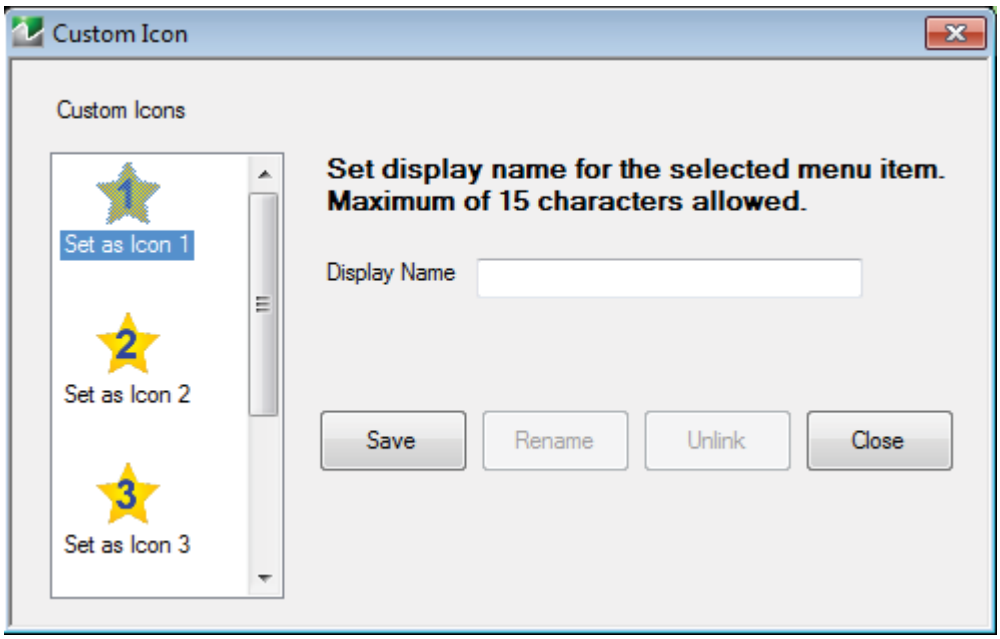


Figure 2-11. Custom Icon Dialog Box—Initial State

c. The custom icon will be added to the Icon Bar. The name of the selected custom icon will be changed in both the Right-side Menu context menu and the Custom Icon dialog box. To move the icon in the Icon Bar, use Customize Toolbar.

- If the Icon Bar is full, use Utilities | Customize Toolbar to adjust the number of icons in the Icon Bar. The Customize Toolbar feature is described in the *MS4632x Operation Manual* (10410-00335).

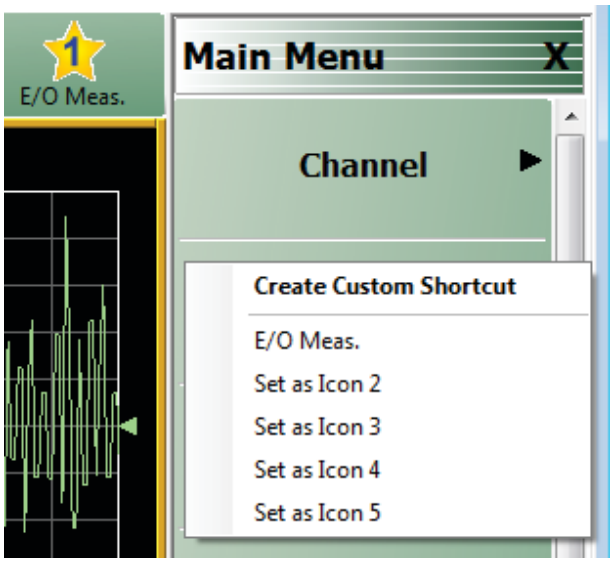


Figure 2-12. Custom Icon Dialog Box and Icon Bar—E/O Meas. Icon Added

d. To redefine a custom icon, right-click the desired menu button and select the appropriate icon entry in the Right-side Menu context menu. Enter new name, if desired, and click Save.

e. To deactivate a custom icon, right-click in the Right-side Menu context menu and select the appropriate icon entry in the Right-side Menu context menu. In the Customize Icon dialog, click Unlink. The custom icon will be removed from the Icon Bar. The name of the selected custom icon will be changed to Set as Icon X in both the Right-side Menu context menu and the Custom Icon dialog box.

Right-Side Menu Scroll Bar

- Available when right-side menu has extended content with a scroll-bar. Right-click in scroll bar.

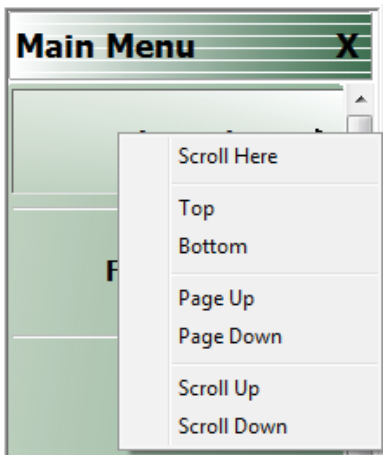


Figure 2-13. Right-Side Menu Scroll Bar Context Menu

Chapter 3 — Channel Menus

3-1 Chapter Overview

This chapter describes how to set the number of channels used and how they are displayed on the instrument. Up to 16 channels can be configured, each with up to 16 traces per channel. For the MS46121A/B only, each channel is dedicated to an individual 1-port VNA. Only those channels associated with VNA hardware will have active trace displays.

3-2 Overview of Channel Menus

There are two channel menus:

- "CHANNEL Menu" on page 3-2
- "CHAN. LAYOUT Menu" on page 3-3

3-3 Channel Menus

The CHANNEL menu and the CHAN. LAYOUT menus are related in that the setting on one menu affects the setting on the other menu.

CHANNEL Menu

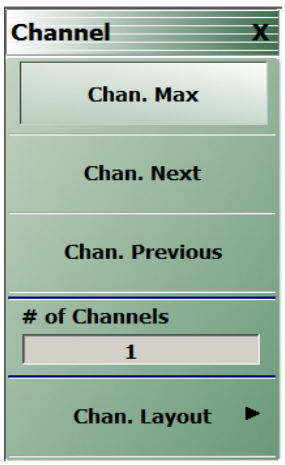
Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Channel | CHANNEL

You can move between channels either by clicking on a channel on-screen, or from the keyboard by pressing ALT and holding it, and pressing 3 followed by the menu number of the operation you want (such as 1 – Menu, 2 – Max, 3 – Previous, or 4 – Next).



Chan. Max

When multiple channels are displayed, use the Channel Maximum button to maximize the active channel to fill the display area. Clicking a second time returns to the prior multi-channel view.

Chan. Next

When multiple channels are displayed, the Channel Next button activates the next higher channel number. When the highest channel number is reached, the next click activates channel 1.

Chan. Previous

When multiple channels are displayed, the Channel Previous button activates the next lower channel number. When channel 1 is reached, the next click activates the highest channel number.

# of Channels

Select displays the Number of Channels field toolbar below the icon toolbar. The toolbar allows the user to set the number of displayed channels in discrete values of 1 (one), 2, 3, 4, 6, 8, 9, 10, 12, or 16 channels. If other channel settings are applied (5, 7, 11, 13, 14, or 15), the instrument applies the next permitted channel setting. The Channel Layout (described below) is automatically set to the number of selected channels.

Chan. Layout

The Channel Layout button displays the CHAN. LAYOUT menu which defines how multiple channels are displayed on the screen.

- "CHAN. LAYOUT Menu" on page 3-3

Figure 3-1. CHANNEL Menu

CHAN. LAYOUT Menu

The CHANNEL LAYOUT menu allows the user to select from 22 selectable channel views. The channel view buttons are not labeled, but instead provide a representative icon of each view configuration. For example, the Single Channel View button provides a channel view where one channel is displayed in one display area. Once the desired view is selected, click the Back button at the bottom of the CHAN. LAYOUT menu to return to the CHANNEL menu. Note that CHAN. LAYOUT menu setting and the # of Channels setting on the CHANNEL menu are linked. Changing the number of channels selects an appropriate channel layout. Changing the channel layout where the number of displayed channels changes, changes the number of channels set on the CHANNEL menu.

Full Name

- CHANNEL LAYOUT Menu

Previous

- "CHANNEL Menu" on page 3-2.

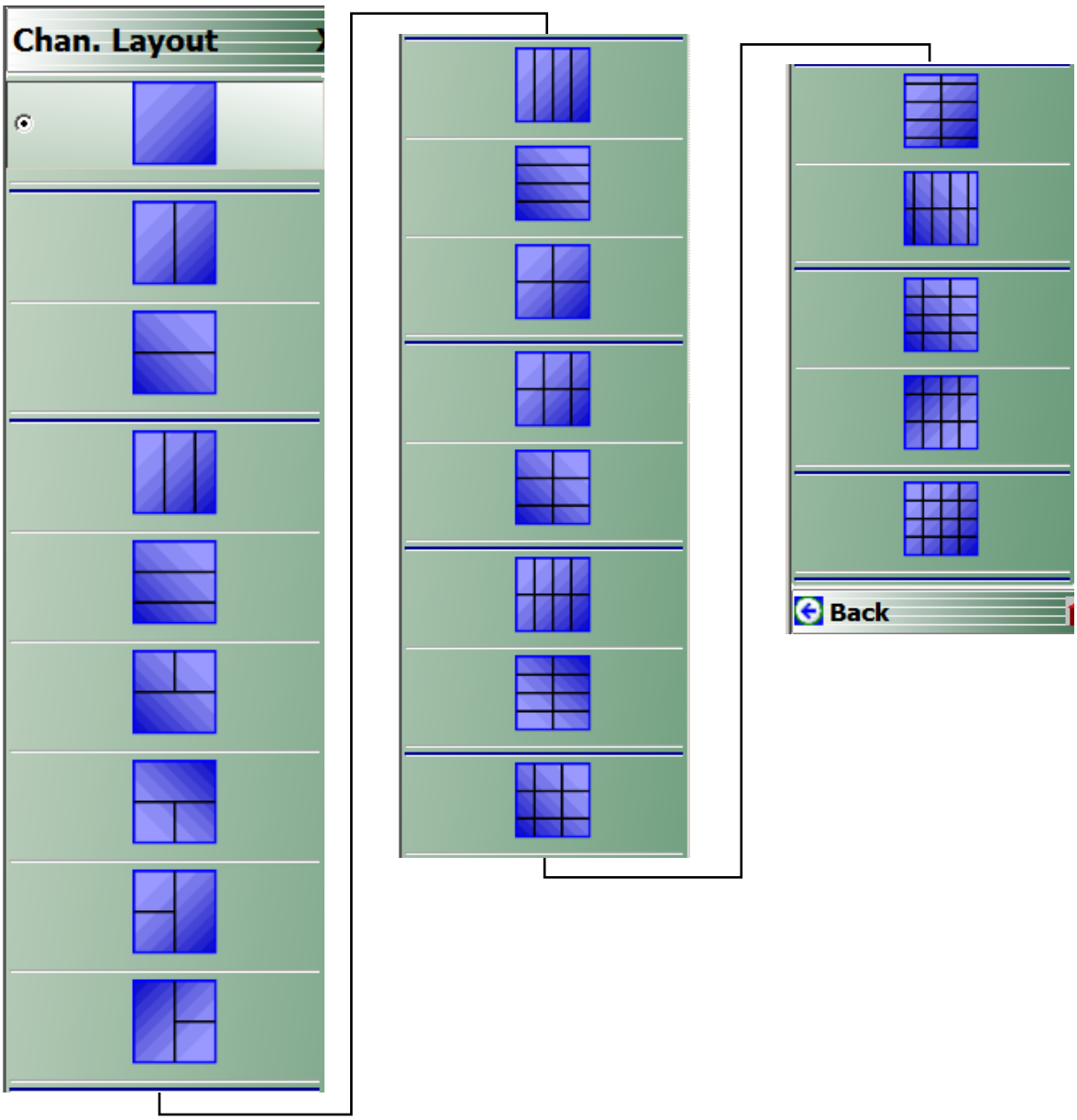
Navigation

- MAIN | Channel | CHANNEL | Chan. Layout | CHAN. LAYOUT

.

Note	The **Chan. Layout** buttons do not have labels, but do have tool tips that appear if the mouse pointer is hovered over the button. The selected channel layout view is indicated by the button selected icon. For VNA programmatic control, note also that each channel layout is described by the appropriate SCPI parameter. For example, to program a three across channel layout, use the R1C3 parameter.

The long CHAN LAYOUT menu is immediately below. The names of the different channel layout displays are shown in the Table 3-1, "Channel Layout Options" on page 3-5 below.



The menu uses the right-side scroll bar to display the entire menu.

Figure 3-2. CHAN. LAYOUT (CHANNEL LAYOUT) Menu

The table below describes each Channel Layout option.

Table 3-1. Channel Layout Options (1 of 2)

Graphic	Description
	Single Channel View Click Back to return to the CHANNEL menu. R1C1 for SCPI programs.
	Two Channel View – 2 Across x 1 Down Click Back to return to the CHANNEL menu. R1C2 for SCPI programs.
	Two Channel View – 1 Across x 2 Down Click Back to return to the CHANNEL menu. R2C1 for SCPI programs.
	Three Channel View – 3 Across Click Back to return to the CHANNEL menu. R1C3 for SCPI programs.
	Three Channel View – 3 Down Click Back to return to the CHANNEL menu. R3C1 for SCPI programs.
	Three Channel View – 2 on Top x 1 on Bottom Click Back to return to the CHANNEL menu. R2C2C1 for SCPI programs.
	Three Channel View – 1 on Top x 2 on Bottom Click Back to return to the CHANNEL menu. R2C1C2 for SCPI programs.
	Three Channel View – 2 on Left x 1 on Right Click Back to return to the CHANNEL menu. C2R2R1 for SCPI programs.
	Three Channel View – 1 on Left x 2 on Right Click Back to return to the CHANNEL menu. C2R1R2 for SCPI programs.
	Four Channel View – 4 Across Click Back to return to the CHANNEL menu. R1C4 for SCPI programs.
	Four Channel View – 4 Down Click Back to return to the CHANNEL menu. R4C1 for SCPI programs.
	Four Channel View – 2 Across x 2 Down Click Back to return to the CHANNEL menu. R2C2 for SCPI programs.

Table 3-1. Channel Layout Options (2 of 2)

Graphic	Description
	Six Channel View – 3 Across x 2 Down Click Back to return to the CHANNEL menu. R2C3 for SCPI programs.
	Six Channel View – 2 Across x 3 Down Click Back to return to the CHANNEL menu. R3C2 for SCPI programs.
	Eight Channel View – 4 Across x 2 Down Click Back to return to the CHANNEL menu. R2C4 for SCPI programs.
	Eight Channel View – 2 Across x 4 Down Click Back to return to the CHANNEL menu. R4C2 for SCPI programs.
	Nine Channel View – 3 Across x 3 Down Click Back to return to the CHANNEL menu. R3C3 for SCPI programs.
	Ten Channel View – 5 Across x 2 Down Click Back to return to the CHANNEL menu. R5C2 for SCPI programs.
	Ten Channel View – 2 Across x 5 Down Click Back to return to the CHANNEL menu. R2C5 for SCPI programs.
	Twelve Channel View – 3 Across x 4 Down Click Back to return to the CHANNEL menu. R4C3 for SCPI programs.
	Twelve Channel View – 4 Across x 3 Down Click Back to return to the CHANNEL menu. R3C4 for SCPI programs.
	Sixteen Channel View – 4 Across x 4 Down Click Back to return to the CHANNEL menu. R4C4 for SCPI programs.

3-4 MS46121A/B Multi-Channel

For the 1-port MS46212A/B VNA the CHANNEL menu and the CHAN. LAYOUT menus are related in that the setting on one menu affects the setting on the other menu.

CHANNEL Menu

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Channel | CHANNEL

You can move between channels either by clicking on a channel on-screen, or from the keyboard by pressing ALT and holding it, and pressing 3 followed by the menu number of the operation you want (such as 1 – Menu, 2 – Max, 3 – Previous, or 4 – Next).

Chan. Max

When multiple channels are displayed, use the Channel Maximum button to maximize the active channel to fill the display area. Clicking a second time returns to the prior multi-channel view.

Chan. Next

When multiple channels are displayed, the Channel Next button activates the next higher channel number. When the highest channel number is reached, the next click activates channel 1.

Chan. Previous

When multiple channels are displayed, the Channel Previous button activates the next lower channel number. When channel 1 is reached, the next click activates the highest channel number.

Chan. Layout

The Channel Layout button displays the CHAN. LAYOUT menu.

Reconfigure

The Reconfigure button opens the CHANNEL RECONFIGURATION dialog that allows the user to select channels for each 1 port MS46121A/B VNA, based on the device's serial number.

Figure 3-3. MS46121A/B CHANNEL Menu

Reconfigure Dialog Box

The channel Reconfiguration allows the user to set multiple channels on each MS46121A/B device attached. A maximum total of 16 channels can be set between all MS46121A/B devices.

Previous

- "CHANNEL Menu" on page 3-7

Navigation

- MAIN | Channel | CHANNEL | Reconfigure

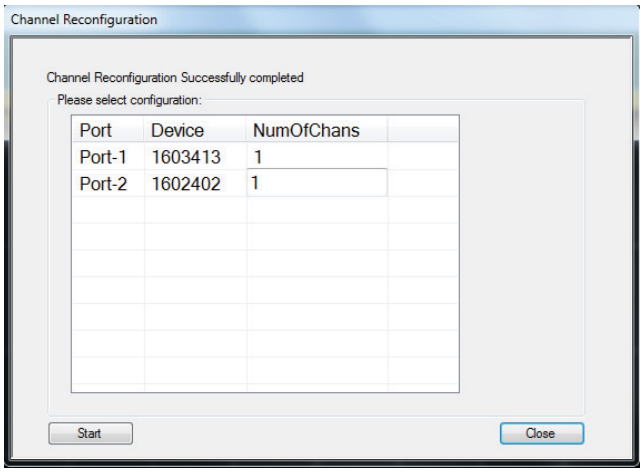


Figure 3-4. SAVE (AUTOCAL CHARACTERIZATION/CAL) KIT FILE Dialog Box

Port

This provides the assignment of channels for a given device.

Device

This is the MS46121A/B device and is listed by serial number

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.

Chapter 4 — Frequency Menus

4-1 Chapter Overview

This chapter covers the FREQUENCY menu which allows the user to set frequency start, stop, span, number of points, and CW mode parameters for the currently active (selected) channel. The FREQUENCY menu has several variants; the one that is displayed depends on the Sweep Types setting for the current channel. The sweep type is set on the SWEEP SETUP menu.

4-2 Overview of Frequency Menus

The appearance and content of the FREQUENCY menu and sub menus depend on the current channel's sweep mode, set by the SWEEP TYPES menu. The settings on the FREQUENCY menu apply to the currently active channel.

The setup sequence is:

1. Select a channel

2. Select a sweep type for the channel.

See "SWEEP TYPES Menu" on page 6-6

- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES

3. Set the channel's frequency parameters on the FREQUENCY menu variant appropriate for your situation.

This chapter covers the sweep-based variants of the FREQUENCY menu. They are:

- "Frequency Menu for Frequency-Based Linear Sweep Mode" on page 4-2
- "Frequency Menu for Frequency-Based Logarithmic Sweep Mode" on page 4-4
- "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
- "Frequency Menu for Segmented Sweep (Index-Based) Mode" on page 4-7

4-3 Frequency Menu for Frequency-Based Linear Sweep Mode

Function(s)

This menu controls linear sweeps.

Displays

- Traces for the channel will show linear axes.

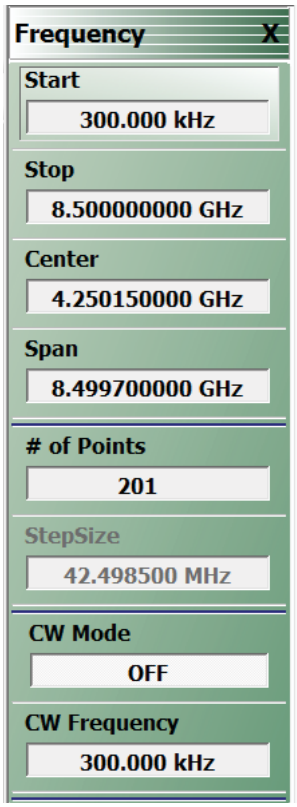
Prerequisites

- User has selected a channel to set up.
- This menu is enabled by selection of Frequency Sweep on the SWEEP TYPES menu.

Navigation

- MAIN | Frequency | FREQUENCY

Appearance and Controls



Start (Frequency)

Displays the Start (Frequency) field toolbar and allows the user to enter a starting frequency.

Stop (Frequency)

Displays the Stop (Frequency) field toolbar and allows the user to enter a stop frequency.

Center (Frequency)

The Center (Frequency) button displays the Center (Frequency) field toolbar and allows the user to enter a center frequency.

Span (Frequency)

The Span (Frequency) button displays the Span (Frequency) field toolbar and allows the user to enter a span frequency.

# of Points

The Number of Points button displays the # of Points field toolbar and allows the user to enter the number of points for the frequency span, allowing separate parameter point settings for CW Mode ON and CW Mode OFF.

Figure 4-1. FREQUENCY Freq. Based Sweep Menu (1 of 2)

Step Size (Frequency)

This read-only field displays the frequency step-size computed from the requested frequency span and the number of points selected in the buttons above. If the CW Mode (below) is set to ON, the read-only field displays 0 (zero) Hz.

CW Mode (Off/On)

The Continuous Wave (CW) toggle button toggles the CW function off and on. The default setting is OFF. If CW Mode is ON, the Step Size (Frequency) display (described above) is set to 0 (zero) Hz and the # of Points setting changes to what has been set for the CW Mode.

CW Frequency

The CW Frequency button displays the CW Frequency field toolbar and allows the user to set the required CW frequency. Input the required frequency value and select GHz, MHz, kHz, or Hz. If a calibration is active, the VNA will choose the closest CW frequency point from the active calibration points. If the requested CW frequency is a calibrated point, the VNA will assign the entered value. Note that the CW Frequency must fall within the range set by the Start/Stop buttons above.

Figure 4-1. FREQUENCY Freq. Based Sweep Menu (2 of 2)

4-4 Frequency Menu for Frequency-Based Logarithmic Sweep Mode

Function(s)

This menu controls logarithmic sweeps.

Displays

- Traces for the channel will show logarithmic axes.

Prerequisites

- User has selected a channel to set up.
- This menu is enabled by selection of Frequency Sweep (Log) on the SWEEP SETUP menu's SWEEP TYPES button.

Navigation

- MAIN | Frequency | FREQUENCY

Appearance and Controls

The menu appearance and controls are exactly the same as for Frequency-Based Linear Sweep shown in "Frequency Menu for Frequency-Based Linear Sweep Mode" on page 4-2. Traces appear the same except that the graph bars are logarithmic.

4-5 Frequency Menu for Frequency-Based Segmented Sweep Mode

Function(s)

This menu controls frequency-based segmented sweeps. (Parameters are also set at the SWEEP SETUP menu's Freq-based Seg. Sweep Setup button and its menu.)

Displays

- Traces for the channel will show linear axes.

Prerequisites

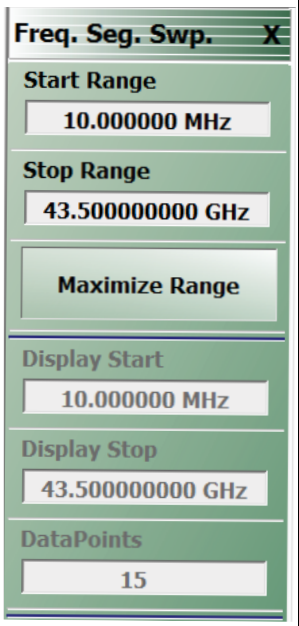
- User has selected a channel to set up.
- This menu is enabled by selection of Segmented (Freq) sweep type on the SWEEP SETUP menu's Sweep Types button.

Navigation

- MAIN | Frequency | FREQUENCY

Appearance and Controls

- The three active buttons are Start Range, Stop Range, and Maximize Range
- The three read-only buttons are Display Start, Display Stop, and DataPoints.



Start Range (Frequency)

Select displays the Start Range (Frequency) toolbar with frequency values and units of GHz, MHz, kHz, and Hz.

Stop Range (Frequency)

Select displays the Stop Range (Frequency) toolbar with frequency values and units of GHz, MHz, kHz, and Hz.

Maximize Range (Frequency)

Select maximizes the start and stop value to the maximum of the instrument. Note that when clicked, any previously entered Start and Stop value are overwritten and cannot be recovered unless a preset save was done.

Display Start (Frequency)

A read-only display of the Start Range frequency.

Display Stop (Frequency)

A read-only display of the Stop Range frequency.

Figure 4-2. FREQUENCY Freq. Based Segmented Sweep Menu (1 of 2)

	DataPoints (Number) A read-only display of the calculated number of data points in the set frequency range.

Figure 4-2. FREQUENCY Freq. Based Segmented Sweep Menu (2 of 2)

4-6 Frequency Menu for Segmented Sweep (Index-Based) Mode

Function(s)

This menu controls index-based segmented sweeps. (Parameters are also set at the SWEEP SETUP Menu's Index-based Seg. Sweep Setup button and its menu.)

Displays

Sweeps showing index-based data.

Prerequisites

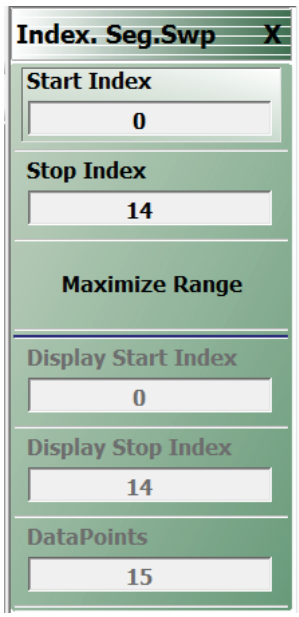
- User has selected a channel to set up.
- This menu is available when Segmented Sweep (Index-based) is selected on the SWEEP TYPES menu's Sweep Types button.

Navigation

- MAIN | Frequency | FREQUENCY

Appearance

- The three (3) active buttons are Start Index, Stop Index, and Maximize Range
- The three read-only buttons are Display Start Index, Display Stop Index, and DataPoints



Start Index (Number)

Select displays the Start (Index Number) toolbar allowing the selection of a starting index number for the sweep.

Stop Index (Number)

Select displays the Stop (Index Number) toolbar allowing the selection of an ending index number for the sweep.

Maximize Range

Select maximizes the start and stop value to the maximum of the instrument. Note that when clicked, any previously entered Start and Stop values are overwritten and cannot be recovered unless a preset save was done.

Display Start Index (Number)

A read-only display of the Start Index number.

Figure 4-3. INDEX. SEG. SWP (FREQUENCY) Index-Based Segmented Sweep Menu (1 of 2)

	Display Stop Index (Number) A read-only display of the Stop Index number. **DataPoints (Number)** A read-only display of the calculated number of data points in the swept frequency range.

Figure 4-3. INDEX. SEG. SWP (FREQUENCY) Index-Based Segmented Sweep Menu (2 of 2)

Chapter 5 — Power Menus

5-1 Chapter Overview

This chapter provides information on port power control in MS461xx series and MS463xx series VNAs. Power conditions for sweeps are set in different places in the ShockLine application, depending on the sweep type: 1) for frequency-based sweeps, the POWER menu is used to set power parameters, and 2) for segmented and indexed sweeps, the power setup controls are in segment or index setup characteristics areas of the sweep table (see Chapter 6 — Sweep Menus for details).

Note	The MS46121A/B 1-port VNA has only one default power level, so the power menu is not applicable and not available.

MS46322A/B Maximum and Minimum Power Settings

The VNAs in the MS46322A/B series support using one of two power levels—High or Low—in normal use.

For all configurations, the maximum power setting is High.

Table 5-1 below shows values for the two standard power settings.

Table 5-1. Summary of Standard Maximum and Minimum Power Levels

VNA	Power Level	Power Setting	Output Power (Typical)
MS46322A-004 MS46322A/B-010 MS46322A-014 MS46322A/B-020 MS46322A-030 MS46322A/B-040 MS46322B-043	Maximum Power	High	-3 dBm
	Minimum Power	Low	-20 dBm

MS46122A/B Maximum and Minimum Power Settings

The VNAs in the MS46122A/B series support using one of two power levels—High or Low—in normal use.

For all configurations, the maximum power setting is High.

Table 5-2 below shows values for the two standard power settings.

Table 5-2. Summary of Standard Maximum and Minimum Power Levels

VNA	Power Level	Power Setting	Output Power (Typical)
MS46122A/B-010 MS46122A/B-020 MS46122A/B-040 MS46122B-043	Maximum Power	High	-3 dBm
	Minimum Power	Low	-20 dBm

MS46131A, ME7868A, and ME7869A Maximum and Minimum Power Settings

The VNAs in the MS46131A, ME7868A, and ME7869A series support three power levels—High, Low, or Off.

For all configurations, the maximum power setting is High.

Table 5-3 below shows values for the two standard power settings.

Table 5-3. Summary of Standard Maximum and Minimum Power Levels

VNA	Power Level	Power Setting	Output Power (Typical)
MS46131A-010 MS46131A-020 MS46131A-043 ME7868A (2 Port) ME7869A (2 Port)	Maximum Power	High	0 dBm
	Minimum Power	Low	-20 dBm
	No Power	Off	-50 dBm

5-2 Overview – Power Menus

Locations of Power Settings

There are two main things to know about the VNA power controls:

1. The sweep type determines where the power controls are found. For basic frequency-based sweeps the controls are in the POWER menus. For segment or index sweeps, the controls are both in the POWER menus and in SWEEP menu setup tables.
2. The POWER menu contents such as menu title text, buttons, and available functions, may vary depending on selected sweep type, instrument model, and installed options.

This chapter organizes discusses of POWER menus by sections reflecting the sweep type. The following is a quick reference:

1. POWER Settings for Frequency-Based Sweeps

If SWEEP Menu SWEEP TYPES is set to either Frequency Sweep (for linear sweep) or to Frequency Sweep (Log), the power settings are under the POWER menu and its submenus.

2. POWER Settings for Segment-Based Sweeps

If SWEEP Menu SWEEP TYPES is set to a Segment-Based Sweep type (Frequency or Index), the per-port power and effective power are set on a per-segment basis in the Segmented Sweep Setup Tableau dialog area. To reach that dialog:

How to Navigate to Power Settings for Frequency-Segment-Based Sweeps

- MAIN | Sweep Setup | SWEEP SETUP | Freq-Based Seg Sweep Setup | FREQ BASE SETUP
- For use see “FREQ BASE SETUP Menu” on page 6-7

How to Navigate to Power Settings for Index-Based Segmented Sweeps

- MAIN | Sweep Setup | SWEEP SETUP | Index-Based Seg Sweep Setup | INDEX BASE SETUP
- For use see “INDEX BASE SETUP Menu” on page 6-13

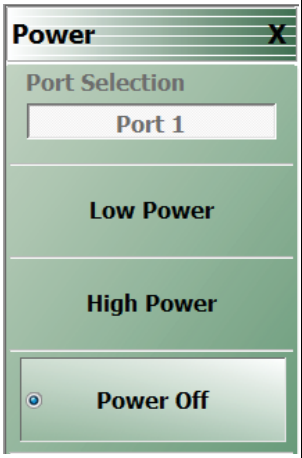
Power Coupling State Is Shown in Power Menu Titles

- POWER menu title text of 'POWER [COUPLED]' or 'POWER [C]' indicates that all port powers are coupled.
- POWER menu title text of 'POWER' indicates that the port powers are not coupled.

5-3 Power Menu for Frequency-Based Sweeps (Linear or Log)

Navigation

- MAIN | Power | POWER



POWER Menu

The menu title dynamically changes to show whether the port power levels are coupled or not

Other Setup

Selection opens the POWER SETUP dialog. (See description of MIN. PORT POWER below.) When Sweep Type is Segmented (Frequency or Indexed), this capability is not available and the button is deactivated and grayed out.

Low Power

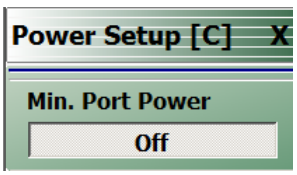
Selection applies the Low Power setting to both ports for sweeps on the current channel.

High Power

Selection applies the High Power setting to both ports for sweeps on the current channel.

Figure 5-1. POWER Menu – Frequency-Based Sweep Modes – MS46122A/B and MS46322A/B 2-Port VNAs

Power Setup Menu

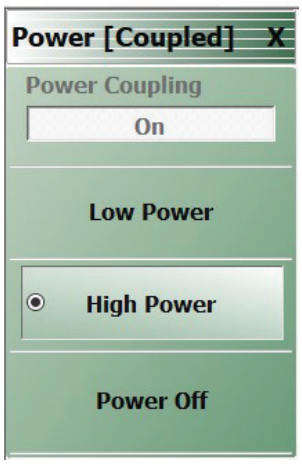


Min. Port Power Dialog

This dialog has one button for on/off control of minimum power on the ports. When set ON, the VNA will use the lowest output power it can achieve. (This is not the same as the Low Power setting, which simply applies the normal Low Power setting in sweeps.

Figure 5-2. POWER Setup Menu – Frequency-Based Sweep Modes – MS46122A/B and MS46322A/B 2-Port VNAs

Power Menu (MS46131A 2-Port VNAs, ME7868A, ME7869A)



POWER Menu

Power Coupling

Power Coupling is always ON.

Low Power

Selection applies the Low Power setting to both ports for sweeps on the current channel.

High Power

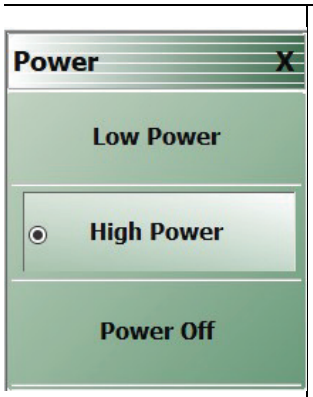
Selection applies the High Power setting to both ports for sweeps on the current channel.

Power Off

Selection applies turns off power for both ports for sweeps on the current channel.

Figure 5-3. POWER Menu – Frequency-Based Sweep Modes – MS46131A 2-Port VNAs

Power Menu (MS46131A 1-Port VNAs)



POWER Menu

Low Power

Selection applies the Low Power setting to both ports for sweeps on the current channel.

High Power

Selection applies the High Power setting to both ports for sweeps on the current channel.

Power Off

Selection applies turns off power for both ports for sweeps on the current channel

Figure 5-4. POWER Menu – Frequency-Based Sweep Modes – MS46131A 1-Port VNAs

5-4 Power Menu for Segment-Based Sweeps – 2-Port VNAs

Previous

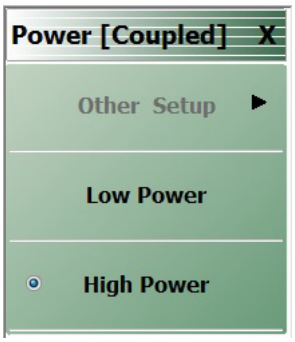
- "Main Menu" on page 2-6

Navigation

- MAIN | Power | POWER

Prerequisites

- SWEEP TYPES = Frequency-Based Segmented Sweep or Index-Based Segmented Sweep
- Segmented Sweep Frequency-Based Setup
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Segmented Sweep (Freq-Based)
  - "SWEEP SETUP Menu — MS46122A/B and MS46322A/B Series" on page 6-2
- SWEEP TYPES – Segmented Sweep Index-Based Setup
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Segmented Sweep (Index-Based)
  - "SWEEP SETUP Menu — MS46122A/B and MS46322A/B Series" on page 6-2



POWER Menu

The menu title dynamically changes to show whether the port power levels are coupled or not.

Other Setup (Power)

OTHER SETUP is not available, nor applicable, under this sweep mode.

Low Power

Selection applies the Low Power setting to both ports for sweeps on the current channel.

High Power

Selection applies the High Power setting to both ports for sweeps on the current channel.

Figure 5-5. POWER Menu – Segment-Based Sweep – 2-Port VNAs

Chapter 6 — Sweep Menus

6-1 Chapter Overview

This chapter describes sweep types supported by the VNA and how to set and configure them.

6-2 Sweep on the ShockLine VNA

The SWEEP menu is used to select sweep type for a channel, and to set key sweep parameters. You can choose from these types:

A. Basic (continuous) frequency sweeps:

- Frequency-based (linear) sweep–you can set start and end frequency values for the sweep. All traces in the display have linear frequency axes.
- Frequency-based (logarithmic) sweep–you can set start and end frequency values for the sweep. All traces in the display have logarithmic frequency axes

This sweep type is configured for frequency on the Frequency menu and port power is set at the Power menu.

B. Segmented frequency sweeps:

- Segmented frequency-based sweep—you can create multiple linear segments each with its own independent start and end frequencies.
- Segmented index-based sweep—you can create a collection of index-based specific frequencies that the instrument steps through. Any index point can have any frequency assigned.

Segments for these sweep types are configured through the SWEEP SETUP menu. Segment parameters for frequency, power, and number of points are set on the SWEEP SETUP tableau at the bottom of the display window. You can also set parameters for segments at the FREQUENCY menu.

In all cases, the Sweep Type selected for a channel applies to all traces of that channel.

All sweep configurations can be saved or recalled individually and/or can be assigned to a user-defined preset setup configuration. The configuration can be recalled at any time. You can configure the hold and trigger conditions for a sweep type.

6-3 Overview of Sweep Menus

These are the sweep control menus and dialog boxes:

- "SWEEP SETUP Menu — MS46122A/B and MS46322A/B Series" on page 6-2
- "SWEEP SETUP Menu — MS46131A/ME7868A/ME7869A Series" on page 6-3
- "FREQ BASE SETUP Menu" on page 6-7
- "SEGMENTED SWEEP DEFINITION Table" on page 6-9
- "SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box" on page 6-11
- "RECALL SEGMENTED SWEEP TABLE SGS FILE Dialog Box" on page 6-12
- "INDEX BASE SETUP Menu" on page 6-13
- "HOLD FUNCTIONS Menu" on page 6-14
- "TRIGGER Menu" on page 6-16
- "TRIGGER SOURCE Menu" on page 6-17
- "EXT. TRIGGER Menu" on page 6-18

6-4 Sweep Setup Menu

SWEEP SETUP Menu — MS46122A/B and MS46322A/B Series

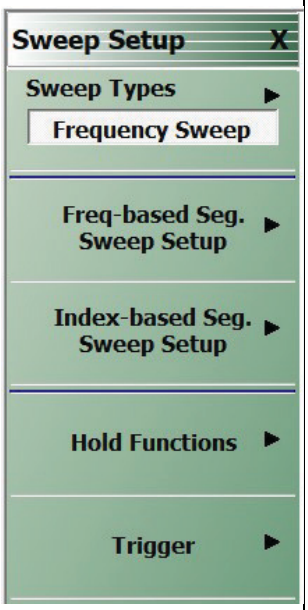
Purposes

- Select sweep type, and set up sweep parameters.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP

MS46122A/B, MS46322A/B



Sweep Types

Selecting displays the SWEEP TYPES menu for selection frequency sweep options. The display field in the Sweep Types button displays the instrument sweep setting for the active channel. The possible field display values and their meanings are:

- Frequency Sweep – Linear sweep from start to stop frequency
- Frequency Sweep (Log) – Logarithmic sweep from start to stop frequency
- Segmented Sweep (Freq-based) – Sweep using frequency-based segments
- Segmented (Index) – Index-based segmented sweep

Freq-Based Seg Sweep Setup

Selecting displays the FREQ BASE SETUP menu and opens the FREQ DEF for F1 & F2 tableau area below the main display area.

- “FREQ BASE SETUP Menu” on page 6-7

Index-Based Seg Sweep Setup

Selecting displays the INDEX BASE SETUP menu and opens the FREQ DEF for F1 & F2 table area below the main display area.

- “INDEX BASE SETUP Menu” on page 6-13

Hold Functions

Selecting displays the HOLD FUNCTIONS menu.

- “HOLD FUNCTIONS Menu” on page 6-14

Trigger

Selecting displays the TRIGGER menu.

- “TRIGGER Menu” on page 6-16

Figure 6-1. SWEEP SETUP Menu – MS46122A/B and MS46322A/B Series

SWEEP SETUP Menu — MS46131A/ME7868A/ME7869A Series

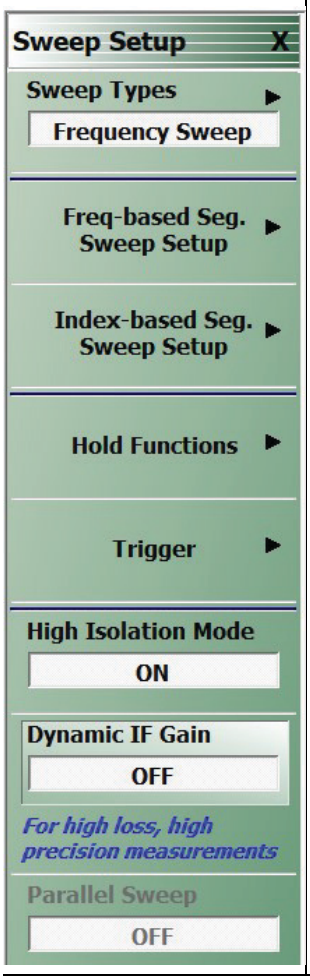
Purposes

- Select sweep type, and set up sweep parameters.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP

ME7868A, ME7869A 2 Port



Sweep Types

Selecting displays the SWEEP TYPES menu for selection frequency sweep options. The display field in the Sweep Types button displays the instrument sweep setting for the active channel. The possible field display values and their meanings are:

- Frequency Sweep – Linear sweep from start to stop frequency
- Frequency Sweep (Log) – Logarithmic sweep from start to stop frequency
- Segmented Sweep (Freq-based) – Sweep using frequency-based segments
- Segmented (Index) – Index-based segmented sweep

Freq-Based Seg Sweep Setup

Selecting displays the FREQ BASE SETUP menu and opens the FREQ DEF for F1 & F2 tableau area below the main display area.

- "FREQ BASE SETUP Menu" on page 6-7

Index-Based Seg Sweep Setup

Selecting displays the INDEX BASE SETUP menu and opens the FREQ DEF for F1 & F2 table area below the main display area.

- "INDEX BASE SETUP Menu" on page 6-13

Hold Functions

Selecting displays the HOLD FUNCTIONS menu.

- "HOLD FUNCTIONS Menu" on page 6-14

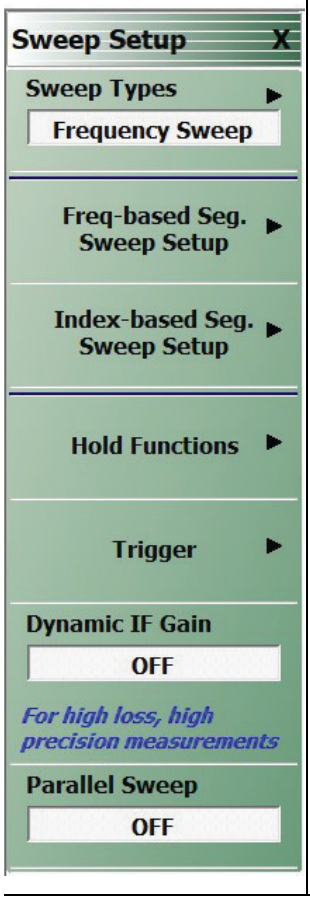
Trigger

Selecting displays the TRIGGER menu.

- "TRIGGER Menu" on page 6-16

Figure 6-2. SWEEP SETUP Menu – MS46131A Series (1 of 3)

MS46131A 2 Port Without Option 012, 025, 050, 100



High Isolation Mode (ME7868A, ME7869A only)

The High Isolation Mode button will only be present if an ME7868A or ME7869A VNA are connected.

If a calibration exists and is on, the High Isolation Mode state cannot be changed, and the button will be disabled.

Dynamic IF Gain Mode (MS46131A, ME7868A, ME7869A only)

With Dynamic IF Gain mode ON, low level linearity is improved and there are fewer response steps that impact interpolation accuracy (for user and factory calibrations). The trade-off is that measurement time can slightly increase and trace noise may increase slightly at higher signal levels. Default is OFF.

Parallel Sweep (Up to 4 MS46131A Without Option 012, 025, 050, 100 VNAs only)

If there is a trace display set to a transmission response (i.e., S12, S21), the parallel sweep button will be disabled.

If parallel sweep is turned on, then user cannot change the response of any trace to transmission type.

Figure 6-2. SWEEP SETUP Menu – MS46131A Series (2 of 3)

MS46131A 1 Port
Without Option 012, 025, 050, 100
ME7868A 1 Port

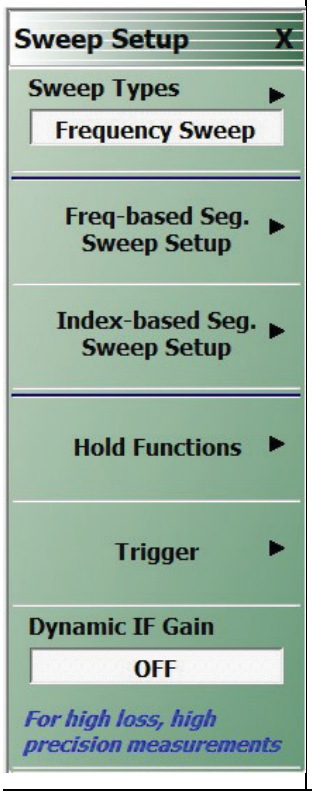


Figure 6-2. SWEEP SETUP Menu – MS46131A Series (3 of 3)

SWEEP TYPES Menu

Purposes

- Select sweep type.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES

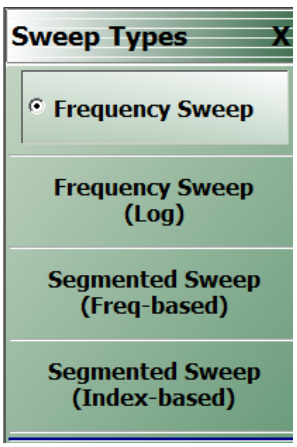
Notes

Several classes of sweep type appear here, invoked by control buttons:

- linear or log frequency sweep
- segmented sweep (either normal segments each with a start and end frequency, or indexed segments each having a start and end frequency)

Segmented Sweep: Introduction

Segmented Sweep allows selections of different frequency segments, each monotonic in frequency, and where each segment can have a different number of points, power level, and Averaging. There are two types of segmented sweep. In the frequency-based version, segments can have many points in a short segment or no points within a long segment. In index based, the sweep has all points are plotted with equal spacing, and any point can have any frequency



Frequency Sweep

Sets the sweep type to a linear function. The displayed X-axis is linear. Sweep frequency parameters are set at the FREQUENCY menu.

Frequency Sweep (Log)

Sets the sweep type to a log function. Log sweeps have unequal step sizes and the number of points selected are spread equally between the decade divisions, and are displayed on a log scale X-axis. Sweep frequency parameters are set at the FREQUENCY menu.

Segmented Sweep (Freq-Based)

Sets the sweep type to a frequency segment-based sweep. The displayed x-axis is linear and the frequencies are plotted where those frequencies lie. Sweep frequency parameters are set using the SEGMENTED SWEEP DEFINITION table dialog that appears below the main display when in this mode.

Segmented Sweep (Index-Based)

Sets the sweep type to an index-based segmented sweep and de-selects all other sweep types. Sweep frequency parameters are set using the SEGMENTED SWEEP DEFINITION table dialog that appears below the main display when in this mode. An index-based segmented sweep sweeps over a custom list of frequency points. The indexed frequencies do not have to be in any order. Plotting on the X-axis is index-based and not frequency based, and index points are shown in order on the axis, displayed at equal spacing. The frequencies in each segment do not have to be monotonic. Index-based sweeps are often used when reverse sweeps and a particular frequency order is required. If index-based segmented sweep is selected, the display mode for all traces if the channel is always limited to index-based.

Figure 6-3. SWEEP TYPES Menu

6-5 Frequency-Based Segmented Sweep Setup

FREQ BASE SETUP Menu

Purposes

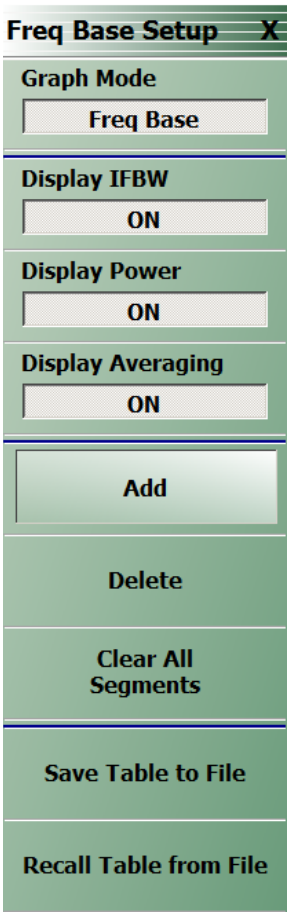
- Used to set up frequency-based segment sweep parameters.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Freq-Based Seg Sweep Setup | FREQ BASE SETUP

Notes

When the FREQ BASE SETUP menu appears, the companion set of controls, SEGMENTED SWEEP DEFINITION table dialog, also appears. The table display at the bottom of the main display area allows the configuration of frequency segments for sweep management. See instructions in "SEGMENTED SWEEP DEFINITION Table" on page 6-9.



Graph Mode (Freq Base/Index Base)

Toggles graph mode between Freq Base and Index Base. When Freq Base is selected, the display status bar shows Freq Base.

Display IFBW (Off/On)

Toggles the IFBW column off and on. If ON, the IFBW field is added to the Freq Def. for F1 & F2 table header in the SEGMENTED SWEEP DEFINITION table below.

Display Power (Off/On)

Toggles the Power column display off and on. If ON, the P1 Src. Pwr (Src. Atten – 0 dB) and P2 Src. Pwr (Src. Atten – 0 dB) columns are added to the Freq Def. for F1 & F2 table header in the SEGMENTED SWEEP DEFINITION table.

Display Averaging (Off/On)

Toggles the Averaging column display off and on. If ON, the Averaging field is added to the Freq Def. for F1 & F2 table header in the SEGMENTED SWEEP DEFINITION table.

Add (Freq-Based Segment)

Adds a row for a new segment to the FREQ DEF. FOR F1 & F2 table information below the currently selected segment.

Delete (Freq-Based Segment)

Deletes the currently selected row/segment from the FREQ DEF. FOR F1 & F2 table information.

Clear All Segments (Freq-Based Segment)

Clears all rows except for Row 1 from the FREQ DEF. FOR F1 & F2 table information.

Figure 6-4. FREQ BASE SETUP (FREQUENCY-BASED SEGMENTED SWEEP SETUP) Menu (1 of 2)

	Save Table to File (Freq-Based Segment) Saves the table data to a Segment Sweep .sgs file. Select displays the SAVE SEGMENTED SWEEP Table (SGS File) dialog box. • "SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box" on page 6-11 **Recall Table from File (Freq-Based Segment)** Recalls table data from a Segment Sweep .sgs file. Select displays the RECALL SEGMENTED SWEEP TABLE (Sweep SGS File) dialog box. • "RECALL SEGMENTED SWEEP TABLE SGS FILE Dialog Box" on page 6-12

Figure 6-4. FREQ BASE SETUP (FREQUENCY-BASED SEGMENTED SWEEP SETUP) Menu (2 of 2)

SEGMENTED SWEEP DEFINITION Table

Purposes

Used to edit frequency-based segment sweep parameters.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Freq-Based Seg Sweep Setup | FREQ BASE SETUP

Overview

The FREQ DEF. FOR F1 and F2 (Segmented Sweep Definition) table information appears below the display area. The number of rows and columns displayed depend on the button settings in the Freq Base Setup menu. The default settings display the following column fields: IFBW, P1 source power, P2 source power, and Averaging.

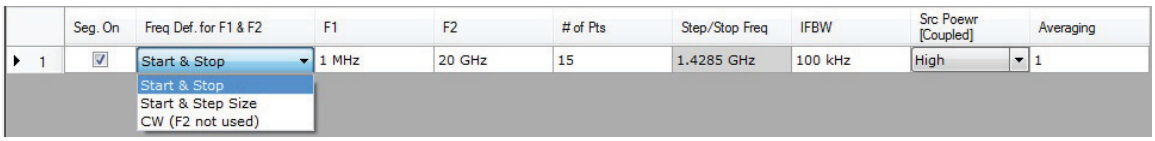
Default Appearance

The following table displays all possible fields.

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	IFBW	Src Poewr [Coupled]	Averaging
1	☑	Start & Stop	1 MHz	20 GHz	15	1.4285 GHz	100 kHz	High	1

Freq Def. for F1 & F2 Column, Sweep Segment Options Pull-Down Menu

The FREQ DEF. FOR F1 & F2 pull-down menu allows each segments to be set as either a Stop & Start, Start & Step Size, or CW (F2 not used).



Display IFBW Column, Toggle Off/On

The Display IFBW button on the FREQ BASE SETUP menu causes the IFBW column to disappear and appear.

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	Src Poewr [Coupled]	Averaging
1	☑	CW (F2 not used)	1 MHz		1	0 MHz	High	1

Display Power Column, Toggle Off/On

The Display Power button on the FREQ BASE SETUP menu causes the Power columns to disappear and appear.

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	IFBW	Averaging
1	☑	CW (F2 not used)	1 MHz		1	0 MHz	100 kHz	1

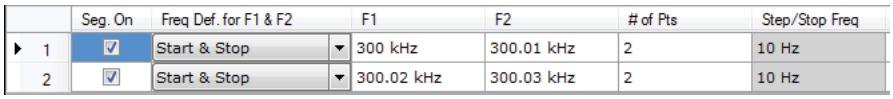
Display Averaging, Toggle Off/On

The Display Averaging button on the FREQ BASE SETUP menu causes the Averaging column to disappear and appear.

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	IFBW	Src Poewr [Coupled]
1	☑	CW (F2 not used)	1 MHz		1	0 MHz	100 kHz	High

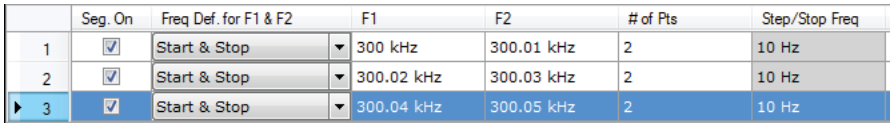
Adding Rows

Selecting the Add button on the FREQ BASE SETUP menu adds a row to the tableau so that another frequency segment can be added.



	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq
1	☑	Start & Stop	300 kHz	300.01 kHz	2	10 Hz
2	☑	Start & Stop	300.02 kHz	300.03 kHz	2	10 Hz

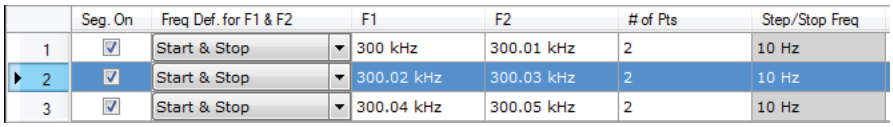
To add additional rows, repeat selecting the Add button. Note that the currently selected and editable row is indicated by the left arrow, as shown in Row 3 below.



	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq
1	☑	Start & Stop	300 kHz	300.01 kHz	2	10 Hz
2	☑	Start & Stop	300.02 kHz	300.03 kHz	2	10 Hz
3	☑	Start & Stop	300.04 kHz	300.05 kHz	2	10 Hz

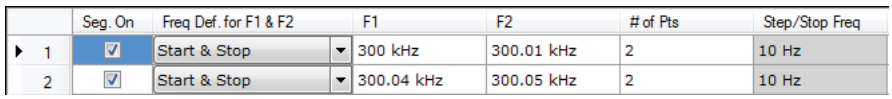
Deleting Rows

Select a row to delete it. A selected row is indicated by the right-facing arrow icon as shown for Row 2 below:



	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq
1	☑	Start & Stop	300 kHz	300.01 kHz	2	10 Hz
2	☑	Start & Stop	300.02 kHz	300.03 kHz	2	10 Hz
3	☑	Start & Stop	300.04 kHz	300.05 kHz	2	10 Hz

Click the Delete button on the FREQ BASE SETUP menu to delete the row:



	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq
1	☑	Start & Stop	300 kHz	300.01 kHz	2	10 Hz
2	☑	Start & Stop	300.04 kHz	300.05 kHz	2	10 Hz

Click the Clear All Seg. button on the FREQ BASE SETUP menu to clear all rows.

SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box

Purposes

- Used to save the frequency-based segment sweep table.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Freq-Based Seg Sweep Setup | FREQ BASE SETUP | Save Table to File | SAVE SEGMENTED SWEEP TABLE Dialog Box

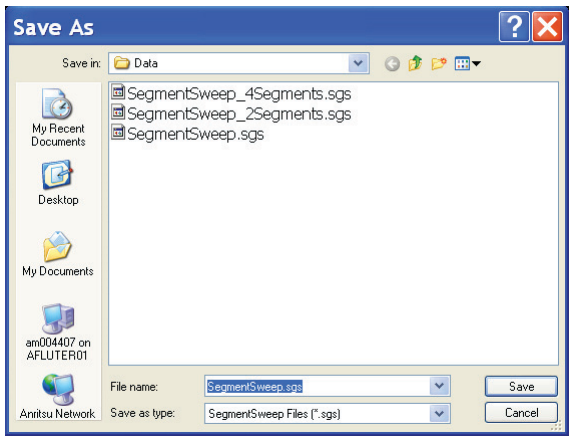


Figure 6-5. SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box

Instructions

Navigate to required location, enter unique file name, and click Save. Click Cancel to return to the FREQ BASE SETUP menu.

RECALL SEGMENTED SWEEP TABLE SGS FILE Dialog Box

Purposes

- Used to load and use a frequency-based segment sweep table.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Freq-Based Seg Sweep Setup | FREQ BASE SETUP | Recall Table from File | RECALL SEGMENTED SWEEP TABLE SGS FILE Dialog Box

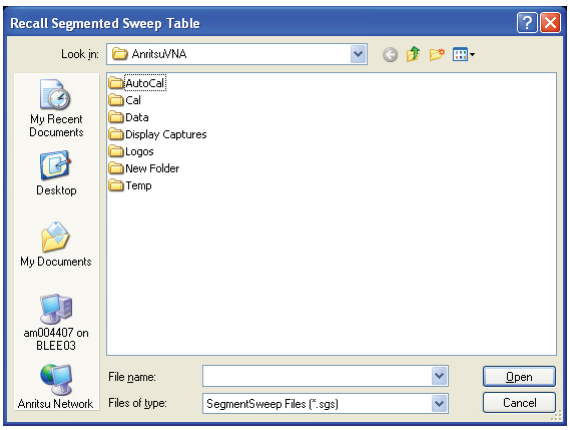


Figure 6-6. RECALL (SEGMENTED SWEEP TABLE SGS FILE) Dialog Box

Instructions

Navigate to required location, select the required SGS file, and click Open. Click Cancel to return to the FREQ BASE SETUP menu.

6-6 Index-Based Segmented Sweep Setup

INDEX BASE SETUP Menu

Purposes

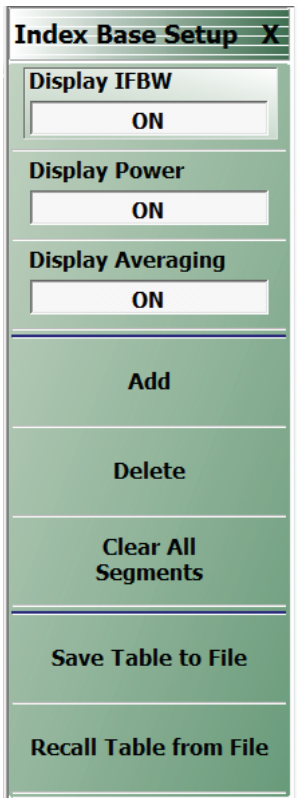
Used to set up index-based segment sweep parameters.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Index-Based Seg Sweep Setup | INDEX BASE SETUP

Notes

When the INDEX BASE SETUP menu appears, the companion set of controls, SEGMENTED SWEEP DEFINITION TABLE dialog, also appears. The table display at the bottom of the main display area. allows the configuration of frequency segments for sweep management. For Add, Delete, and Clear, see instructions in "SEGMENTED SWEEP DEFINITION Table" on page 6-9.



Display IFBW (Off/On)

Toggles the IFBW column ff and on in the tableau display. If ON, the IFBW column field is added to the Freq Def. for F1 & F2 table header.

Display Power (Off/On)

Toggles the P1 Src. Pwr and P2 Src. Pwr columns off and on in the tableau display

Display Averaging (Off/On)

Toggles the Averaging column display off and on in the tableau display. If ON, an Averaging column field is added to the Freq Def. for F1 & F2 table header.

Add (Index-Based Segment)

Adds a row to the FREQ DEF. FOR F1 & F2 table information in the tableau area.

Delete (Index-Based Segment)

To delete a row in the tableau, select a row there so the Right Arrow icon appears. Click Delete to remove the row from the FREQ DEF. FOR F1 & F2 table information.

Clear All Segments (Index-Based Segment)

To clear all rows in the tableau area, select the Clear All Segments button. This clears all rows except for Row 1 from the FREQ DEF. FOR F1 & F2 table information.

Save Table to File (Index-Based Segment)

This displays the Save Segmented Sweep Table (SGS File) dialog box to save the segment table data as a Segment Sweep SGS file.

- "SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box" on page 6-11

Recall Table from File (Index-Based Segment)

This displays the RECALL SEGMENTED SWEEP TABLE (SGS) dialog box to recall table data from a previously stored Segment Sweep SGS file.

- "RECALL SEGMENTED SWEEP TABLE SGS FILE Dialog Box" on page 6-12

Figure 6-7. INDEX BASE SETUP (INDEX-BASED SEGMENTED SWEEP SETUP) Menu

6-7 Sweep Hold and Trigger Functions

HOLD FUNCTIONS Menu

Purposes

Provides hold control over sweep in the current display channel.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Hold Functions | HOLD FUNCTIONS

HOLD FUNCTIONS Menu – Button Selection Group

The top three buttons of the HOLD FUNCTIONS menu provide hold control for the active channel.

The Hold, Sweep, and Single Sweep & Hold buttons form a three button selection group where the selection of any one button de-selects the other two buttons.

The fourth button, Hold Conditions, opens the menu for setting hold conditions.

Hold

The Hold button pauses the display and stops the channel signal processing.

Sweep

The Sweep button starts signal processing and resumes the active channel display.

Single Sweep & Hold

For the active channel, the Single Sweep & Hold button performs a single sweep signal processing, and then holds the display, stops signal processing, and returns the button selection to the Hold button.

Hold All Channels

The Hold button pauses the display and stops the signal processing on all channels.

Sweep All Channels

The Sweep button starts the signal processing and resumes all channel displays.

Single Sweep & Hold All Channels

For all channels, the single sweep and hold all channels button performs a single sweep signal processing, and then holds the display, stops signal processing, and returns the button selection to the Hold button.

Hold Conditions

Select displays the HOLD CONDITIONS menu with toggle settings for RF, and Hold Power Value for Power-based sweep (not applicable to the MS46121A/B).

- "HOLD CONDITIONS Menu" on page 6-15

Figure 6-8. HOLD FUNCTIONS Menu

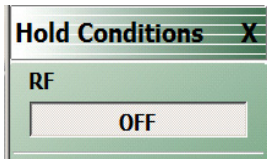
HOLD CONDITIONS Menu

Previous

- HOLD FUNCTIONS Menu

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Hold Functions | HOLD FUNCTIONS| HOLD CONDITIONS



HOLD CONDITIONS Menu

The HOLD CONDITIONS menu sets hold conditions for the active channel.

The Hold Power field appears only when Sweep is the selected sweep mode.

RF (Off/On)

Select toggles the Radio Frequency (RF) option off and on during Hold mode.

Figure 6-9. HOLD CONDITIONS Menu

TRIGGER Menu

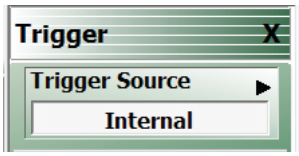
Purposes

Access to trigger controls for the sweep in the current display channel. The MS46121A/B is internal trigger only; this menu is not applicable to the MS46121A/B.

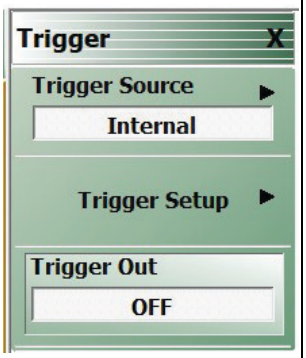
Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Trigger | TRIGGER

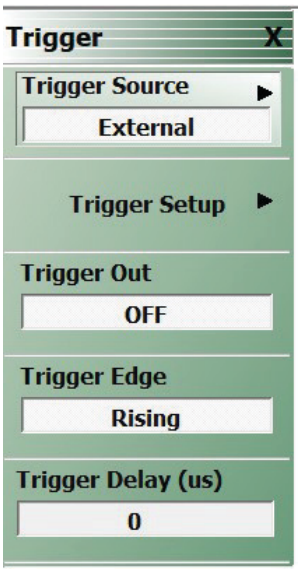
MS46121/122/322



MS46131A, ME7868A, ME7869A Int. Trigger



MS46131A, ME7868A, ME7869A Ext. Trigger



Trigger Source

Displays the Trigger Source menu to select an Internal or External trigger source. The configuration and settings for each trigger source type are defined by the buttons below.

- "TRIGGER SOURCE Menu" on page 6-17

Trigger Setup (MS46131A, ME7868A, ME7869A)

Displays the Ext. Trigger menu to select receiving an external trigger Per Point or Per Sweep. The external trigger will be applied to all sweeping channels.

External Trigger Out is only supported when two MS46131A VNAs are in the ME7868A or ME7869A configuration. Cases where two MS46131A VNAs will not support external trigger output are as follows:

- The system is in Parallel Return Loss sweep mode.
- The PhaseLync™ option (Option 012, 025, 050, 100) is not enabled on one or more of the MS46131A VNAs in an ME7868A or ME7869A 2-port VNA.
- There is no sync cable connected between two units in an ME7868A or ME7869A configuration.

The configuration and settings for each external trigger type are defined by the buttons below.

- "EXT. TRIGGER Menu" on page 6-18

Trigger Out (MS46131A, ME7868A, ME7869A)

Selects whether a trigger output is sent through the rear panel trigger connector on the satellite MS46131A.

Trigger Edge (MS46131A, ME7868A, ME7869A)

Selects whether the rising or falling edge of the external trigger signal is used as the triggering event.

Trigger Delay (us) (MS46131A, ME7868A, ME7869A)

Selects the delay (in microseconds) between the external trigger event and when the measurement cycle begins.

Figure 6-10. TRIGGER Menu

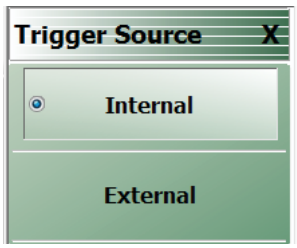
TRIGGER SOURCE Menu

Purposes

- Set trigger controls for the sweep in the current display channel.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Trigger | TRIGGER | Trigger Source | TRIGGER SOURCE



TRIGGER SOURCE Menu Auto-Return Button Selection Group

In the TRIGGER SOURCE menu, the Internal and Triggering buttons are members of a radio button selection group. Selection of either button de-selects the other button and automatically returns to the TRIGGER menu.

Internal (Trigger Source)

Sets triggering to be automatically initiated within the instrument. Internal triggering mode is an automatically triggered point-by-point measurement that is controlled by the instrument internal software.

External (Trigger Source)

Sets triggering to be initiated externally by another instrument and sensed through the external port/connector.

Figure 6-11. TRIGGER SOURCE Menu

EXT. TRIGGER Menu

Only available for the MS46131A, ME7868A, and ME7869A VNAs.

Full Name

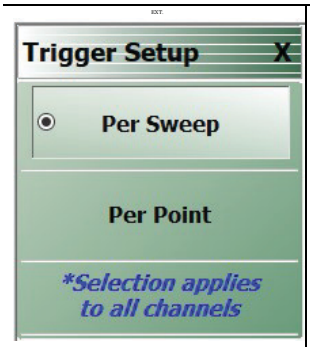
- EXTERNAL TRIGGER Menu

Purposes

- Set external trigger for Per Sweep or Per Point.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Trigger | TRIGGER | Ext. Trigger Setup | EXT. TRIGGER



EXT. TRIGGER Menu Auto-Return Button Selection Group

In the EXT. TRIGGER menu, the Per Sweep and Per Point buttons are members of a radio button selection group. Selection of either button de-selects the other button and automatically returns to the TRIGGER menu.

Per Sweep

Per Sweep is a system setting. Sets the system to receive an external trigger to start a single sweep.

Per Point

Per Point is a system setting. Sets the system to receive an external per point trigger.

Figure 6-12. TRIGGER SOURCE Menu

Chapter 7 — Averaging Menu

7-1 Chapter Overview

The AVERAGING menu allows users to turn averaging on or off, set the averaging factor, and select whether the averaging type is per point or per sweep. Control is also provided for IFBW and trace smoothing.

7-2 Overview of the Averaging Menu

There is one averaging menu:

- "AVERAGING Menu" on page 7-2

7-3 Averaging Menu Functions

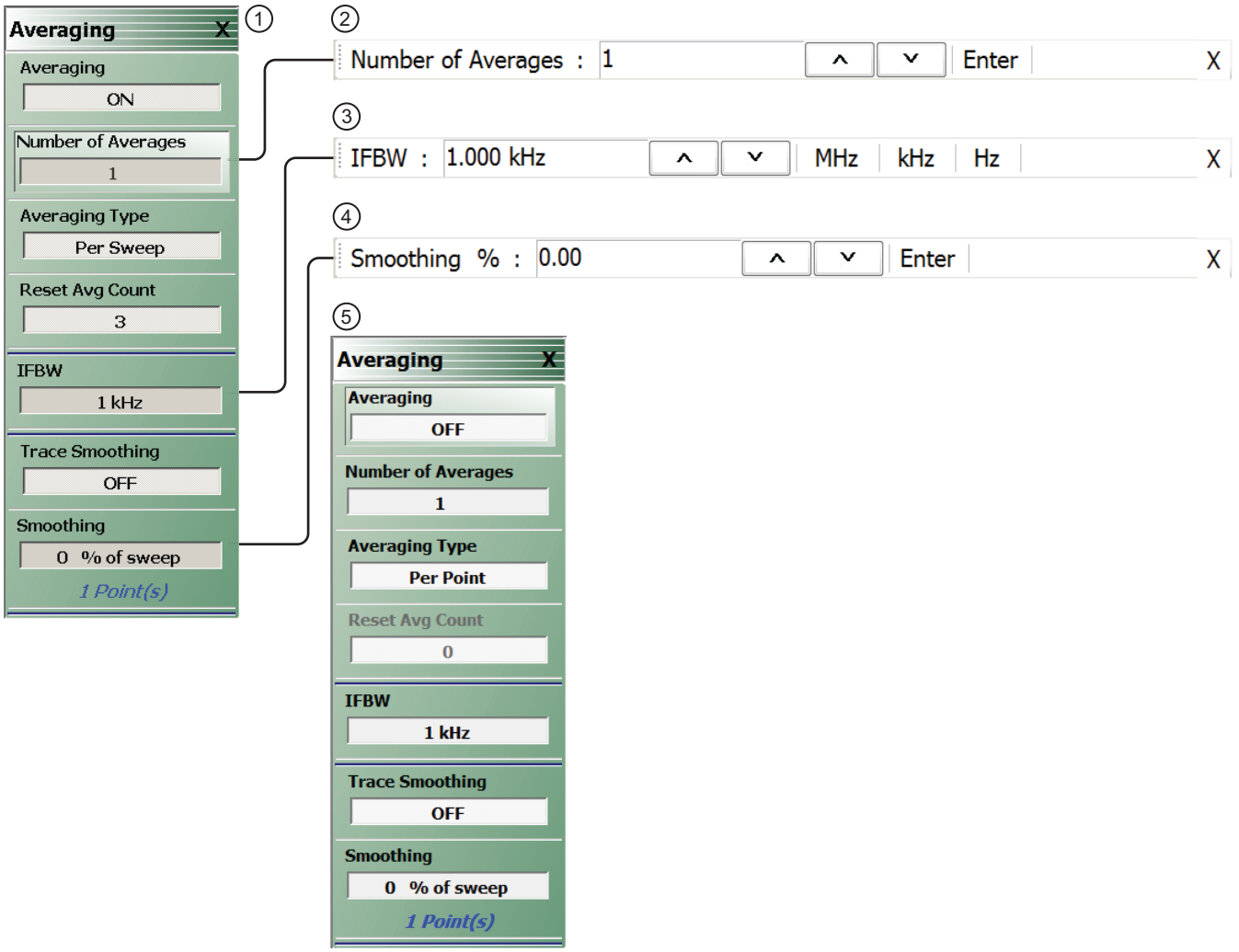
AVERAGING Menu

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | Averaging | AVERAGING



1. AVERAGING Menu – Shown with parameters set and with Averaging ON. When set to ON, the Reset Avg Count and a field in the status bar counts up to the Averaging Factor value setting.
2. Number of Averages Field Toolbar
3. IFBW Frequency Field Toolbar
4. Smoothing % (Smoothing Percentage) Field Toolbar
5. AVERAGING Menu – Example of menu with parameters set, and Averaging OFF.

Figure 7-1. AVERAGING Menu and Field Toolbars

Averaging

Select toggles trace averaging OFF and ON.

Number of Averages

Select displays the NUMBER OF AVERAGES field toolbar.

Averaging Type

Select toggles between averaging Per Point and averaging Per Sweep.

Reset Average Count

Read only display field. Counts up to the Averaging Factory value as the averaging session proceeds. Select resets the averaging count to 0 (zero), and the averaging session starts anew.

IFBW

Button present for all frequency-based sweeps. Select displays the IFBW field toolbar for setting the Intermediate Frequency Bandwidth frequency. The toolbar allows discrete values of:

10 Hz, 20 Hz, 30 Hz, 50 Hz, 70 Hz

100 Hz, 200 Hz, 300 Hz, 500 Hz, 700 Hz

1 kHz, 2 kHz, 3 kHz, 5 kHz, 7 kHz,

10 kHz, 20 kHz, 30 kHz, 50 kHz, 70 kHz

100 kHz, 200 kHz, 300 kHz.

Note	10 kHz is the lowest IFBW for MS46121A/B-021 without an external reference. When an external reference is used, the lowest IFBW is 30 Hz.

Trace Smoothing

On a per-trace basis, toggles trace smoothing OFF and ON.

Smoothing

On a per-trace basis, select displays the SMOOTHING % field toolbar. The toolbar allows the user to set the percentage of trace smoothing in use. A display below the button field shows the number of points that are smoothed.

Chapter 8 — Calibration Menus: 1-Port and 2-Port VNAs

8-1 Chapter Overview

This chapter describes the menus used when calibrating 1- and 2-port ShockLine VNAs. It is organized to follow the flows in the progressions of menus and dialog boxes for calibration control. Though it provides representative examples of dialogs, it does not show all the possible dialog contents. This is because their appearance changes dynamically based on combination of instrument calibration ports, AutoCal™, manual calibration, calibration methods, line types, and connectors. However, basic elements in the combinations are explained. The calibration menus for MS46121A/B with Option 21 are also explained.

8-2 Listing of Calibration Menus

This section lists coverage in this chapter of the calibration menu types for a 1- or 2-port VNA, including:

Primary Calibration Menus

The primary calibration menus are:

- "CALIBRATION [TR] Menu" on page 8-6
- "CALIBRATE Menu" on page 8-8
- "THRU (Update) Menu – 2-Port VNAs" on page 8-11

General Setup and Utilities for Calibration

The calibration utility and setup function and management menus, key buttons, and dialog boxes are:

- "CAL KIT Menu" on page 8-13
  - "LOAD (Cal Kit) Dialog Box" on page 8-14
  - "SAVE (Cal Kit) Dialog Box" on page 8-15
  - "CAL KIT INFO Dialog Box" on page 8-16
  - "RESTORE DEFAULT COEF. Dialog Box" on page 8-19
- "CAL OPTIONS Menu" on page 8-21
- "HYBRID CAL Menu – 2-Port VNAs" on page 8-22
  - "HYBRID CAL SETUP Dialog Box – 2-Port VNAs" on page 8-23
- "DEEMBED. TOOLS Menu" on page 8-25
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27
  - "SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 8-42
  - "MANUAL ADAPTER REMOVAL Dialog Box" on page 8-44
- "CAL SETUP Menu" on page 8-74
- "CAL METHOD Menu" on page 8-76

AutoCal/SmartCal Calibration on 2-Port VNAs

- "AutoCal or SmartCal Port Selection Setup (2-Port VNAs)" on page 8-46
  - "AUTOCAL/SMARTCAL Menu" on page 8-46

Menus for Performing 2-Port AutoCal/SmartCal Calibration (2-Port VNAs)

- "SMARTCAL SETUP Menu — 2-Port Cal (2-Port VNAs)" on page 8-47
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-49
- "AUTOCAL SETUP Menu — 2-Port Cal (2-Port VNAs)" on page 8-52
  - "MODIFY 2-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-54

Menus for Performing 1-Port AutoCal/SmartCal Calibration (2-Port VNAs)

- "SMARTCAL SETUP Menu — 1-Port Cal (2-Port VNAs)" on page 8-57
  - "MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-59
- "AUTOCAL SETUP Menu — 1-Port Cal (2-Port VNAs)" on page 8-61
  - "MODIFY 1-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-62

AutoCal/SmartCal Calibration on 1-Port VNAs

Menus for Performing Reflect-Only AutoCal/SmartCal Calibration (1-Port VNAs)

- "SMARTCAL SETUP Menu — 1-Port Cal (1-Port VNAs)" on page 8-64
  - "MODIFY SMARTCAL SETUP Dialog Box (1-Port VNAs)" on page 8-65
- "AUTOCAL SETUP Menu — 1-Port Cal (1-Port VNAs)" on page 8-67
  - "MODIFY AUTOCAL SETUP Dialog Box (1-Port VNAs)" on page 8-68

Manual Calibration

Start at CALIBRATION [TR] menu, and do setup as needed with any of:

Setup and Configuration Menus

- "CAL KIT Menu" on page 8-13
  - "LOAD (Cal Kit) Dialog Box" on page 8-14
  - "SAVE (Cal Kit) Dialog Box" on page 8-15
  - "CAL KIT INFO Dialog Box" on page 8-16

Once a calibration type is selected from the MANUAL CALIBRATION menu, the next menus are used to set up the calibration method and line type. The settings for calibration parameters in these three menus determine which dialog boxes will be available and which procedural menus will appear:

- "CAL SETUP Menu" on page 8-74
- "MANUAL CAL Menu" on page 8-73
- "CAL METHOD Menu" on page 8-76
- "LINE TYPE Menu" on page 8-78

Menus and Dialogs for Performing 2-Port Manual Calibration — 2-Port VNAs

Note	LRL, LRM, TRM, TRL, and SOLR are available with MS46122/322 “B”, ME7868A, and ME7869A models only.

- “MANUAL CAL Menu” on page 8-73
- “MANUAL 2-PORT CAL Setup Dialog Box Summary” on page 8-99
- “TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box” on page 8-82
- “TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box” on page 8-85
- “TWO PORT CAL SETUP (SSST, COAXIAL) Dialog Box” on page 8-88
- “TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box” on page 8-92

  The LRL/LRM calibration methods are available for the MS46122/322 “B”, ME7868A, and ME7869A models only.
- “TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box” on page 8-96

  The TRL/TRM calibration methods are available for the MS46122/322 “B”, ME7868A, and ME7869A models only.
- “THRU/RECIP Menu” on page 8-106

Menus for Performing 1-Port Manual Calibration (2-Port VNAs)

- “ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs” on page 8-108
- “Modify One-Port Cal Setup Dialog Boxes” on page 8-110
- “ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box — 2-Port VNAs” on page 8-111
- “ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box — 2-Port VNAs” on page 8-114
- “ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box — 2-Port VNAs” on page 8-117
- “REFL. DEVICE(S) Menu” on page 8-104

Additional Menus and Dialogs

- “TRANS. RESPONSE Menu” on page 8-122
- “TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT – Coaxial) Dialog Box” on page 8-125
- “Manual Cal – Trans. Freq. Resp. Cal” on page 8-122
- “Manual Cal-Reflection Only Cal” on page 8-129
- “REFL. RESPONSE Menu” on page 8-138
- “REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box” on page 8-141

General Purpose Calibration Dialog Boxes

These dialog boxes are representative of those that can be linked-to from multiple locations. Not all possible dialog boxes are shown:

- “AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box” on page 8-147
- “STANDARD INFO Dialog Box” on page 8-149. Exists in different variants from the normal one, with differences in cal type and line type.
- “THRU INFO Dialog Box” on page 8-150
- “USER DEFINED WAVEGUIDE Dialog Box” on page 8-154

8-3 Primary Menus for VNA Calibration

The menus shown in Figure 8-1 provide access to all 2-Port VNA calibration functions. Additional menus and dialog boxes accessed from the MANUAL CAL menu provide configuration and setup for 2-Port, 1-Port, Transmission Frequency Response, and Reflection Frequency Response manual calibration procedures.

This section provides descriptions for each primary menu.

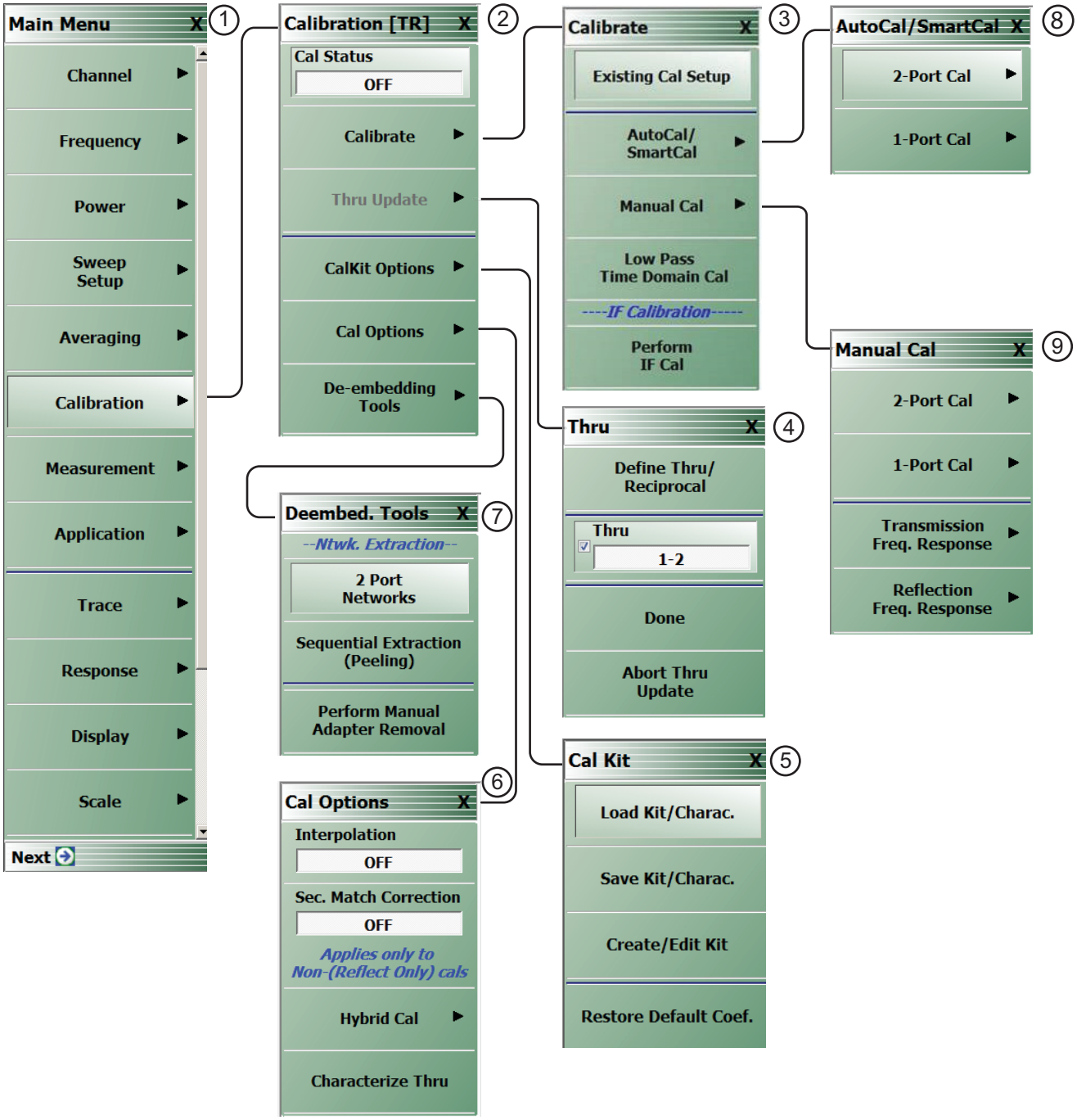


Figure 8-1. Primary Menus for VNA Calibration (1 of 2)

1. MAIN MENU 2. CALIBRATION [TR] Menu 3. CALIBRATE Menu 4. Thru Update button and THRU (Update) Menu (these are available only if a valid calibration has been completed)	5. CAL KIT Menu 6. CAL OPTIONS Menu 7. DEEMBED. TOOLS Menu (with Option 24, Universal Fixture Extraction) 8. AUTOCAL/SMARTCAL Menu 9. MANUAL CAL Menu

Figure 8-1. Primary Menus for VNA Calibration (2 of 2)

CALIBRATION [TR] Menu

Full Name

- CALIBRATION [TRANSMISSION-REFLECTION] Menu

Purpose

The CALIBRATION [TR] menu provides options to configure and run calibration routines, to configure cal kit characterization files, to enable /disable interpolation, and to perform manual adapter removal.

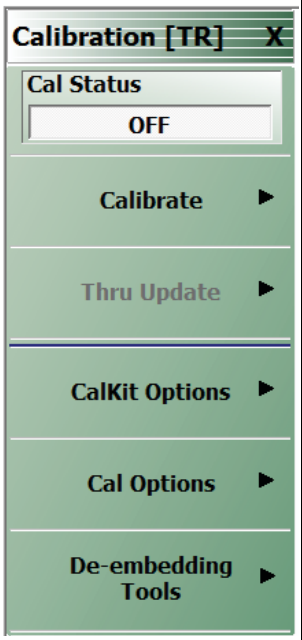
Prerequisites

- Availability of the Thru Update button on the CALIBRATION [TR] menu requires successful completion of a full 4-Port, 3-Port, 2-Port, or 1 Path-2 Port calibration.

Navigation

- MAIN | Calibration | CALIBRATION

2-Port VNAs



Cal Status

The Cal Status button toggles display of calibration status between OFF and ON based on the last calibration run. If ON, the Status bar at the bottom of the display area shows a status of CORR in green.

If a calibration has not been performed, the Cal Status button is unavailable.

Calibrate

Use the Calibrate button to start the manual calibration process. Options on sub-menus allow for selection of automatic or manual calibration, calibration type, calibration method, line type and other calibration parameters. Select displays the CALIBRATE menu.

- "CALIBRATE Menu" on page 8-8

Thru Update

Select displays the THRU UPDATE menu. Thru update is a calibration refreshing technique where the user connects a thru line and quickly refreshes the transmission tracking and load match terms without the time and complexity of a full calibration run. The thru update is essentially a one-step refresh calibration for Full 2 Port and 1 Path-2 Port calibrations.

The Thru Update button and the THRU (Update) Menu are available only after a valid calibration has been completed.

- "THRU INFO Dialog Box" on page 8-150

Cal Kit Options

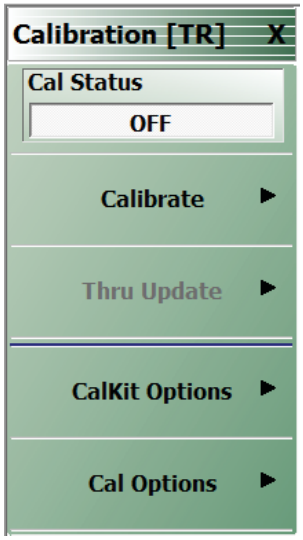
Select displays the CAL KIT menu to save, load, and recall characterization files for manual calibration kits.

"CAL KIT Menu" on page 8-13.

(continued)

Figure 8-2. CALIBRATION Menu (1 of 2)

MS46121A/B



Cal Options

Select displays the CAL OPTIONS menu to add interpolated measurement points and perform manual adapter removal after calibration completion.

- "CAL OPTIONS Menu" on page 8-21

De-embedding Tools (2-Port VNAs only)

Select displays the DEEMBED. TOOLS menu to perform network extraction, sequential extraction, and manual adapter removal.

- "DEEMBED. TOOLS Menu" on page 8-25

Figure 8-2. CALIBRATION Menu (2 of 2)

CALIBRATE Menu

The CALIBRATE menu initiates the manual calibration process with the selection of calibration parameters, calibration types, calibration methods, line types, and test port connectors.

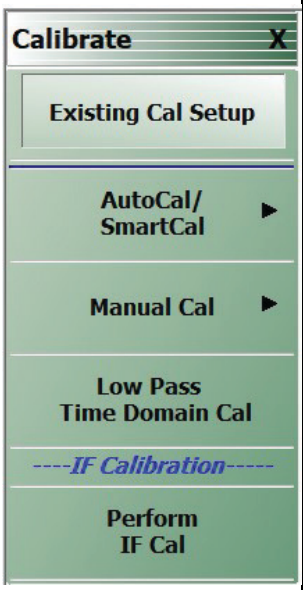
Previous

- "CALIBRATION [TR] Menu" on page 8-6

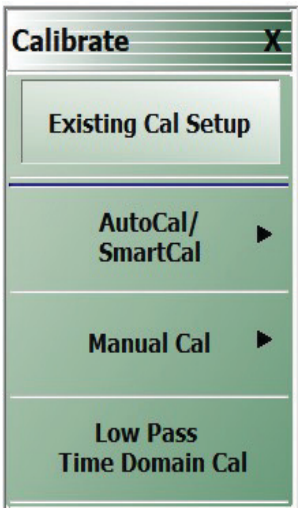
Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE

MS46122A/B, MS46322A/B



MS46121A/B



Existing Cal Setup

Displays a dialog showing setups that were used during the current calibrations.

AutoCal/SmartCal

Select displays the AUTOCAL/SMARTCAL menu.

- "AutoCal or SmartCal Port Selection Setup (2-Port VNAs)" on page 8-46

Manual Cal

Select displays the MANUAL CALIBRATION menu.

- "MANUAL CAL Menu" on page 8-73

Low Pass Time Domain Cal

Select displays the LOW PASS TIME DOMAIN CAL dialog box.

- "LOW PASS TIME DOMAIN CAL Dialog" on page 10-3

---IF Calibration---

Perform IF Cal

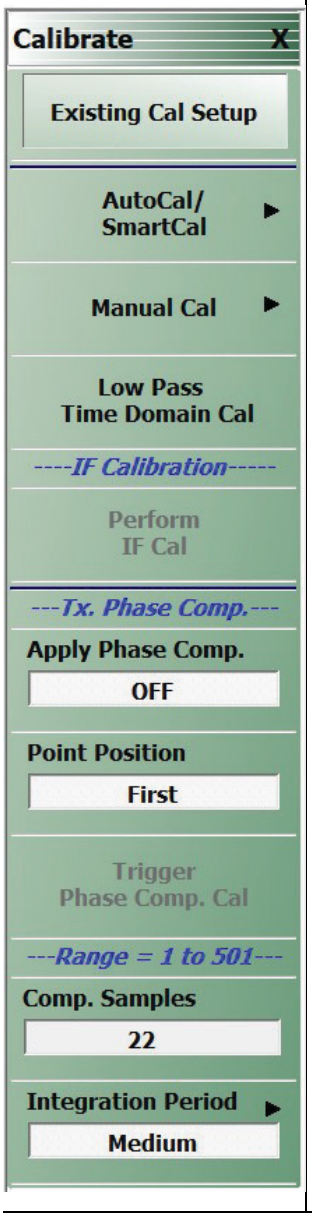
Select displays the IF CALIBRATION dialog box. Not applicable to MS46121A/B.

- "IF CALIBRATION Dialog Box" on page 8-10

(continued)

Figure 8-3. CALIBRATE Menu (1 of 2)

ME7868A, ME7869A



---Tx. Phase Compensation--- (ME7868A, ME7869A)

Apply Phase Comp. (ME7868A, ME7869A)

Turn on and off Phase Compensation. A per sweep measurement at a proprietary frequency in conjunction with the phase compensation calibration is used for phase compensation when phase compensation is turned on for the ME7868A or ME7869A VNA.

Point Position (ME7868A, ME7869A)

Select the point position where the phase compensation will be applied, either first point of sweep or the last. The selection can only be changed when the Phase Compensation is not being applied already.

Trigger Phase Comp. Cal (ME7868A, ME7869A)

Starts a phase compensation calibration. This calibration creates a baseline measurement which is used in the PhaseLync phase compensation algorithm. A phase compensation calibration is automatically performed if a manual or AutoCal/SmartCal user calibration is executed.

---Range = 1 to 501--- (ME7868A, ME7869A)

Comp. Samples (ME7868A, ME7869A)

Enter the number of samples to be used to perform phase compensation. Number of samples can be from 1 to 501. A lower number of points will speed up the measurement; a higher number of points will slow the measurement speed, but allow a more accurate measurement.

Integration Period (ME7868A, ME7869A)

Sets the number of running averages used in the phase compensation measurement. A larger value results in smaller static phase fluctuations, but slows the response time to external disturbances (e.g., interconnect cable movement).

Select None, Medium (3 running averages), or High (10 running averages).

Figure 8-3. CALIBRATE Menu (2 of 2)

IF CALIBRATION Dialog Box

Not available for the MS46121A/B model.

Previous

- "CALIBRATE Menu"

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Perform IF Cal | IF CALIBRATION Dialog Box

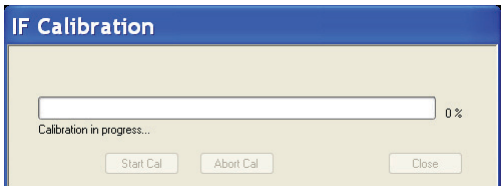


Figure 8-4. IF CALIBRATION Dialog Box

Instructions

Click Start Cal button to begin calibration; click Abort Cal to cancel calibration; click Close to exit the dialog box.

THRU (Update) Menu – 2-Port VNAs

The THRU (Update) menu is a completion button menu. When the through update calibration procedure is complete, the menu's Thru button is annotated with a completion checkmark as shown in the figure below.

Prerequisites

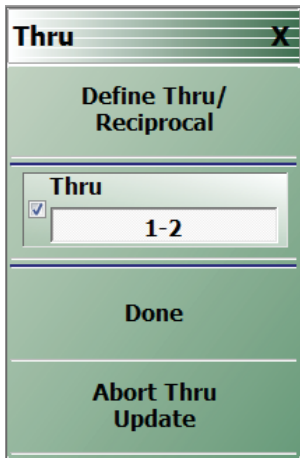
- You must first perform a successful Full 2-Port, or a 1 Path-2 Port calibration (AutoCal or manual) before the Thru Update button on the MANUAL CALIBRATION menu is available. The button will be grayed out before that.

Previous

- "CALIBRATION [TR] Menu" on page 8-6

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Thru Update | THRU (Update)



Define Thru/Reciprocal

Displays the THRU INFO dialog box where the through parameters can be changed.

- "THRU INFO Dialog Box" on page 8-150

Thru

Select to calibrate Thru connection and update the existing calibration's data.

Done

Select when all Thru calibrations are completed. Available when all Thru calibrations are completed. Select returns to the CALIBRATION menu, activating Cal Status button.

- "CALIBRATION [TR] Menu" on page 8-6

Abort Thru Update

Abort Thru Update stops the current calibration procedure and returns to the CALIBRATION menu.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-5. THRU (Update) Calibration Menu – 2-Port VNAs

8-4 Calibration Utility Functions

The calibration utility function and management menus and dialog boxes are:

- "CAL OPTIONS Menu" on page 8-21
  - "MANUAL ADAPTER REMOVAL Dialog Box" on page 8-44
- "CAL KIT Menu" on page 8-13
  - Load Kit/Charac. button – "LOAD (Cal Kit) Dialog Box" on page 8-14
  - Save Kit/Charac. button – "SAVE (Cal Kit) Dialog Box" on page 8-15
  - Create/Edit Kit button – "CAL KIT INFO Dialog Box" on page 8-16
  - Restore Default Coef. button – "RESTORE DEFAULT COEF. Dialog Box" on page 8-19
- "DEEMBED. TOOLS Menu" on page 8-25
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27
    - "NETWORK EXTRACTION Dialog Box – Type A" on page 8-29
    - "NETWORK EXTRACTION Dialog Box – Type B (Full Standards)" on page 8-30
    - "NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)" on page 8-31
    - "NETWORK EXTRACTION Dialog Box – Type C" on page 8-35
    - "NETWORK EXTRACTION Dialog Box – Type D (No Option 24)" on page 8-36
    - "NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards (Option 24)" on page 8-37
    - "NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)" on page 8-40
  - "SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 8-42
  - "MANUAL ADAPTER REMOVAL Dialog Box" on page 8-44
- "CAL SETUP Menu" on page 8-74
- "CAL METHOD Menu" on page 8-76

CAL KIT Menu

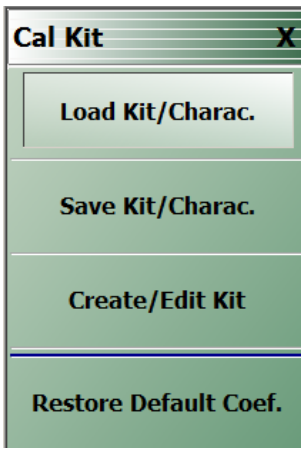
The CAL KIT menu provides tools to load, save, and create, and edit calibration kit characterization files between an external memory device, the instrument firmware, and a hard drive on the instrument or on a network.

Previous

- "CALIBRATION [TR] Menu" on page 8-6

Navigation

- MAIN | Calibration | CALIBRATION [TR] | CalKit Options | CAL KIT



Load Kit/Charac.

Select loads the Calibration Kit file or AutoCal Characterization file from the hard drive or external memory device into the VNA firmware through the LOAD (AutoCal Characterization/Cal Kit File) dialog box.

- "LOAD (Cal Kit) Dialog Box" on page 8-14

Save Kit/Charac.

Select saves the Cal Kit or AutoCal Characterization file from the firmware to the location of choice (typically the instrument hard drive) for later use through the SAVE FILE (AutoCal Characterization/Cal Kit) dialog box.

- "SAVE (Cal Kit) Dialog Box" on page 8-15

Create/Edit Kit

Select displays the CAL KIT INFO dialog box which shows parametric information about the calibration kit and allows user edits of the values.

- "CAL KIT INFO Dialog Box" on page 8-16

Restore Default Coef.

Select displays the RESTORE DEFAULT COEF dialog box.

- "RESTORE DEFAULT COEF. Dialog Box" on page 8-19

Figure 8-6. CAL KIT Menu

LOAD (Cal Kit) Dialog Box

The LOAD (Cal Kit) dialog box is used to install a calibration kit coefficients file in the instrument for subsequent use. A recommended best practice is to keep the cal kit serial number as part of the file name.

Previous

- "CAL KIT Menu" on page 8-13

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Kit Options | CAL KIT | Load Kit/Charac. | LOAD Dialog Box

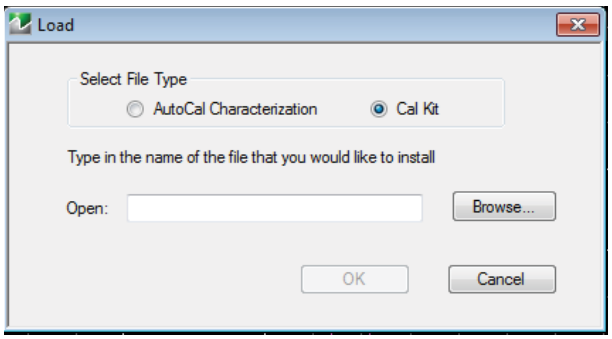


Figure 8-7. LOAD (Cal Kit) Dialog Box

Instructions

1. In the Select File Type area, select either the AutoCal Characterization or the Cal Kit radio button.
2. In the Open field, either enter the file name or click Browse to navigate manually.
3. If AutoCal Characterization was selected, the file type will be an AutoCal Characterization ACD file.
4. If Cal Kit was selected, the file types will be a Cal Kit Coefficient (.ccf), or LRL/LRM Cal Kit Files (.lcf).
5. Click Open to load the file or Cancel to return to the menu.

SAVE (Cal Kit) Dialog Box

The SAVE (Cal Kit) dialog is used to save Cal Kit Coefficient Files from the VNA firmware to other locations such as the instrument hard drive, a network drive, or an external memory device, allowing storage of multiple files from available cal kits.

An alternate method is to a Windows® program such as File Manager to copy files from the supplied USB flash drive to the recommended internal hard drive location C:\AnritsuVNA\Data.

Previous

- "CAL KIT Menu" on page 8-13

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Kit Options| CAL KIT | Save Kit/Charac | SAVE (Cal Kit) Dialog Box

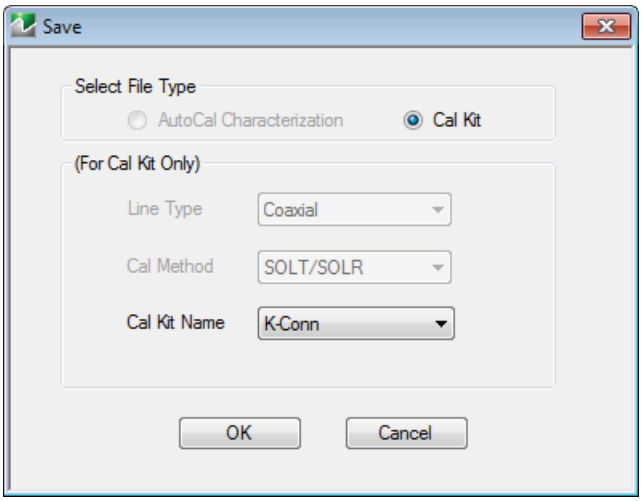


Figure 8-8. SAVE (AUTOCAL CHARACTERIZATION/CAL) KIT FILE Dialog Box

Instructions

1. Cal Kit is the default selection under Select File Type.
2. Select a calibration kit characterization file from the Cal Kit Name drop-down menu list:
   - K-Conn
   - GPC-3.5
   - SMA
   - N-Conn
   - other types in the menu
3. Click OK to proceed or Cancel to return to the menu.
4. A SAVE AS dialog box appears with a default Cal Kit Coefficient Files (*.ccf) file name.
5. Navigate to a storage location:
   - C:\AnritsuVNA\Data is recommended.
6. Click Save to save the file or Cancel to return to the menu.

CAL KIT INFO Dialog Box

The CAL KIT INFO dialog box provides access to instrument calibration kit information that is read-only for selections from the CAL STANDARD drop-down menu list, but editable for user-defined cal kits.

Previous

- "CAL KIT Menu" on page 8-13

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Kit Options | CAL KIT | Create/Edit Kit | CAL KIT INFO Dialog Box

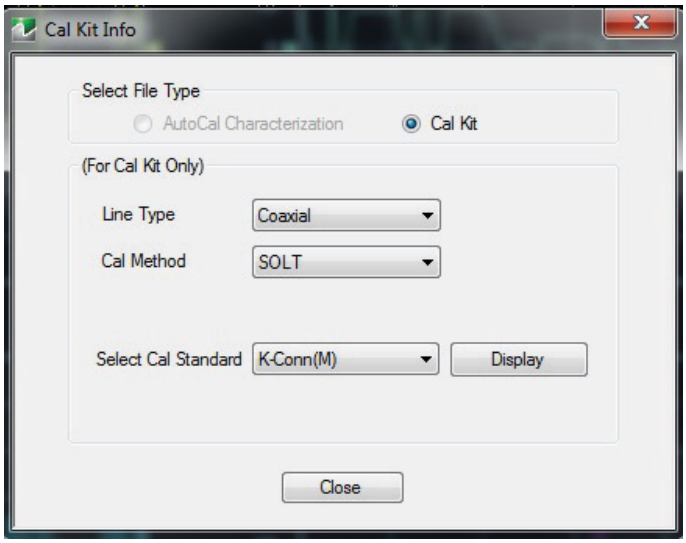


Figure 8-9. CAL KIT INFO Dialog Box

Instructions

1. Cal Kit is the default selection under Select File Type.
2. Select a connector type from the Select Cal Standard drop-down menu list:

- TOSLKF50A
- TOSLK50A
- TOSLNF50A
- TOSLN50A
- K-Conn (M)
- K-Conn (F)
- GPC-3.5 (M)
- GPC-3.5 (F)
- SMA (M)
- SMA (F)
- N-Conn (M)
- N-Conn (F)
- 2.4 mm (M)
- 2.4 mm (F)
- TNC (M)
- TNC (F)
- V-conn (M)
- V-conn (F)
- W1-conn (M)
- W1-conn (F)
- 7/16 (M)
- 7/16 (F)
- GPC-7
- N-conn(75) (M)
- N-conn(75) (F)
- User-Defined 1 through 32 (M or F)

3. Depending on how the pre-condition parameters are defined will determine whether the Display or Display/Edit button appears.

If the pre-condition parameters in the CAL KIT INFO dialog box (Figure 8-9, "CAL KIT INFO Dialog Box") are defined and Display appears:

4. Click Display
5. The STANDARD INFO read-only dialog box opens (Figure 8-10).
   - Note that the dialog box title and content fields reflect selections made in the CAL SETUP menu ("CAL SETUP Menu" on page 8-74). These are "read-only" parameters.
6. Click OK to close the STANDARD INFO dialog box.
7. Click Close to close the CAL KIT INFO dialog box.

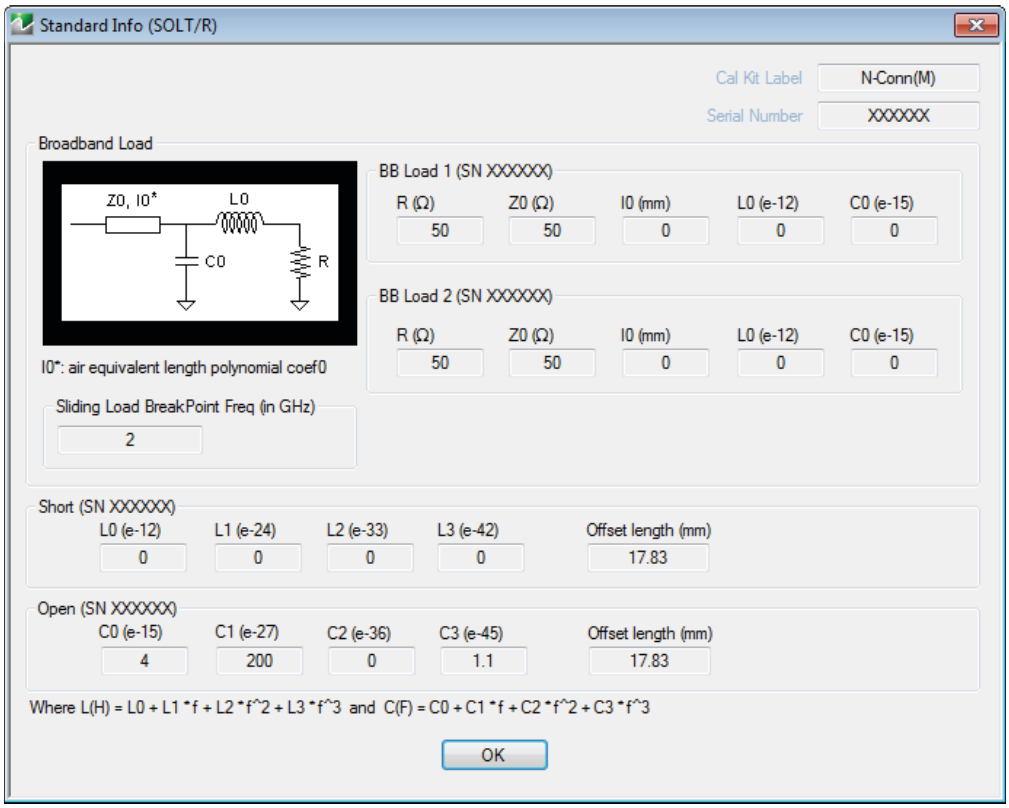


Figure 8-10. STANDARD INFO Dialog Box

When the parameters selected in the CAL KIT INFO dialog box (Figure 8-9, "CAL KIT INFO Dialog Box") are for a user-defined entry and the Display/Edit menu bar appears (Figure 8-11, "Cal Kit Info-Display/Edit"), the user must define the calibration kit parameter fields as in the example shown in Figure 8-12, "User Define Waveguide".

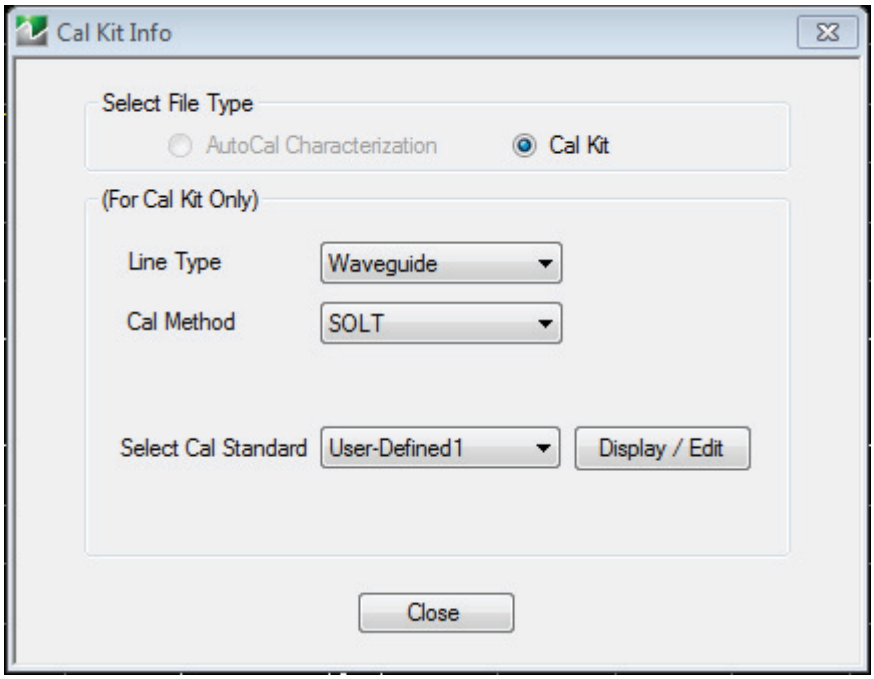


Figure 8-11. Cal Kit Info-Display/Edit

8. Click Display/Edit.

The USER DEFINE menu appears as in Figure 8-12, "User Define Waveguide".

9. Select the open parameter fields and edit.

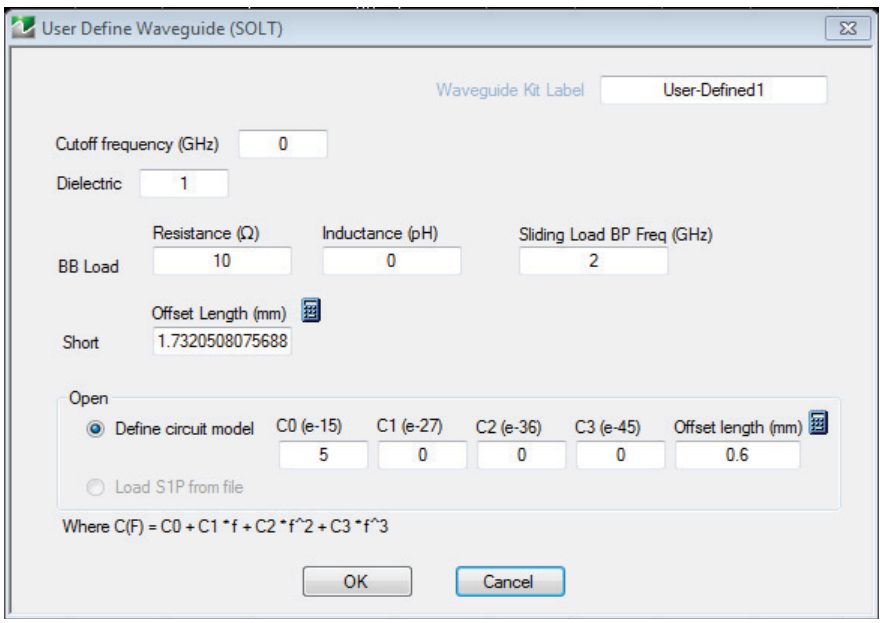


Figure 8-12. User Define Waveguide

RESTORE DEFAULT COEF. Dialog Box

Use the RESTORE DEFAULT COEF. dialog box to restore firmware-stored Cal Kit Coefficients fields back to their default coefficients. For best performance, either install the cal kit coefficients file supplied with your cal kit, or enter your user-defined coefficients before starting this procedure. The restore function is not available to AutoCal kits as they do not have restartable characterization data.

Previous

- "CAL KIT Menu" on page 8-13

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Kit Options | CAL KIT | Restore Default Coef. | RESTORE DEFAULT COEF. Dialog Box

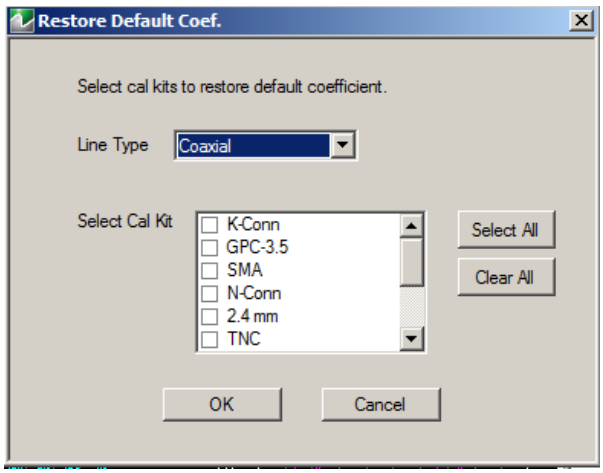


Figure 8-13. RESTORE DEFAULT COEF. (RESTORE DEFAULT COEFFICIENTS) Dialog Box

Instructions Restore Default Calibration Coefficients

Use this dialog to restore factory coefficients to available calibration kits.

1. Select the Line Type as required.
2. Select the Calibration Kits as required to be restored.
3. Click OK.

Available Selections

The table below shows the available calibration kits in the Select Cal Kit field of the RESTORE DEFAULT COEFFICIENTS dialog box. The available kits depend on the input combination selected for Line Type Media and Cal Method.

Table 8-1. Calibration Kit Availability in the RESTORE DEFAULT COEF. Dialog Box

LINE TYPE Media Setting	CAL METHOD Setting	Available Calibration Kits
Coaxial	SOLT/SOLR	W1-Conn, V-Conn, K-Conn, 2.4 mm, 2.4 mm, V-Conn, GPC-3.5, SMA, N-Conn, N-Conn (75), GPC-7, 7/16, TNC, TOLSK50, TOSLN50, GCS35M
	SSLT	
	SSST	
Non-Dispersive	SOLT/SOLR	W1-Conn, V-Conn, K-Conn, 2.4 mm, 2.4 mm, V-Conn, GPC-3.5, SMA, N-Conn, N-Conn (75), GPC-7, 7/16, TNC, TOLSK50, TOSLN50, GCS35M
	SSLT	
	SSST	
Microstrip	SOLT/SOLR	10 Mil Kit, 15 Mil Kit, 25 Mil Kit
	SSLT	10 Mil Kit, 15 Mil Kit, 25 Mil Kit
	SSST	10 Mil Kit, 15 Mil Kit, 25 Mil Kit
Waveguide	SOLT/SOLR	WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159,WR187, WR229
	SSLT	
	SSST	

CAL OPTIONS Menu

The CAL OPTIONS menu provides control for use of interpolation and procedure for manual adapter removal. Only Interpolation is available for the MS46121A/B.

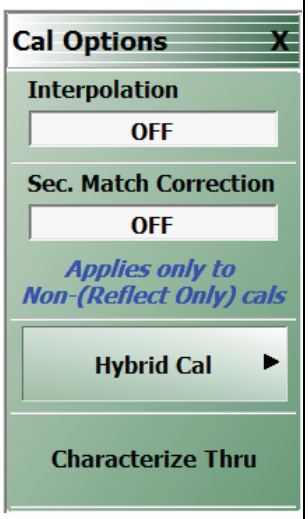
Previous

- "CALIBRATION [TR] Menu" on page 8-6

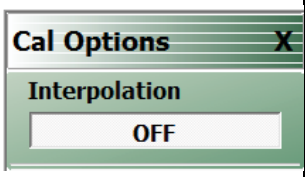
Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Options | CAL OPTIONS

MS46122A/B, MS46322A/B, ME7868A, ME7869A



MS46121A/B, 1-Port MS46131A



Interpolation (On/Off)

Select toggles interpolation off and on, with a default state of OFF.

Interpolation allows additional interpolated measurement points between calibrated measurement points. This is useful if the user wants to zoom into a specific area without having to recalibrate the instrument. The interpolated points must lie within the calibration frequency points.

Sec. Match Correction (On/Off)

Secondary Match Correction provides a calibration enhancement that reduces high-spatial-frequency ripple by removing the effects of the multiple reflection paths within a DUT. Default value is OFF. This feature only applies for full-term calibrations, 1p2p and TFR. This function has no effect when an appropriate calibration is not applied, when the frequency range is too small (~<2GHz), the step size is too large (~>1 GHz) or for certain very irregular segmented sweep setups. See the Measurement Guide for more details.

Hybrid Cal

Select displays the HYBRID CAL menu where the hybrid calibration is configured.

Hybrid calibrations take two 1-port calibrations and hybridizes them into a 2-port calibration which allows a mixed-media calibration for a device that may have coaxial and waveguide connections.

- "HYBRID CAL Menu – 2-Port VNAs" on page 8-22

Characterize Thru

Select displays the THRU CHARACTERIZATION dialog box.

The THRU CHARACTERIZATION dialog box provides a process to characterize an unknown Thru standard. Two 1-port calibrations are performed, one at the VNA port and one at the end of the unknown Thru. A network extraction is performed to create an s2p file characterizing the unknown Thru. This s2p file can then be used in an SOLT/SOLR calibration.

- "THRU CHARACTERIZATION Dialog Box" on page 8-45

Figure 8-14. CAL OPTIONS (CALIBRATION OPTIONS) Menu

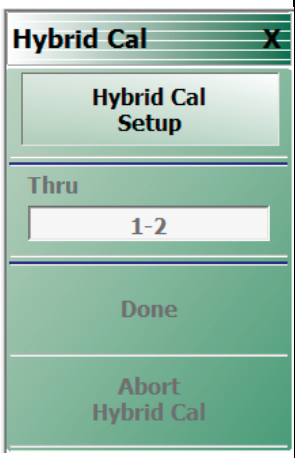
HYBRID CAL Menu – 2-Port VNAs

Previous

- "CAL OPTIONS Menu" on page 8-21

Navigation

- MAIN | Calibration | CALIBRATION | Cal Options | CAL OPTIONS | Hybrid Cal | HYBRID CAL



Hybrid Cal Setup

Hybrid calibrations take two 1-port calibrations and hybridizes them into a 2-port calibration which allows a mixed-media calibration for a device that may have coaxial and waveguide connections. It also allows 2-port calibrations where the two 1-port calibrations are not restricted to be the same type. Select displays the HYBRID CAL SETUP dialog box where the hybrid calibration is configured.

- "HYBRID CAL SETUP Dialog Box – 2-Port VNAs" on page 8-23

Thru

After the hybridized calibration has been configured in the HYBRID CAL SETUP dialog box, make sure all through connections are complete. When ready to proceed, select the Thru button to start the hybridization. The display dims for a few seconds, and then reappears with a completion check box.

Done

If the Done button is unavailable, the hybrid calibration has not been successfully completed. After a successful completion, the Done button is available. Select returns to the CALIBRATION menu where the Cal Status button is set to ON.

- "CALIBRATION [TR] Menu" on page 8-6

Abort Hybrid Cal Setup

Selecting the Abort button stops the hybrid calibration and returns to the CALIBRATION menu.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-15. CAL OPTIONS (CALIBRATION OPTIONS) Menu

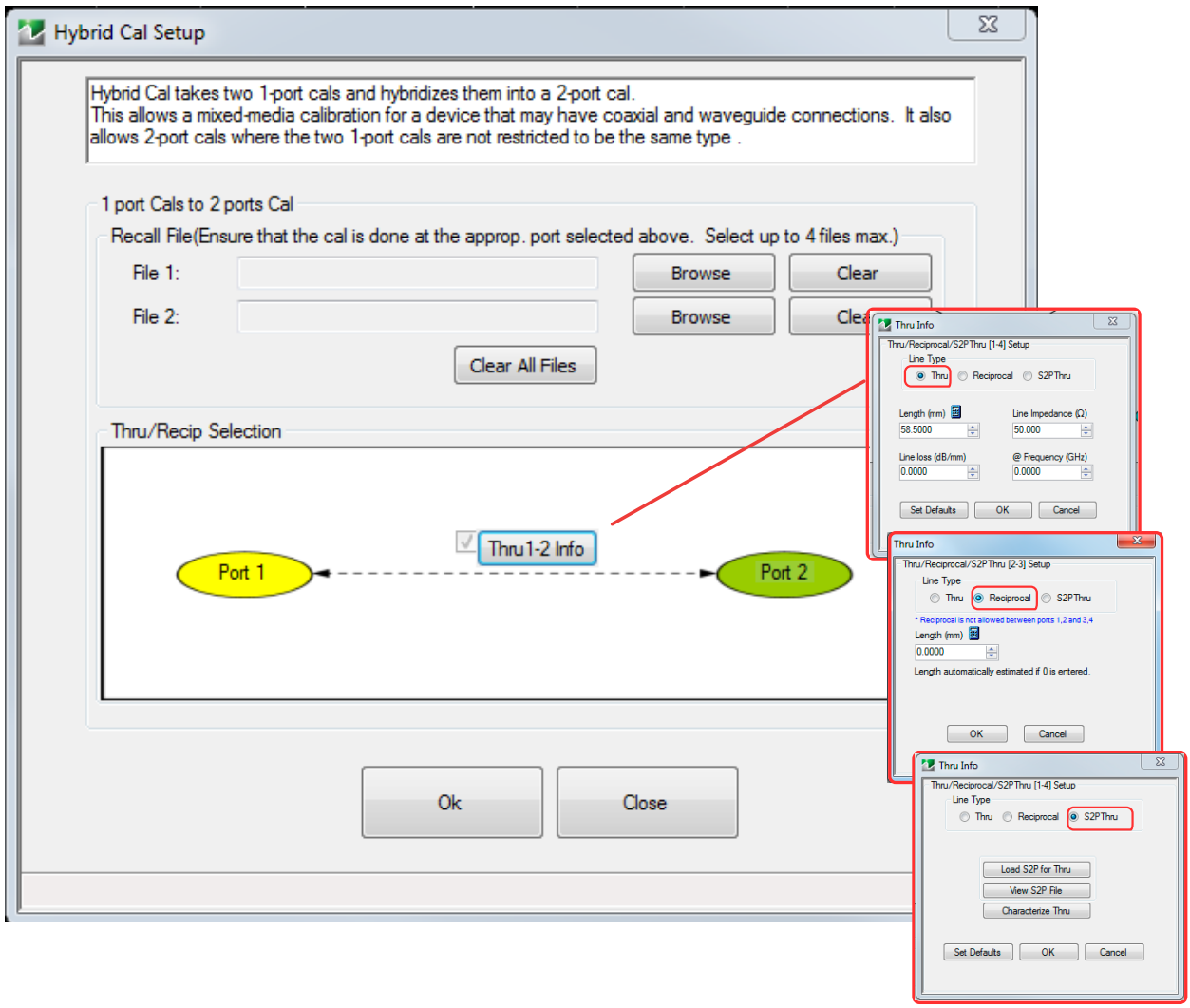
HYBRID CAL SETUP Dialog Box – 2-Port VNAs

Previous

- "HYBRID CAL Menu – 2-Port VNAs" on page 8-22

Navigation

- MAIN | Calibration | CALIBRATION | Cal Options | CAL OPTIONS | Hybrid Cal | HYBRID CAL | Hybrid Cal Setup | HYBRID CAL SETUP Dialog Box



"THRU INFO Dialog Box" on page 8-150

1. Through selected allows user entries for length, line impedance, line loss and frequency.
2. Note that Reciprocal is disabled for MS46122A.
3. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files).

Figure 8-16. HYBRID CAL SETUP Dialog Box – 2-Port VNAs

Instructions

A hybrid calibration takes two 1-port calibrations and hybridizes them into a 2-port calibration. This allows a mixed-media calibration for a device that may have both coaxial and waveguide connections. It also allows 2-port calibrations where the two 1-port calibrations are not restricted to the same type.

Hybridizing Two 1-Port Cals into a 2-Port Cal

In the File 1 field, select the Browse button to navigate to the appropriate Channel Setup and Calibration (CHX) file for the first calibration.

Repeat for the File 2 field.

Thru/Reciprocal/S2P Thru Area

- "THRU INFO Dialog Box" on page 8-150

OK

When both files have been identified, select OK to return to the HYBRID CAL menu.

DEEMBED. TOOLS Menu

Use the DEEMBED. TOOLS menu to for network extraction and adapter removal. De-embedding tools are not available on MS46121A/B.

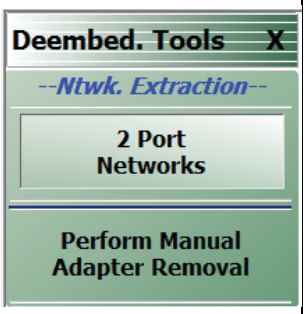
Previous

- "CALIBRATION [TR] Menu" on page 8-6

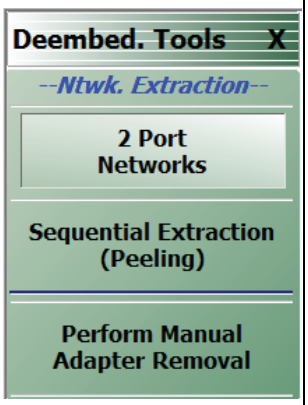
Navigation

- MAIN | Calibration | CALIBRATION [TR] | De-embedding Tools | DEEMBED. TOOLS

Without Option 24



With Option 24



Network Extraction

2 Port Networks

Select displays the NETWORK EXTRACTION (2 PORT NETWORKS) dialog box.

Use network extraction to generate an S-Parameter (.s2p) file for a set of networks. The file can be embedded or de-embedded as required.

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26
- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

Sequential Extraction (Peeling) — *Present only with* Option 24

Select displays the SEQUENTIAL EXTRACTION dialog box.

Sequential Extraction will construct a .s2p or .s4p file based on a localization of the selected parameter to isolate a given defect. This process can be used to sequentially de-embed and identify additional defects.

- "SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 8-42

Perform Manual Adapter Removal

Select displays the MANUAL ADAPTER REMOVAL dialog box.

Adapter removal permits accurate measurement of non-insertable devices using an adapter of known electrical length and two full 12-term calibrations. Manual adapter removal extracts the behavior of the adapter from the setup after a successful calibration.

- "MANUAL ADAPTER REMOVAL Dialog Box" on page 8-44

Figure 8-17. CAL OPTIONS (CALIBRATION OPTIONS) Menu

NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)

The network extraction features provides a method of generating an S-Parameter (.s2p) file for a set of networks. The.s2p file can then be embedded or de-embedded into the error coefficient of the VNA as required. Four extractable network configurations are provided:

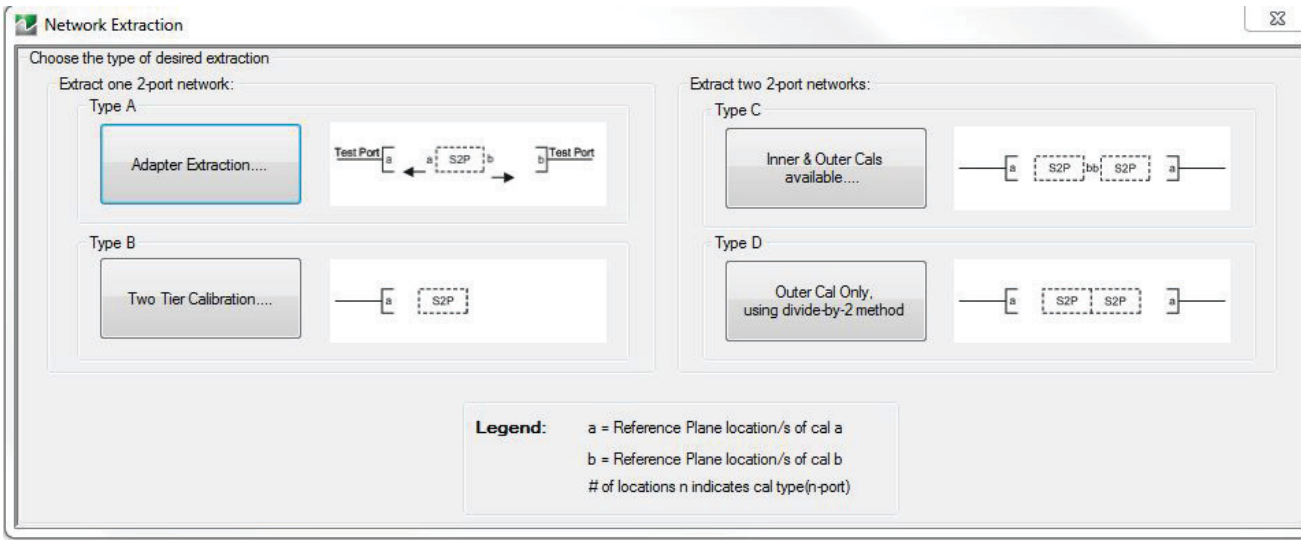
- Type A – Adapter Extraction – Extract one 2-port network
- Type B – Two Tier Calibration – Extract one 2-port network
- Type C – Inner and Outer Calibrations Available – Extract two 2-port networks
- Type D – Outer Cal Only – Extract two 2-port networks.

Previous

- “DEEMBED. TOOLS Menu” on page 8-25

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | Deembed. Tools | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION Dialog Box



NETWORK EXTRACTION Dialog Box – Choose the type of desired extraction from the four buttons:

- Type A – Extract one 2-Port Network – Adapter Extraction: “NETWORK EXTRACTION Dialog Box – Type A” on page 8-29
- Type B – Extract one 2-Port Network – Two Tier Calibration: “NETWORK EXTRACTION Dialog Box – Type B (Full Standards)” on page 8-30
- Type C – Extract two 2-Port Networks – Inner and Outer Cals Available: “NETWORK EXTRACTION Dialog Box – Type C” on page 8-35
- Type D – Extract two 2-Port Networks – Outer Cal Only using divide-by-2 method: “NETWORK EXTRACTION Dialog Box – Type D (No Option 24)” on page 8-36

Figure 8-18. NETWORK EXTRACTION Dialog Box (Without Option 24)

NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)

The network extraction features provide a method of generating S-Parameter (.sNp) files for a set of networks. The.generated files can then be embedded or de-embedded into the error coefficient of the VNA as required. Six extractable network configurations are provided. Based on the type of extraction chosen, multiple .sNp files may be generated, as shown in the graphics for each extraction type. Port Swapping can be performed in the EMBEDDING/DE-EMBEDDING menus. All calibration files must be Full cals, of the same Cal type, and over the same exact frequency points. From DEEMBED. TOOLS | 2 Port Networks, open the corresponding Network Extraction dialog, which are explained with more detail in Table 8-2 on page 8-28.

Full Name

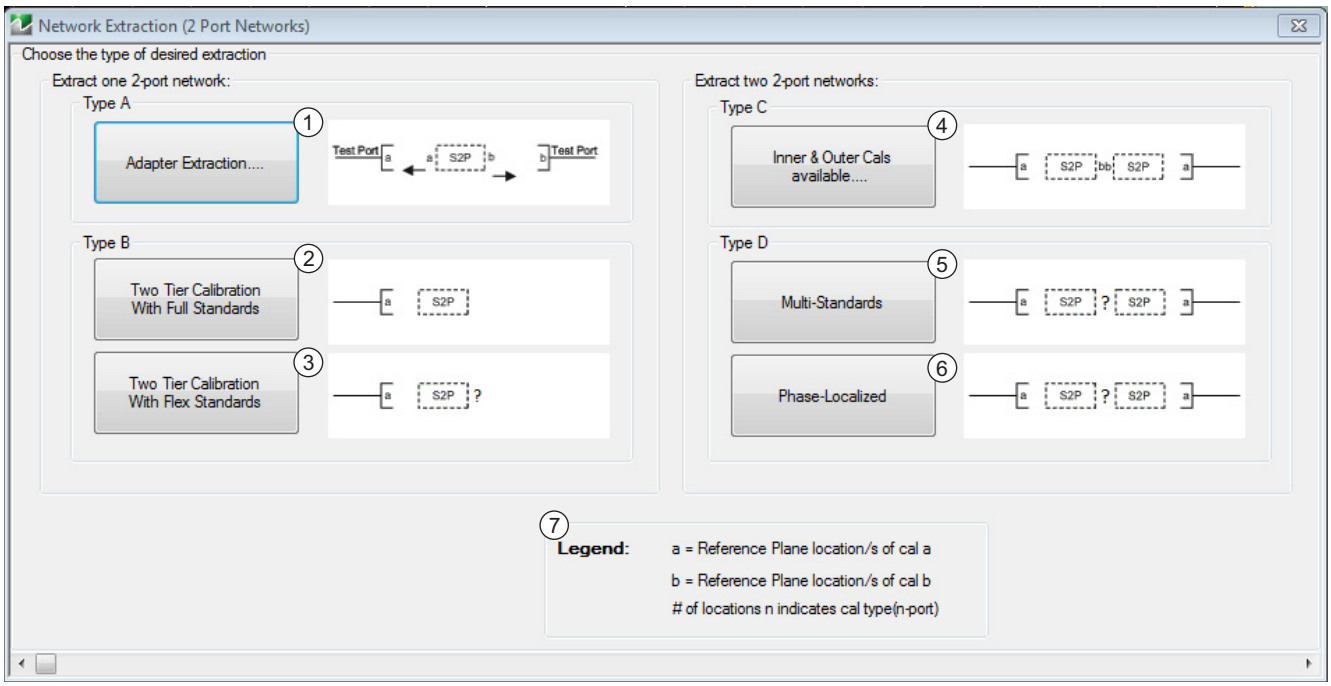
Network Extraction (2-Port Networks)

Previous

- "DEEMBED. TOOLS Menu" on page 8-25

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED.TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2-PORT NETWORKS) Dialog Box



NETWORK EXTRACTION Dialog Box – Choose the type of desired extraction from the six (6) buttons:

1. Type A – Extract one 2-Port Network – Adapter Extraction
2. Type B – Extract one 2-Port Network – Two Tier Calibration With Full Standards
3. Type B – Extract one 2-Port Network – Two Tier Calibration With Flex Standards (Available only with Option 24 Universal Fixture Extraction installed)
4. Type C – Extract two 2-Port Networks – Inner and Outer Cals Available
5. Type D – Extract two 2-Port Networks – Multi-Standards (Available only with Option 24 Universal Fixture Extraction installed)
6. Type D – Extract two 2-Port Networks – Phase-Localized (Available only with Option 24 Universal Fixture Extraction installed)

Figure 8-19. NETWORK EXTRACTION Dialog Box (With Option 24)

Instructions

The network extraction feature provides the method for generating the S-Parameter for a given set of networks. This generated.s2p file can then be embedded or de-embedded into the error coefficient for the VNA at a later stage. The dialog box provides extraction choices accessible via large buttons. Each choice provides a separate configuration dialog box, as described in the sections below.

Table 8-2. Network Extraction Type Definitions

Network Extraction Type	Extract These Networks	Extraction Method	Cross Reference to Dialog Box Description
Type A	One 2-Port Network	Adapter Extraction	"NETWORK EXTRACTION Dialog Box – Type A" on page 8-29
Type B	One 2-Port Network	Two Tier Calibration with Full Standards	"NETWORK EXTRACTION Dialog Box – Type B (Full Standards)" on page 8-30
		Two Tier Calibration with Flexible Standards (Available only with Option 24)[a]	"NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)" on page 8-31
Type C	Two 2-Port Networks	Inner and Outer Cals Available	"NETWORK EXTRACTION Dialog Box – Type C" on page 8-35
Type D	Two 2-Port Networks	Outer Cal only using Divide-by-Two Method	"NETWORK EXTRACTION Dialog Box – Type D (No Option 24)" on page 8-36
		Outer Cal only using Divide-by-Two Method (Multi-Standards) (Available only with Option 24)[a]	"NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards (Option 24)" on page 8-37
		Phase Localized (Available only with Option 24)[a]	"NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)" on page 8-40
Sequential Extraction	–	Sequential Extraction (Peeling) (Available only with Option 24)[a]	"SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 8-42

a. For more information on Type B, Type D, and Sequential Extraction with Option 24 installed, refer to the Measurement Guide (10410-00336).

NETWORK EXTRACTION Dialog Box – Type A

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26
- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 PORT NETWORKS) Dialog Box | Extract One 2-Port Network – Type A – Adapter Extraction | NETWORK EXTRACTION [EXTRACT ONE 2-PORT NETWORK (TYPE A)]

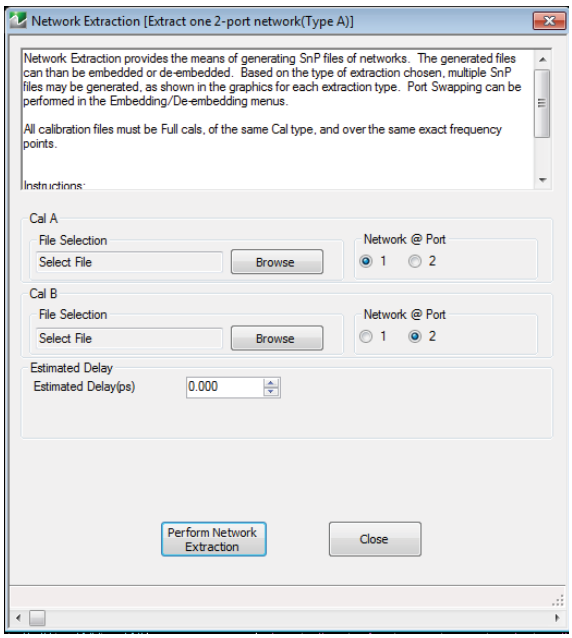


Figure 8-20. Adapter Extraction

Instructions

1. Use the Browse button to define the Cal A file path. Repeat to define the Cal B file path.
2. If necessary, enter the Estimated Delay in ps.
3. Select Perform Network Extraction to perform the extraction.
4. If the extraction is successful, follow the prompt to save the generated .sNp files/s.
5. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
6. After the .sNp files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network Configuration panel to recall the .sNp files and configure the network.

NETWORK EXTRACTION Dialog Box – Type B (Full Standards)

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26
- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 PORT NETWORKS) Dialog Box | Extract One 2-Port Network – Type B – Two Tier Calibration With Full Standards | NETWORK EXTRACTION | EXTRACT ONE 2-PORT NETWORK (TYPE B)]

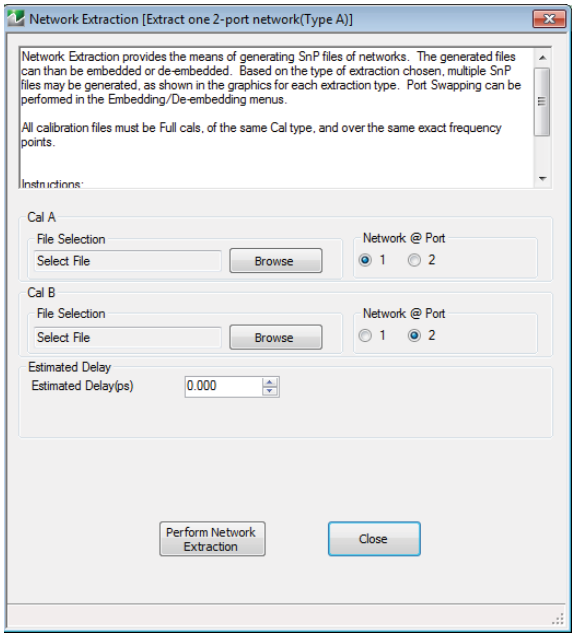


Figure 8-21. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration – With Full Standards

Use Type B Network Extraction to extract one 2-Port network using available two tier calibration.

Network Extraction provides the means of generating .sNp files of networks. The generated files can then be embedded or de-embedded. Based on the type of extraction chosen, multiple .sNp files may be generated, as shown in the graphics for each extraction type. Port Swapping can be performed in the EMBEDDING/DE-EMBEDDING menu.

Cal a and b must share a common test port. Cal b in this extraction type must only be a full 1-port cal, which is ideal if a Thru is not available. Both cals must have the exact same frequency points.

Instructions

1. Use the Browse button to select the appropriate cal file(s).
2. If necessary, enter the Estimated Delay in ps.
3. Select Perform Network Extraction to perform the extraction.
4. If the extraction is successful, follow the prompt to save the generated .sNp file(s).
5. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
6. After the .s2p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s2p files and configure the network.

NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)

Prerequisites

- Option 24 Universal Fixture Extraction installed
- A calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 PORT NETWORKS) Dialog Box | Extract One 2-Port Network – Type B – Two Tier Calibration With Flex Standards | NETWORK EXTRACTION [EXTRACT ONE 2-PORT NETWORK – (TYPE B – FLEX STANDARDS)]

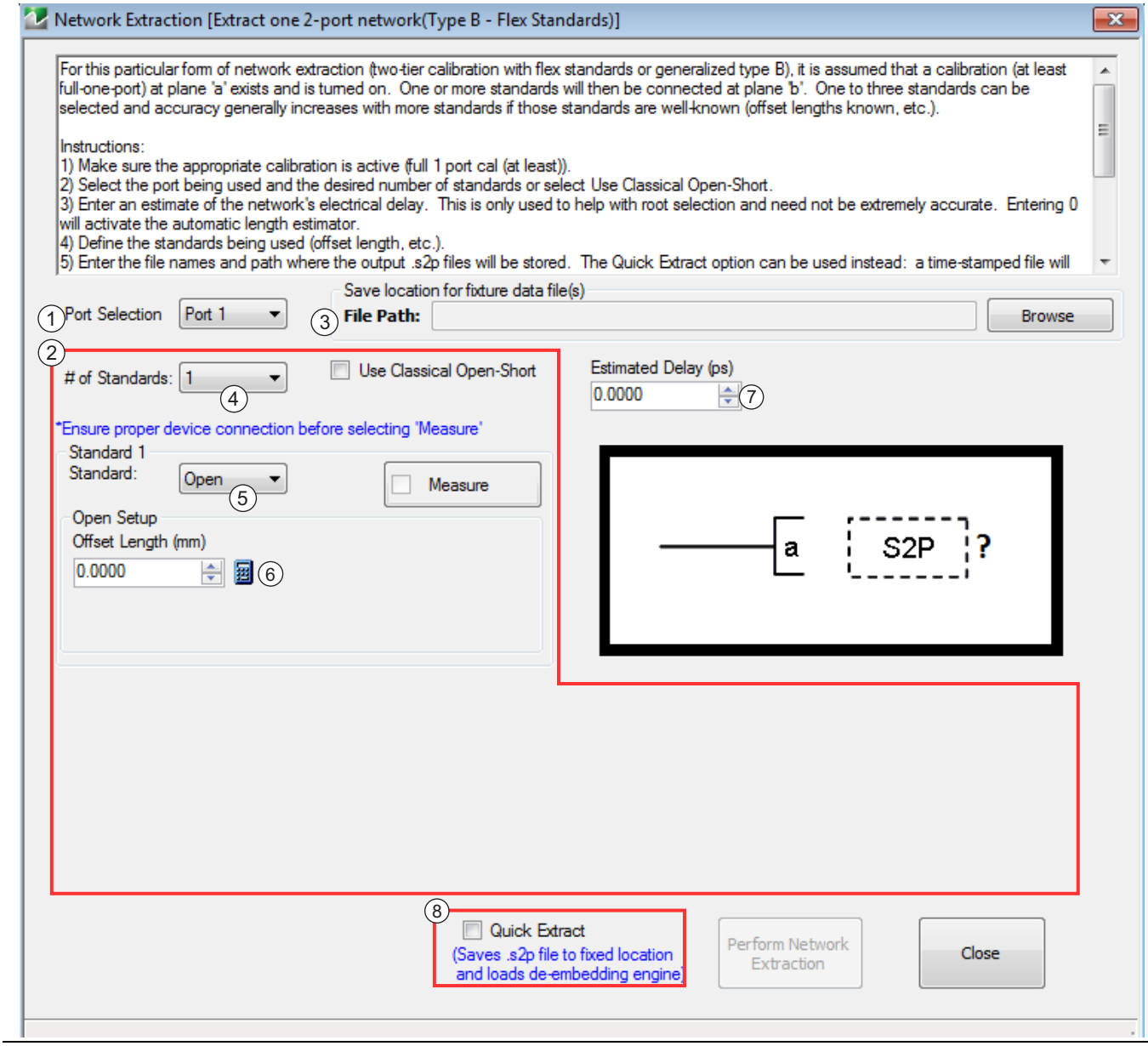


Figure 8-22. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration With Flex Standards (1 of 2)

Default view shown above.

1. **Port Selection:** Two ports available (with 2-Port VNAs)
2. See Figure 8-23 for available extraction options based on the **Number of Standards** selected, or whether **Use Classical Open Short** box is checked.
3. **File Path:** Location for saving file
4. **# of Standards:** Three standards available; corresponding setup fields appear for up to three standards.
5. **Standard (1, 2, 3) Standard:** Selections for up to four standard types; **Short, Open, Load, or S1P file** (Provides File Browse navigation for .s1p files).
6. **Short or Open or Setup:** Setup field for Offset Length (mm)
   When Load is Selected: Load Setup has setup fields for Resistance (ohm), Inductance (pH), and Offset Length (mm)
7. **Estimated Delay (ps)**: An estimate of the network's electrical delay is entered. This is only used to help with root selection and need not be extremely accurate. Entering 0 will activate the automatic length estimator.
8. Checking **Quick Extract** saves .s2p file to a fixed location and loads deembedding dialog (Figure 8-24).

Figure 8-22. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration With Flex Standards (2 of 2)

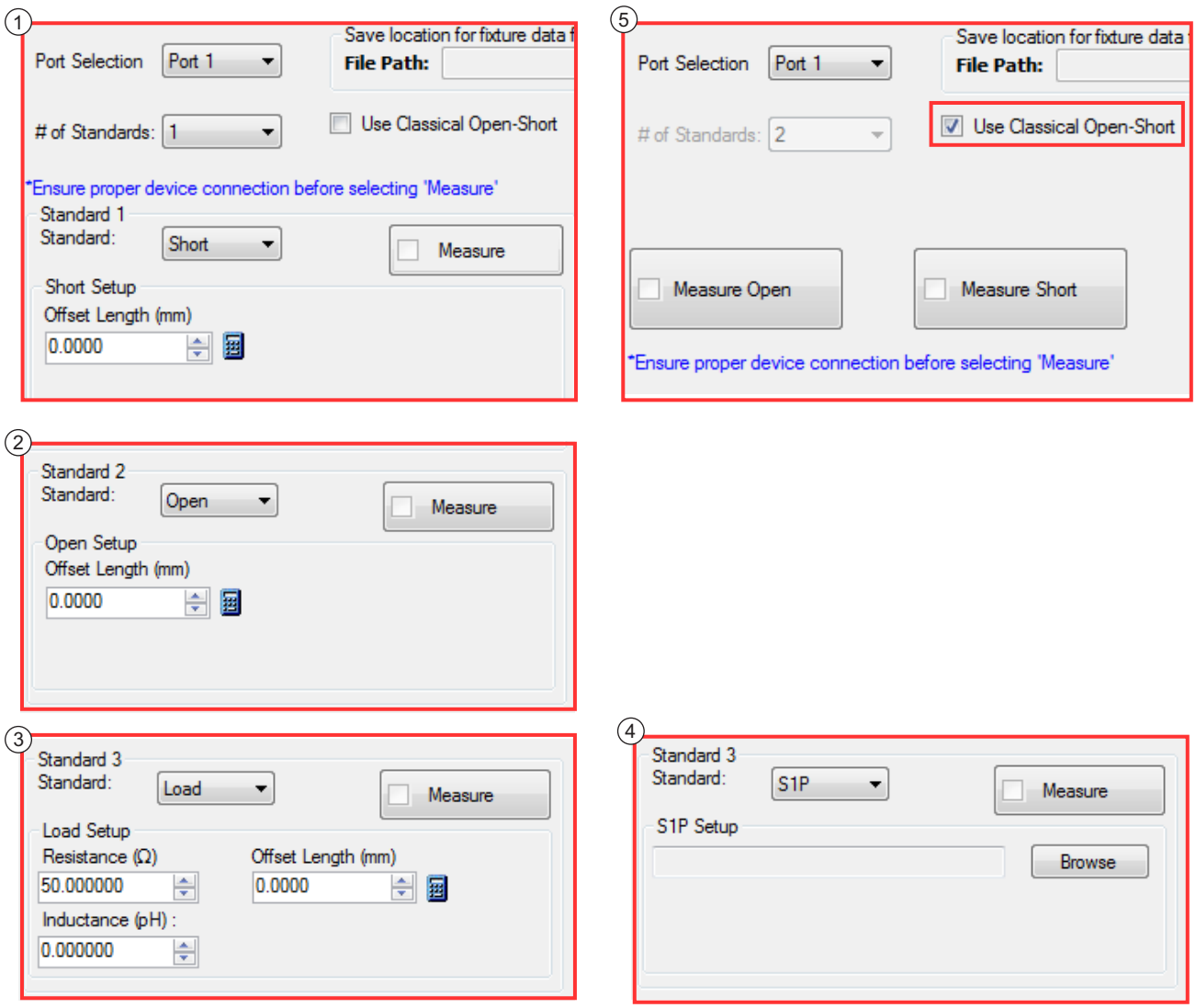
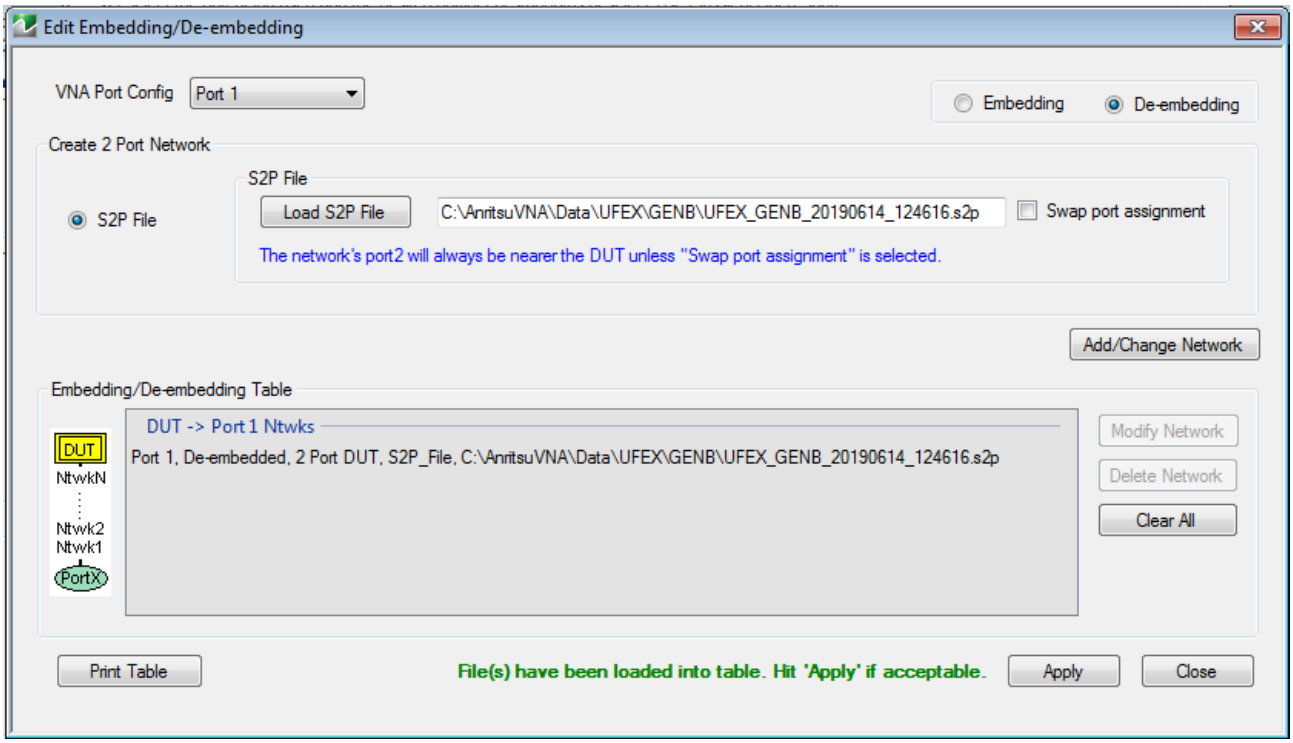


Figure 8-23. Type B – Two Tier Calibration With Flex Standards Extraction Setup Options (1 of 2)

1. Selecting **Short** from the drop-down opens the setup options as shown.
2. Selecting **Open** from the drop-down opens the setup options as shown.
3. Selecting **Load** from the drop-down opens the setup options as shown.
4. Selecting **S1P** from the drop-down opens the setup options as shown.
5. Checking the **Use Classical Open-Short** box opens the setup options as shown. This selection sets up a special case of the 2-standards scenario where a zero offset open and short are used and the fixture arm is assumed to be electrically short. When selected, dialog options adjust as shown.

Figure 8-23. Type B – Two Tier Calibration With Flex Standards Extraction Setup Options (2 of 2)



If the option **Quick Extract** is selected, and after **Perform Network Extraction** is executed, the above dialog appears with a pre-loaded Networks table using newly created .sNp files.

Figure 8-24. Quick Extract – Edit Embedding/De-embedding Dialog

Instructions

Network Extraction provides the means of generating .sNp files of networks. The generated files can then be embedded or de-embedded. Port Swapping can be performed in the Embedding/De-embedding menus.

For this particular form of network extraction (two-tier calibration with flex standards or generalized type B), it is assumed that a calibration (at least full-one-port) at plane 'a' exists and is turned on. One or more standards will then be connected at plane 'b'. One to three standards can be selected and accuracy generally increases with more standards if those standards are well-known (offset lengths known, etc.).

Procedure (Use Classical Open-Short ***Is Not*** Selected)

1. Make sure the appropriate calibration is active (full 1 port cal (at least)).
2. Select the port being used and the desired number of standards.
3. Enter an estimate of the network's electrical delay. This is only used to help with root selection and need not be extremely accurate. Entering 0 will activate the automatic length estimator.

4. Define the standards being used (offset length, etc.). Note if two standards are of the same type, they should have different parameters.
5. Enter the file names and path where the output .s2p files will be stored. The Quick Extract option can be used instead: a time-stamped file will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files. Remember to keep track of available disk space.
6. Connect each standard sequentially and click the appropriate Measure button when ready. When the sweep is complete, a check will appear in the box and the button will turn green.
7. When all desired standards have been measured, click on Perform Network Extraction. If successful, a confirmation dialog will appear.
8. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
9. If Quick Extract was not selected, after the .s2p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s2p files and configure the network.

Procedure (Use Classical Open-Short ***Is*** Selected)

1. Select the port being used.
2. Enter an estimate of the network's electrical delay. This is only used to help with root selection and need not be extremely accurate. Entering 0 will activate the automatic delay estimator.
3. Enter the file names where the output .s2p files will be stored. The Quick Extract option can be used instead: the file will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files.
4. Connect each standard sequentially and click the appropriate Measure button when ready. When the sweep is complete, a check will appear in the box and the button will turn green.
5. When all desired standards have been measured, click on Perform Network Extraction.
6. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
7. If Quick Extract was not selected, after the .s2p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s2p files and configure the network.

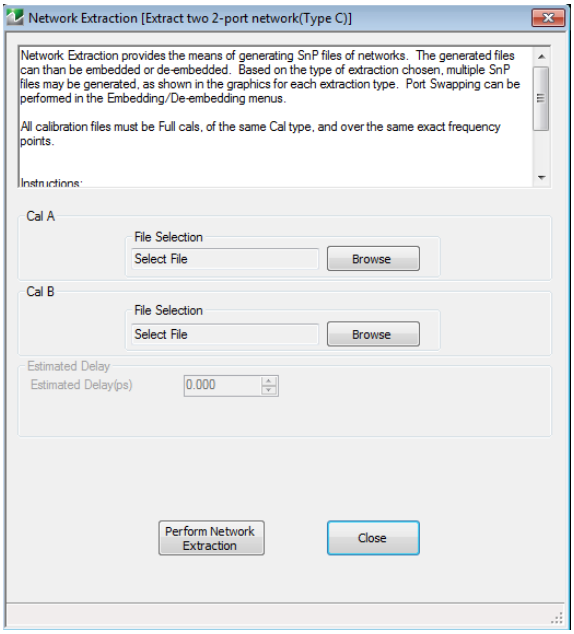
NETWORK EXTRACTION Dialog Box – Type C

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26
- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 PORT NETWORKS) Dialog Box | Extract Two 2-Port Networks | Extract Two 2-Port Networks – Type C – Inner and Outer Cals Available | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORKS (TYPE C)] dialog box]



Use Type C Network Extraction to extract two (2) 2-Port networks using available Inner and Outer calibrations.

Figure 8-25. NETWORK EXTRACTION Dialog Box – Type C – Inner and Outer Cals

Description

Network Extraction provides the means of generating .sNp files of networks. The generated files can then be embedded or de-embedded. Port Swapping can be performed in the Embedding/De-embedding menus.

All calibration files must be Full Cals, of the same cal type, and over the same exact frequency points.

Instructions:

1. Use the Browse button to define the appropriate cal file(s) path. Note that CalB is the inner file and CalA is the outer file.
2. Select Neglect fixture match if desired (this sets all reflection terms to 0 and may be helpful if the fixture is extremely unrepeatable).
3. If the extraction is successful, follow the prompt to save the generated .sNp files(s).
4. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
5. After the .sNp files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .sNp files and configure the network.

NETWORK EXTRACTION Dialog Box – Type D (No Option 24)

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (No Option 24)" on page 8-26

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 PORT NETWORKS) Dialog Box | Extract Two 2-Port Networks – Type D – Multi-Standards | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORK (TYPE D - Multi-Standards)] Dialog Box

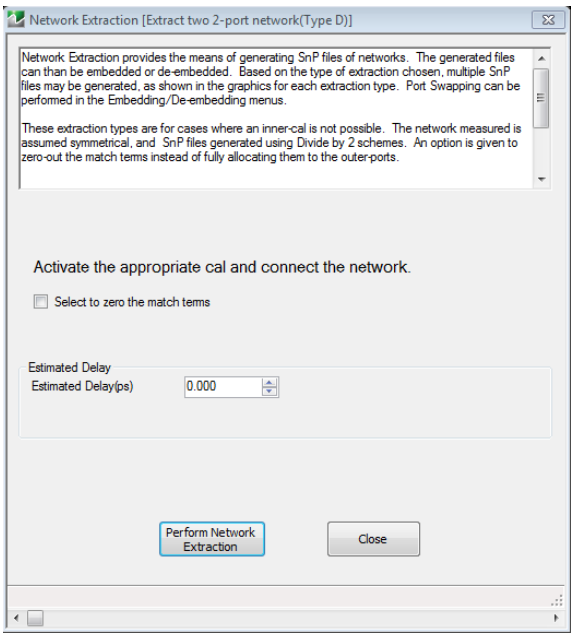


Figure 8-26. NETWORK EXTRACTION Dialog Box – Type D (Without Option 24)

Description

Network Extraction provides the means of generating .sNp files of networks. The generated files can then be embedded or de-embedded. Port Swapping can be performed in the Embedding/De-embedding menus.

These extraction types are for cases where an inner-cal is not possible. The network measured is assumed symmetrical, and .sNp files generated using Divide-by-2 schemes. An option is given to neglect fixture match terms instead of fully allocating them to the outer-ports.

Procedure

1. Make sure the appropriate calibration is active.
2. Select Neglect fixture match if desired (this sets all reflection terms to 0 and may be helpful if the fixture is extremely unrepeatable).
3. Connect the network and select Perform Network Extraction.
4. If the extraction is successful, follow the prompt to save the generated .sNp files/s.
5. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
6. After the .sNp files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .sNp files and configure the network.

NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards (Option 24)

The NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards is only available with Option 24. For more information on Type D Multi-Standards network extraction, refer to the Measurement Guide (10410-00336).

Prerequisites

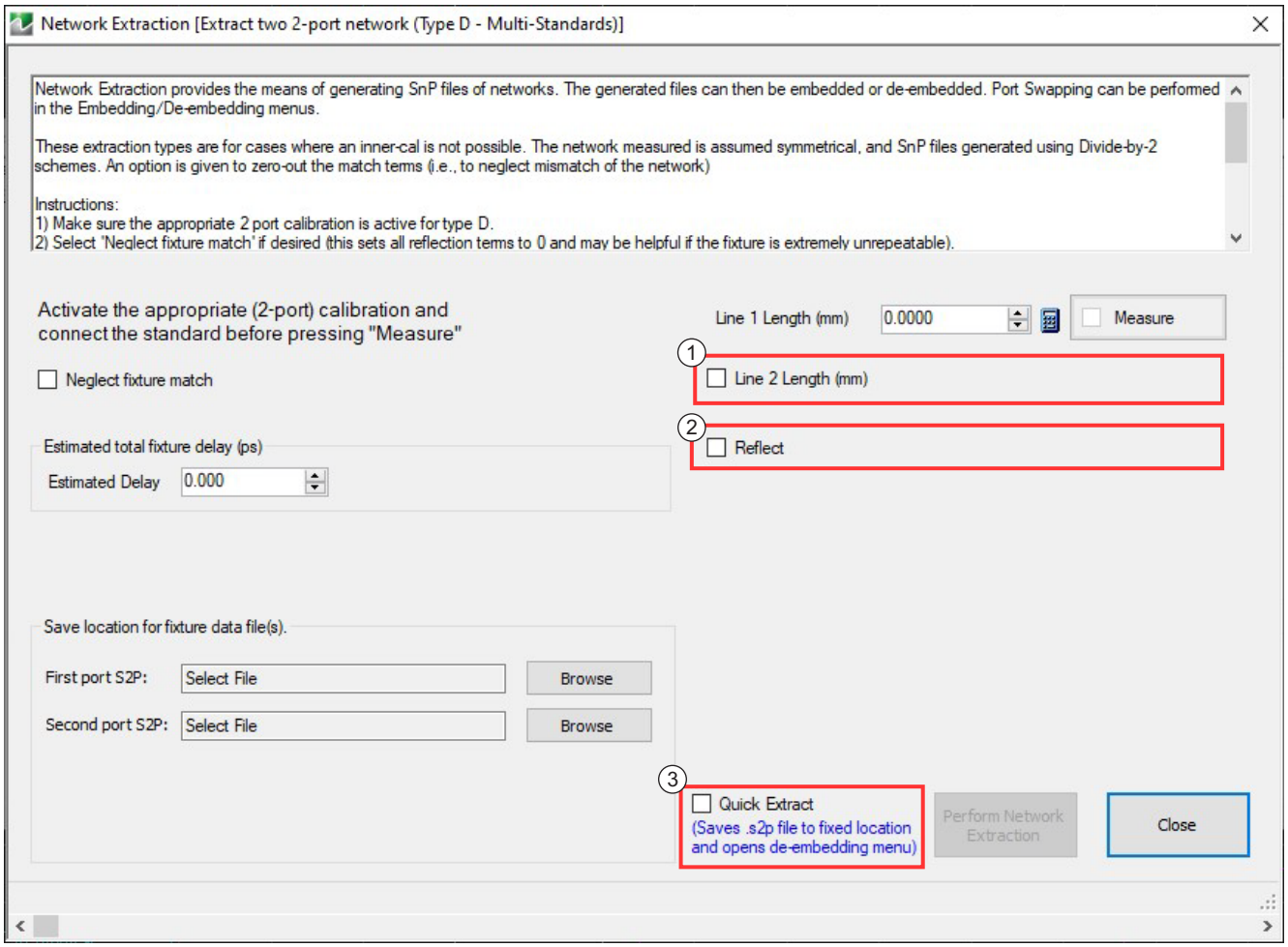
- Option 24 Universal Fixture Extraction installed
- A calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

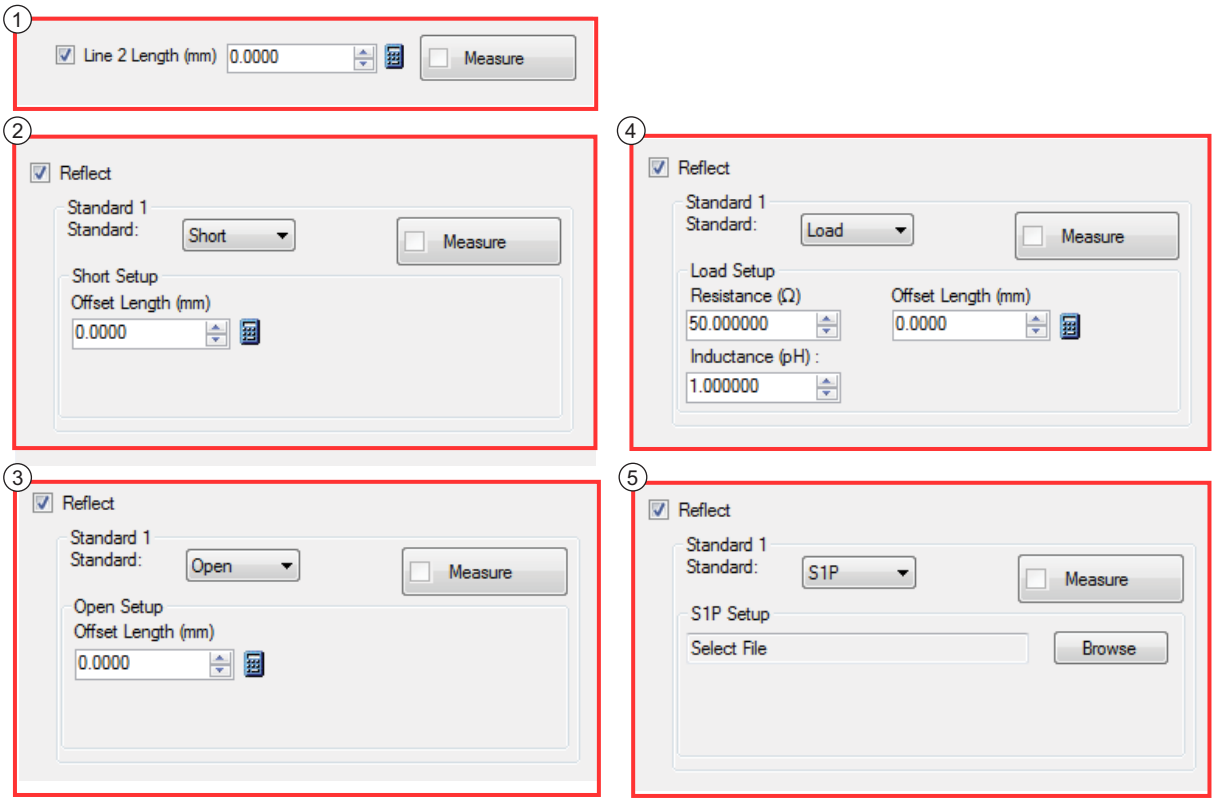
Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 Port Networks) Dialog Box | Extract Two 2-Port Networks – Type D – Multi-Standards | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORK (TYPE D – MULTI-STANDARDS)] Dialog Box



1. Checking **Line 2 Length** box opens entry area as shown in Figure 8-28.
2. Checking **Reflect** box opens various options related to Reflect as shown in Figure 8-28.
3. Checking **Quick Extract** saves .s2p file to a fixed location and loads DEEMBEDDING dialog (Figure 8-24).

Figure 8-27. NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards



1. Checking **Line 2 Length** box opens an area to adjust length.
2. Checking **Reflect** box and selecting **Short** from the drop-down opens the area as shown.
3. Checking **Reflect** box and selecting **Open** from the drop-down opens the area as shown.
4. Checking **Reflect** box and selecting **Load** from the drop-down opens the area as shown.
5. Checking **Reflect** box and selecting **S1P** from the drop-down opens the area as shown.

Figure 8-28. TYPE D – Multi Standards Dialog – Extraction Selections

Description

Network Extraction provides the means of generating .sNp files of networks. The generated files can then be embedded or de-embedded. Port Swapping can be performed in the Embedding/De-embedding menus.

Application

These extraction types are for cases where an inner-cal is not possible. The network measured is assumed symmetrical, and .sNp files generated using Divide-by-2 schemes. An option is given to neglect fixture match terms (i.e., to neglect mismatch of the network).

Instructions

1. Make sure the appropriate 2-port calibration is active for Type D.
2. Select Neglect fixture match if desired (this sets all reflection terms to 0 and may be helpful if the fixture is extremely unrepeatable).
3. Select the number of standards to be used and their definitions. Line 1 is always required.
4. Connect each standard (or standards in the case of Reflect; all ports must have the Reflect connected simultaneously) before pressing Measure.
5. Enter the file names and path where the output .s2p files will be stored. The Quick Extract option can be used instead: time stamped files will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files. Remember to keep track of available disk space.

6. When all fields have been entered and all standards measurements have been completed (all of the check boxes marked and the buttons turn green), press Perform Network Extraction. If successful, a confirmation dialog will appear.
7. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.
8. If Quick Extract was not selected, after the .s2p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s2p files and configure the network.

NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)

The NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized is only available with Option 24. For more information on Type D Phase-Localized network extraction, refer to the Measurement Guide (10410-00336).

Prerequisites

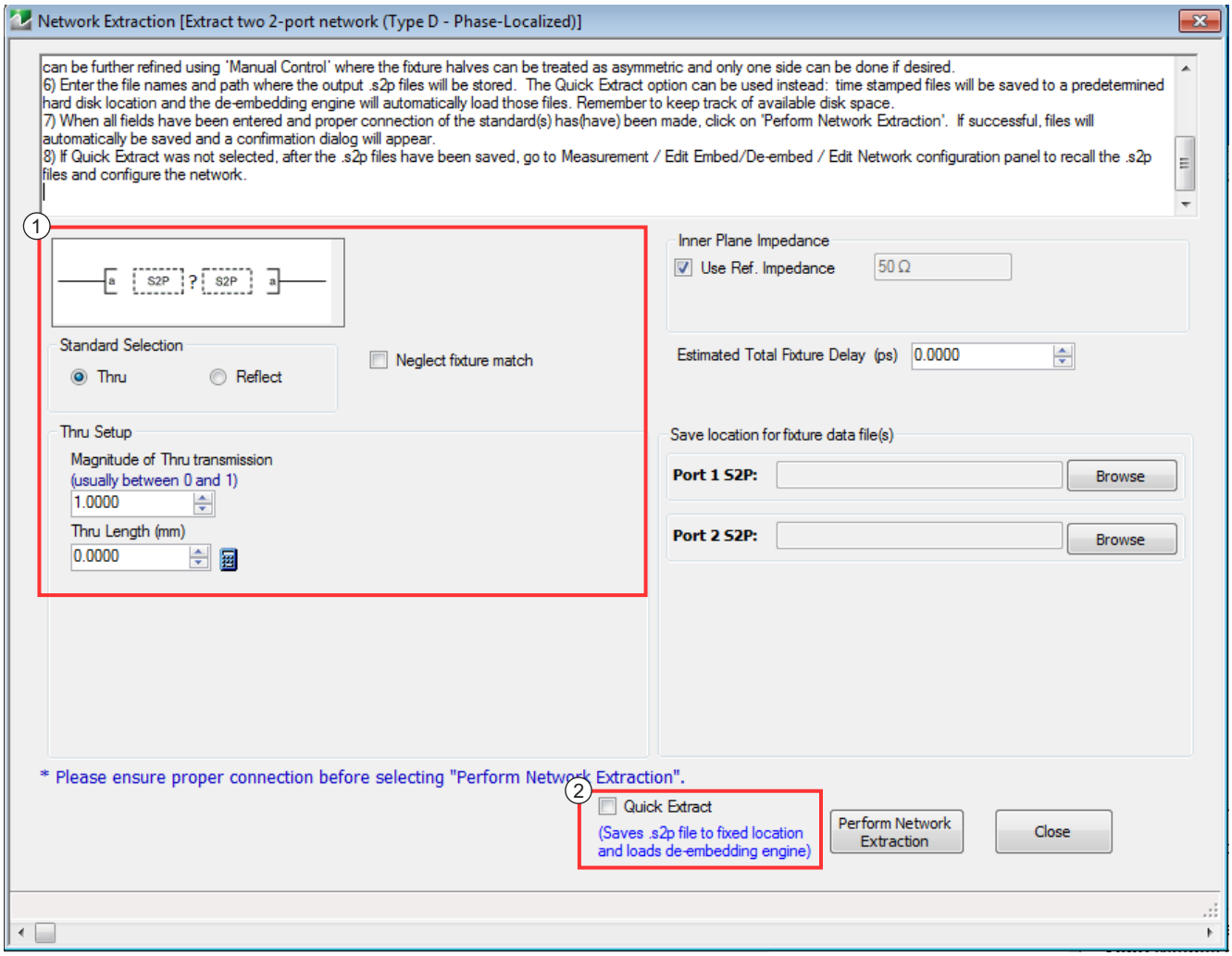
- Option 24 Universal Fixture Extraction installed
- A calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port VNAs (Option 24)" on page 8-27

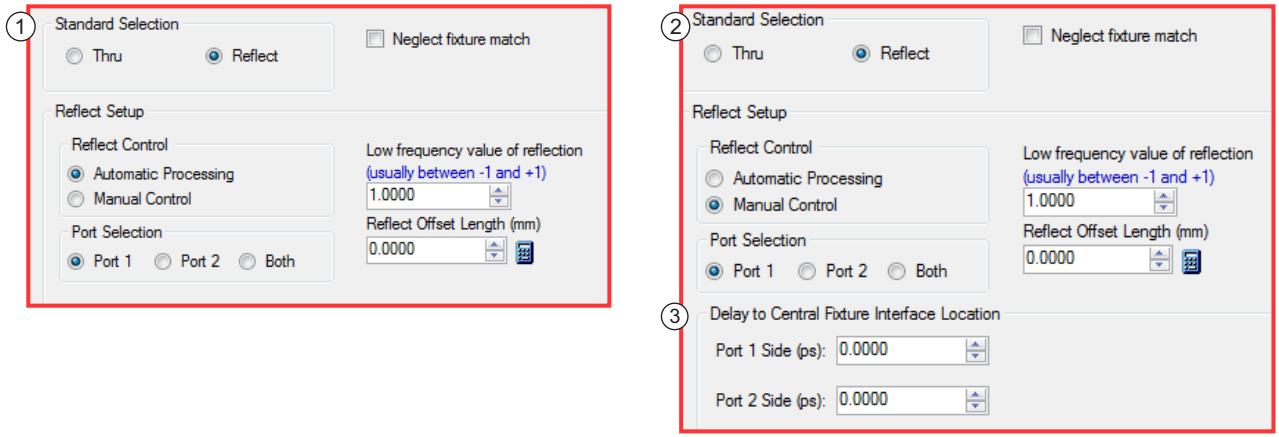
Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – 2 Port Networks | NETWORK EXTRACTION (2 Port Networks) Dialog Box | Extract Two 2-Port Networks | Phase-Localized | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORK – (Type D – PHASE-LOCALIZED)] Dialog Box



1. Default dialog settings shown with **Thru** selected. For **Reflect** variants of this dialog, see Figure 8-30 on page 8-41.
2. Checking **Quick Extract** saves .s2p file to a fixed location and loads DEEMBEDDING dialog (Figure 8-24).

Figure 8-29. NETWORK EXTRACTION Dialog – Type D – Phase-Localized with Thru Standard Selected



1. Checking **Reflect** and selecting **Automatic Processing** opens the area as shown.
2. Checking **Reflect** and selecting **Manual Control** opens the area as shown.
3. Note that when Manual Control is selected, the Delay to Central Fixture Interface Location is enabled.

Figure 8-30. TYPE D – Phase-Localized Dialog – Reflect Extraction Setup Variations

Description

This will construct .s2p files based on a thru or reflect measurement using a single fixture arm or a two-port fixture pair. Phase localization processing is used to aid the extraction.

To do this phase localization, the frequency list must be relatively uniform (no CW or log sweep and segmented sweep step sizes should not deviate more than 3% from the mean) and the range should be large enough that the total fixture length (ns)>5/(frequency range (GHz)). The frequency step should be small enough that the total fixture length (ns) < 0.3/(Frequency step (GHz)).

Instructions:

1. Make sure the appropriate 2-port calibration is active (a 1-port calibration is acceptable for a reflection-based extraction on a single-sided fixture).
2. Select Neglect fixture match if desired (this sets all reflection terms to 0 and may be helpful if the fixture is extremely unrepeatable).
3. Select the number of standards to be used and their definitions. Line 1 is always required.
4. Connect each standard (or standards in the case of Reflect; all ports must have the Reflect connected simultaneously) before pressing Measure.
5. Enter the file names where the output .s2p files will be stored. The Quick Extract option can be used instead; time-stamped files will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files. Remember to keep track of available disk space.
6. When all fields have been entered and all standard measurements have been completed, click on Perform Network Extraction. If successful, files will be saved and a confirmation dialog will appear.
7. If Quick Extract was not selected, after the .s2p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s2p files and configure the network.
8. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu.

SEQUENTIAL EXTRACTION Dialog Box (Option 24)

Sequential Extraction will construct a .s2p or .s4p file based on a localized model of an isolated defect (treated as lumped) created from the data on the selected parameter. This process can be used to sequentially de-embed and identify additional defects.

The SEQUENTIAL EXTRACTION dialog is only available with Option 24. For more information on Sequential Extraction with Option 24 installed, refer to the Measurement Guide (10410-00336).

Prerequisites

- Option 24 Universal Fixture Extraction installed

Previous

- "DEEMBED. TOOLS Menu" on page 8-25

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* – Sequential Extraction (Peeling) | SEQUENTIAL EXTRACTION (Peeling) Dialog Box

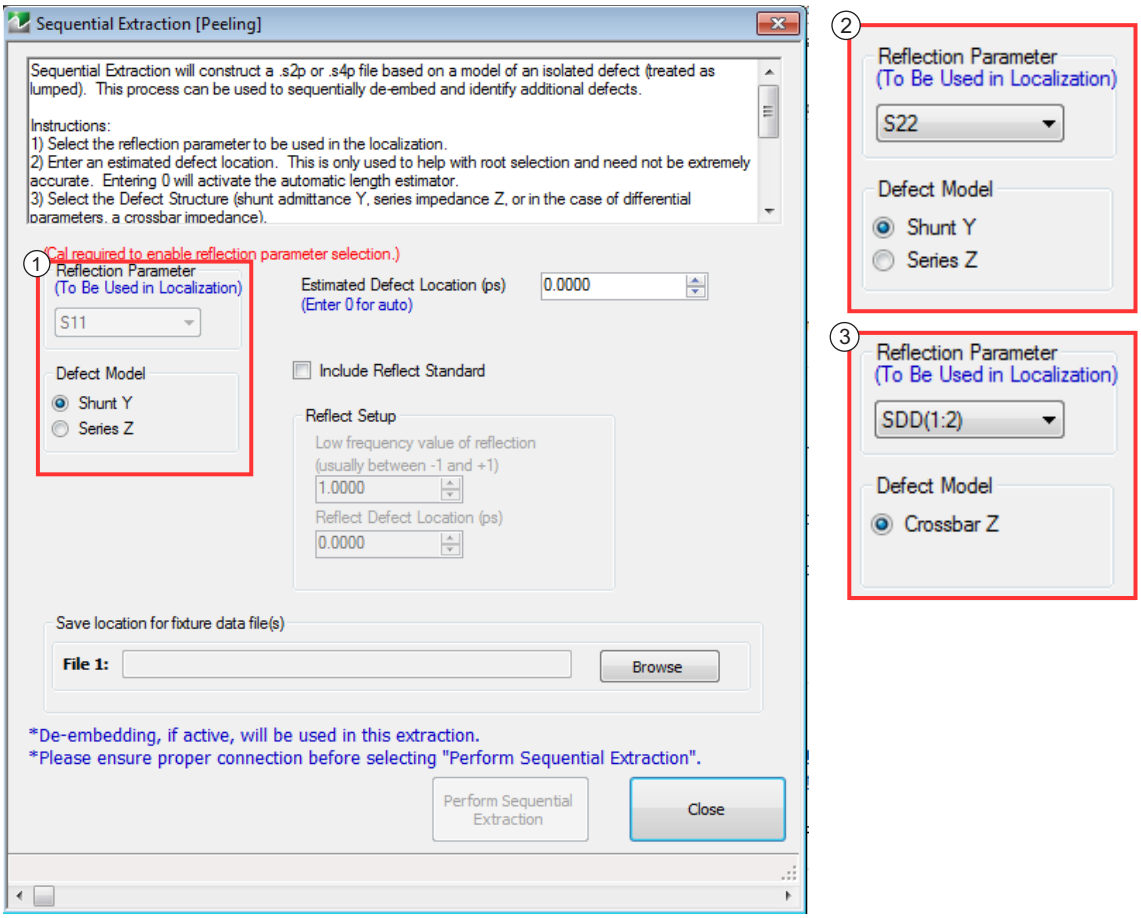


Figure 8-31. SEQUENTIAL EXTRACTION (Peeling) Dialog Box

Notes

- The Reflection Parameter selection is dynamic and will be based on active cal settings. ***Note:*** *If no active cal is in place or cal is off, the* Reflection Parameter *drop down list will be disabled with a note indicating a calibration requirement.*
- If the Reflection Parameter is switched between standard and mixed, the file name will be cleared. The Browse button on file name will bring up appropriate filter (.s2p or .s4p) based on current selected reflect parameter.
- When Perform Sequential Extraction is selected, measurement will be taken and the processing of the mixed mode will occur internally.

Instructions

1. Select the Reflection Parameter to be used in the localization. ***Note:*** *If no active cal is in place or cal is off, the* Reflection Parameter *drop down list will be disabled with a note indicating requirement.*
2. Enter an estimated defect location. This is only used to help with root selection and need not be extremely accurate. Entering 0 will activate the automatic length estimator.
3. Select the Defect Model (shunt admittance Y, series impedance Z, or in the case of differential parameters, a crossbar impedance).
4. Select Include Reflect Standard to include the reflect standard to help compensate for loss between the reference plane and the defect of interest. The location of the reflect standard should be entered (enter 0 for auto estimation; the largest response will be assumed to be the reflect standard, and if auto length is also used for the defect, the next larger and closer-in response will be assumed to be the defect). The reflection coefficient of the standard must be entered and is assumed to be real. Uncheck Include Reflect Standard to omit this correction.
5. When all fields have been entered and proper connection has been made, click on Perform Sequential Extraction.
6. After the extraction, the focus auto-returns to the "DEEMBED. TOOLS Menu" on page 8-25.

MANUAL ADAPTER REMOVAL Dialog Box

The MANUAL ADAPTER REMOVAL dialog box provides a process to extract the electrical behavior of an adapter after completion of a calibration procedure using different connectors at each end that are incompatible with the DUT configuration.

Previous

- "DEEMBED. TOOLS Menu" on page 8-25

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Options | CAL OPTIONS | Perform Manual Adapter Removal | MANUAL ADAPTER REMOVAL Dialog Box

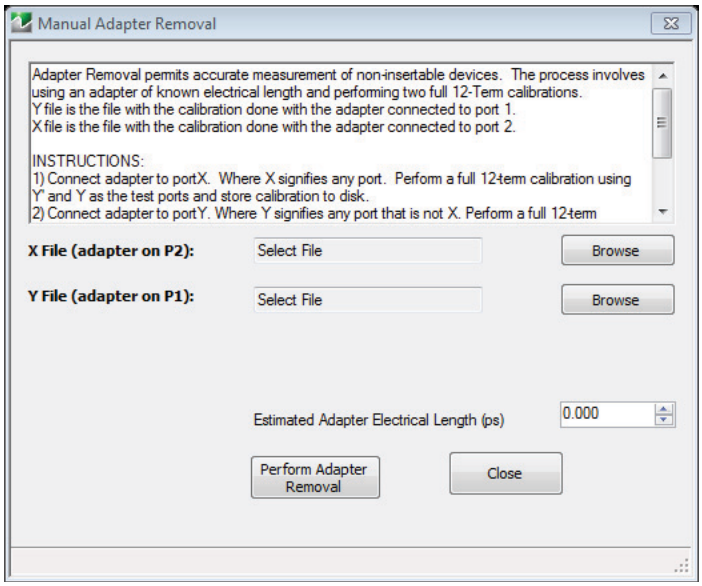


Figure 8-32. MANUAL ADAPTER REMOVAL Dialog Box

Instructions

Adapter removal permits accurate measurement of non-insertable devices. The process involves using an adapter of known electrical length and performing two full 12-term calibrations. In the procedure below:

- The Y file is the file with the calibration when the adapter connected to Port 1.
- The X file is the file with the calibration when the adapter connected to Port 2

Procedure

1. Connect the adapter to port X, where X signifies any port. Perform a full 12-term (Full 2 Port) calibration using Y' and Y as the test ports and store the calibration to disk.
2. Connect the adapter to port Y, where Y signifies any port that is not X. Perform a full 12-term calibration using X and X' as the test ports and store calibration to disk.
3. Call up the X and Y files.
4. Input the estimated adapter electrical length.
5. Select Perform Adapter Removal to remove adapter.

THRU CHARACTERIZATION Dialog Box

The THRU CHARACTERIZATION dialog box provides a process to characterize an unknown Thru standard. Two 1-port calibrations are performed, one at the VNA port and one at the end of the unknown Thru. A network extraction is performed to create an s2p file characterizing the unknown thru. This s2p file can then be used in an SOLT/SOLR calibration.

Previous

- "CAL OPTIONS Menu" on page 8-21

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Options | CAL OPTIONS | Thru Characterization | THRU CHARACTERIZATOIN Dialog Box

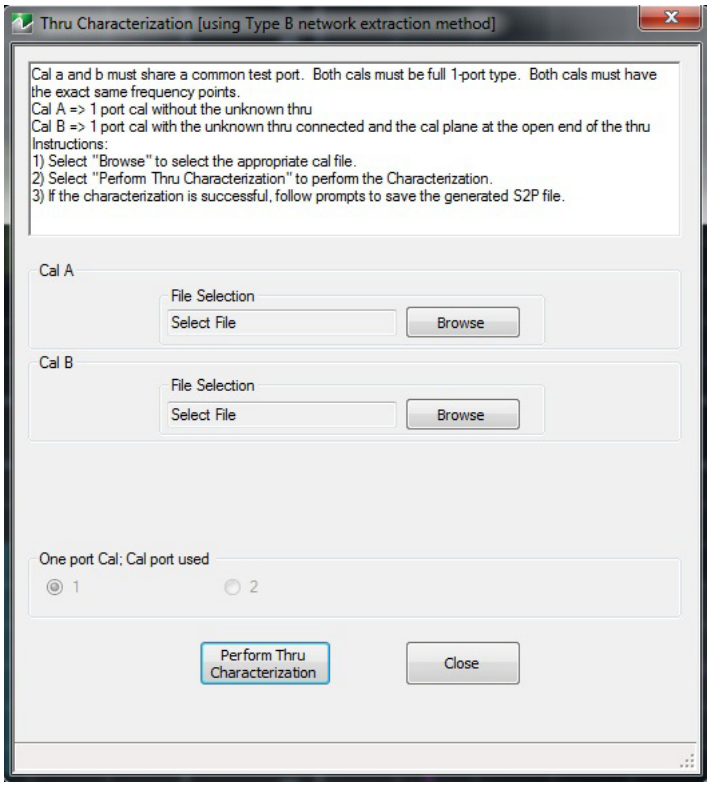


Figure 8-33. THRU CHARACTERIZATION Dialog Box

Thru Characterization

Cal a and b must share a common test port. Both cals must be full 1-port type. Both cals must have the exact same frequency points.

Cal A => 1 port cal without the unknown thru

Cal B => 1 port cal with the unknown thru connected and the cal plane at the open end of the thru

Instructions:

1. Select Browse to select the appropriate cal file.
2. Select Perform Thru Characterization to perform the characterization.
3. If the characterization is successful, follow prompts to save the generated S2P file.

8-5 AutoCal or SmartCal Port Selection Setup (2-Port VNAs)

AUTOCAL/SMARTCAL Menu

Use the AUTOCAL/SMARTCAL menu to define whether the AutoCal or SmartCal™ calibration procedure will be a two-port calibration or a one-port calibration.

Note	To use the 36585 Series AutoCal with ShockLine VNAs, a serial to USB converter (Anritsu part number 2000-1809-R USB to Serial adapter) must be employed to enable communication between the autocal unit and the VNA. The proper comm port will need to be selected once the adapter has been installed.

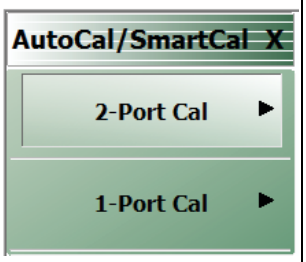
Previous

- "CALIBRATE Menu" on page 8-8

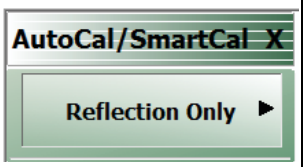
Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL

2-Port VNAs



1-Port VNAs



2-Port Cal (2-Port VNAs)

Sets the AutoCal or SmartCal calibration function for 2-Port VNAs to a 2-port method and displays the AUTOCAL (or SMARTCAL) SETUP (2-port cal) menu.

- "SMARTCAL SETUP Menu — 2-Port Cal (2-Port VNAs)" on page 8-47
- "AUTOCAL SETUP Menu — 2-Port Cal (2-Port VNAs)" on page 8-52

1-Port Cal (2-Port VNAs)

Sets the AutoCal or SmartCal calibration function for 2-Port VNAs to a 1-port method and displays the AUTOCAL (or SMARTCAL) SETUP (1-port cal) menu.

- "SMARTCAL SETUP Menu — 1-Port Cal (2-Port VNAs)" on page 8-57
- "AUTOCAL SETUP Menu — 1-Port Cal (2-Port VNAs)" on page 8-61

Reflection Only (1-Port VNAs)

Sets the AutoCal or SmartCal calibration function for 1-Port VNAs to the Reflection Only method and displays the AUTOCAL (or SMARTCAL) SETUP (1-port cal) menu.

- "SMARTCAL SETUP Menu — 1-Port Cal (1-Port VNAs)" on page 8-64
- "AUTOCAL SETUP Menu — 1-Port Cal (1-Port VNAs)" on page 8-67

Figure 8-34. AUTOCAL (Port Selection) Menu

8-6 SmartCal 2-Port Cal Setup — 2-Port VNAs

SMARTCAL SETUP Menu — 2-Port Cal (2-Port VNAs)

Note	This menu applies to the SmartCal 2- and 4-port calibration modules. If you are using an AutoCal calibration module, select Modify Cal Setup and then select AutoCal in the MODIFY 2-PORT SMARTCAL SETUP dialog box.

Instrument Mode

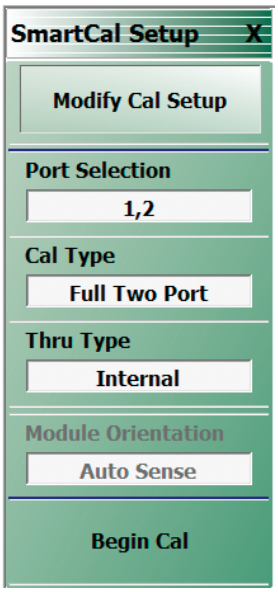
- 2-Port VNA Mode

Previous

- "AUTOCAL/SMARTCAL Menu" on page 8-46
- "MODIFY 2-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-54

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 2-Port Cal | SMARTCAL SETUP



Modify Cal Setup

Select displays the MODIFY 2-PORT SMARTCAL SETUP dialog box. The dialog box provides control settings for Port Selection, Cal Type, Through Setup, Adapter Removal, Module Orientation, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-49

Port Selection (Read Only)

Displays the Ports selected for the SmartCal procedure. The settings are determined in the MODIFY 2-PORT SMARTCAL SETUP dialog box.

Cal Type (Read Only)

Displays the Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY 2-PORT SMARTCAL SETUP dialog box.

Thru Type (Read Only)

Displays the Thru Type selected for the SmartCal procedure as either Internal Thru or True Thru. The settings are determined in the MODIFY 2-PORT SMARTCAL SETUP dialog box. See "THRU INFO Dialog Box" on page 8-150.

Adapter Starting Position (for Adapter Removal Only) (Read Only)

Displays the Adapter Starting Position selected for the SmartCal procedure. This setting is only available if the Cal Type is Adapter Removal. The settings are determined in the MODIFY 2-PORT SMARTCAL SETUP dialog box.

(continued)

Figure 8-35. SMARTCAL 2-PORT CAL SETUP Menu (1 of 2)

	Module Orientation (Read Only) Displays the left/right VNA Port orientation and assignment for the SmartCal procedure. Options are either Left=P1, Right =P1 or Left=P2, Right=P1. The settings are determined in the MODIFY 2-PORT SMARTCAL SETUP dialog box. **Begin Cal** Starts the SmartCal procedure. On-screen dialogs and prompts provide user instructions for the selected calibration procedure. When the calibration is complete, the display returns to the CALIBRATION [TR] menu where the Cal Status button is enabled and set to ON. • "CALIBRATION [TR] Menu" on page 8-6

Figure 8-35. SMARTCAL 2-PORT CAL SETUP Menu (2 of 2)

MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)

Use the MODIFY 2-PORT SMARTCAL SETUP dialog box to change the calibration parameters prior to a SmartCal calibration procedure. Options include the calibration and thru types to be used. If required, an adapter removal calibration can be configured. For production installations, the port sense can be automatically or manually configured.

Previous

- "SMARTCAL SETUP Menu — 2-Port Cal (2-Port VNAs)" on page 8-47

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 2-Port Cal | SMARTCAL SETUP | Modify Cal Setup | MODIFY 2-PORT SMARTCAL SETUP Dialog Box

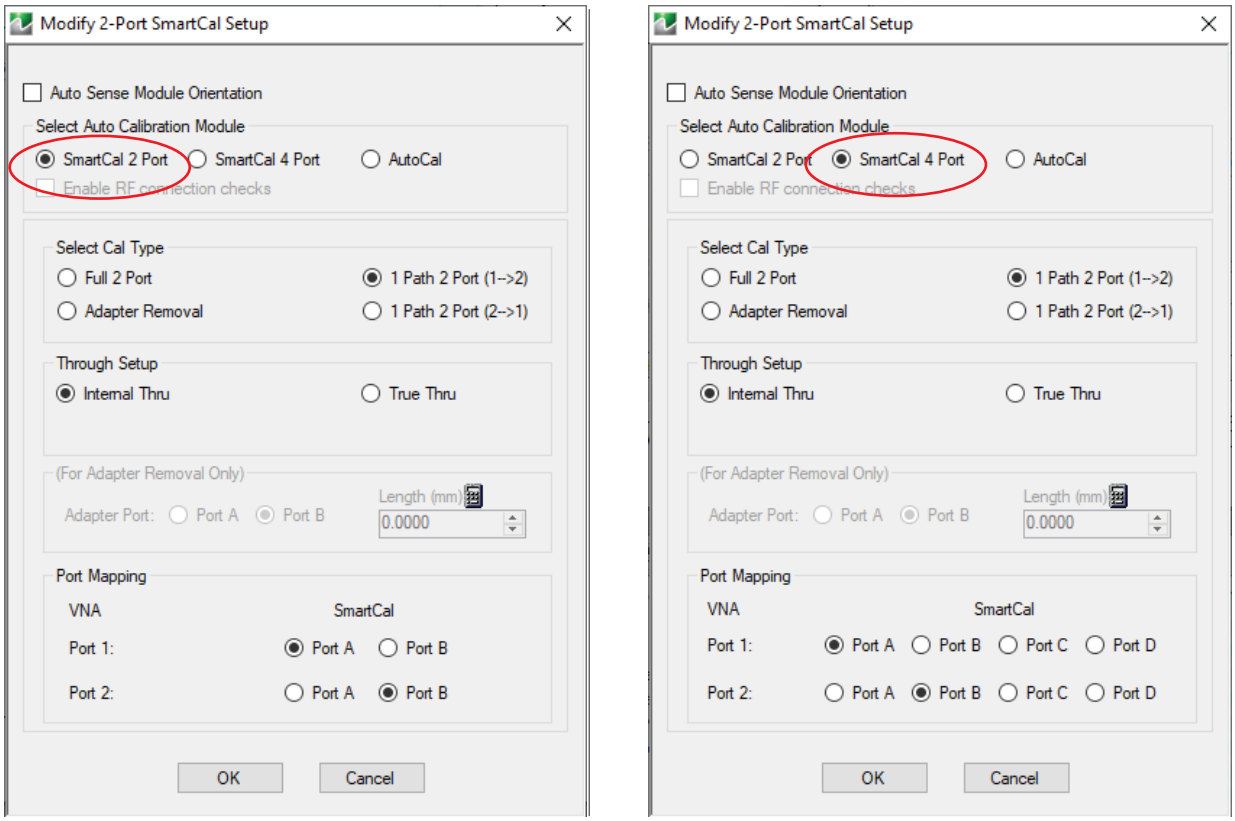


Figure 8-36. MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port/4-Port SMARTCAL Calibration Modules)

Note	For 2-Port AutoCal dialog box descriptions, see "MODIFY 2-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-54.

Auto Sense Module Orientation Check Box

- If selected, the SmartCal Module determines the Port A/B (or Port A/B/C/D for SmartCal 4-port calibration modules) assignments.
- If not selected, manual port assignment is available in the Port Mapping section of the dialog box. The user can select a radio button to assign ports A or B (or Port A, B, C, or D for SmartCal 4-port calibration modules).

Select Auto Calibration Module

Select the appropriate calibration module using the provided radio buttons.

Enable RF connection checks: Only available for AutoCal. Disabled for 1-port autocals, as well as Smartcal 2-port and 4-port calibrations.

Select Cal Type Area

Select one of the following using the provided radio buttons:

- Full 2 Port
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area is unavailable.
- Adapter Removal
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area becomes available.
- 1 Path 2 Port (1–>2)
  - When selected, the Through Setup area becomes available
  - When selected, the For Adapter Removal Only area is unavailable.
- 1 Path 2 Port (2–>1)
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area is unavailable.

Through Setup Area

This area is available for all SmartCal Types. The button selection options are:

- Internal Thru
  - If selected, the SmartCal module uses internal circuitry to determine the through values.
  - The Thru Info button is unavailable.
- True Thru
  - If selected, the SmartCal module will prompt the user to remove the module and connect the ports with a through line.
  - If selected, the Thru Info button becomes available. When clicked, the THRU INFO dialog box appears and allows input of values for Thru Length, Thru Line Impedance, Thru Line Loss, and Thru Frequency Setting. See "THRU INFO Dialog Box" on page 8-150.
    - In the Thru Line Length field, enter the line length in mm. For example, enter a value of 30 mm.
    - In the Line Impedance field, enter the impedance in ohms. For example, use the default value of 50 ohms.
    - In the Line Loss field, enter the loss as dB per mm. For example, enter a value of 0.1 dB/mm.
    - In the @ Frequency field, enter the working frequency in GHz. For example, enter a value of 45 GHz.
    - When all entries are complete, click OK to return to the MODIFY 2-PORT AUTOCAL SETUP dialog box.

For Adapter Removal Only Area

This area is only available if Adapter Removal button is+ selected in the Select Cal Type area above. The adapter removal controls are:

- Adapter Port Select Radio Buttons
  - Port A
  - Port B

- Adapter Length (mm) Field

  Available as either a direct entry field or using the dialog box below to calculate the parameters.

  - To use the calculator dialog, click the Calculator icon.
  - The AIR EQUIVALENT LENGTH CONVERSION dialog box appears. Entries can be typed in, or incremented by clicking the field up/down arrows or by pressing the keyboard up/down arrow keys.
    - Enter the adapter length in ps. For example, enter a length of 100 ps.
    - Enter the adapter dielectric constant. For example, enter a dielectric constant for polyethylene of 2.26.
    - Click the Calculate Air Equivalent Length button.
    - The air equivalent length in mm is: 9.9778515... or 9.9779.
    - Click OK and the result appears in the For Adapter Removal Only Length field.
    - See "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147.)

Port Mapping Area

This area is only available if the Auto Sense Module Orientation check box at the top of the dialog box is deselected.

- If the Auto Sense check box is selected, the Port A/B (or Port A/B/C/D for SmartCal 4-port calibration modules) buttons at the bottom of the dialog box are unavailable. The instrument identifies the Port A / Port B and directs the user to the appropriate port.
- If the Auto Sense check box is deselected, the Port A/B (or Port A/B/C/D for SmartCal 4-port calibration modules) buttons at the bottom of the dialog box are available. The user defines which port is "Port A" and which port is "Port B", etc. This is especially useful if the instrument is oriented differently from the work environment. Options for SmartCal 2-port calibration modules sare:
  - Port 1=Port A, Port 2=Port B
  - Port 1=Port B, Port 2=Port A

    or for SmartCal 4-port calibration modules:
  - Port 1=Port A, Port 2=Port B/C/D
  - Port 1=Port B, Port 2=Port A/C/D
  - Port 1=Port C, Port 2=Port A/B/D
  - Port 1=Port D, Port 2=Port A/B/C

Completing SmartCal Setup

When all SmartCal Setup functions are completed, click OK to return to the SMARTCAL SETUP menu. Click Cancel to make no changes and close the dialog box.

8-7 AutoCal 2-Port Cal Setup — 2-Port VNAs

AUTOCAL SETUP Menu — 2-Port Cal (2-Port VNAs)

Note	This menu applies to the AutoCal calibration module. If you are using a SmartCal 2- or 4-port calibration module, select Modify Cal Setup and then select the appropriate SmartCal calibration module in the MODIFY 2-PORT AUTOCAL SETUP dialog box.

Instrument Mode

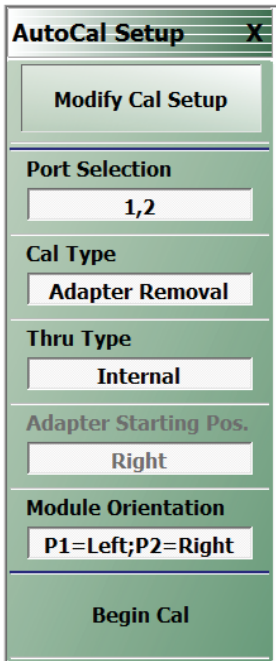
- 2-Port VNA Mode

Previous

- "AUTOCAL/SMARTCAL Menu" on page 8-46
- "MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-59

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 2-Port Cal | AUTOCAL SETUP



Modify Cal Setup

Select displays the MODIFY 2-PORT AUTOCAL SETUP dialog box. The dialog box provides control settings for Port Selection, Cal Type, Through Setup, Adapter Removal, Module Orientation, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-49

Port Selection (Read Only)

Displays the Ports selected for the AutoCal procedure. The settings are determined in the MODIFY 2-PORT AUTOCALSETUP dialog boxes.

Cal Type (Read Only)

Displays the Cal Type selected for the AutoCal procedure. The settings are determined in the MODIFY 2-PORT AUTOCAL SETUP dialog box.

Thru Type (Read Only)

Displays the Thru Type selected for the AutoCal procedure as either Internal Thru or True Thru. The settings are determined in the MODIFY 2-PORT AUTOCAL SETUP dialog box.

Adapter Starting Pos. (for Adapter Removal Only) (Read Only)

Displays the Adapter Starting Position selected for the AutoCal procedure. This setting is only available if the Cal Type is Adapter Removal. The settings are determined in the MODIFY 2-PORT AUTOCAL SETUP dialog box.

Figure 8-37. AUTOCAL 2-PORT CAL SETUP Menu (1 of 2)

	Module Orientation (Read Only) Displays the left/right VNA Port orientation and assignment for the AutoCal procedure. Options are either Left=P1, Right =P1 or Left=P2, Right=P1. The settings are determined in the MODIFY 2-PORT AUTOCAL SETUP dialog box. **Begin Cal** Starts the AutoCal procedure. On-screen dialogs and prompts provide user instructions for the selected calibration procedure. When the calibration is complete, the display returns to the CALIBRATION [TR] menu where the Cal Status button is enabled and set to ON. • "CALIBRATION [TR] Menu" on page 8-6

Figure 8-37. AUTOCAL 2-PORT CAL SETUP Menu (2 of 2)

MODIFY 2-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)

Use the MODIFY 2-PORT AUTOCAL SETUP dialog box to change the calibration parameters prior to an AutoCal calibration procedure. Options include the calibration and thru types to be used. If required, an adapter removal calibration can be configured. For production installations, the left/right port sense can be automatically or manually configured.

Previous

- "AUTOCAL SETUP Menu — 2-Port Cal (2-Port VNAs)" on page 8-52

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 2-Port Cal | AUTOCAL SETUP | Modify Cal Setup | MODIFY 2-PORT AUTOCAL SETUP Dialog Box

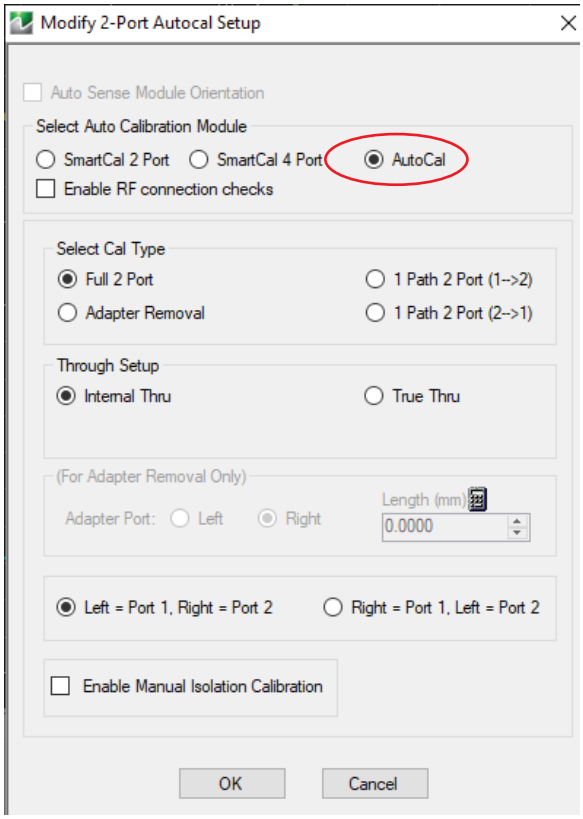


Figure 8-38. MODIFY 2-PORT AUTOCAL SETUP Dialog Box

Note	For 2-Port SmartCal dialog box descriptions, see "MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-49.

Auto Sense Module Orientation Check Box

- Not available for AutoCal.

Select Auto Calibration Module

Select the appropriate calibration module using the provided radio buttons.

Enable RF connection checks: Checks if the connections are correct during the autocal steps and notifies the user in case of invalid connections. Only available for AutoCal. Disabled for 1-port autocals, as well as Smartcal 2-port and 4-port calibrations.

Select Cal Type Area

Select one of the following using the provided radio buttons:

- Full 2 Port
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area is unavailable.
- Adapter Removal
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area becomes available.
- 1 Path 2 Port (1–>2)
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area is unavailable.
- 1 Path 2 Port (2–>1)
  - When selected, the Through Setup area becomes available.
  - When selected, the For Adapter Removal Only area is unavailable.

Through Setup Area

This area is available for all AutoCal types. The button selection options are:

- Internal Thru
  - If selected, the AutoCal module uses internal circuitry to determine the through values.
  - The Thru Info button is unavailable.
- True Thru
  - If selected, the AutoCal module will prompt the user to remove the module and connect the ports with a through line.
  - If selected, the Thru Info button becomes available. When clicked, the THRU INFO dialog box appears and allows input of values for Thru Length, Thru Line Impedance, Thru Line Loss, and Thru Frequency Setting. (See "THRU INFO Dialog Box" on page 8-150.)
    - In the Thru Line Length field, enter the line length in mm. For example, enter a value of 30 mm.
    - In the Line Impedance field, enter the impedance in ohms. For example, use the default value of 50 ohms.
    - In the Line Loss field, enter the loss as dB per mm. For example, enter a value of 0.1 dB/mm.
    - In the @ Frequency field, enter the working frequency in GHz. For example, enter a value of 45 GHz.
    - When all entries are complete, click OK to return to the Modify 2-Port AutoCal Setup dialog box.

For Adapter Removal Only Area

This area is only available if Adapter Removal button was selected in the Select Cal Type area above. The adapter removal controls are:

- Adapter Port Select Radio Buttons
  - Left

    - Right
- Adapter Length (mm) Field

  Available as either a direct entry field or using the dialog box below to calculate the parameters.

    - To use the calculator dialog, click the Calculator icon. The AIR EQUIVALENT LENGTH CONVERSION dialog box appears. Entries can be typed in, or incremented by clicking the field up/down arrows or by pressing the keyboard up/down arrow keys.
        - Enter the adapter length in ps. For example, enter a length of 100 ps.
        - Enter the adapter dielectric constant. For example, enter a dielectric constant for polyethylene of 2.26.
        - Click the Calculate Air Equivalent Length button.
        - The air equivalent length in mm is: 9.9778515... or 9.9779.
        - Click OK and the result appears in the For Adapter Removal Only Length field.
        - See "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147.

Manual Port Orientation Area

- The user defines which port is "Left" and which port is "Right". This is especially useful if the instrument is oriented differently from the work environment. Options are:
    - Left = Port 1, Right = Port 2
    - Right = Port 1, Left = Port 2

Completing AutoCal Setup

When all AutoCal Setup functions are completed, click OK to return to the AUTOCAL SETUP menu. Click Cancel to make no changes and close the dialog box.

8-8 SmartCal 1-Port Cal Setup — 2-Port VNAs

SMARTCAL SETUP Menu — 1-Port Cal (2-Port VNAs)

Note	This menu applies to the SmartCal 2- or 4-port calibration module. If you are using an AutoCal calibration module, select Modify Cal Setup and then select the AutoCal calibration module in the MODIFY 1-PORT SMARTCAL SETUP dialog box.

Instrument Mode

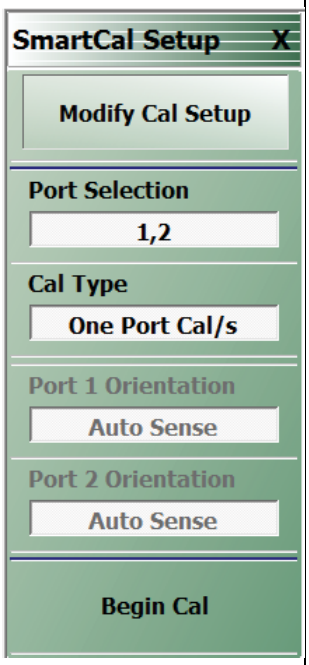
- 2-Port VNA Mode

Previous

- "AUTOCAL/SMARTCAL Menu" on page 8-46
- "MODIFY 1-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-62

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-Port Cal | SMARTCAL SETUP



Modify Cal Setup

Select displays the MODIFY 1-PORT SMARTCAL SETUP dialog box. The dialog box provides control settings for Port Selection, Cal Type, and Port Orientation.

- "MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-59

Port Selection (Read Only)

Displays the Ports selected for the AutoCal procedure. The settings are determined in the MODIFY 1-PORT SMARTCAL SETUP dialog box.

Cal Type (Read Only)

Displays the Cal Type selected for the AutoCal procedure. The settings are determined in the MODIFY 1-PORT SMARTCAL SETUP dialog box.

Port 1 Orientation (Read Only)

This read-only button only appears if Port 1 was selected in the MODIFY 1-PORT SMARTCAL SETUP dialog box. If available, shows the Port A / Port B (or Port A/B/C/D for SmartCal 4-Port calibration module) assignment for Port 1.

Port 2 Orientation (Read Only)

This read-only button only appears if Port 2 was selected in the MODIFY 1-PORT SMARTCAL SETUP dialog box. If available, shows the Port A / Port B (or Port A/B/C/D for SmartCal 4-Port calibration module) assignment for Port 2.

Figure 8-39. SMARTCAL 1-PORT CAL SETUP Menu (1 of 2)

	Begin Cal Starts the SmartCal procedure. On-screen dialogs and prompts provide user instructions for the selected calibration procedure. When the calibration is complete, the display returns to the CALIBRATION [TR] menu when the Cal Status button is enabled and set to ON. • "CALIBRATION [TR] Menu" on page 8-6

Figure 8-39. SMARTCAL 1-PORT CAL SETUP Menu (2 of 2)

MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)

Use the MODIFY 1-PORT SMARTCAL SETUP dialog box to change the calibration parameters prior to a SmartCal calibration procedure. For production installations, the port sense can be automatically or manually configured.

Previous

- "SMARTCAL SETUP Menu — 1-Port Cal (2-Port VNAs)" on page 8-57

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-Port Cal |SMARTCAL SETUP | Modify Cal Setup | MODIFY 1-PORT SMARTCAL SETUP Dialog Box

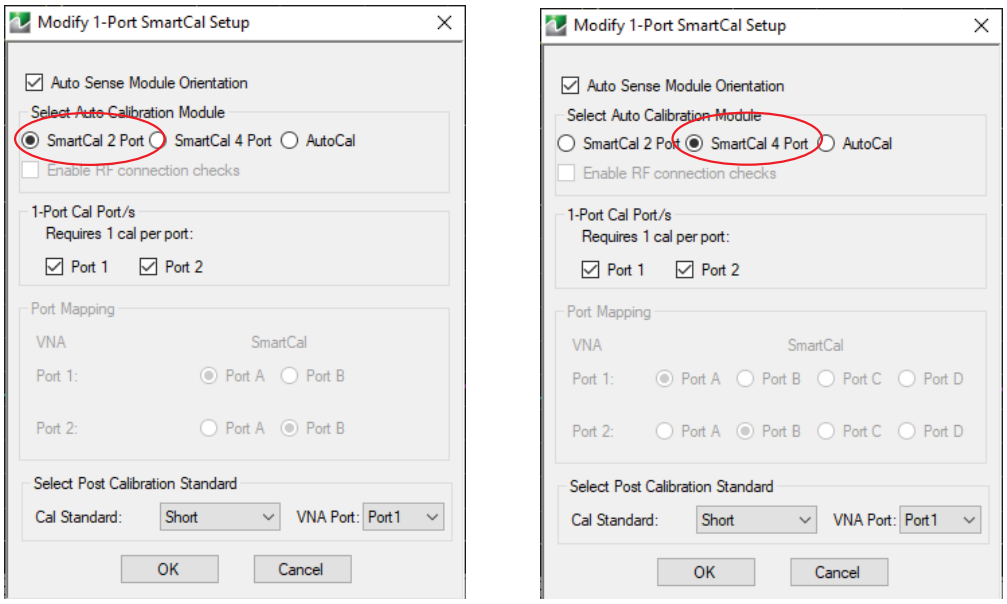


Figure 8-40. MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port/4-Port SMARTCAL Calibration Modules)

Note	For 1-Port AutoCal dialog box descriptions, see "MODIFY 1-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-62.

Auto Sense Module Orientation Check Box

- If selected, the SmartCal Module determines the Port A/B (or Port A/B/C/D for SmartCal 4-port calibration modules) assignments.
- If not selected, manual port assignment is available in the Port Mapping section of the dialog box. The user can select a radio button to assign ports A or B (or Port A, B, C, or D for SmartCal 4-port calibration modules).

Select Auto Calibration Module

Select the appropriate calibration module using the provided radio buttons.

Only available for AutoCal. Disabled for 1-port autocals, as well as Smartcal 2-port and 4-port calibrations.

1-Port Cal Port/s Area

Select either one or both of the available ports. Ports will be automatically mapped depending on the choice for one port cal or both.

- Port 1 Only
  - If selected, the Port 1 SmartCal Port Mapping area is available.
- Port 1 and Port 2
  - If selected, the Port 1 SmartCal Port Mapping and Port 2 SmartCal Port Mapping areas are available.
- Port 2 Only
  - If selected, the Port 2 SmartCal Port Mapping area is available.

Port Mapping Area

This area is only available if the Auto Sense Module Orientation check box at the top of the dialog box is deselected.

- If the Auto Sense check box is selected, the Port A / Port B (or Port A/B/C/D for SmartCal 4-Port calibration module) buttons at the bottom of the dialog box are unavailable. The instrument identifies the Port A / Port B and directs the user to the appropriate port.
- If the Auto Sense check box is deselected, the Port A / Port B (or Port A/B/C/D for SmartCal 4-Port calibration module) buttons at the bottom of the dialog box are available. The user defines which port is "Port A" and which port is "Port B". This is especially useful if the instrument is oriented differently from the work environment. For the SmartCal 2-Port calibration module, the options are:
  - Port 1=Port A, Port 2=Port B
  - Port 1=Port B, Port 2=Port A

Select Post Calibration Standard

This allows the user to change the Calibration Standard that is set by a VNA Port attached to a selected SmartCal port. All other ports on the SmartCal device are automatically set to Load Calibration Standard by hardware.

- Cal Standard – Drop-down menu list provides the Calibration Standard selections:
  - Open
  - Short
  - Load
  - Thru

Completing SmartCal Setup

When all SmartCal Setup functions are completed, click OK to return to the SMARTCAL SETUP menu. Click Cancel to make no changes and close the dialog box.

8-9 AutoCal 1-Port Cal Setup — 2-Port VNAs

AUTOCAL SETUP Menu — 1-Port Cal (2-Port VNAs)

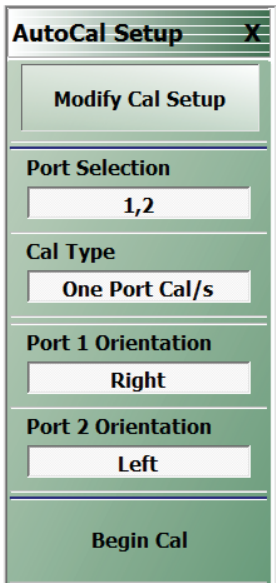
Note	This menu applies to the AutoCal calibration module. If you are using a SmartCal 2- or 4-port calibration module, select Modify Cal Setup and then select the appropriate SmartCal calibration module in the MODIFY 1-PORT AUTOCAL SETUP dialog box.

Previous

- "AUTOCAL/SMARTCAL Menu" on page 8-46
- "MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-59

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-PORT CAL | 1-Port Cal | AUTOCAL SETUP



Modify Cal Setup

Select displays the MODIFY 1-PORT AUTOCAL SETUP dialog box. The dialog box provides control settings for Port Selection, Cal Type, and Port Orientation.

- "MODIFY 1-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-62

Port Selection (Read Only)

Displays the Port or Ports selected for the AutoCal procedure. The settings are determined in the MODIFY 1-PORT AUTOCAL SETUP dialog box.

Cal Type (Read Only)

Displays the Cal Type selected for the AutoCal procedure. The setting is defined in the MODIFY 1-PORT AUTOCAL SETUP dialog box menu.

Port 1 Orientation (Read Only)

This read-only button only appears if Port 1 was selected in the MODIFY 1-PORT AUTOCAL SETUP dialog box. If available, shows the right/left assignment for Port 1. The setting is defined in the MODIFY 1-PORT AUTOCAL SETUP dialog box.

Port 2 Orientation (Read Only)

This read-only button only appears if Port 2 was selected in the MODIFY 1-PORT AUTOCAL SETUP dialog box. If available, shows the right/left assignment for Port 2. The setting is defined in the MODIFY 1-PORT AUTOCAL SETUP dialog box.

Begin Cal

Starts the AutoCal procedure. On-screen dialogs and prompts provide user instructions for the selected calibration procedure. When the calibration is complete, the display returns to the CALIBRATION [TR] menu when the Cal Status button is enabled and set to ON.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-41. AUTOCAL SETUP Menu – One-Port Calibration

MODIFY 1-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)

Use the MODIFY 1-PORT AUTOCAL SETUP dialog box to change the calibration parameters prior to an AutoCal calibration procedure. For production installations, the left/right port sense can be manually configured.

Previous

- "AUTOCAL SETUP Menu — 1-Port Cal (2-Port VNAs)" on page 8-61

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-Port Cal | AUTOCAL SETUP | Modify Cal Setup | MODIFY 1-PORT AUTOCAL SETUP Dialog Box

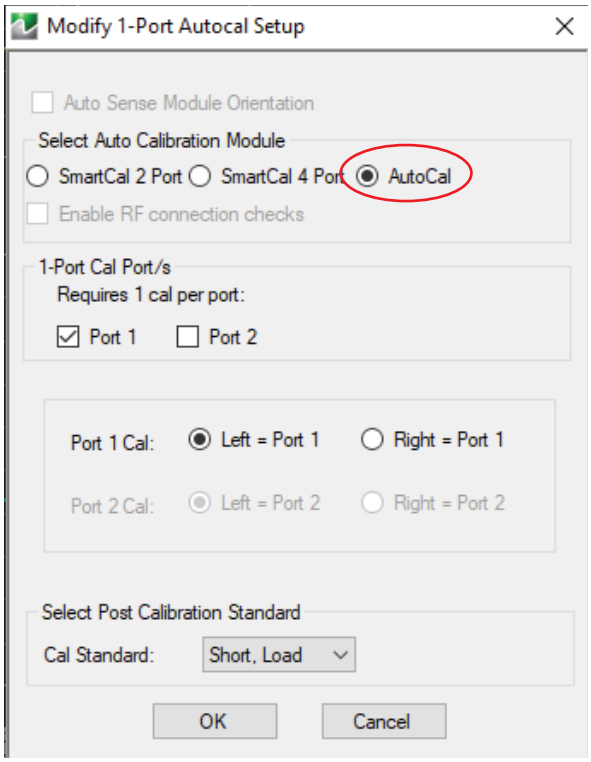


Figure 8-42. MODIFY 1-PORT AUTOCAL SETUP Dialog Box — MS46x22AB

Note	For 1-Port SmartCal dialog box descriptions see, "MODIFY 1-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-59.

Auto Sense Cal Port(s)

The Auto Sense selection check box is not available in AutoCal 1-Port.

Select Auto Calibration Module

Select the appropriate calibration module using the provided radio buttons.

Disabled for 1-port autocals, as well as Smartcal 2-port and 4-port calibrations.

1-Port Cal Port/s

Select either one or both of the available ports.

- Port 1 Only
  - If selected, the Port 1 Cal Left/Right area is available.
- Port 1 and Port 2
  - If selected, the Port 1 Cal Left/Right and Port 2 Cal Left/Right areas are available.
- Port 2 Only
  - If selected, the Port 2 Cal Left/Right area is available.

Port 1 Cal Left/Right Radio Buttons

Port 1 above must be selected to make the radio buttons available. If available, allows the following port left/right options:

- Left = Port 1
- Right = Port 1

Port 2 Cal Left/Right Radio Buttons

Port 2 above must be selected to make the radio buttons available. If available, allows the following port left/right options:

- Left = Port 2
- Right = Port 2

Select Post Calibration Standard

This allows the user to change the Calibration Standard that is set by a VNA Port attached to a selected AutoCal port. All other ports on the AutoCal device are automatically set to Load Calibration Standard by hardware.

- Cal Standard – Drop-down menu list provides the Calibration Standard selections:
  - Short, Load
  - Open, Short
  - Short, Open
  - Load, Short
  - Thru, Thru

Completing AutoCal Setup

When all AutoCal Setup functions are completed, click OK to return to the AUTOCAL SETUP menu. Click Cancel to make no changes and close the dialog box.

8-10 SmartCal 1-Port Cal Setup — 1-Port VNAs

SMARTCAL SETUP Menu — 1-Port Cal (1-Port VNAs)

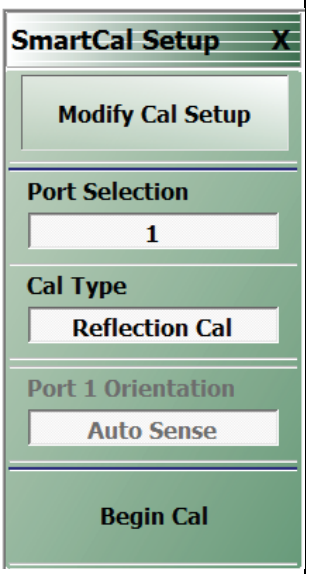
Note	This menu applies to the SmartCal 2- or 4-port calibration modules. If you are using an AutoCal calibration module, select Modify Cal Setup and then select the AutoCal calibration module in the MODIFY 1-PORT SMARTCAL SETUP dialog box.

Previous

- "AUTOCAL/SMARTCAL Menu" on page 8-46
- "MODIFY AUTOCAL SETUP Dialog Box (1-Port VNAs)" on page 8-68

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-Port Cal | SMARTCAL SETUP



Modify Cal Setup

Select displays the MODIFY SMARTCAL SETUP dialog box. The dialog box provides control settings for Port Selection, Cal Type, Port Orientation, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY SMARTCAL SETUP Dialog Box (1-Port VNAs)" on page 8-65

Port Selection (Read Only)

Displays the Ports selected for the SmartCal procedure. The settings are determined in the MODIFY SMARTCAL SETUP dialog box.

Cal Type (Read Only)

Displays the Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY SMARTCAL SETUP dialog box.

Port 1 Orientation (Read Only)

Displays the VNA Port orientation for the SmartCal procedure. Options are either Port A or Port B. The settings are determined in the MODIFY SMARTCAL SETUP dialog box.

Begin Cal

Starts the SmartCal procedure. On-screen dialogs and prompts provide user instructions for the selected calibration procedure. When the calibration is complete, the display returns to the CALIBRATION [TR] menu when the Cal Status button is enabled and set to ON.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-43. SMARTCAL 1-PORT CAL SETUP Menu

MODIFY SMARTCAL SETUP Dialog Box (1-Port VNAs)

Use the MODIFY SMARTCAL SETUP dialog box to change the calibration parameters prior to a SmartCal calibration procedure. For production installations, the port sense can be automatically or manually configured.

Previous

- "SMARTCAL SETUP Menu — 1-Port Cal (1-Port VNAs)" on page 8-64

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-Port Cal |SMARTCAL SETUP | Modify Cal Setup | MODIFY SMARTCAL SETUP Dialog Box

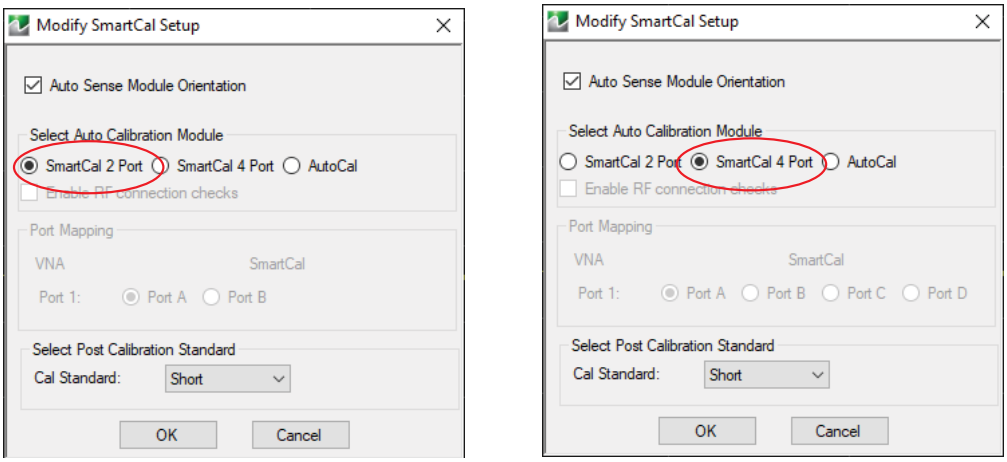


Figure 8-44. MODIFY SMARTCAL SETUP Dialog Box (2-Port/4-Port SMARTCAL Calibration Modules)

Note	For 1-Port AutoCal dialog box descriptions see, "MODIFY AUTOCAL SETUP Dialog Box (1-Port VNAs)" on page 8-68.

Auto Sense Module Orientation Check Box

- If selected, the SmartCal Module determines the Port A/B (or Port A/B/C/D for SmartCal 4-port calibration modules) assignments.
- If not selected, manual port assignment is available in the Port Mapping section of the dialog box. The user can select a radio button to assign ports A or B (or Port A, B, C, or D for SmartCal 4-port calibration modules).

Select Auto Calibration Module Radio Buttons

Select the appropriate calibration module using the provided radio buttons.

Only available for AutoCal. Disabled for 1-port autocals, as well as Smartcal 2-port and 4-port calibrations.

Port Mapping Area

This area is only available if the Auto Sense Module Orientation check box at the top of the dialog box is deselected.

- If the Auto Sense check box is selected, the Port A / Port B buttons at the bottom of the dialog box are unavailable. The instrument identifies the Port A / Port B and directs the user to the appropriate port.
- If the Auto Sense check box is deselected, the Port A/B (or Port A/B/C/D for SmartCal 4-port calibration modules) buttons at the bottom of the dialog box are available. The user defines which port is "Port A" and which port is "Port B", etc. This is especially useful if the instrument is oriented differently from the work environment. Options are:
    - Port 1=Port A
    - Port 1=Port B

      or for SmartCal 4-port calibration modules
    - Port 1=Port C
    - Port 1=Port D

Select Post Calibration Standard

This allows the user to change the Calibration Standard that is set by a VNA Port attached to a selected SmartCal port. All other ports on the SmartCal device are automatically set to Load Calibration Standard by hardware.

- Cal Standard – Drop-down menu list provides the Calibration Standard selections:
    - Open
    - Short
    - Load
    - Thru

Completing SmartCal Setup

When all SmartCal Setup functions are completed, click OK to return to the SMARTCAL SETUP menu. Click Cancel to make no changes and close the dialog box.

8-11 AutoCal 1-Port Cal Setup — 1-Port VNAs

AUTOCAL SETUP Menu — 1-Port Cal (1-Port VNAs)

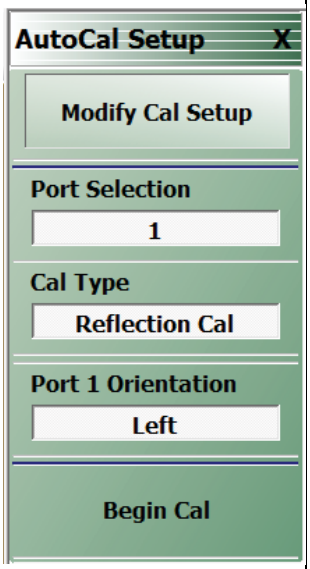
Note	This menu applies to the AutoCal calibration module. If you are using a SmartCal 2- or 4-port calibration module, select Modify Cal Setup and then select the appropriate SmartCal calibration module in the MODIFY 1-PORT AUTOCAL SETUP dialog box.

Previous

- "AUTOCAL/SMARTCAL Menu" on page 8-46
- "MODIFY SMARTCAL SETUP Dialog Box (1-Port VNAs)" on page 8-65

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-PORT CAL | 1-Port Cal | AUTOCAL SETUP



Modify Cal Setup

Select displays the MODIFY AUTOCAL SETUP dialog box. The dialog box provides control settings for Port Selection, Cal Type, and Port Orientation.

- "MODIFY AUTOCAL SETUP Dialog Box (1-Port VNAs)" on page 8-68

Port Selection (Read Only)

Displays the Port or Ports selected for the AutoCal procedure. The settings are determined in the MODIFY AUTOCAL SETUP dialog box.

Cal Type (Read Only)

Displays the Cal Type selected for the AutoCal procedure. The setting is defined in the MODIFY AUTOCAL SETUP dialog box.

Port 1 Orientation (Read Only)

Displays the right/left assignment for Port 1 for the AutoCal procedure. The setting is defined in the MODIFY AUTOCAL SETUP dialog box.

Begin Cal

Starts the AutoCal procedure. On-screen dialogs and prompts provide user instructions for the selected calibration procedure. When the calibration is complete, the display returns to the CALIBRATION [TR] menu when the Cal Status button is enabled and set to ON.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-45. AUTOCAL SETUP Menu – 1-Port Calibration

MODIFY AUTOCAL SETUP Dialog Box (1-Port VNAs)

Use the MODIFY AUTOCAL SETUP dialog box to change the calibration parameters prior to an AutoCal calibration procedure. For production installations, the left/right port sense can be manually configured.

Previous

- "AUTOCAL SETUP Menu — 1-Port Cal (1-Port VNAs)" on page 8-67

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 1-Port Cal | AUTOCAL SETUP | Modify Cal Setup | MODIFY AUTOCAL SETUP Dialog Box

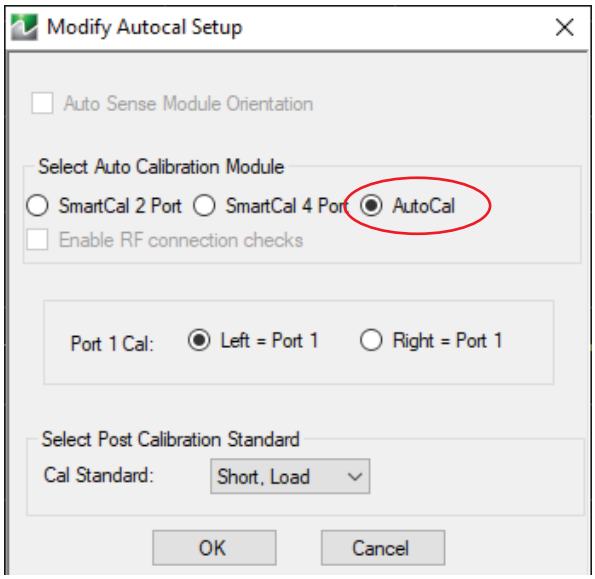


Figure 8-46. MODIFY AUTOCAL SETUP Dialog Box — MS46121A/B

Note	For 1-Port SmartCal dialog box descriptions see, "MODIFY SMARTCAL SETUP Dialog Box (1-Port VNAs)" on page 8-65.

Auto Sense Cal Port(s)

The Auto Sense selection check box is not available in AutoCal 1-Port.

Select Auto Calibration Module

Select the appropriate calibration module using the provided radio buttons.

Enable RF connection checks: Disabled for 1-port autocals, as well as Smartcal 2-port and 4-port calibrations.

Port 1 Cal Left/Right Radio Buttons

If available, allows the following port left/right options:

- Left = Port 1
- Right = Port 1

Select Post Calibration Standard

This allows the user to change the Calibration Standard that is set by a VNA Port attached to a selected AutoCal port. All other ports on the AutoCal device are automatically set to Load Calibration Standard by hardware.

- Cal Standard – Drop-down menu list provides the Calibration Standard selections:
  - Short, Load
  - Open, Short
  - Short, Open
  - Load, Short
  - Thru, Thru

Completing AutoCal Setup

When all AutoCal Setup functions are completed, click OK to return to the AUTOCAL SETUP menu. Click Cancel to make no changes and close the dialog box.

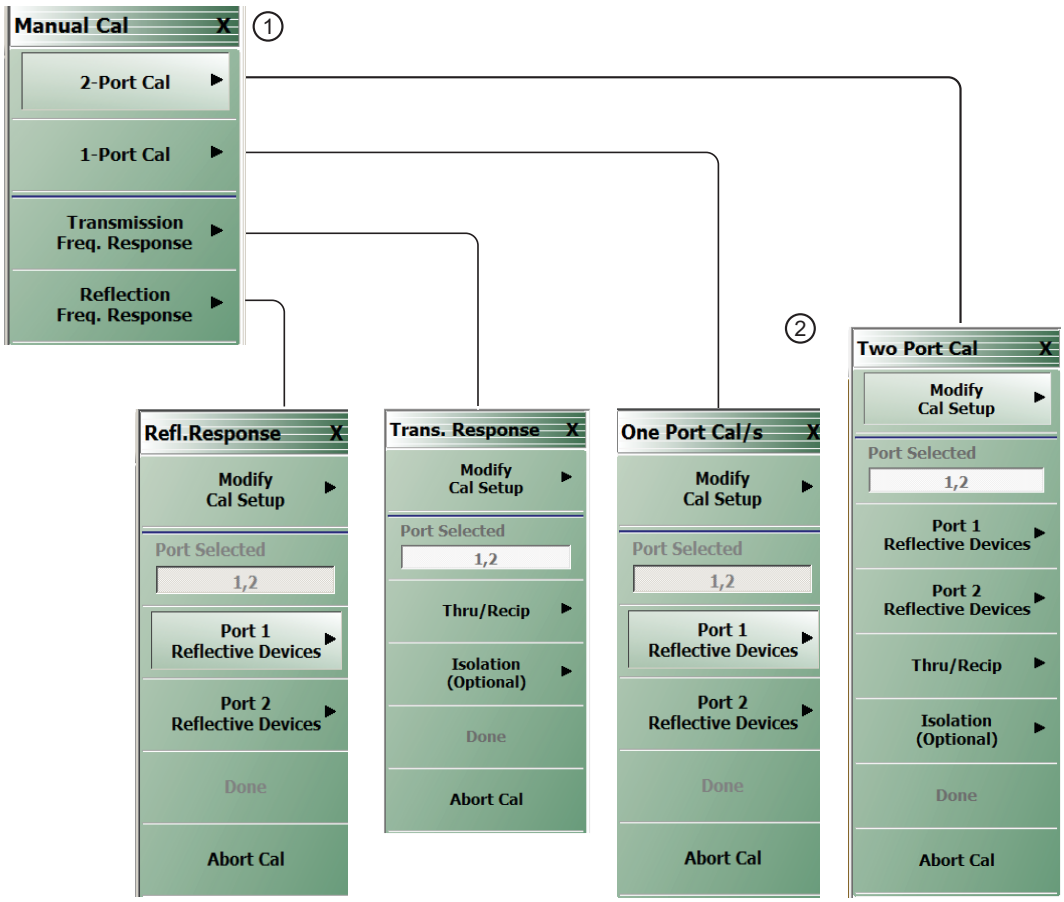
8-12 Manual Calibration Menus and Dialog Boxes

The MANUAL CAL menu buttons select a calibration type and then open the main setup menu for that type.

In the main setup menus, the Modify Cal Setup button opens the CAL SETUP menu which has Cal Method, Line Type, and Edit Cal Params buttons. Edit Cal Params opens a calibration parameter configuration dialog box showing parameters appropriate to the cal type, cal method, and line type.

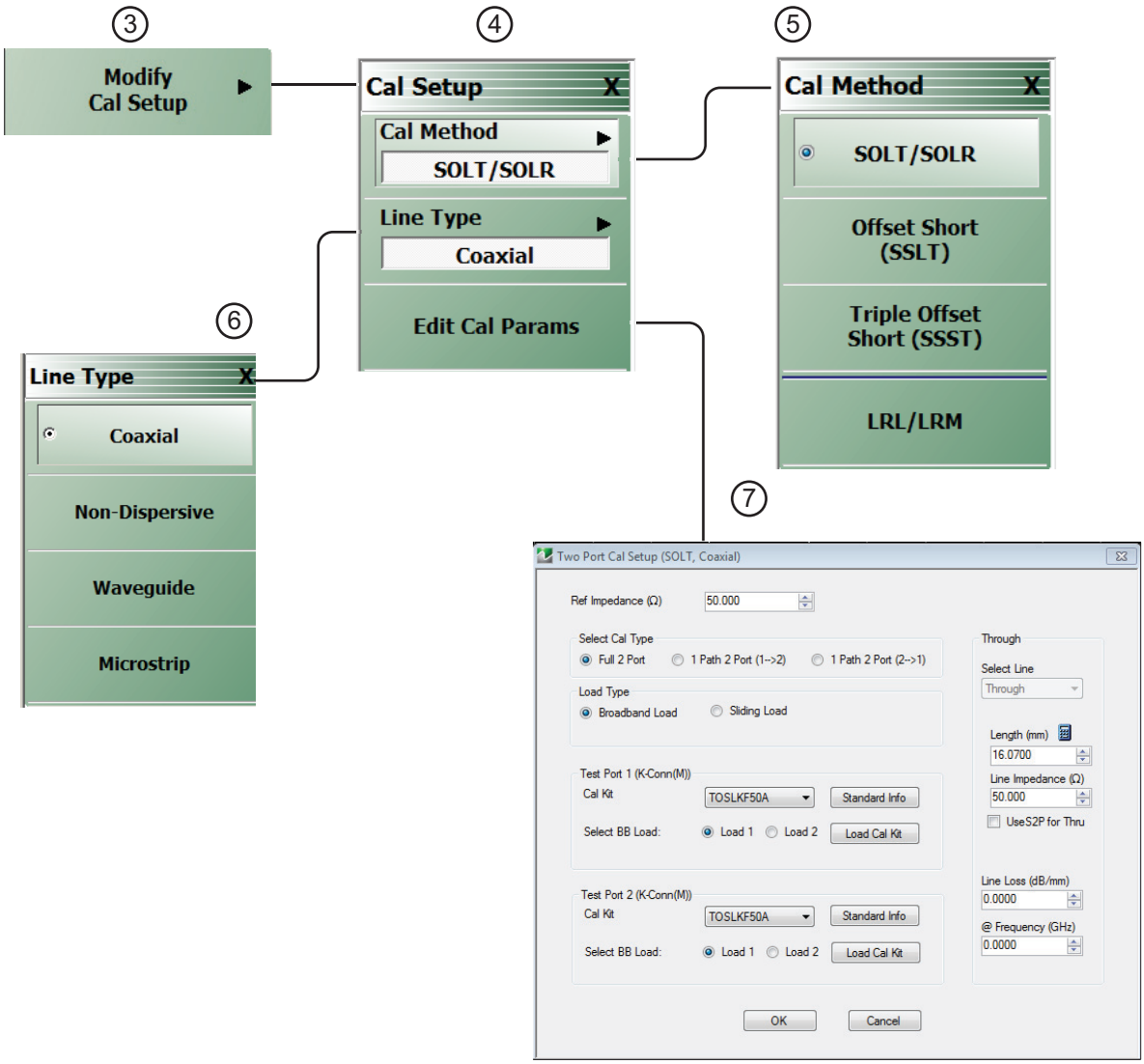
The selection of parameters shown on a menu or dialog depends on the configuration set by previous parameter selections higher in the tree.

The figure "Manual Calibration Setup Menus (1 of 2)" on page 8-70 summarizes the configuration menus and dialogs.



1. MANUAL CAL menu
2. TWO PORT CAL, ONE PORT CAL (select cal for a specific single port), TRANSMISSION RESPONSE, REFLECTION RESPONSE menus

Figure 8-47. Manual Calibration Setup Menus (1 of 2)



3. MODIFY CAL SETUP menu
4. CAL SETUP menu
5. CAL METHOD menu
6. LINE TYPE menu
7. TWO PORT CAL SETUP (example: SOLT/SOLR, COAXIAL) dialog box

Figure 8-48. Manual Calibration Setup Menus (2 of 2)

Manual Calibration Types

- 2-Port Calibration
- 1-Port Calibration
- Transmission Frequency Response Calibration
- Reflection Frequency Response Calibration

Manual Calibration Methods

- SOLT/SOLR – Short-Open-Load-Thru / Short-Open-Load-Return
- SSLT – Offset Short or Short-Short-Load-Thru
- SSST – Triple Offset Short or Short-Short-Short-Thru
- LRL/LRM – Line-Reflect-Line/Line-Reflect-Match. (Available in the MS46122B, MS46131A, ME7868A, ME7869A, and MS46322B series)
- TRL/TRM – Thru-Reflect-Line/Thru-Reflect-Match. (Available in the MS46122B, MS46131A, ME7868A, ME7869A, and MS46322B series)

Calibration Line Types

- Coaxial
- Non-Dispersive – Essentially the same as coaxial
- Waveguide
- Microstrip

Manual Calibration Dialog Box Settings

All permissible combinations of the calibration parameters above can be further modified through a series of dialog boxes that control DUT connectors, load types such as broadband or sliding loads, port selection, through types, reference plane location, number of bands, and similar settings. Many of these dialog boxes are shown in this document and all are summarized in tables.

MANUAL CAL Menu

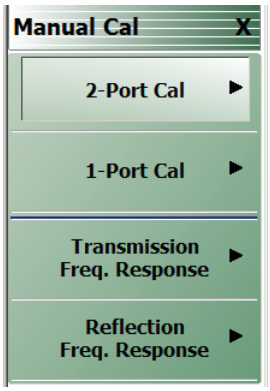
Previous

- "CALIBRATE Menu" on page 8-8

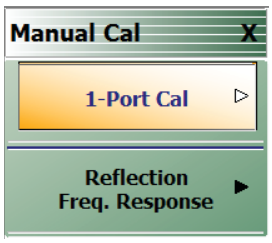
Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL

2-Port VNAs



1-Port VNAs



2-Port Cal

Select displays the TWO PORT CAL menu where the calibration step-by-step procedure is carried out. Also called 12 Term Calibration. This is the most complete calibration, and fully corrects the four S-parameters (S11, S12, S21, and S22) parameters for both instrument ports.

- "TWO PORT CAL Menu" on page 8-79

1-Port Cal

Select displays the ONE PORT CAL menu. Allows selecting which port is to be corrected, A single reflection parameter, configured in the Edit Cal Params | CAL SETUP dialog, is fully corrected (S11 or S22). Both ports can be covered but only reflection measurements are corrected.

- "ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs" on page 8-108

Transmission Freq. Response

Selecting the Transmission Frequency Response button displays the TRANS FREQ menu. During the calibration configuration in the Edit Cal Params | CAL SETUP dialog, select forward or reverse or both directions. This is applicable for MS46121A/B model with Option 21 as the calibration for the Thru standard.

- "TRANS. RESPONSE Menu" on page 8-122

Reflection Freq. Response

Select displays the Refl. Response menu.

- "REFL. RESPONSE Menu" on page 8-138

Figure 8-49. MANUAL CAL (MANUAL CALIBRATION) Menu

CAL SETUP Menu

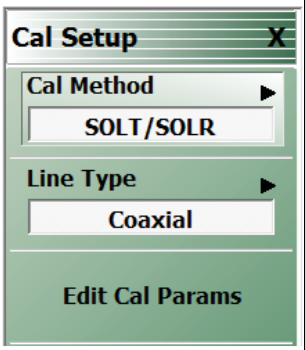
Use the CAL SETUP menu to set the calibration method (for example SOLT/SOLR), the calibration line type (such as coaxial or microwave), and additional parameters for ports and connectors shown via the Edit Cal Parameters button and the linked CAL SETUP dialogs.

Previous

- The CAL SETUP menu can be accessed from multiple menus depending on the manual calibration type selected on the MANUAL CAL menu.
  - "TWO PORT CAL Menu" on page 8-79
  - "ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs" on page 8-108
  - "TRANS. RESPONSE Menu" on page 8-122
  - "REFL. RESPONSE Menu" on page 8-138

Navigation Alternatives

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE PORT CAL | Modify Cal Setup | CAL SETUP
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq, Response | TRANS. RESPONSE | Modify Cal Setup | CAL SETUP
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Freq, Response | REFL. RESPONSE | Modify Cal Setup | CAL SETUP



Cal Method

The field displays the currently selected calibration method (SOLT/SOLR, SSLT, SSST, LRL/LRM, TRL/TRM, SOL, SSL, SSS). (SOLR, LRL/LRM, and TRL/TRM are available for MS46122/322 "B", ME7868A and ME7869A models only.) Clicking the button displays the CAL METHOD menu for selection of the calibration method. Once a selection is made, the display returns to the CAL SETUP menu.

- "CAL METHOD Menu" on page 8-76

Line Type

The field displays the currently selected line type such as Coaxial (the default value) or others. The button opens the LINE TYPE menu which allows selecting a line type. Once a selection is made, the display returns to the CAL SETUP menu.

- "LINE TYPE Menu" on page 8-78

(continued)

Figure 8-50. CAL SETUP (CALIBRATION SETUP) MENU (1 of 2)

	Edit Cal Params
	The button opens a calibration setup dialog box with parameters appropriate to the configuration. The displayed name of the dialog box always changes to match the combination of selected calibration type, calibration method, and line type.
	• Dialog box name format: [Cal Type] [Cal Method] Cal Setup [Line Type]
	• For example, if Full 2 Port, SOLT/SOLR, and Coaxial were selected, the dialog box name is:
	  • Full Two Port Cal Setup (SOLT/SOLR, Coaxial)
	• Examples of Cal Setup dialog boxes using Coaxial line type are available in the links below:
	  • "TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 8-82
	• A summary table lists dialog box contents for all other combinations of method and line type:
	  • Table 8-3, "MANUAL 2-PORT CAL Setup Dialog Box Summary" on page 8-99

Figure 8-50. CAL SETUP (CALIBRATION SETUP) MENU (2 of 2)

CAL METHOD Menu

Use the CAL METHOD menu to select whether the method of SOLT/SOLR, SSLT, SSST, LRL/LRM, or TRL/TRM will be used during the calibration (SOLR, LRL/LRM, and TRL/TRM are available for MS46122/322 “B”, ME7868A, and ME7869A models only.

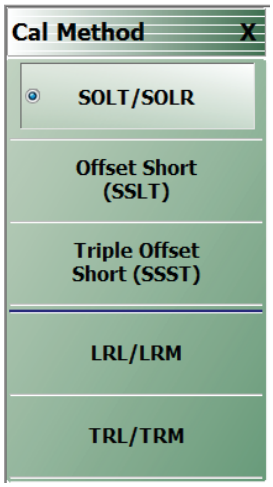
Previous

- “CAL SETUP Menu” on page 8-74

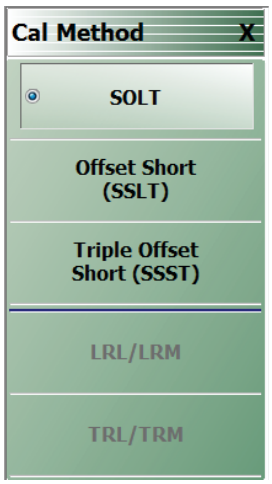
Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method | CAL METHOD
- The navigation path above assumes that Two Port Cal calibration type was selected on the Manual Cal menu.

2-Port VNAs



Single MS46131A With Option 012



Selecting any button marks the selection with the select icon, de-selects the other buttons, and auto-returns to the CAL SETUP menu.

- “CAL SETUP Menu” on page 8-74

SOLT/SOLR (SOL – 1-Port VNAs Only)

Selecting the SOLT/SOLR button sets the calibration method to Short-Open-Load-Thru/ Short-Open-Load-Reciprocal and then auto-returns to the CAL SETUP menu.

Offset Short (SSLT) (SSL – 1-Port VNAs Only)

Selecting the Offset Short (SSLT) button sets the calibration method to Short-Short-Load-Thru and then auto-returns to the CAL SETUP menu.

Triple Offset Short (SSST) (SSS – 1-Port VNAs Only)

Selecting the Triple Offset Short (SSST) button sets the calibration method to Short-Short-Short-Thru and then auto-returns to the CAL SETUP menu.

LRL/LRM (LRL/LRM is available for MS46122/322 “B”, ME7868A, and ME7869A

Selecting the LRL/LRM button sets the calibration method to Line-Reflect-Line or Line-Reflect-Match and then auto-returns to the CAL SETUP menu.

TRL/TRM (TRL/TRM is available for MS46122/322 “B”, ME7868A, and ME7869A models only.)

Selecting the TRL/TRM button sets the calibration method to Thru-Reflect-Line or Thru-Reflect-Match and then auto-returns to the CAL SETUP menu.

(continued)

Figure 8-51. CAL METHOD Menu (1 of 2)

MS46121 or Single MS46131A Without Option 012

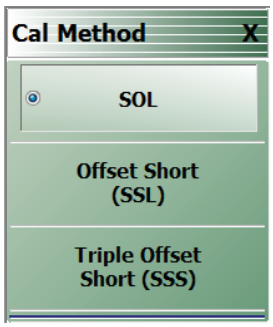


Figure 8-51. CAL METHOD Menu (2 of 2)

LINE TYPE Menu

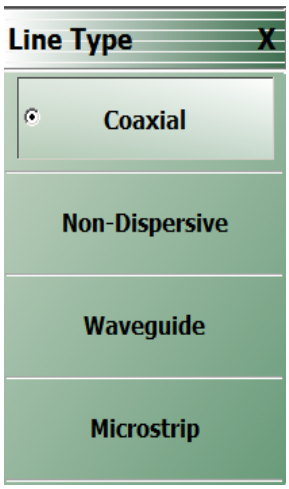
Use the LINE TYPE menu to select from coaxial, non-dispersive, waveguide, or microstrip line types. Non-dispersive is for line types such as coplanar waveguide, stripline, or twin-lead and is treated the same as coaxial line.

Previous

- "CAL SETUP Menu" on page 8-74.

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Line Type | LINE TYPE



Auto-Return Button Selection Group

The four buttons of the LINE TYPE menu form an auto-return button selection group. Selecting any one button marks the selection with the select icon, de-selects the other three buttons, and auto-returns to the CAL SETUP menu.

Coaxial (Line Type)

Select sets the line type to coaxial, marks the button with the select icon, de-selects the Non-Dispersive, Waveguide, and Microstrip buttons, and then auto-returns to the CAL SETUP menu.

- "CAL SETUP Menu" on page 8-74

Non-Dispersive (Line Type)

Non-dispersive line types, such as Coplanar Waveguide, Stripline, or twin-lead, are used on transmissions. The system treats non-dispersive lines the same as coaxial line types.

Select sets the line type to non-dispersive, marks the button with the select icon, de-selects the Coaxial, Waveguide, and Microstrip buttons, and then auto-returns to the CAL SETUP menu.

- "CAL SETUP Menu" on page 8-74

Waveguide (Line Type)

Waveguide is transmission media such as rectangular or circular waveguide.

Select sets the line type to waveguide, marks the button with the select icon, de-selects the Coaxial, Non-Dispersive, and Microstrip buttons, and then auto-returns to the CAL SETUP menu.

- "CAL SETUP Menu" on page 8-74

Microstrip (Line Type)

Microstrip line is typically used in on-wafer media.

Select sets the line type to microstrip, marks the button with the select icon, de-selects the Coaxial, Non-Dispersive, and Waveguide buttons, and then auto-returns to the CAL SETUP menu.

- "CAL SETUP Menu" on page 8-74

Figure 8-52. LINE TYPE Menu

8-13 Manual 2-Port Cal Setup

TWO PORT CAL Menu

Button Availability

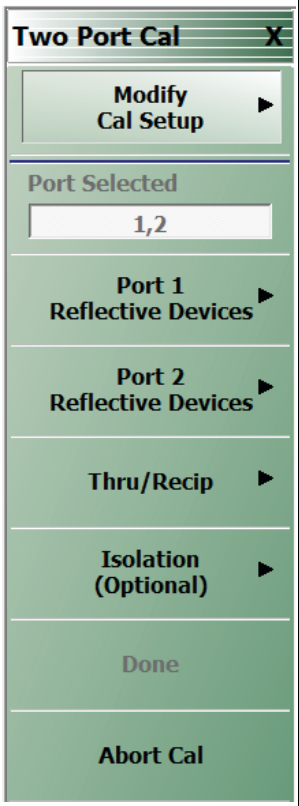
- The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant TWO PORT CAL SETUP dialog box.
- A representative menu is shown below.
- The example procedures at the end of this chapter show examples of various TWO PORT CAL menus.

Previous

- "MANUAL CAL Menu" on page 8-73

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL



Modify Cal Setup

Select displays the CAL SETUP menu.

- "CAL SETUP Menu" on page 8-74

Here, changes to the calibration method, line type, and associated parameters are made on the CAL METHOD and LINE TYPE submenus.

- Calibration method options are SOLT/SOLR, Offset Short (SSLT), Triple Offset Short (SSST), LRL/LRM, or TRL/TRM. SOLR, LRL/LRM, and TRL/TRM are available for MS46122/322 "B", ME7868A, and ME7869A models only.
- Line Type options are Coaxial, Non-Dispersive, Waveguide, or Microstrip.

A composite view of the CAL SETUP menu set is available in the figure below:

- Figure 8-47, "Manual Calibration Setup Menus (1 of 2)" on page 8-70

Descriptions of the calibration configuration menus are available at:

- "CAL SETUP Menu" on page 8-74
- "CAL METHOD Menu" on page 8-76

A summary of 2-port calibration setup dialog box controls and functions is available in the table below:

- Table 8-3, "MANUAL 2-PORT CAL Setup Dialog Box Summary" on page 8-99

Ports Selected (Read Only)

A display button showing the port numbers that are in the calibration.

(continued)

Figure 8-53. TWO PORT CAL MENU – Typical Example (1 of 2)

Port 1 Reflective Devices

When selected, provides the REFL. DEVICES PORT 1 menu. Each button represents a completion task. When ready for the task, click the button, and the instrument performs the calibration. When the calibration task is successfully completed, the button is marked with a completion checkmark. When all tasks are completed on the menu, return to the TWO PORT CAL menu.

Port 2 Reflective Devices

When selected, displays the REFL. DEVICES PORT 2 menu. When all tasks are completed, return to the TWO PORT CAL menu.

Port 1-2 Reflective Devices

When Cal Method selected is LRL/LRM or TRL/TRM, the Port 1 Reflective Devices button label changes to Port 1-2 Reflective Devices and the menu that opens from there offers selections in accordance with the settings made in the 2 Port Cal Setup dialog. SOLR, LRL/LRM, and TRL/TRM are available for MS46122/322 “B”, ME7868A, and ME7869A models only.

Port 1-2 Lines/Matches

When Cal Method selected is LRL/LRM or TRL/TRM, the Port 1 Reflective Devices button label changes to Port 1-2 Lines/Matches and select opens a menu offering selections in accordance with the settings made in the 2 Port Cal Setup dialog. This offers selections of up to 5 bands and ten devices. SOLR, LRL/LRM, and TRL/TRM are available for MS46122/322 “B”, ME7868A,and ME7869A models only.

Thru/Recip

When selected, displays the THRU/RECIP menu. When all tasks are completed, return to the TWO PORT CAL menu.

Isolation (Optional)

When selected, displays the ISOLATION menu. When all tasks are completed, return to the TWO PORT CAL menu.

Done

This button is unavailable until all calibration tasks have been successfully completed. When available, select the button to return to the CALIBRATION menu when the Cal Status is set to ON.

- “CALIBRATION [TR] Menu” on page 8-6

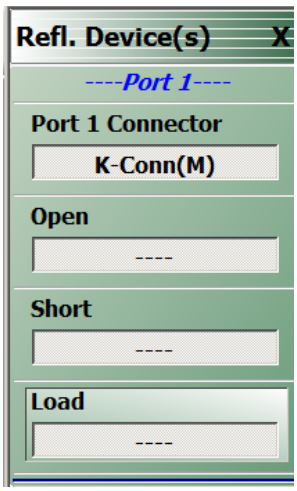
Abort Cal

Select aborts the current calibration and returns to the CALIBRATION menu.

- “CALIBRATION [TR] Menu” on page 8-6

Figure 8-53. TWO PORT CAL MENU – Typical Example (2 of 2)

REFLECTIVE DEVICES Menu



Port 1 Connector

Double-clicking it opens the Cal Setup dialog for setup of parameters relevant for the calibration.

Open

Clicking performs the calibration. When the action is complete, a checkmark appears.

Short

Clicking performs the calibration. When the action is complete, a checkmark appears.

Load

Clicking performs the calibration. When the action is complete, a checkmark appears.

Figure 8-54. REFLECTIVE DEVICES MENU

Manual 2-Port Cal Setup Dialog Boxes

From the TWO PORT CAL menu, Modify Cal Setup button links to the CAL SETUP menu, where the Edit Cal Params button displays the appropriate configuration dialog box with that vary depending on the settings made in the MANUAL CAL, CAL SETUP, CAL METHOD, and LINE TYPE menus. Sample dialog boxes are described in the sections below for:

- "TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 8-82
- "TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 8-85
- "TWO PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 8-88
- "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 8-92
- "TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 8-96

For all other calibration combinations, see the summary table of all dialog boxes and their controls:

- Table: "MANUAL 2-PORT CAL Setup Dialog Box Summary" on page 8-99.

TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

LRL, LRM, SOLR, and TRL/TRM are available for MS46122/322 “B”, ME7868A, and ME7869A models only.

Prerequisites

- Cal Method = SOLT/SOLR
- Line Type = Coaxial

Previous

- “CAL SETUP Menu” on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | TWO-PORT CAL SETUP (SOLT/SOLR, COAXIAL Dialog Box

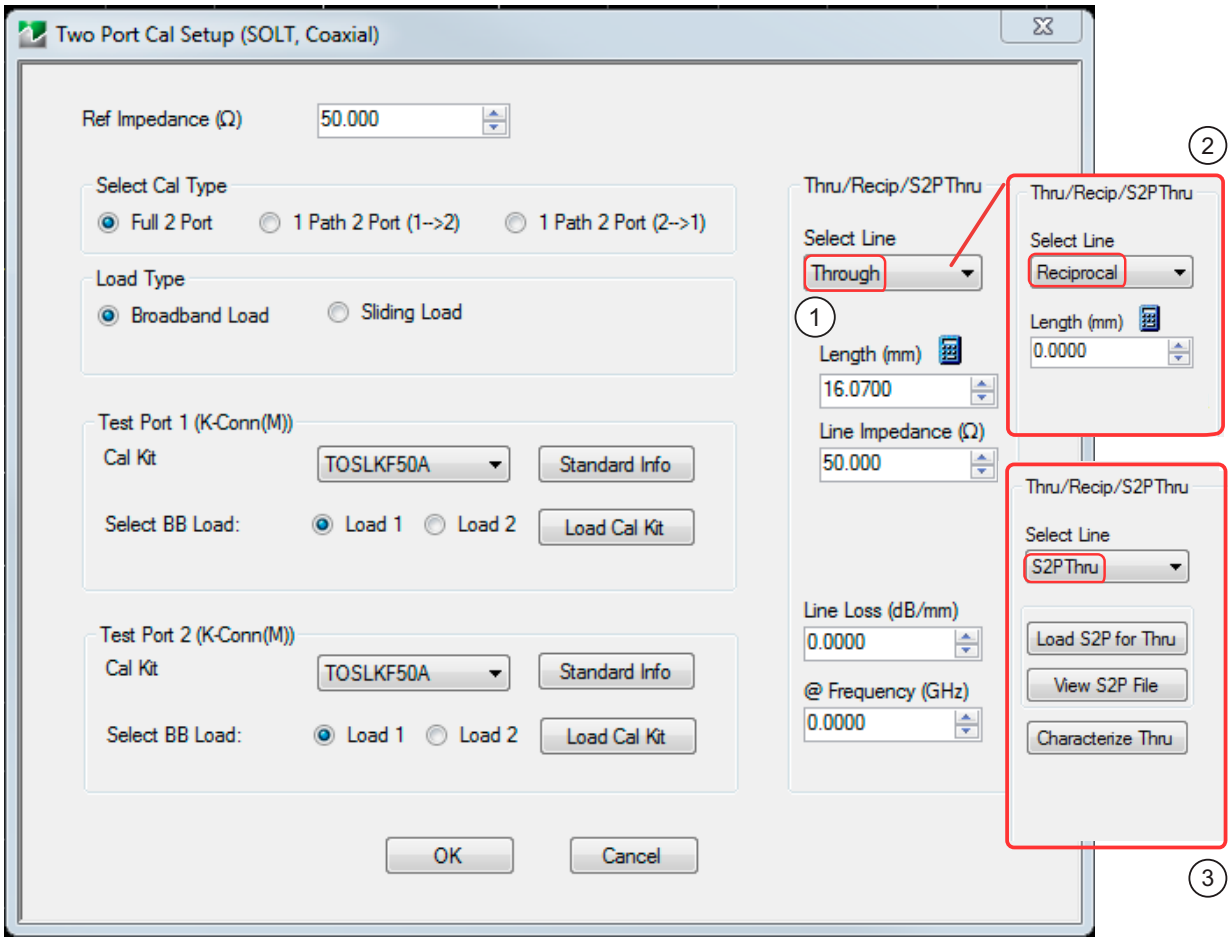


Figure 8-55. Edit Cal Params – TWO PORT CAL SETUP (SOLT, COAXIAL) Dialog Box (1 of 2)

Typical through line configuration in the THRU INFO dialog box for the defined-standards calibrations.

"THRU INFO Dialog Box" on page 8-150

1. Thru selected, allowing configuration of Thru.
2. Reciprocal selected, allowing configuration of Thru.
3. S2P Thru selected, allowing loading, viewing and generation of S2P files.

Figure 8-55. Edit Cal Params – TWO PORT CAL SETUP (SOLT, COAXIAL) Dialog Box (2 of 2)

Reference Impedance

Reference Impedance is 50 ohms.

Select Cal Type

Select from three radio button controlled options:

- Full 2 Port
- 1 Path 2 Port (1 –> 2)
- 1 Path 2 Port (2 –> 1)

Load Type Area

Select from two radio button controlled options:

- Broadband Load
- Sliding Load. If Sliding Load is selected:
  - A message appears in the "Still requires broadband loads below sliding load breakpoint frequency."
  - A Sliding Load button appears on the PORT 1 REFLECTIVE DEVICES menu and on the PORT 2 REFLECTIVE DEVICES menu.

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- TOSLKF50A
- TOSLK50A
- TOSLNF50A
- TOSLN50A
- K-Conn (M)
- K-Conn (F)
- GPC-3.5 (M)
- GPC-3.5 (F)
- SMA (M)
- SMA (F)
- N-Conn (M)
- N-Conn (F)
- 2.4 mm (M)
- 2.4 mm (F)
- TNC (M)
- TNC (F)
- V-conn (M)
- V-conn (F)
- W1-conn (M)
- W1-conn (F)
- 7/16 (M)
- 7/16 (F)
- GPC-7
- N-conn(75) (M)
- N-conn(75) (F)
- User-Defined 1 through 32 (M or F)

Select BB Load for Test Port 1 Area

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Load Cal Kit

Prompts the LOAD dialog box.

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Test Port 2 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options the same as the Test Port 1 Connector area above see “Test Port 1 Connector Type Area” on page 8-83.

Test Port 2 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Select BB Load for Test Port 2 Area

Select BB Load number for Test Port 2:

- Load 1
- Load 2.

Load Cal Kit

Prompts the LOAD dialog box.

Thru/Reciprocal/S2P Thru Area

Located on the right side of the dialog box, these controls allow characterization of the Thru/Reciprocal/S2P Thru settings. These are the same controls as “THRU INFO Dialog Box” on page 8-150.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu.

Click Cancel to abandon any changes and return to the CAL SETUP menu.

TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

Prerequisites

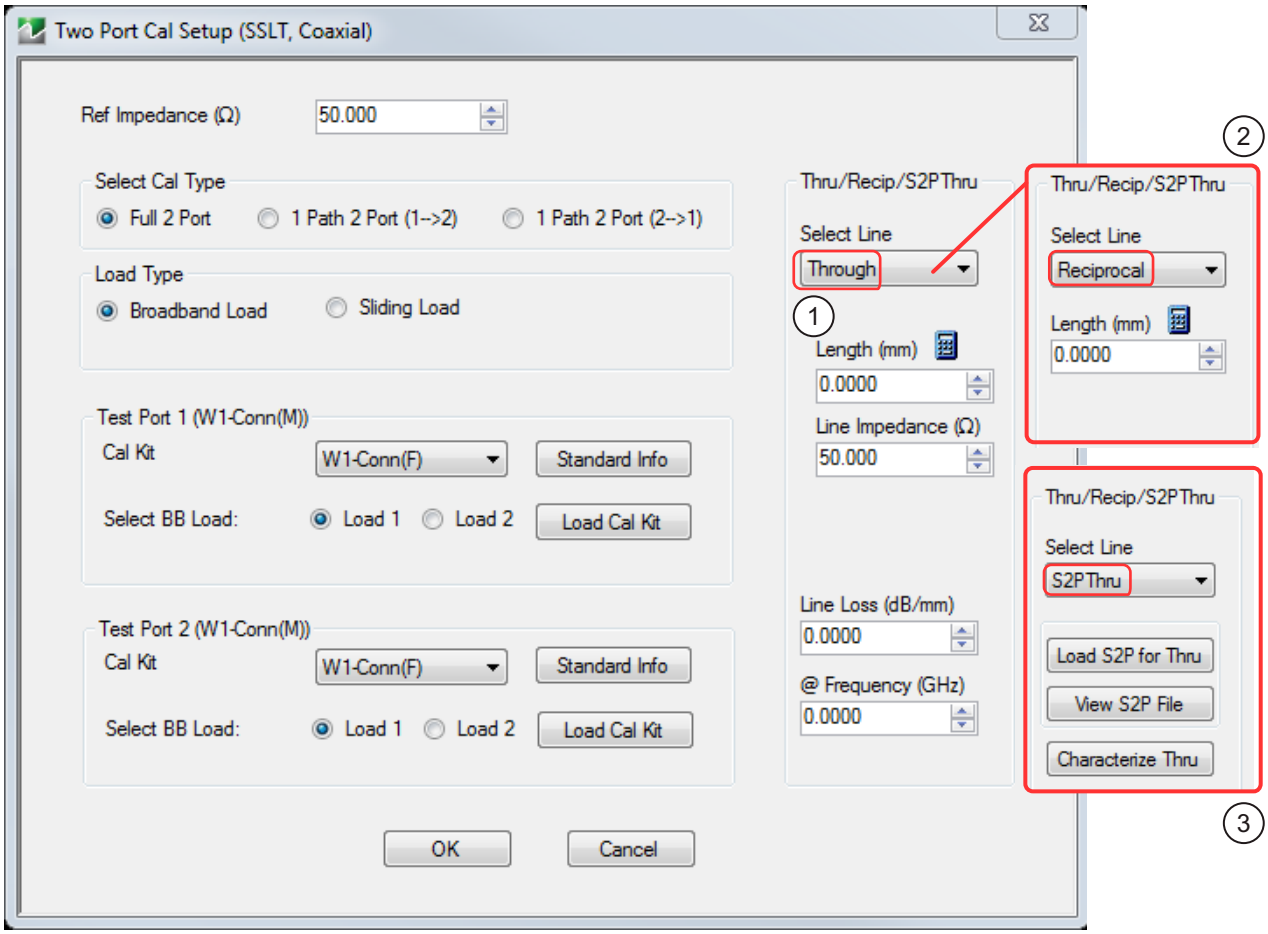
- Cal Method = SSLT
- Line Type = Coaxial

Previous

- "CAL SETUP Menu" on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | TWO-PORT CAL SETUP (SSLT, COAXIAL Dialog Box



Typical through line configuration in the Thru Info area for the defined-standards calibrations.

"THRU INFO Dialog Box" on page 8-150

1. Thru selected, allowing configuration of Thru.
2. Reciprocal selected, allowing configuration of Thru.
3. S2P Thru selected, allowing loading, viewing and generation of S2P files.

Figure 8-56. Edit Cal Params – TWO PORT CAL SETUP (SOLT, COAXIAL) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted although input values <0.01 Ohms are converted to 0.01 Ohms.

Select Cal Type

Select from three radio button controlled options:

- Full 2 Port
- 1 Path 2 Port (1 –> 2)
- 1 Path 2 Port (2 –> 1)

Load Type Area

Select from two radio button controlled options:

- Broadband Load
- Sliding Load. If Sliding Load is selected:
  - A message appears in the "Still requires broadband loads below sliding load breakpoint frequency."
  - A Sliding Load button appears on the PORT 1 REFLECTIVE DEVICES menu and on the PORT 2 REFLECTIVE DEVICES menu.

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- W1-Conn (M)
- W1-Conn (F)
- User-Defined1 (M) through User-Defined32 (M)
- User-Defined1 (F) through User-Defined32 (F)

Select BB Load for Test Port 1 Area

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Test Port 2 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options the same as the Test Port 1 Connector area above.

Test Port 2 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Select BB Load for Test Port 2 Area

Select BB Load number for Test Port 2:

- Load 1
- Load 2

Through/Reciprocal/S2P Thru Area

Located on the right side of the dialog box, these controls allow characterization of the Through/Reciprocal/S2P Thru line settings. They are the same controls as "THRU INFO Dialog Box" on page 8-150.

Through Setup Area

This area is available for all AutoCal Types. The button selection options are:

- Internal Thru
  - If selected, the AutoCal module uses internal circuitry to determine the through values.
  - The Thru Info button is unavailable.
- True Thru
  - If selected, the AutoCal module will prompt the user to remove the module and connect the ports with a through line.
  - If selected, the Thru Info button becomes available. When clicked, the THRU INFO dialog box appears and allows input of values for Thru Length, Thru Line Impedance, Thru Line Loss, and Thru Frequency Setting.
    - In the Thru Line Length field, enter the line length in mm. For example, enter a value of 30 mm.
    - In the Line Impedance field, enter the impedance in ohms. For example, use the default value of 50 ohms.
    - In the Line Loss field, enter the loss as dB per mm. For example, enter a value of 0.1 dB/mm.
    - In the @ Frequency field, enter the working frequency in GHz. For example, enter a value of 45 GHz.
    - When all entries are complete, click OK to return to the Modify 2-Port AutoCal Setup dialog box.
    - "THRU INFO Dialog Box" on page 8-150

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu.

Click Cancel to abandon any changes and return to the CAL SETUP menu.

TWO PORT CAL SETUP (SSST, COAXIAL) Dialog Box

Prerequisites

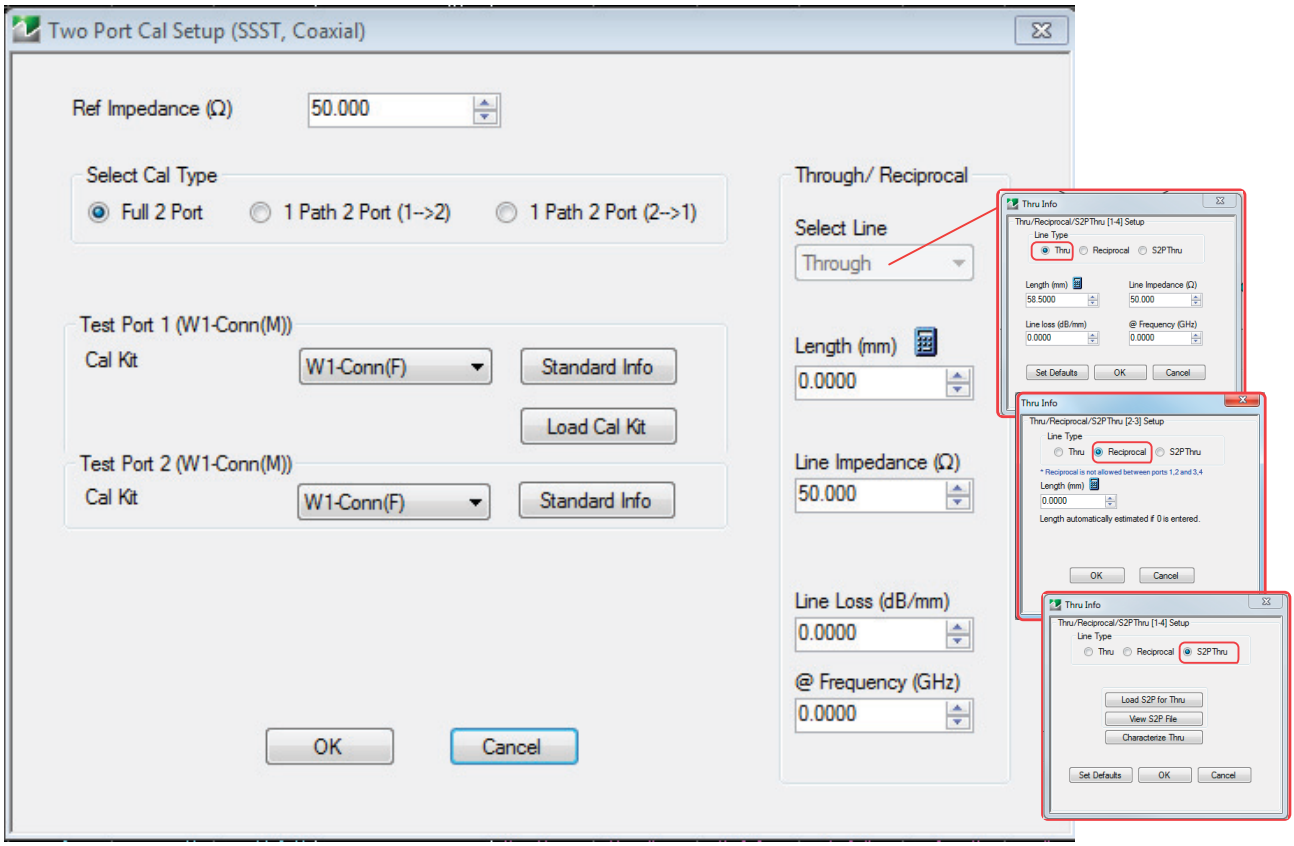
- Cal Method = SSST
- Line Type = Coaxial

Previous

- "CAL SETUP Menu" on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | TWO-PORT CAL SETUP (SSST, COAXIAL Dialog Box



Typical through line configuration in the THRU INFO dialog box for the defined-standards calibrations.

"THRU INFO Dialog Box" on page 8-150

1. Thru selected, allowing configuration of Thru.
2. Reciprocal selected, allowing configuration of Thru.
3. S2P Thru selected, allowing loading, viewing and generation of S2P files

Figure 8-57. Edit Cal Params – TWO PORT CAL SETUP (SOLT, COAXIAL) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted although input values <0.01 Ohms are converted to 0.01 Ohms.

Select Cal Type

Select from three radio button controlled options:

- Full 2 Port
- 1 Path 2 Port (1 –> 2)
- 1 Path 2 Port (2 –> 1)

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- W1-Conn (M)
- W1-Conn (F)
- User-Defined1 (M) through User-Defined32 (M)
- User-Defined1 (F) through User-Defined32 (F)

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Test Port 2 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options the same as the Test Port 1 Connector area above.

Test Port 2 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Through/Reciprocal/S2P Thru Area

Located on the right side of the dialog box, these controls allow characterization of the Through/Reciprocal/S2P Thru line settings. They are the same controls as “THRU INFO Dialog Box” on page 8-150.

Through Setup Area

This area is available for all AutoCal Types. The button selection options are:

- Internal Thru
  - If selected, the AutoCal module uses internal circuitry to determine the through values.
  - The Thru Info button is unavailable.
- True Thru
  - If selected, the AutoCal module will prompt the user to remove the module and connect the ports with a through line.
  - If selected, the Thru Info button becomes available. When clicked, the THRU INFO dialog box appears and allows input of values for Thru Length, Thru Line Impedance, Thru Line Loss, and Thru Frequency Setting.

- In the Thru Line Length field, enter the line length in mm. For example, enter a value of 30 mm.
- In the Line Impedance field, enter the impedance in ohms. For example, use the default value of 50 ohms.
- In the Line Loss field, enter the loss as dB per mm. For example, enter a value of 0.1 dB/mm.
- In the @ Frequency field, enter the working frequency in GHz. For example, enter a value of 45 GHz.
- When all entries are complete, click OK to return to the Modify 2-Port AutoCal Setup dialog box.
- "THRU INFO Dialog Box" on page 8-150

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu.

Click Cancel to abandon any changes and return to the CAL SETUP menu.

.Characterize Thru

Cal a and b must share a common test port. Both cals must be full 1-port type. Both cals must have the exact same frequency points.

Cal A => 1 port cal without the unknown thru

Cal B => 1 port cal with the unknown thru connected and the cal plane at the open end of the thru

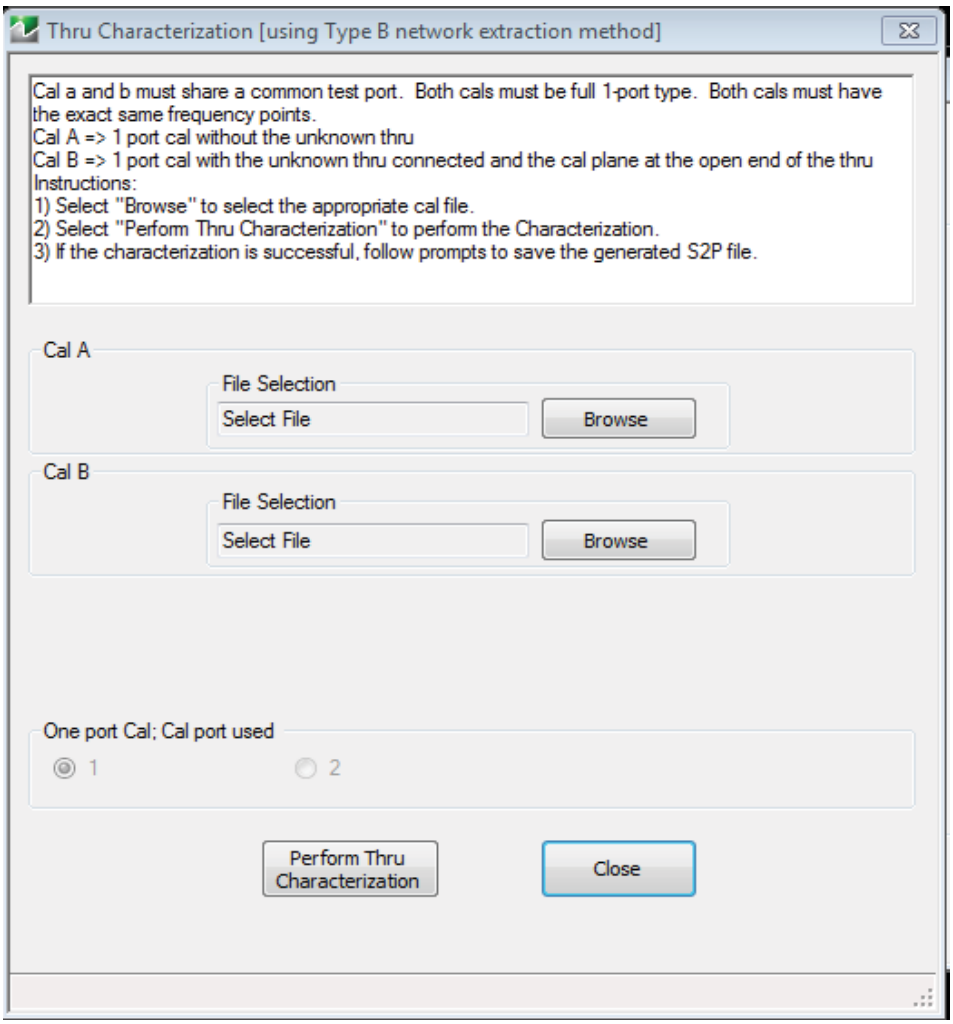


Figure 8-58. Characterize Thru

Instructions

1) Select Browse to select the appropriate cal file.

2) Select Perform Thru Characterization to perform the Characterization.

3) If the characterization is successful, follow prompts to save the generated S2P file.

TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

When LRL/LRM Cal Method is selected, the Edit Cal Parameters LRL/LRM dialog provides for up to five bands and 10 devices.

Prerequisites

- Cal Method = LRL/LRM
- Line Type = Coaxial

Previous

- "CAL SETUP Menu" on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | TWO-PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

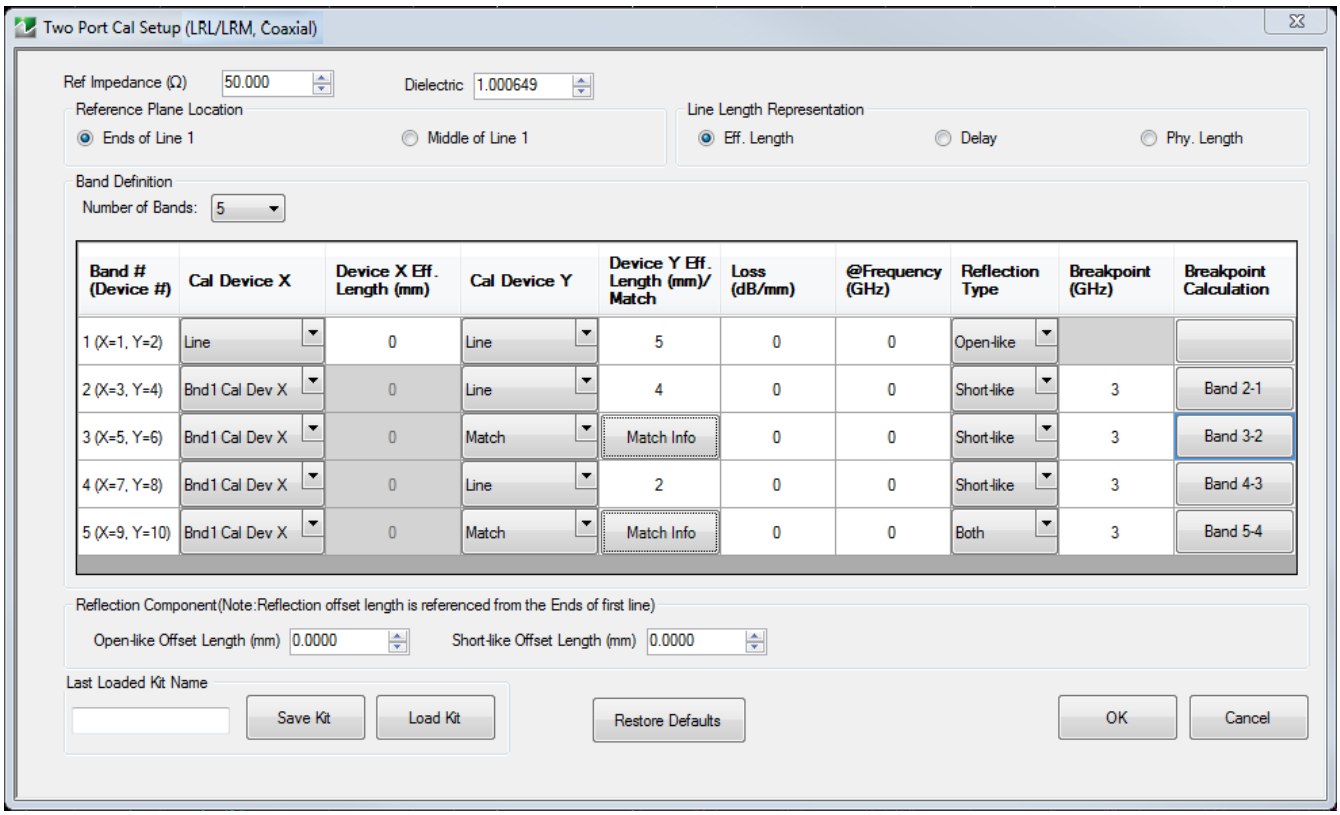


Figure 8-59. Edit Cal Params – TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted although input values < 0.01 Ohms are converted to 0.01 Ohms.

Dielectric

Enter a value if different than the default.

Reference Plane Location

Select from two radio button controlled options:

- Ends of Line 1
- Middle of Line 1

Line Length Representation

Select from three radio button controlled options:

- Eff. (Effective) Length (the free-space equivalent length)
- Delay
- Phy. (Physical) Length

Note	Line Length representation selection is not used for Reflection Component (Open-Like or Short-Like).

Band Definition

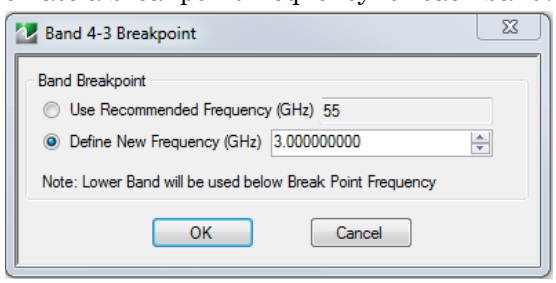
Select one to five bands from the pull-down menu.

- Number of Bands = 1. Only the Band 1 Definition and editable parameters appear.
- Number of Bands = 2. The Band 2 Definition and editable parameters appear.
- Number of Bands = 3. The Band 3 Definition and editable parameters appear.
- Number of Bands = 4. The Band 4 Definition and editable parameters appear.
- Number of Bands = 5. The Band 5 Definition and editable parameters appear.

Band Parameter Definitions

- **Band # (Device #)**
  - Band 1 defines Devices as X = 1 and Y = 2)
  - Band 2 defines Devices as X = 3 and Y = 4)
  - Band 3 defines Devices as X = 5 and Y = 6)
  - Band 4 defines Devices as X = 7 and Y = 8)
  - Band 5 defines Devices as X = 9 and Y = 10)
- **Cal Device X**
  - Band 1 choice is
    - Line
  - Band 2 choices are
    - New Line
    - Bnd1 Cal Dev X
    - Bnd1 Cal Dev Y
  - Band 3 choices are
    - New Line
    - Bnd1 Cal Dev X
    - Bnd1 Cal Dev Y

    - Bnd2 Cal Dev X
    - Bnd2 Cal Dev Y
  - Band 4 choices are
    - New Line
    - Bnd1 Cal Dev X, Bnd1 Cal Dev Y
    - Bnd2 Cal Dev X, Bnd2 Cal Dev Y
    - Bnd3 Cal Dev X, Bnd3 Cal Dev Y
  - Band 5 choices are
    - New Line
    - Bnd1 Cal Dev X, Bnd1 Cal Dev Y
    - Bnd2 Cal Dev X, Bnd2 Cal Dev Y
    - Bnd3 Cal Dev X, Bnd3 Cal Dev Y
    - Bnd4 Cal Dev X, Bnd4 Cal Dev Y
- **Device X Length (mm)**
  - Enter device length for each band.
- **Cal Device Y**
  - Select Line or Match for each band.
- **Device Y Length (mm)/Match**
  - Enter device length for each band if Device Y is Line.
  - Select Match Info if Device Y is Match. Opens "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154
- **Loss (dB/mm)**
  - Enter loss for each band.
- **@Frequency (GHz)**
  - Enter frequency for line loss for each band.
- **Reflection Type**
  - Enter a reflection type for each band.
    - Short-like
    - Open-like
    - Both (available only if Cal Device Y= Match)
- **Breakpoint (GHz)**
  - Enter a breakpoint frequency for each band. (This area only active for bands 2 through 5.)
- **Breakpoint Calculation**
    - Select to Calculate a breakpoint frequency for each band:



Reflection Component

- Enter Open-like and/or Short-like offset length. Open-like and reflect-like are in terms of effective length and not the selection from the line representation

Last Loaded Kit Name, Save Kit, Load Kit, Restore Defaults

- Last Loaded Kit Name – Loaded kit name appears in the field. The name can be edited in this field and then saved as another kit.
- Save Kit – Saves the present cal setup.
- Load Kit – Opens window to navigate to a desired existing LRL/LRM cal kit file (.lcf).
- Restore Defaults – Loads the instrument default values for the Cal Setup.

OK/Cancel

Returns user to the CAL SETUP menu.

TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

When TRL/TRM Cal Method is selected, the Edit Cal Parameters TRL/TRM dialog provides for up to five bands.

Prerequisites

- Cal Method = TRL/TRM
- Line Type = Coaxial

Previous

- "CAL SETUP Menu" on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | TWO-PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

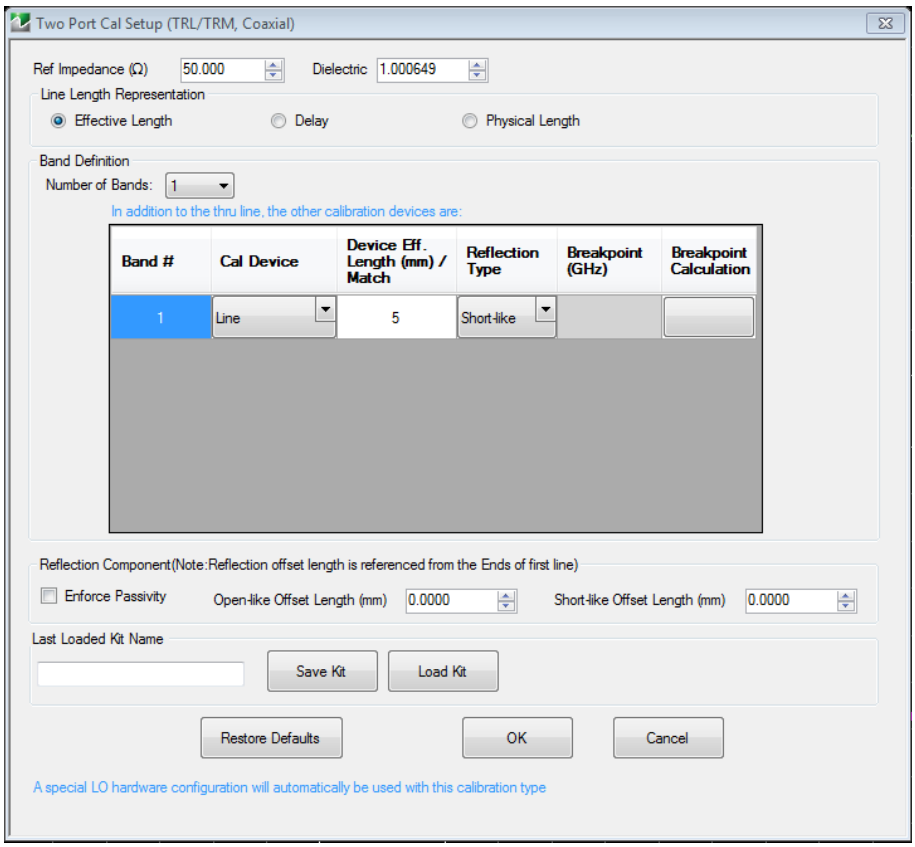


Figure 8-60. Edit Cal Params – TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted although input values < 0.01 Ohms are converted to 0.01 Ohms.

Dielectric

Enter a value if different than the default.

Line Length Representation

Select from three radio button controlled options:

- Eff. (Effective) Length (the free-space equivalent length)
- Delay
- Phy. (Physical) Length

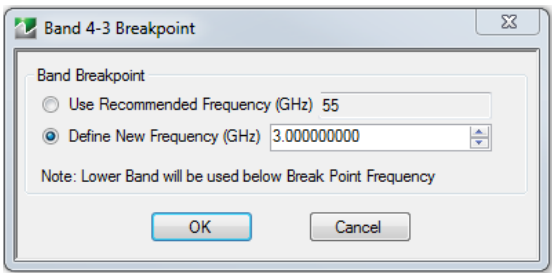
Band Definition

Select one to five bands from the pull-down menu.

- Number of Bands = 1. Only the Band 1 Definition and editable parameters appear.
- Number of Bands = 2. The Band 2 Definition and editable parameters appear.
- Number of Bands = 3. The Band 3 Definition and editable parameters appear.
- Number of Bands = 4. The Band 4 Definition and editable parameters appear.
- Number of Bands = 5. The Band 5 Definition and editable parameters appear.

Band Parameter Definitions

- **Cal Device**
  - Choice of
    - Line
    - Match
- **Device Eff. Length (mm)/Match**
  - Enter device length for each band.
- **Reflection Type**
  - Enter a reflection type for each band.
    - Short-like
    - Open-like
- **Breakpoint (GHz)**
  - Enter a breakpoint frequency for each band. (This area only active for bands 2 through 5.)
- **Breakpoint Calculation**
    - Select to calculate a breakpoint frequency for each band:



- **Enforce Passivity**
    - Forces the reflection value to be passive at an intermediate step in the calibration, which rescales the reflection tracking terms.
- **Open-like Length, Short-like Length**
    - Enter open-like and/or short-like values.

Last Loaded Kit Name, Save Kit, Load Kit, Restore Defaults

- Last Loaded Kit Name – Loaded kit name appears in the field. The name can be edited in this field and then saved as another kit.
- Save Kit – Saves the present cal setup.
- Load Kit – Opens window to navigate to a desired existing TRL/TRM cal kit file (.lcf).
- Restore Defaults – Loads the instrument default values for the Cal Setup.

OK/Cancel

Returns user to the CAL SETUP menu.

MANUAL 2-PORT CAL Dialog Box Summary

The table below summarizes the available fields in all 2-port calibration setup dialog boxes. If the dialog box is described above, a link is provided to that description. To view each dialog box, set the CAL METHOD and LINE TYPE menus to the appropriate settings, and then select the Edit Cal Params button. All dialog boxes are named "Two Port Cal Setup (*Cal Method, Line Type*)"

Table 8-3. MANUAL 2-PORT CAL Setup Dialog Box Summary (1 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
SOLT/SOLR Coaxial	See full description above at "TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 8-82. LRL, LRM, SOLR, and TRL/TRM are available for MS46122/322 "B", ME7868A, and ME7869A models only. Reference Impedance (Ohms) Select Cal Type: Full 2 Port, 1 Path 2 Prt (1–>2), 1 Path 2 Port (2–>1) Load Type: Broadband Load, Sliding Load Test Port 1 and Test Port 2 controls are the same. Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), V-Conn (M), V-Conn (F), K-Conn (M), K-Conn (F), 2.4 mm (M), 2.4 mm (F), GPC-3.5 (M), GPC-3.5 (F), SMA (M), SMA (F), N-Conn (M), N-Conn (F), N-Conn (75) (M), N-Conn (75) (F), GPC-7, 7/16 (M), 7/16 (F), TNC (M), TNC (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F) Test Port Connector Standard Info Button: For each DUT port connector, displays the STANDARD INFORMATION or USER-DEFINED dialog box for the selected connector. • Typical "STANDARD INFO Dialog Box" on page 8-149. Test Port Select BB Load: Load 1, Load 2 Through/Reciprocal/2P Thru Select Line: Select Through, Reciprocal, S2P Thru Through/Reciprocal Length (mm): Input field Through Line Impedance (Ohms): Input field Through Line Loss (dB/mm): Input field Through @ Frequency (GHz): Input field S2P Thru Load S2P for Thru: Opens the LOAD dialog box. S2P Thru View S2P File: Opens the VIEW FILE- S2P for Thru dialog box. S2P Thru Load S2P for Thru: Opens the THRU CHARACTERIZATION dialog box.

Table 8-3. MANUAL 2-PORT CAL Setup Dialog Box Summary (2 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
SSLT Coaxial	See full description above at "TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 8-85 Reference Impedance (Ohms) Select Cal Type: Full 2 Port, 1 Path 2 Prt (1–>2), 1 Path 2 Port (2–>1) Load Type: Broadband Load, Sliding Load Test Port 1 and Test Port 2 controls are the same. Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), V-Conn (M), V-Conn (F), K-Conn (M), K-Conn (F), 2.4 mm (M), 2.4 mm (F), GPC-3.5 (M), GPC-3.5 (F), SMA (M), SMA (F), N-Conn (M), N-Conn (F), N-Conn (75) (M), N-Conn (75) (F), GPC-7, 7/16 (M), 7/16 (F), TNC (M), TNC (F), User-Defined1 (M) through User-Defined32 (M), User-Defined 1 (F) through User-Defined32 (F). Test Port Connector Standard Info Button: For each DUT port connector, displays the STANDARD INFORMATION or USER-DEFINED dialog box for the selected connector. • Typical "STANDARD INFO Dialog Box" on page 8-149 Use S2P for Thru: Allows user to define a Thru using an S2P file. S2P file can be loaded from memory or characterized before use. Test Port Select BB Load: Load 1, Load 2 Through/Reciprocal Select Line: Through, Reciprocal Through/Reciprocal Length (mm): Input field Through/Reciprocal Line Impedance (Ohms): Input field Through/Reciprocal Line Loss (dB/mm): Input field Through/Reciprocal @ Frequency (GHz): Input field
SSLT Non-Dispersive	Same controls and functions as SSLT Coax above.
SSLT Waveguide	Same controls and functions as SSLT Coax above with the following changes: Waveguide Kit: WR10, WR12, WR15, User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box. • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154
SSLT Microstrip	Same controls and functions as SSLT Coax above with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149 Test Port DUT Connector Type: User-Defined1 to User-Defined32 Test Port DUT Connector Standard Info button: Displays USER DEFINED STANDARD dialog box for selected calibration method and kit.

Table 8-3. MANUAL 2-PORT CAL Setup Dialog Box Summary (3 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
SSST Coaxial	See full description above at "TWO PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 8-88. Reference Impedance (Ohms) Select Cal Type: Full 2 Port, 1 Path 2 Prt (1–>2), 1 Path 2 Port (2–>1) Load Type: Broadband Load, Sliding Load Test Port 1 and Test Port 2 controls are the same. Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), V-Conn (M), V-Conn (F), K-Conn (M), K-Conn (F), 2.4 mm (M), 2.4 mm (F), GPC-3.5 (M), GPC-3.5 (F), SMA (M), SMA (F), N-Conn (M), N-Conn (F), N-Conn (75) (M), N-Conn (75) (F), GPC-7, 7/16 (M), 7/16 (F), TNC (M), TNC (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F). Test Port Connector Standard Info Button: For each DUT port connector, displays the STANDARD INFORMATION or USER-DEFINED dialog box for the selected connector. • Typical "STANDARD INFO Dialog Box" on page 8-149 Through/Reciprocal Select Line: Through, Reciprocal Through/Reciprocal Length (mm): Input field Through/Reciprocal Line Impedance (Ohms): Input field Through/Reciprocal Line Loss (dB/mm): Input field Through/Reciprocal @ Frequency (GHz): Input field
SSST Non-Dispersive	Same controls and functions as SSST Coaxial above.
SSST Waveguide	Same controls and functions as SSLT Coax above with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box. • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154
SSST Microstrip	Same controls and functions as SSST Coax above with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149 Test Port DUT Connector Type: User-Defined1 to User-Defined32 Test Port DUT Connector Standard Info button: Displays USER DEFINED STANDARD dialog box for selected calibration method and kit.

Table 8-3. MANUAL 2-PORT CAL Setup Dialog Box Summary (4 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
LRL/LRM Coaxial (MS46122/322 "B", ME7868A, and ME7869A Models Only	See full description above display logic and controls at "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 8-92. Reference Impedance (Ohms) Dielectric: Enter a value if different than the default. Reference Plane Location: Ends of Line 1 or Middle of Line 1 Line Length Representation: Eff. Length, Delay, Phy. Length Number of Bands: 1 through 5 Band# (Device#): Up to 10 devices Band 1 Device 1: Type defaults to Line, Line Length (mm) or Delay (ps), Line Loss (dB/mm), @ Frequency (GHz) Band 1 Device 2 Type: Line or Match • If Device 2 = Match, Match Info button appears. Select displays USER DEFINED MATCH DEVICES dialog box for selected calibration method and kit. • Typical "USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs" on page 8-152 Band 1 Device 2 Type of Reflection: Use Short-like component, Use Open-like component, Use both • If Use Short-like component selected: Reflection Component = Short-like Offset Length (mm) • If Use Open-like component selected: Reflection Component = Open-like Offset Length (mm) • If Use both selected: Reflection Component = Short-like Offset Length (mm) and Open-like Offset Length (mm) If Number of Bands = 2, Band 2 Device 3 and Band 2 Device 4 areas appear: Band 2 Device 3: Use device 1, Use new line • If Use new line selected: Line Length (mm) or Delay (ps), Line Loss (dB/mm), and @ Frequency (GHz) fields appear Band 2 Device 4: Line or Match • If Line selected: Line Length (mm) field appears. • If Match selected: Match Info button appears. Select displays USER DEFINED MATCH DEVICES dialog box for selected calibration method and kit. • Typical "USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs" on page 8-152 Band 2 Device 4 Type of Reflection: Use Short-like component, Use Open-like component Band Break Point: Calculate Recommended Value, Use Recommended Frequency (GHz) or Define New Frequency (GHz). Reflection Component: Open-like Length (mm) and/or Short-like Offset Length (mm) Line length representation is in terms of effective length. Last Loaded Kit Name: Provides the ability to save calibration kit data. Click opens a Save Cal Kit dialog to save current settings to an LRL/LRM cal kit file (.lcf) in a desired location. Load Kit: Provides the ability to recall calibration kit data. Click opens window to navigate to a desired existing LRL/LRM cal kit file (.lcf).
LRL/LRM Non-Dispersive	Same controls and functions as LRL/LRM Coaxial above.

Table 8-3. MANUAL 2-PORT CAL Setup Dialog Box Summary (5 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
LRL/LRM Waveguide	Same controls and functions as LRL/LRM Coaxial above with the following changes: • Cutoff frequency (GHz) • Dielectric
LRL/LRM Microstrip	Same controls and functions as LRL/LRM Coaxial above with the following changes: • Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined 1 to User-Defined 32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149
TRL/TRM Coaxial (MS46122/322 "B", ME7868A, and ME7869A Models Only	See full description above display logic and controls at "TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 8-96. Reference Impedance (Ohms) Dielectric: Enter a value if different than the default. Line Length Representation: Eff. Length, Delay, Phy. Length Number of Bands: 1 through 5 Cal Device: Line or Match Device Effective Length (mm): Enter device length for each band. Reflection Component: Open-like or Short-like. Breakpoint: Set frequency (GHz). Breakpoint Calculation: Calculate a breakpoint frequency for each band. Reflection Component: • Enforce Passivity: Forces the reflection value to be passive at an intermediate step in the calibration, which rescales the reflection tracking terms. • Open-like Length / Short-like Length: Enter open-like and/or short-like values. Last Loaded Kit Name: Provides the name of the TRL/TRM Cal Kit file that was last loaded. Save Kit: Provides the ability to save calibration kit data. Click opens a Save Cal Kit dialog to save current settings to an TRL/TRM cal kit file (.lcf) in a desired location. Load Kit: Provides the ability to recall calibration kit data. Click opens window to navigate to a desired existing TRL/TRM cal kit file (.lcf). Restore Defaults: Loads the instrument default values for the Cal Setup.
TRL/TRM Non-Dispersive	Same controls and functions as TRL/TRM Coaxial above.
TRL/TRM Waveguide	Same controls and functions as TRL/TRM Coaxial above with the following changes: • Cutoff frequency (GHz)
TRL/TRM Microstrip	Same controls and functions as TRL/TRM Coaxial above with the following changes: • Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined 1 to User-Defined 32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149

8-14 Typical Calibration Sub-Menus

The menus in this section are example menus for the calibration step procedures. The exact content and presence of each menu is dependent on the settings for each calibration run.

REFL. DEVICE(S) Menu

This example is a representative menu based on the following configuration:

- VNA is in 2-port mode
- A 2-port calibration
- A SOLT/SOLR calibration method. LRL, LRM, SOLR, and TRL/TRM are available for the MS46122/322 “B”, ME7868A, and ME7869A models only.
- A coaxial line type
- Connector

Using a different configuration set can change the appearance of the REFL. DEVICE(S) menu.

Full Name

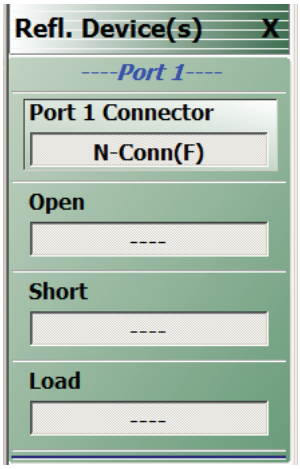
- REFLECTIVE DEVICE(S) Menu

Previous

- The previous menu can be any of the following manual calibration menus and their associated configuration dialog boxes.
  - “TWO PORT CAL Menu” on page 8-79
  - “ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs” on page 8-108
  - “TRANS. RESPONSE Menu” on page 8-122
  - “REFL. RESPONSE Menu” on page 8-138
- The REFL. DEVICE(s) menu controls and functions are also subject to the settings in the following:
  - “CAL SETUP Menu” on page 8-74
  - “CAL METHOD Menu” on page 8-76
  - “LINE TYPE Menu” on page 8-78

Similar Menus

- The REFL. DEVICE(S) Port 1 menu is nearly identical to the typical REFL. DEVICE(S) Port 2 menu (not shown).



A typical REFL. DEVICE(S) menu.

Each button is a completion task button and marked with a checkmark when the calibration task is complete.

Port 1 Connector

This button returns user to the TWO PORT CAL SETUP dialog box, allowing changes to the connector type.

Open

In general, prepare the indicated connections and components and then select the button. Starts the open calibration procedure for the indicated port. When the calibration task is completed, the button is marked with a checkmark.

Short

Starts the short calibration procedure for the indicated port. When the calibration task is completed, the button is marked with a checkmark.

Load

Starts the load calibration procedure for the indicated port. When the calibration task is completed, the button is marked with a checkmark.

Sliding Load

If present, selecting this button displays the SLIDING LOADS menu, which is described in the section below.

Figure 8-61. REFL. DEVICE(S) (REFLECTIVE DEVICES) Menu – Typical Example

THRU/RECIP Menu

This menu example is a representative menu based on the following configuration:

- VNA is in 2-port mode
- A 2-port calibration
- A SOLT/SOLR calibration method. SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only.
- Sliding loads selected
- A coaxial line type
- Connector

Using a different configuration set can change the appearance of the THRU/RECIP menu.

Previous

- The previous menu can be any of the following manual calibration menus and their associated configuration dialog boxes.
  - “TWO PORT CAL Menu” on page 8-79
  - “ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs” on page 8-108
  - “TRANS. RESPONSE Menu” on page 8-122
  - “REFL. RESPONSE Menu” on page 8-138
- The THRU/RECIP menu controls and functions are also subject to the settings in the following:
  - “CAL SETUP Menu” on page 8-74
  - “CAL METHOD Menu” on page 8-76

A typical THRU/RECIP menu.

Each button is a completion task button and marked with a checkmark when the calibration task is complete.

Thru (Port Pair 1-2)

In general, prepare the indicated connections and components and then select the button. Starts the through calibration procedure for the indicated port pair. When the calibration task is completed, the button is marked with a checkmark.

When all calibration procedures are complete, use the Back button to return to the REFL DEVICE menu.

- “REFL. DEVICE(S) Menu” on page 8-104

Figure 8-62. THRU/RECIP Menu – Typical Example

ISOLATION(S) Menu – 2-Port VNA

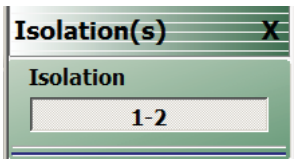
This menu example is a representative menu based on the following configuration:

- VNA is in 2-port mode
- A 2-port calibration
- A SOLT/SOLR calibration method. SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only.
- A coaxial line type
- A K (f) Connector

Using a different configuration set can change the appearance of the THRU/RECIP menu.

Previous

- The previous menu can be any of the following manual calibration menus and their associated configuration dialog boxes.
  - “TWO PORT CAL Menu” on page 8-79
  - “ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs” on page 8-108
  - “TRANS. RESPONSE Menu” on page 8-122
  - “REFL. RESPONSE Menu” on page 8-138
- The THRU/RECIP menu controls and functions are also subject to the settings in the following:
  - “CAL SETUP Menu” on page 8-74
  - “CAL METHOD Menu” on page 8-76



A typical ISOLATION(S) menu.

Each button is a completion task button and marked with a checkmark when the calibration task is complete.

Isolation (Port Pair 1-2)

In general, prepare the indicated connections and components and then select the button. Starts the optional isolation calibration procedure for the indicated port pair. When the calibration task is completed, the button is marked with a checkmark.

When all calibration procedures are complete, use the Back button to return to the REFL DEVICE menu.

- “REFL. DEVICE(S) Menu” on page 8-104

Figure 8-63. ISOLATION(S) Menu – Typical Example

8-15 Manual 1-Port Cal Setup — 2-Port VNAs

Note	The appearance and button availability of the calibration menus depends on the settings established in the CAL SETUP, CAL METHOD, LINE TYPE menus and in the associated dialog boxes that appear from the Edit Cal Params button.

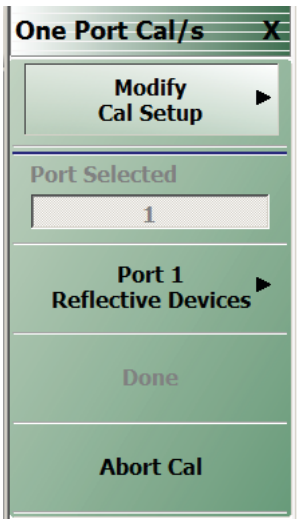
ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs

Previous

- "MANUAL CAL Menu" on page 8-73

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE PORT CAL/S menu



Modify Cal Setup

Select displays the CAL SETUP menu where changes to the calibration method, line type, and associated parameters are made on the CAL METHOD and LINE TYPE submenus.

- "CAL SETUP Menu" on page 8-74.
- "CAL METHOD Menu" on page 8-76.
  - Calibration method options are SOL, Offset Short (SSL), Triple Offset Short (SSS).
- "LINE TYPE Menu" on page 8-78
  - Line Type options are Coaxial, Non-Dispersive, Waveguide, or Microstrip.

A composite view of the CAL SETUP menu set and is available in:

- Figure 8-47 on page 8-70

Ports Selected (Read Only)

A display button showing the port numbers that are in the calibration.

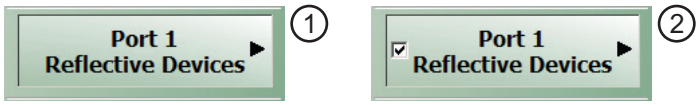
(continued)

Figure 8-64. ONE PORT CAL MENU – Typical Example (1 of 2)

Completion Menu Buttons

For this example menu, the Port 1 Reflective Devices to the Isolation (Optional) buttons link to completion submenus where additional calibration procedures are performed.

For example, the Port 1 Reflective Devices button (shown below at #1) links to the REFL. DEVICES PORT 1 submenu. As each procedure is completed, the submenu button is marked with a completion checkmark. When all the procedures on the submenu are completed, use the Back button to return to the FOUR PORT CAL menu.



The Port 1 Reflective Devices button (shown above at #2) is now marked with a completion checkmark.

Port 1 Reflective Devices

When selected, provides the PORT 1 REFLECTIVE DEVICES menu. Each button represents a completion task. When ready for the task, click the button, and the instrument performs the calibration. When the calibration task is successfully completed, the button is marked with a completion checkmark. When all tasks are completed on the menu, return to the ONE PORT CAL menu.

Done

This button is unavailable until all calibration tasks have been successfully completed. When available, select the button to return to the CALIBRATION menu when the Cal Status is set to ON.

- "CALIBRATION [TR] Menu" on page 8-6

Abort Cal

Select aborts the current calibration and returns to the CALIBRATION menu.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-64. ONE PORT CAL MENU – Typical Example (2 of 2)

Modify One-Port Cal Setup Dialog Boxes

The controls and fields in Edit Cal Params dialog boxes depend on the settings made in the MANUAL CAL, CAL SETUP, CAL METHOD, and LINE TYPE menus. Dialog box examples are:

- "ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-111
- "ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-114
- "ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-117

Note	The LRL/LRM and TRLTRM calibration method are not available for One-Port Calibrations.

For all other combinations of calibration methods and line types, see the summary in Table 8-4 on page 8-119 for a listing of dialog box controls and functions.

ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box — 2-Port VNAs

Prerequisites

- Calibration Method = SOLT/SOLR
- Line Type = Coaxial
- Calibration Method = SOL 1-port VNAs

Previous

- "ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs" on page 8-108

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE-PORT CAL(S) | Modify Cal Setup | CAL SETUP | Edit Cal Params | ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

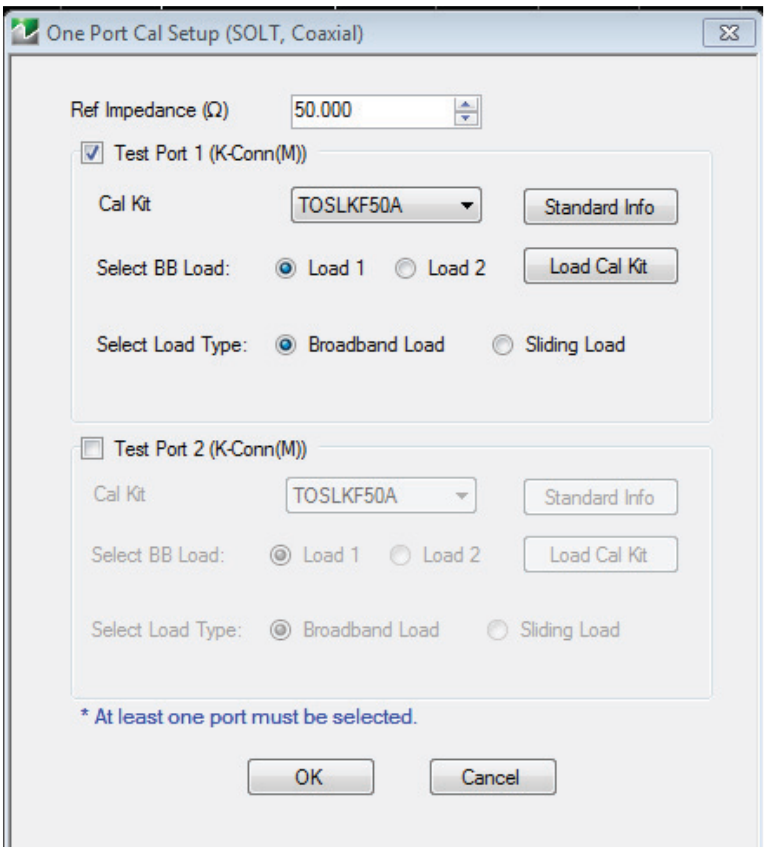


Figure 8-65. ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

Reference Impedance

Read-only field displays 50 Ohms reference impedance.

Test Port 1

At least one test port (Test Port 1 or Test Port 2) must be selected. Both test ports may be selected.

Use the check box to select Test Port 1. If the check box is not selected, all Test Port 1 fields and controls are unavailable. If selected, the following controls are available:

Cal Kit (Connector) Type Field

Select the DUT Connector Type from a drop-down menu list with options of:

- TOSLKF50A
- TOSLK50A
- TOSLNF50A
- TOSLN50A
- K-Conn (M)
- K-Conn (F)
- GPC-3.5 (M)
- GPC-3.5 (F)
- SMA (M)
- SMA (F)
- N-Conn (M)
- N-Conn (F)
- 2.4 mm (M)
- 2.4 mm (F)
- TNC (M)
- TNC (F)
- V-conn (M)
- V-conn (F)
- W1-conn (M)
- W1-conn (F)
- 7/16 (M)
- 7/16 (F)
- GPC-7
- N-conn(75) (M)
- N-conn(75) (F)
- User-Defined 1 through 32 (M or F)

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Select BB Load for Test Port 1

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Load Cal Kit

Prompts the LOAD dialog box.

Select Load Type for Test Port 1

Select the load type for Test Port 1:

- Broadband Load
- Sliding Load. If Sliding Load is selected:
  - A message appears in the “Still requires broadband loads below sliding load breakpoint frequency.”
  - A Sliding Load button appears on the PORT 1 REFLECTIVE DEVICES menu.

Test Port 2 Area

Use the check box to select Test Port 2. If the check box is not selected, all Test Port 2 fields and controls are unavailable. If selected, the following controls are available:

DUT Connector Type Field:

Select the DUT Connector Type from a drop-down menu list with the same options as in Test Port 1 above.

Test Port 2 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Select BB Load for Test Port 2

Select BB Load number for Test Port 2:

- Load 1
- Load 2

Load Cal Kit

Prompts the LOAD dialog box.

Select Load Type for Test Port 2

Select the load type for Test Port 2:

- Broadband Load
- Sliding Load. If Sliding Load is selected:
    - A message appears in the “Still requires broadband loads below sliding load breakpoint frequency.”
    - A Sliding Load button appears on the PORT 2 REFLECTIVE DEVICES menu.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu.

Click Cancel to abandon any changes and return to the CAL SETUP menu.

ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box — 2-Port VNAs

Prerequisites

- Calibration Method = SSLT
- Line Type = Coaxial
- Calibration Method = SOL 1-port VNAs

Previous

- "ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs" on page 8-108

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

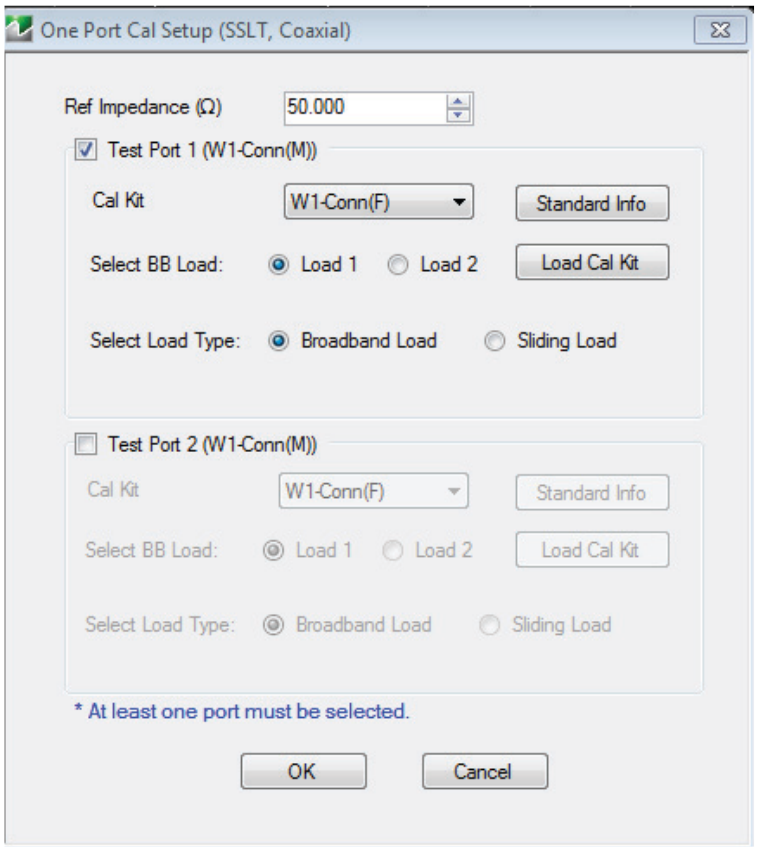


Figure 8-66. ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted although input values <0.01 Ohms are converted to 0.01 Ohms.

Test Port 1

At least one test port (Test Port 1 or Test Port 2) must be selected. Both test ports may be selected.

Use the check box to select Test Port 1. If the check box is not selected, all Test Port 1 fields and controls are unavailable. If selected, the following controls are available:

Test Port 1 DUT Connector Type Field

Select the DUT Connector Type from a drop-down menu list with options of:

- W1-Conn (M)
- W1-Conn (F)
- User-Defined1 (M) through User-Defined32 (M)
- User-Defined1 (F) through User-Defined32 (F)

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the selected connector and Cal Method selected.

Select BB Load for Test Port 1

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Select Load Type for Test Port 1

Select the load type for Test Port 1:

- Broadband Load
- Sliding Load. If Sliding Load is selected:
    - A message appears in the “Still requires broadband loads below sliding load breakpoint frequency.”
    - A Sliding Load button appears on the PORT 1 REFLECTIVE DEVICES menu.

Test Port 2 Area

Use the check box to select Test Port 2. If the check box is not selected, all Test Port 2 fields and controls are unavailable. If selected, the following controls are available:

Test Port 2 DUT Connector Type Field:

Select the DUT Connector Type from a drop-down menu list with the same options as in Test Port 1 above.

Test Port 2 Connector Standard Info Button

Select displays the Standard Info dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Select BB Load for Test Port 2

Select BB Load number for Test Port 2:

- Load 1
- Load 2

Select Load Type for Test Port 2

Select the load type for Test Port 2:

- Broadband Load
- Sliding Load. If Sliding Load is selected:
  - A message appears in the "Still requires broadband loads below sliding load breakpoint frequency."
  - A Sliding Load button appears on the PORT 2 REFLECTIVE DEVICES menu.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu.

Click Cancel to abandon any changes and return to the CAL SETUP menu.

ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box — 2-Port VNAs

Prerequisites

- Calibration Method = SSST
- Line Type = Coaxial
- Calibration Method = SSS 1-port VNAs

Previous

- "ONE PORT CAL Menu (SOL – Coaxial) — 2-Port VNAs" on page 8-108

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE-PORT CAL(S) | Modify Cal Setup | CAL SETUP | Edit Cal Params | ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box

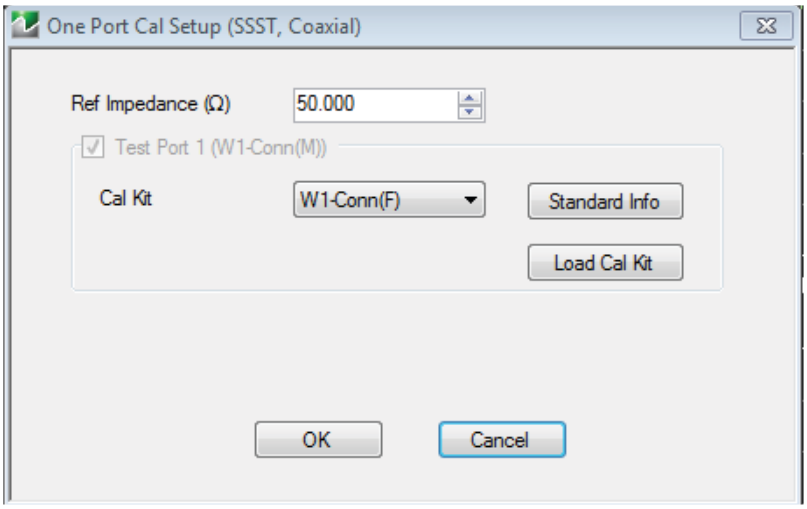


Figure 8-67. ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted although input values <0.01 Ohms are converted to 0.01 Ohms.

Test Port 1

At least one test port (Test Port 1 or Test Port 2) must be selected. Both test ports may be selected.

Use the check box to select Test Port 1. If the check box is not selected, all Test Port 1 fields and controls are unavailable. If selected, the following controls are available:

Test Port 1 DUT Connector Type

Select the DUT Connector Type from a drop-down menu list with options of:

- W1-Conn (M)
- W1-Conn (F)
- User-Defined1 (M) through User-Defined32 (M)
- User-Defined1 (F) through User-Defined32 (F)

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

Test Port 2 Area

Use the check box to select Test Port 2. If the check box is not selected, all Test Port 2 fields and controls are unavailable. If selected, the following controls are available:

Test Port 2 DUT Connector Type Field:

Select the DUT Connector Type from a drop-down menu list with the same options as in Test Port 1 above.

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depends on the connector selected above and on the Cal Method selected.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu.

Click Cancel to abandon any changes and return to the CAL SETUP menu.

Summary of 1-Port Calibration Setup Dialog Boxes — 2-Port VNAs

The table below summarizes the available fields in other one-port calibration setup dialog boxes. To view each dialog box, set the CAL METHOD and LINE TYPE menus to the appropriate settings, and then select the Edit Cal Params button. All dialog boxes are named "One Port Cal Setup (*Cal Method*, *Line Type*)".

Table 8-4. Manual Calibration – 1-Port Calibration Setup Dialog Box Contents (1 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/SOLR (SOL) Coaxial	See full description above at "ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-111. SOLR is available for MS46122/322 "B" and MS46131A 1-port models only. Reference Impedance (Ohms) Select Test Port: Port 1 and/or Port 2 Test Port 1 and Test Port 2 controls are the same. Port must be selected to enable controls. Test Port DUT Connector: For each selected test port, select one of the connector types. Test Port Connector Standard Info Button: For each DUT port connector, displays the info dialog box for the selected connector. • Typical "STANDARD INFO Dialog Box" on page 8-149 Test Port BB Load: Load 1, Load 2 Test Port Load Type: Broadband Load, Sliding Load
SOLT/SOLR (SOL) Non-Dispersive	Same controls and functions as SOLT/SOLR Coaxial above. SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only.
SOLT/SOLR (SOL) Waveguide	SOLT/SOLR is not recommended for Waveguide calibrations. SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only. Same controls and functions as SOLT/SOLR Coaxial above with the following changes: Reference Impedance (Ohms) Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box. • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154
SOLT/SOLR (SOL) Microstrip	Same controls and functions as SOLT/SOLR Coaxial above with the following changes: SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only. Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined 1 to User-Defined8 Microstrip Info button: Displays dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149 Test Port DUT Connector Type: User-Defined1 to User-Defined32 Test Port Standard Info button: Displays info dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149

Table 8-4. Manual Calibration – 1-Port Calibration Setup Dialog Box Contents (2 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSLT (SSL) Coaxial	See full description above at "ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-114. Reference Impedance (Ohms) Select Test Port: Port 1 and/or Port 2 Test Port 1 and Test Port 2 controls are the same. Port must be selected to enable controls. Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F) Test Port Connector Standard Info Button: For each DUT port connector, displays the info dialog box for the selected connector. • Typical "STANDARD INFO Dialog Box" on page 8-149 Test Port BB Load: Load 1, Load 2 Test Port Load Type: Broadband Load, Sliding Load
SSLT (SSL) Non-Dispersive	Same controls and functions as SSLT Coax.
SSLT (SSL) Waveguide	Same controls and functions as SSLT Coax with the following changes: Waveguide Kit: WR10, WR12, WR15, User-Defined1 to User-Defined32 Waveguide Info button: Displays info dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149 • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154
SSLT (SSL) Microstrip	Same controls and functions as SSLT Coax with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays info dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149 Test Port Standard Info button: Displays USER DEFINED STANDARD dialog box for selected calibration method and kit. • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154
SSST (SSS) Coaxial	See the full description above at "ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-117. Reference Impedance (Ohms) Select Test Port: Port 1 and/or Port 2 Test Port 1 and Test Port 2 controls are the same. Port must be selected to enable controls. Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F) Test Port Connector Standard Info Button: For each DUT port connector, displays the info dialog box for the selected connector. • Typical "STANDARD INFO Dialog Box" on page 8-149
SSST (SSS) Non-Dispersive	Same controls and functions as SSST Coaxial.

Table 8-4. Manual Calibration – 1-Port Calibration Setup Dialog Box Contents (3 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSST (SSS) Waveguide	Same controls and functions as SSST Coaxial above with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • Typical “USER DEFINED WAVEGUIDE Dialog Box” on page 8-154
SSST (SSS) Microstrip	Same controls and functions as SSST Coaxial above with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays MICROSTRIP INFO dialog box for selected calibration method and kit. • Typical “STANDARD INFO Dialog Box” on page 8-149
LRL/LRM Coax	The LRL/LRM calibration method is not available for one-port calibrations.
LRL/LRM Non-Dispersive	
LRL/LRM Waveguide	
LRL/LRM Microstrip	
TRL/TRM Coax	The TRL/TRM calibration method is not available for one-port calibrations.
TRL/TRM Non-Dispersive	
TRL/TRM Waveguide	
TRL/TRM Microstrip	

8-16 Manual Cal – Trans. Freq. Resp. Cal

Note	The appearance and button availability of the calibration menus depends on the settings established in the CAL SETUP, CAL METHOD, LINE TYPE menus and in the associated dialog boxes that appear from the Edit Cal Params button.

Full Name

- Transmission Frequency Response Calibration

Menu Name

- TRANS. RESPONSE

Button Name

- Transmission Freq. Response

TRANS. RESPONSE Menu

Full Name

- TRANSMISSION FREQUENCY RESPONSE CALIBRATION SETUP Menu

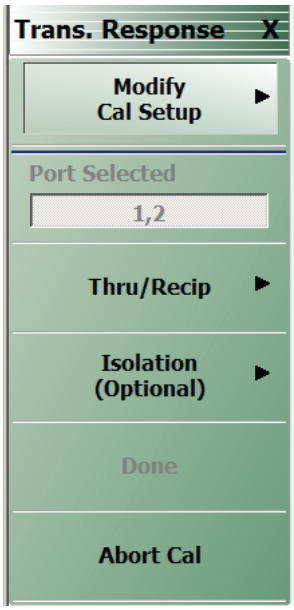
The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant TRANSMISSION FREQUENCY REPONSE CAL SETUP dialog box. A representative menu is shown below. There is one example procedure of a TRANS. RESPONSE calibration in this chapter.

Previous

- "MANUAL CAL Menu" on page 8-73

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq. Response | TRANS. RESPONSE



Modify Cal Setup

Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the TRANSMISSION FREQUENCY RESPONSE CAL SETUP dialog box for the selected calibration method and line type.

- "CAL SETUP Menu" on page 8-74

Example transmission frequency response calibration dialog boxes are available below:

- "TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT – Coaxial) Dialog Box" on page 8-125

A summary table of all transmission frequency response calibration configuration dialog boxes is available here:

- Table 8-5, "Manual Calibration – TRANS. FREQ. RESP. CAL SETUP Dialog Box Contents" on page 8-127

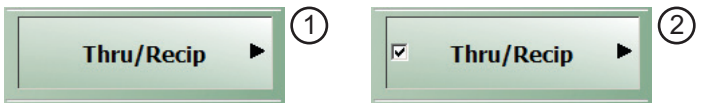
Port Selected

Read-only display of the ports selected for the pending calibration.

Completion Menu Buttons

For this example menu, the Thru/Recip and Isolation (Optional) buttons link to completion submenus where additional calibration procedures are performed.

For example, the Thru/Recip button (shown below at #1) links to the THRU/RECIP submenu. As each procedure is completed, the submenu button is marked with a completion checkmark. When all the procedures on the submenu are completed, use the Back button to return to the TRANS. RESPONSE menu.



The Thru/Recip button (shown above at #2) is now marked with a completion checkmark.

Thru/Recip

When selected, displays the THRU/RECIP menu. When all tasks are complete, return to the TRANS. RESPONSE menu. Only the Thru option is available for the MS46121A/B. The Thru option is used for scalar calibration for the MS46121A/B.

Isolation (Optional)

When selected, s the ISOLATION menu. When all tasks are completed, return to the TRANS. RESPONSE menu. This menu is not applicable to MS46121A/B.

Done

This button is unavailable until all calibration tasks have been successfully completed. When available, select the button to return to the CALIBRATION menu when the Cal Status is set to ON.

- "CALIBRATION [TR] Menu" on page 8-6

Figure 8-68. TRANS. RESPONSE Menu – Trans. Freq. Resp. Cal. – Typical Example (1 of 2)

	Abort Cal Select aborts the current calibration and returns to the CALIBRATION menu. • "CALIBRATION [TR] Menu" on page 8-6

Figure 8-68. TRANS. RESPONSE Menu – Trans. Freq. Resp. Cal. – Typical Example (2 of 2)

TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT – Coaxial) Dialog Box

Full Name

- Transmission Frequency Response Calibration Setup Dialog Box

Note	This menu is not applicable for the MS46121A/B.

Prerequisites

- Cal Method = SOLT/SOLR. SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only.
- Line Type = Coaxial

Previous

- "TRANS. RESPONSE Menu" on page 8-122
- "CAL SETUP Menu" on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq Response | TRANS FREQ (TRANSMISSION FREQUENCY RESPONSE) | Modify Cal Setup | CAL SETUP | Edit Cal Params | TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

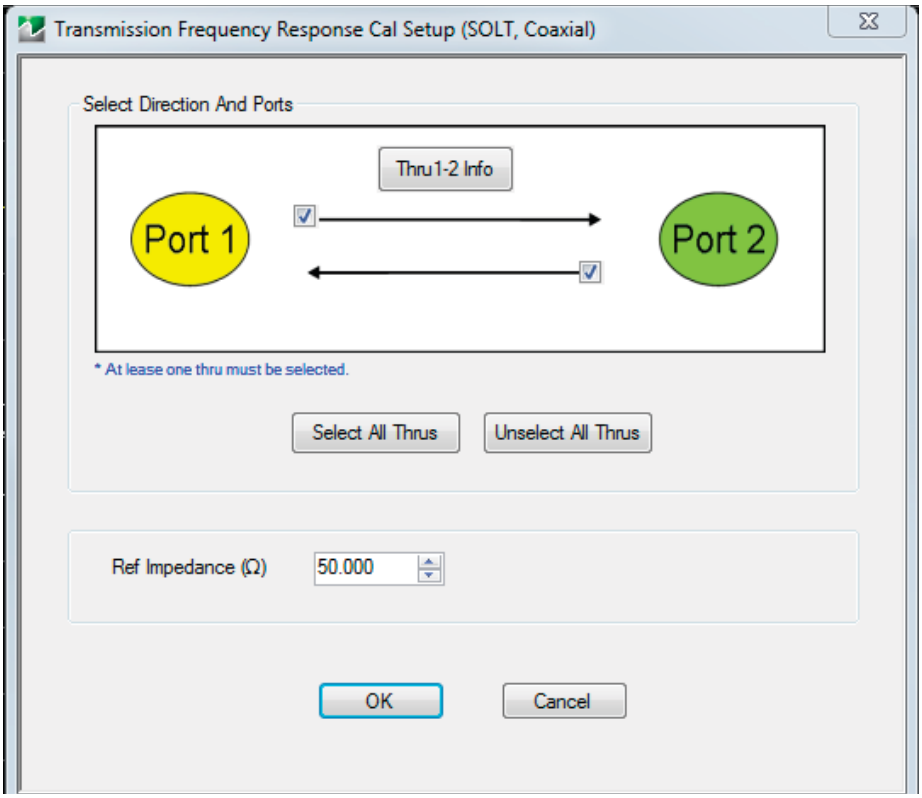


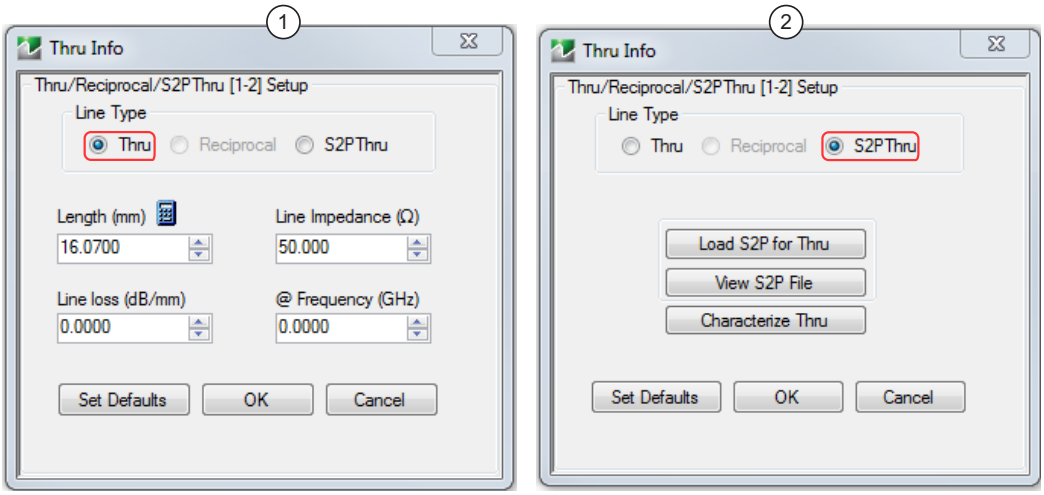
Figure 8-69. TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

Select Direction And Ports

Select any combination of the two available thrus. At least one thru must be selected. Both the Thru Port 1 to Port 2 and the Thru Port 2 to Port 1 may be selected.

Thru 1-2 Info Button

Select the Thru 1-2 to display the THRU INFO dialog box.



Typical through line configuration in the THRU INFO dialog box for the defined-standards calibrations.

"THRU INFO Dialog Box" on page 8-150.

1. Thru selected, allowing configuration of Thru
2. S2P Thru selected, allowing loading, viewing and generation of S2P files

Figure 8-70. THRU INFO Dialog

- The THRU INFO dialog box is described above in "THRU INFO Dialog Box" on page 8-150.

The Calculator icon is available on the THRU INFO dialog box. Select displays the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- The AIR EQUIVALENT LENGTH CONVERSION dialog box is described above in "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147.

Reference Impedance

The reference impedance is 50 Ohms. This field is read only.

TRANSMISSION FREQUENCY RESPONSE CALIBRATION SETUP Dialog Boxes

The table below summarizes the available fields and controls in other transmission frequency response calibration setup dialog boxes (abbreviated in this section as Trans. Freq. Resp. Cal.). To view each dialog box, set the CAL METHOD and LINE TYPE menus to the appropriate settings, and then select the Edit Cal Params button.

Table 8-5. Manual Calibration – TRANS. FREQ. RESP. CAL SETUP Dialog Box Contents (1 of 2)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/SOLR Coaxial	See full description above at "TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT – Coaxial) Dialog Box" on page 8-125. SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only. Select Direction and Ports: Port 1, Port 2, Port 1 and Port 2 Reference Impedance (Ohms)
SOLT/SOLR Non-Dispersive	Same controls and functions as SOLT/SOLR Coaxial. SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only.
SOLT/SOLR Waveguide	Same controls and functions as SOLT/SOLR Coaxial with the following changes: SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only. Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box.
SOLT/SOLR Microstrip	Same controls and functions as SOLT/SOLR Coaxial with the following changes: SOLR is available for MS46122/322 "B", ME7868A, and ME7869A models only. Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays info dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149
SSLT Coaxial	Same controls and functions as SOLT/SOLR Coaxial above.
SSLT Non-Dispersive	Same controls and functions as SOLT/SOLR Coaxial above.
SSLT Waveguide	Same controls and functions as SOLT/SOLR Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box. • Typical "STANDARD INFO Dialog Box" on page 8-149
SSLT Microstrip	Same controls and functions as SOLT/SOLR Coaxial with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays info dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149
SSST Coaxial	Same controls and functions as SOLT/SOLR Coaxial above.
SSST Non-Dispersive	Same controls and functions as SOLT/SOLR Coaxial above.

Table 8-5. Manual Calibration – TRANS. FREQ. RESP. CAL SETUP Dialog Box Contents (2 of 2)

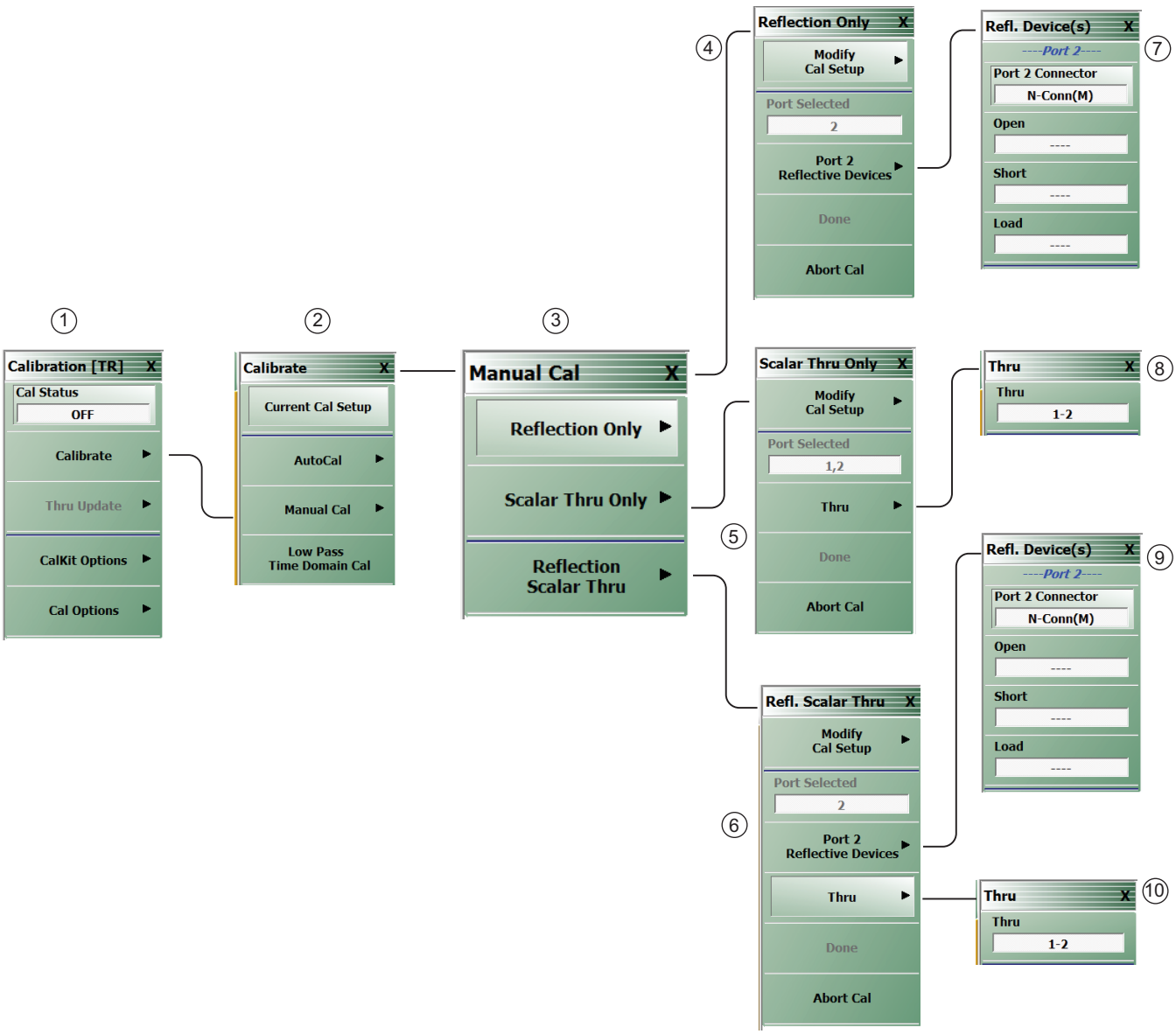
Cal Method Line Type	Dialog Box Input Selections and Controls
SSST Waveguide	Same controls and functions as SOLT/SOLR Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box.
SSST Microstrip	Same controls and functions as SOLT/SOLR Coaxial with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays info dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 8-149
LRL/LRM Coaxial	The LRL/LRM calibration method is not available for transmission frequency response calibrations.
LRL/LRM Non-Dispersive	
LRL/LRM Waveguide	
LRL/LRM Microstrip	
TRL/TRM Coaxial	The TRL/TRM calibration method is not available for transmission frequency response calibrations.
TRL/TRM Non-Dispersive	
TRL/TRM Waveguide	
TRL/TRM Microstrip	

8-17 Manual Cal-Reflection Only Cal

The MS46121A/B with Option 21 will be described in sections 8-13 through 8-15. MS46121A/B with Option 21 can perform scalar transmission measurements in a (1 to 1) or a (1 to n). In (1 to 1), there is only one source and one receiver. In (1 to n), there is one source and n receivers.

1. Manual Cal	6. Cal Setup – Scalar Thru Cal Setup
2. Reflection Only	7. Cal Setup – Response + Scalar Thru Setup
3. Scalar Thru Only	8. One Port Cal Setup (SOL Coaxial)
4. Refl. Scalar Thru	9. Scalar Thru Cal Setup (SOLT/SOLR/R Coaxial)
5. Cal Setup – One Port Cal Setup	10. One Port Cal Setup (SOL Coaxial)

Figure 8-71. MS46121A/B Option 021 Menu-1



1. Calibration [TR]	6. Scalar Thru Only
2. Calibrate	7. Refl. Device(s)
3. Manual Cal	8. Thru
4. Reflection Only	9. Refl. Device(s)
5. Scalar Thru Only	10. Thru

Figure 8-72. MS46121A/B Option 021 Menu-2

Full Name

- Reflection Only Response Calibration

Menu Name

- Manual Cal

Button Name

- Reflection Only

REFL. RESPONSE Menu

Full Name

- Reflection Only Response Calibration Setup Menu

The composition of the menu depends on the CAL SETUP, CAL METHOD, and LINE TYPE menus.

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Only | REFLECTION ONLY

Modify Cal Setup

- Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the ONE PORT CAL SETUP dialog box for the selected calibration and line type method.

Figure 8-73. REFLECTION ONLY menu-Ref. Only Resp. Cal

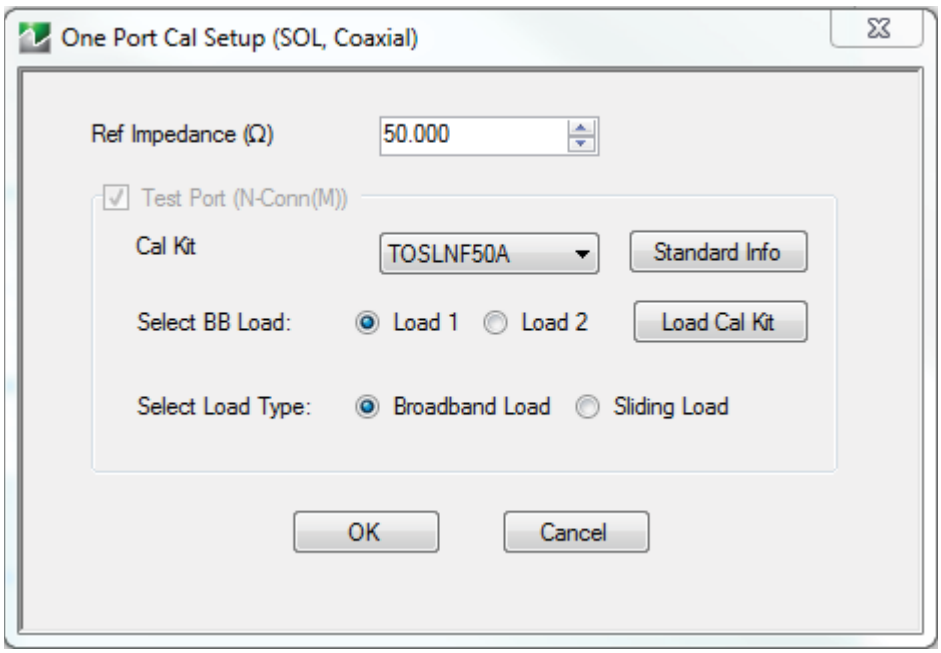


Figure 8-74. ONE PORT CAL SETUP Dialog Box

8-18 Manual Cal-Scalar Thru Only Cal

Full Name

- Scalar Thru Only Response Calibration

Menu Name

- Manual Cal

Button Name

- Scalar Thru Only

REFL. RESPONSE Menu

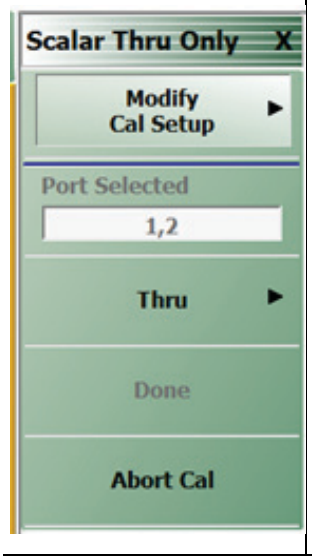
Full Name

- Scalar Thru Only Response Calibration Setup Menu

The composition of the menu depends on the CAL SETUP, CAL METHOD, and LINE TYPE menus.

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Scalar Thru Only | SCALAR THRU ONLY



Modify Cal Setup

- Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the ONE PORT CAL SETUP dialog box for the selected calibration and line type method.

Figure 8-75. One Cal Port Setup.

Scalar Thru Cal Setup (SOLT/R, Coaxial) Dialog Box

Full Name

- Scalar Thru Cal Setup dialog box

Prerequisites

- Cal Method = Thru
- Line Type= Coaxial

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Scalar Thru Only | SCALAR THRU ONLY | Modify Cal Setup | CAL SETUP | Edit Cal Params | SCALAR THRU CAL
- SETUP (SOLT/R, COAXIAL) DIALOG BOX

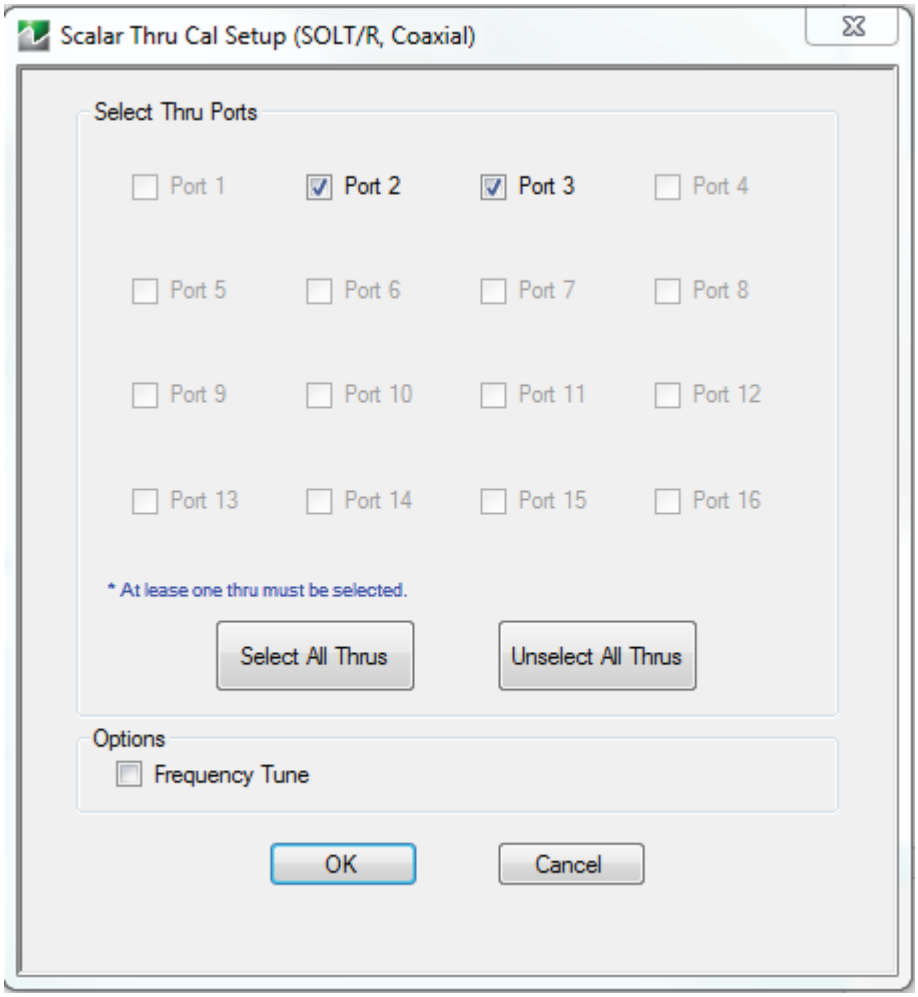


Figure 8-76. SCALAR THRU CAL SETUP Dialog Box

Select Direction And Ports

Select any combination of the available thrus. At least one thru must be selected.

Frequency Tune

Frequency tune is an algorithm used to align MS46121A/B cycles and is selectable. Frequency tune only has to be performed during the initial use of the MS46121A/B VNAs.

8-19 Manual Cal-Reflection Scalar Thru Cal

Full Name

- Reflection Scalar Thru Response Calibration

Menu Name

- Manual Cal

Button Name

- Reflection Scalar Thru

REFL. RESPONSE Menu

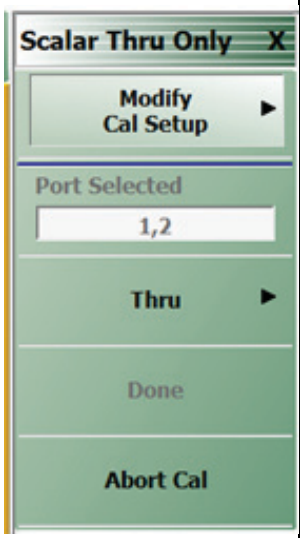
Full Name

- Reflection Scalar Thru Response Calibration Setup

The composition of the menu depends on the CAL SETUP, CAL METHOD, and LINE TYPE menus.

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Scalar Thru | REFLECTION SCALAR THRU



Modify Cal Setup

- Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the RESPONSE + SCALAR THRU SETUP dialog box for the selected calibration and line type method.

Figure 8-77. One Cal Port Setup.

REFLECTION SCALAR CAL SSETUP THRU CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Full Name

- Relection Scalar Thru Cal Setup

Prerequisites

- Cal Method = Thru
- Line Type= Coaxial

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Scalar Thru Only | REFLECTION SCALAR THRU | Modify Cal Setup | CAL SETUP | Edit Cal Params | RESPONSE + SCALAR THRU SETUP (SOL, COAXIAL)
- SETUP (SOLT/R, COAXIAL) dialog box

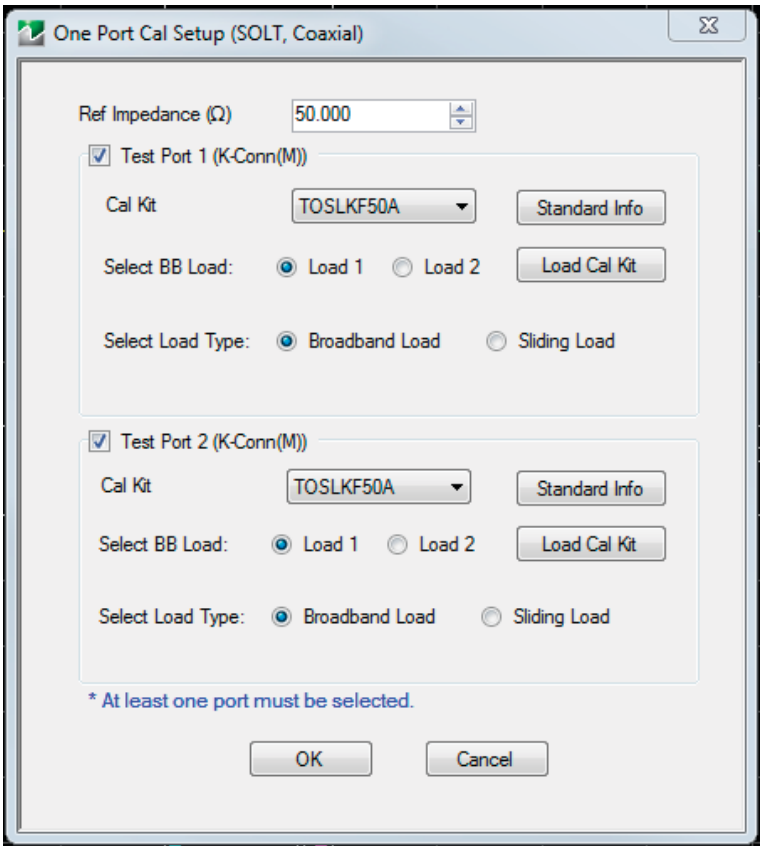


Figure 8-78. SCALAR THRU CAL SETUP Dialog Box

Select Direction And Ports

Select any combination of the available thrus. At least one thru must be selected.

Frequency Tune

Frequency tune is an algorithm used to align MS46121A/B cycles and is selectable. Frequency tune only has to be performed during the initial use of the MS46121A/B VNAs.

8-20 Manual Cal – Refl. Freq. Resp. Cal

Purpose

Setup and configuration of reflection frequency response manual calibration for a 2-port VNA.

Note	The appearance and button availability of the calibration menus depends on the settings established in the CAL SETUP, CAL METHOD, LINE TYPE menus and in the associated dialog boxes that appear from the Edit Cal Params button.

Full Name

- Reflection Frequency Response Calibration

Menu Name

- REFL. RESPONSE

Button Name

- Reflection Freq. Response

REFL. RESPONSE Menu

Full Name

- Reflection Response Menu

The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant REFLECTION FREQUENCY REPONSE CAL SETUP dialog box. A representative menu is shown below. There is one example procedure of a REFL. RESPONSE calibration in this chapter.

Previous

- "MANUAL CAL Menu" on page 8-73

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Freq. Response | REFL. RESPONSE

Modify Cal Setup

Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the REFLECTION FREQ. RESPONSE CAL SETUP dialog box for the selected calibration method and line type.

- "CAL SETUP Menu" on page 8-74

A typical reflection frequency response calibration dialog box is available at:

- "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 8-141

A summary table of all reflection frequency response calibration configuration dialog boxes is available at:

- Table: "Manual Calibration – Reflection Frequency Response Cal Setup" on page 8-143

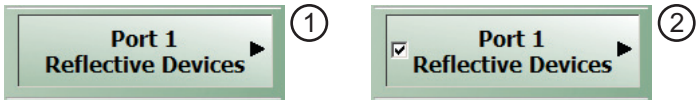
Port Selected

Read-only display of the ports selected for the pending calibration.

Completion Menu Buttons

For this example menu, the Port 1 Reflective Devices, Port 2 Reflective Devices, Thru/Recip, and Isolation (Optional) buttons link to completion submenus where additional calibration procedures are performed.

For example, the Port 1 Reflective Devices button (shown below at #1) links to the REFL. DEVICES PORT 1 submenu. As each procedure is completed, the submenu button is marked with a completion checkmark. When all the procedures on the submenu are completed, use the Back button to return to the REFL. RESPONSE menu.



The Port 1 Reflective Devices button (shown above at #2) is now marked with a completion checkmark.

Port 1 Reflective Devices

When selected, the REFL. DEVICES PORT 1 menu appears where each button represents a completion task. When ready for the task, click the button, and the instrument performs the calibration. When the calibration task is successfully completed, the button is marked with a completion checkmark. When all tasks are completed on the menu, return to the REFL. RESPONSE menu.

Port 2 Reflective Devices

When selected, displays the REFL. DEVICES PORT 2 menu where each button represents a completion task. When ready for the task, click the button, and the instrument performs the calibration. When the calibration task is successfully completed, the button is marked with a completion checkmark. When all tasks are completed on the menu, return to the REFL. RESPONSE menu.

Figure 8-79. REFL. RESPONSE Menu – Refl. Freq. Resp. Cal. – Typical Example (1 of 2)

	Done This button is unavailable until all calibration tasks have been successfully completed. When available, select the button to return to the CALIBRATION menu when the Cal Status is set to ON. • "CALIBRATION [TR] Menu" on page 8-6 **Abort Cal** Select aborts the current calibration and returns to the CALIBRATION menu. • "CALIBRATION [TR] Menu" on page 8-6

Figure 8-79. REFL. RESPONSE Menu – Refl. Freq. Resp. Cal. – Typical Example (2 of 2)

REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only.

Prerequisites

- Cal Method = SOLT/SOLR. SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only.
- Line Type = Coaxial

Previous

- “REFL. RESPONSE Menu” on page 8-138
- “CAL SETUP Menu” on page 8-74

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Freq Response | REFL. RESPONSE | Modify Cal Setup | CAL SETUP | Edit Cal Params | REFLECTION FREQ REPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

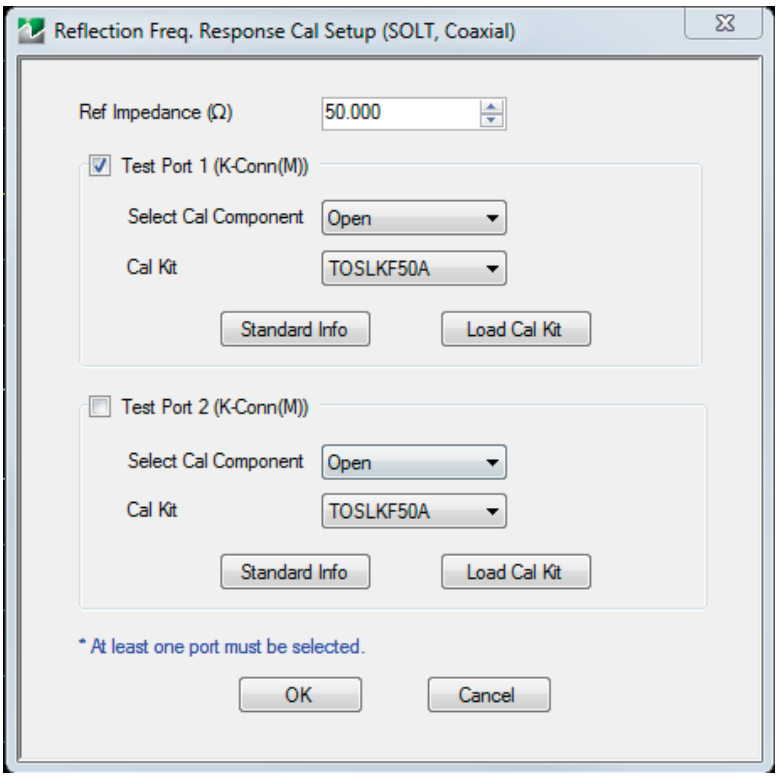


Figure 8-80. One Port Cal Setup Dialog Box

Reference Impedance

The reference impedance is 50 Ohms. This field is read only.

Test Port Selection

Select any combination:

- Test Port 1
- Test Port 2
- Test Port 1 and Test Port 2

Test Port 1 Select Cal Component

Select either:

- Open
- Short

Test Port 1 Cal Kit (Connector)

Select the Test Port 1 Connector type from the pull down menu with options of:

- TOSLKF50A
- TOSLK50A
- TOSLNF50A
- TOSLN50A
- K-Conn (M)
- K-Conn (F)
- GPC-3.5 (M)
- GPC-3.5 (F)
- SMA (M)
- SMA (F)
- N-Conn (M)
- N-Conn (F)
- 2.4 mm (M)
- 2.4 mm (F)
- TNC (M)
- TNC (F)
- V-conn (M)
- V-conn (F)
- W1-conn (M)
- W1-conn (F)
- 7/16 (M)
- 7/16 (F)
- GPC-7
- N-conn(75) (M)
- N-conn(75) (F)
- User Defined 1 through 32 (M or F)

Test Port 1 Connector Standard Info Button

Select displays the STANDARD INFO (SOLT) dialog box. Note that the name of this dialog changes depending on the selected Cal Method.

Load Cal Kit

Prompts the LOAD dialog box.

Test Port 2 Select Cal Component

Select either:

- Open
- Short

Test Port 2 Cal Kit (Connector)

Select the Test Port 2 Connector type from the pull down menu. The options are the same as those for Test Port 1 above.

Test Port 2 Connector Standard Info Button

Select displays the STANDARD INFO (SOLT) STANDARD LABEL (V-Conn M) dialog box. Note that the name of this dialog changes depending on the selected Cal Method and DUT Connector.

- Test Port 1 Connector Load Cal Kit button select displays the LOAD dialog box. The cal kit file can be loaded into memory from this menu.

Load Cal Kit

Prompts the LOAD dialog box.

Refl. Freq. Resp. Calibration Setup Dialog Box Summary

The table below summarizes the available fields and controls in other reflection frequency response calibration setup dialog boxes. To view each dialog box, set the CAL METHOD and LINE TYPE menus to the appropriate settings, and then select the Edit Cal Params button.

Table 8-6. Manual Calibration – Reflection Frequency Response Cal Setup (1 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/SOLR Coaxial	See the full description above “REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box” on page 8-141. SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only. Reference Impedance (Ohms) Select Test Port: Port 1 and/or Port 2 Test Port 1 and Test Port 2 controls are the same. Port must be selected to enable controls. Test Port Cal Component: Open, Short Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), V-Conn (M), V-Conn (F), K-Conn (M), K-Conn (F), 2.4 mm (M), 2.4 mm (F), GPC-3.5 (M), GPC-3.5 (F), SMA (M), SMA (F), N-Conn (M), N-Conn (F), N-Conn (75) (M), N-Conn (75) (F), GPC-7, 7/16 (M), 7/16 (F), TNC (M), TNC (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F) Test Port Connector Standard Info Button: For each DUT port connector, displays the info dialog box for the selected connector. • Typical “STANDARD INFO Dialog Box” on page 8-149\
SOLT/SOLR Non-Dispersive	Same controls and functions as SOLT/SOLR Coaxial above. SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only.
SOLT/SOLR Waveguide	Same controls and functions as SOLT/SOLR Coaxial above with the following changes: SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only. Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box. • Typical “USER DEFINED WAVEGUIDE Dialog Box” on page 8-154

Table 8-6. Manual Calibration – Reflection Frequency Response Cal Setup (2 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/SOLR Microstrip	Same controls and functions as SOLT/SOLR Coaxial above with the following changes: SOLR is available for MS46122/322 “B”, ME7868A, and ME7869A models only. Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays appropriate information dialog box for selected microstrip kit. • Typical “STANDARD INFO Dialog Box” on page 8-149
SSLT Coaxial	Reference Impedance (Ohms) Select Test Port: Port 1 and/or Port 2 Test Port 1 and Test Port 2 controls are the same. Port must be selected to enable controls. Test Port Cal Component: Offset Short 1, Offset Short 2 Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F) Test Port Connector Standard Info Button: For each DUT port connector, displays the info dialog box for the selected connector. • Typical “STANDARD INFO Dialog Box” on page 8-149
SSLT Non-Dispersive	Same controls and functions as SSLT Coaxial above.
SSLT Waveguide	See the full description above Same controls and functions as SSLT Coaxial above with the following changes: Waveguide Kit: WR10, WR12, WR15, User-Defined1 to User-Defined32 Waveguide Info button: Display the appropriate information dialog box for the selected waveguide. • Typical “WAVEGUIDE INFO Dialog Box” on page 8-156
SSLT Microstrip	Same controls and functions as SSLT Coaxial above with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays appropriate information dialog box for the selected microstrip. • Typical “STANDARD INFO Dialog Box” on page 8-149
SSST Coaxial	Reference Impedance (Ohms) Select Test Port: Port 1 and/or Port 2 Test Port 1 and Test Port 2 controls are the same. Port must be selected to enable controls. Test Port Cal Component: Offset Short 1, Offset Short 2, Offset Short 2 Test Port DUT Connector: For each selected test port, select one of the following connectors: W1-Conn (M), W1-Conn (F), User-Defined1 (M) through User-Defined32 (M), User-Defined1 (F) through User-Defined32 (F) Test Port Connector Standard Info Button: For each DUT port connector, displays the appropriate information dialog box for the selected connector. • Typical “STANDARD INFO Dialog Box” on page 8-149
SSST Non-Dispersive	Same controls and functions as SSST Coaxial above.

Table 8-6. Manual Calibration – Reflection Frequency Response Cal Setup (3 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSST Waveguide	Same controls and functions as SSST Coaxial above with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Display the appropriate information dialog box for the selected waveguide.
SSST Microstrip	Same controls and functions as SSST Coaxial above with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-Defined1 to User-Defined32 Microstrip Info button: Displays appropriate information dialog box for the selected microstrip. • Typical “STANDARD INFO Dialog Box” on page 8-149
LRL/LRM Coaxial	The LRL/LRM calibration method is not available for reflection frequency response calibrations.
LRL/LRM Non-Dispersive	
LRL/LRM Waveguide	
LRL/LRM Microstrip	
TRL/TRM Coaxial	The TRL/TRM calibration method is not available for reflection frequency response calibrations.
TRL/TRM Non-Dispersive	
TRL/TRM Waveguide	
TRL/TRM Microstrip	

8-21 Manual Calibration General Dialog Boxes

The dialog boxes displayed below are representative of standard and user-defined dialog boxes associated with the calibration function. Most of these dialog boxes can be called from multiple locations.

- "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147
- "STANDARD INFO Dialog Box" on page 8-149
- "THRU INFO Dialog Box" on page 8-150
- "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154

AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box

Use the AIR EQUIVALENT LENGTH CONVERSION dialog box to speed configuration of a thru line by entering its length in picoseconds (ps) and its dielectric constant. The calculator returns the air equivalent length in millimeters (mm).

Previous

- The AIR EQUIVALENT LENGTH CONVERSION dialog box can be accessed from multiple locations.
  - "TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 8-82
  - "TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 8-85
  - "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 8-92
  - "TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 8-96
  - "ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-111
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-49
  - "MODIFY 2-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-54

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | TWO PORT CAL SETUP dialog | Through/Reciprocal Length Calculator Icon | AIR EQUIVALENT LENGTH Dialog Box

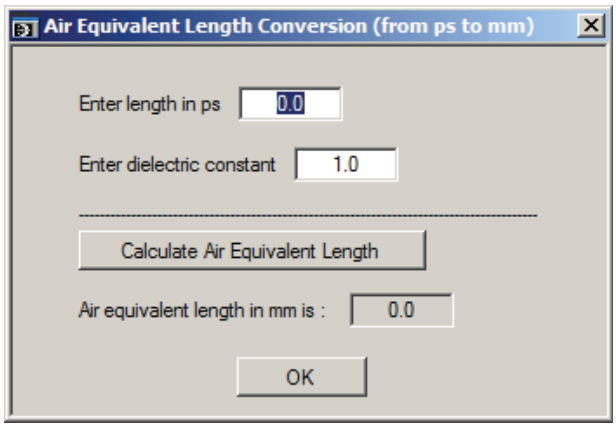


Figure 8-81. AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box

Using the Calculator

1. Use the Enter length in ps (picoseconds) to input a length.
   - For example, enter a value of 250 ps.
2. Use the Enter constant to change the dielectric constant as required.
   - For example, change the dielectric constant to 1.2.
3. Click the Calculate Air Equivalent Length button.
4. The required value appears in the Air Equivalent Length in mm field.
   - Using the examples above, an air equivalent length of 68.465319... appears in the field.
5. Click OK.
6. The THRU INFO dialog box reappears with the calculated value in the Length (mm) field.

7. Using the examples above, the Length (mm) field displays 68.4653 mm.

- "THRU INFO Dialog Box" on page 8-150

8. Click OK on the THRU INFO dialog box.

9. The MODIFY AUTOCAL SETUP dialog box reappears.

STANDARD INFO Dialog Box

The exact title and contents of the dialog box depend on the calibration method and connector types selected. This dialog box displays parametric information for the standard connector selected previously.

Prerequisites

- Line Type = Coaxial
- DUT Connector Type = N-Conn (M)

Previous

- The STANDARD INFO dialog box can be accessed from multiple locations.
  - "ONE-PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box — 2-Port VNAs" on page 8-111
  - "TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 8-82

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SOLT/SOLR | Line Type = Coaxial | Edit Cal Params | TWO PORT CAL SETUP (SOLT/SOLR, COAXIAL) | DUT Connector = N-Conn(M) | Standard Info button | STANDARD INFO (SOLT/SOLR) Dialog Box

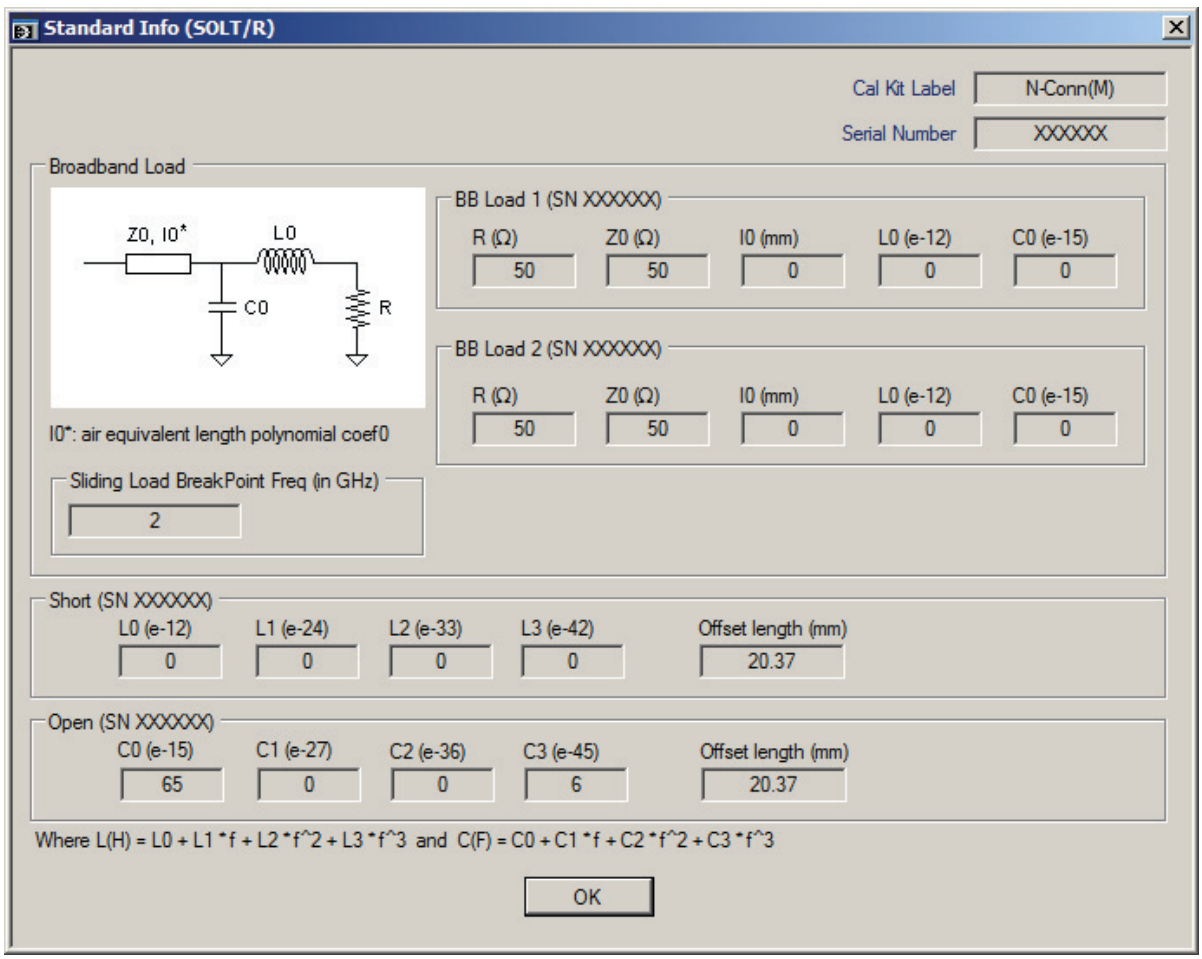


Figure 8-82. STANDARD INFO (SOLT/SOLR) Dialog Box

The read-only dialog box provides the calibration parameters for the selected connector and calibration method.

THRU INFO Dialog Box

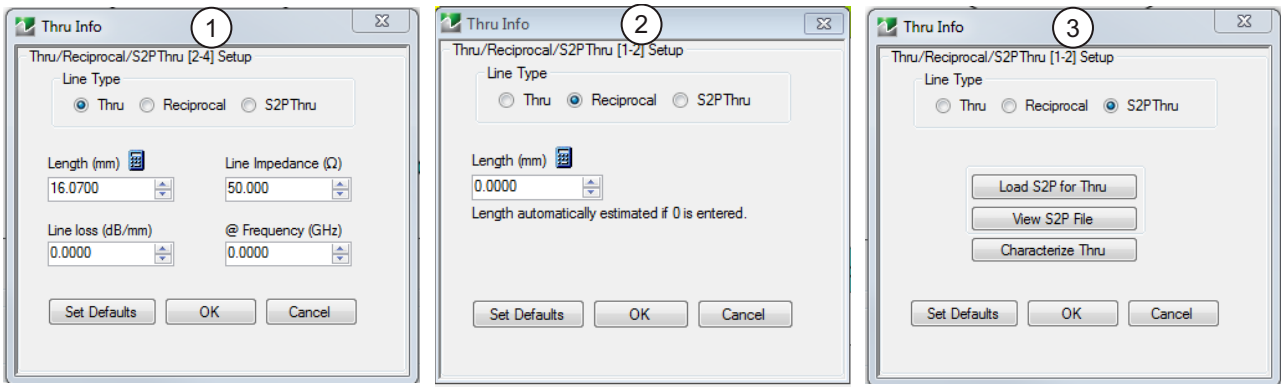
Use the THRU INFO dialog to update the thru information for most calibration types. The dialog includes access to the AIR EQUIVALENT LENGTH CONVERSION dialog box to speed configuration.

Previous

- The THRU INFO dialog box can be accessed from multiple locations.
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box (2-Port VNAs)" on page 8-49
  - "MODIFY 2-PORT AUTOCAL SETUP Dialog Box (2-Port VNAs)" on page 8-54

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Thru Update | THRU | Define Thru/Reciprocal | THRU INFO Dialog Box



Typical through line configuration in the THRU INFO dialog box for the defined-standards calibrations.

1. Thru selected, allowing configuration of Thru.
2. Reciprocal selected, allowing configuration of Thru.
3. S2P Thru selected, allowing loading, viewing and generation of S2P files

Figure 8-83. THRU INFO Dialog Box

These controls allow characterization of the Thru/Reciprocal/S2P Thru line settings.

- **Line Type**. Allows options of:
  - Thru
  - Reciprocal
  - S2P Thru
- **Thru** Selected
  - Length (mm)
    - Input line length in mm.
    - Calculator icon displays the AIR EQUIVALENT LENGTH CONVERSION dialog box.
      - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147
  - Line Impedance (Ohms)
    - Input defaults to be 50 Ohms. Any numeric value accepted.
  - Line Loss (dB/mm)
    - Allows input of a line loss in dB per mm at the frequency specified in the field below.

    - @ Frequency (GHz)
        - Allows input of a frequency setting for the Line Loss factor input above.
- **Reciprocal** Selected
    - Length (mm)
        - Input line length in mm. Default length is 0 mm. The thru length is set if the cal kit definition has the thru defined. Not all cal kits define the thru length.
        - Calculator icon displays the AIR EQUIVALENT LENGTH CONVERSION dialog box.
            - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147
- **S2P Thru** Selected
    - Load S2P for Thru
        - Opens navigation window to load S2P file.
    - View S2P File
        - Opens window to view contents of S2P file.
    - Characterize Thru
        - Allows a thru characterization and generation of an .s2p file.

Thru Information Parameters and Calculator

The THRU INFO dialog box allows user input field for the thru connection parameters of:

- Length (mm). If needed, click the Calculator icon to display the AIR EQUIVALENT LENGTH CONVERSION dialog box.
    - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147
- Line Loss (dB/mm)
- Line Impedance (Ω or Ohms)
- @ Frequency (GHz)

USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs

Prerequisites

- Calibration Method = LRL/LRM (LRL/LRM is only available for the MS46122/322 “B”, ME7868A, and ME7869A models.)
- Line Type = Coaxial
- Band 1 Device 2 = Match

Previous

- The STANDARD INFO dialog box can be accessed from multiple locations.
  - “TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box” on page 8-92

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal |TWO PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = LRL\LRM | Edit Cal Params | TWO PORT CAL SETUP (LRL/LRM, COAXIAL) | Band 1 Device 2 = Match | Match button | USER DEFINED MATCHDEVICES Dialog Box

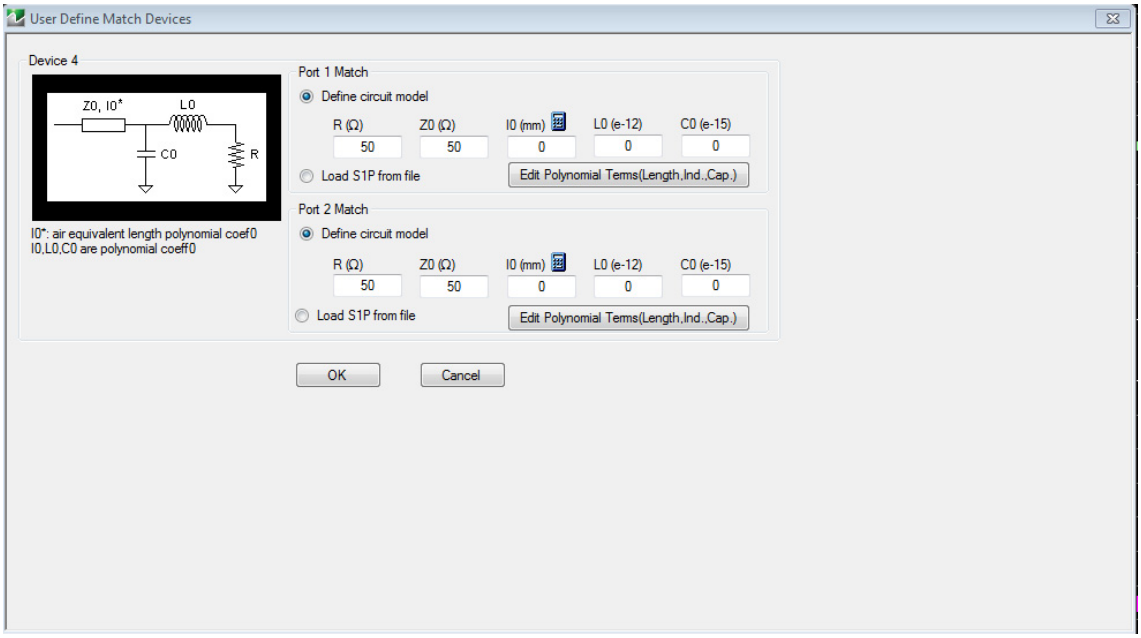


Figure 8-84. User Defined Match Devices Dialog Box

Description

The dialog box allows the definition of a user-provided match device.

Port 1 Match

Define the Port 1 Match device by entering the following parameters:

- R (Ohms)
- Z0 (Ohms)

- I0 (mm)
  - If required, a link is available to the AIR EQUIVALENT LENGTH CONVERSION dialog box.
  - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147
- L0 (e-12)
- C0 (e-15)
- Provides the calibration parameters for the selected connector and calibration method.
- Edit Polynomial Terms (Length, Ind., Cap) button opens a window for editing the polynomial terms.

Port 2 Match

The Port 2 Match parameters and controls are the same as the Port 1 Match.

USER DEFINED WAVEGUIDE Dialog Box

This dialog box displays parametric information for a user-defined waveguide. For the equivalent dialog box for a standard waveguide kit, see "WAVEGUIDE INFO Dialog Box" on page 8-156.

Prerequisites

- Line Type = Waveguide
- DUT Connector Type = User-Defined1 to User-Defined32

Previous

- Item 1 shows TWO PORT CAL SETUP (SSLT, WAVEGUIDE) Dialog Box
- Item 2 in figure is the user-defined waveguide dialog box titled WAVEGUIDE INFO, which is invoked by the Waveguide Info button in the TWO PORT CAL SETUP dialog box.

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Waveguide | Edit Cal Params | TWO PORT CAL SETUP (SSLT, WAVEGUIDE) | Waveguide Kit = User-Defined 1 | Waveguide Info button | USER DEFINED WAVEGUIDE Dialog Box

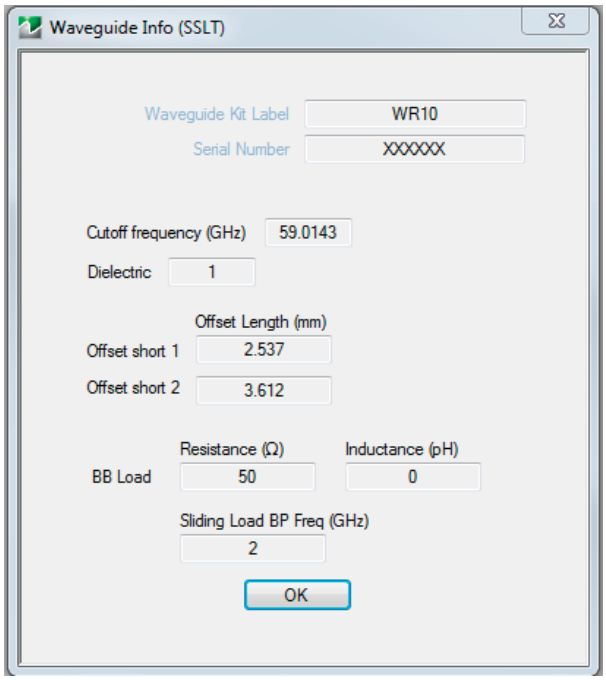


Figure 8-85. USER DEFINED WAVEGUIDE Dialog Box

Description

The USER DEFINED WAVEGUIDE dialog box allows the input of the calibration parameters for a user-defined device.

Standard Label

Either leave as the pre-defined label or input a new label for the device.

Cutoff Frequency and Dielectric

- Cutoff frequency (GHz)
- Dielectric value

Broadband Load Definition

Define the broadband load with the following parameters:

- Resistance (Ohms)
- Inductance (pH)
- Sliding Load Break Point Frequency (GHz)

Short Definition

- Offset length (mm)
  - If required, a link is available to the AIR EQUIVALENT LENGTH CONVERSION dialog box.
  - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147

Open Circuit Model

Define the Open Circuit Model with the following parameters:

- C0 (e-15)
- C1 (e-27)
- C2 (e-36)
- C3 (e-45)
- Offset length (mm)
  - If required, a link is available to the AIR EQUIVALENT LENGTH CONVERSION dialog box.
  - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 8-147

WAVEGUIDE INFO Dialog Box

This read-only dialog box displays parametric information for a standard waveguide kit. For the equivalent dialog box for a user-defined waveguide, see "USER DEFINED WAVEGUIDE Dialog Box" on page 8-154.

Prerequisites

- Line Type = Waveguide
- DUT Connector Type = User-Defined1 to User-Defined32

Previous

- The WAVEGUIDE INFO dialog box can be accessed from multiple locations when Line Type is set to Waveguide.
- TWO PORT CAL SETUP (SSLT, WAVEGUIDE) Dialog Box

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Waveguide | Edit Cal Params | TWO PORT CAL SETUP (SSLT, WAVEGUIDE) | Waveguide Kit = WR10, WR12, or WR15 | Waveguide Info button | WAVEGUIDE Dialog Box

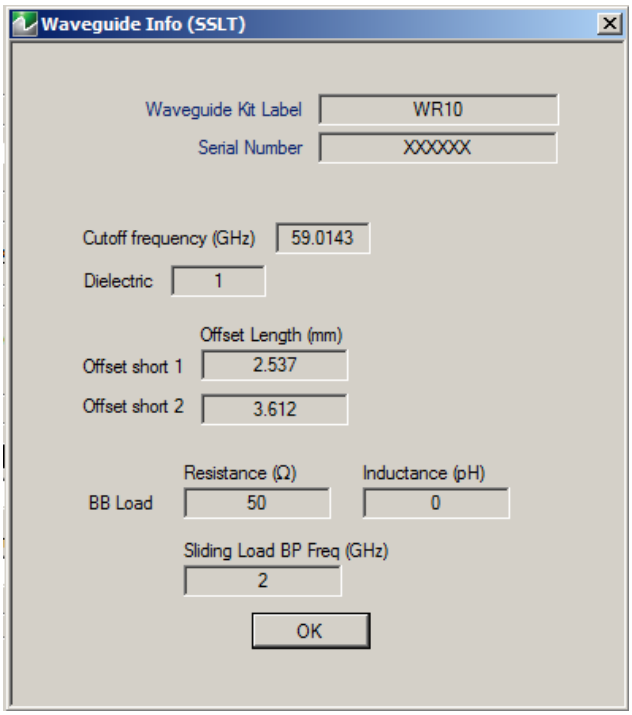


Figure 8-86. WAVEGUIDE INFO Dialog Box

Description

The read-only WAVEGUIDE INFO dialog box provides the calibration parameters for the WR10, WR12, and WR15 waveguide kits.

Instructions

The parameters are:

- Waveguide Kit Label
- Cutoff Frequency (GHz)
- Dielectric value
- Cutoff frequency (GHz)
- Offset short 1 length (mm)
- Offset short 2 length (mm)
- Broadband Load Resistance (Ohms)
- Broadband Load Inductance (pH)
- Sliding Load Break Point Frequency (GHz)

Chapter 9 — Measurement Menus

9-1 Chapter Overview

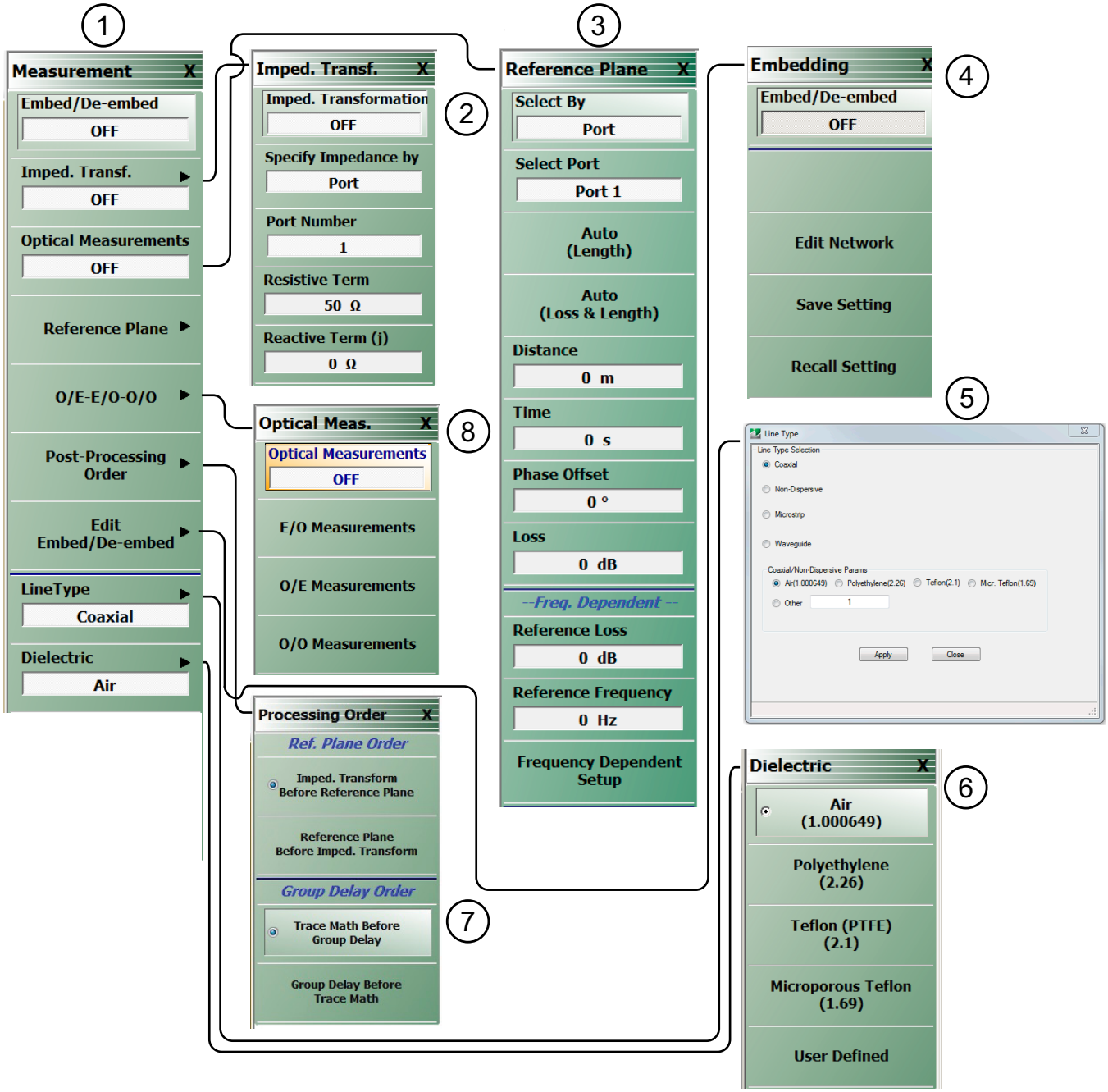
This chapter provides information for the measurement menu system which controls the embed/de-embed functions, the impedance transformations, reference plane location, post-processing order functions, and dielectric parameters along with their related configuration dialog boxes. Impedance transformation and post-processing order functions do not apply to the MS46121A/B.

9-2 Overview of Measurement Menus

There are six menus in the measurement menus:

- "MEASUREMENT Menu" on page 9-3
- "IMPED. TRANSF. Menu" on page 9-4
- "REFERENCE PLANE Menu" on page 9-6
  - "FREQUENCY DEPENDENT SETUP Dialog Box" on page 9-10
  - "SELECT TERMINATOR TYPE FOR PORT1 Dialog Box" on page 9-11
  - "SELECT TERMINATOR TYPE FOR TRACE1 Dialog Box" on page 9-12
- "OPTICAL MEASUREMENTS Menu" on page 9-13
  - "2-PORT E/O MEASUREMENT Dialog Box" on page 9-15
  - "2-PORT O/E MEASUREMENT Dialog Box" on page 9-16
  - "2-PORT O/O MEASUREMENT Dialog Box" on page 9-18
    - "2-Port MEASURE E/O (or MEASURE O/E) Dialog Box" on page 9-20
- "PROCESSING ORDER Menu" on page 9-21
- "EMBEDDING Menu" on page 9-22
  - "EDIT EMBEDDING/DE-EMBEDDING (2 Port DUT) Dialog Box" on page 9-23
  - "SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box" on page 9-26
  - "OPEN (EMBED/DE-EMBED EDL File) Dialog Box" on page 9-27
  - "LINE TYPE Dialog Box" on page 9-28
- "DIELECTRIC Menu" on page 9-32

The Measurement Menu Set is shown in the figure below.



1. MEASUREMENT Menu
2. IMPED. TRANSF.(Impedance Transformation) Menu
3. REFERENCE PLANE Adjustment Menu
4. EMBEDDING Menu
5. LINE TYPE Dialog
6. DIELECTRIC Selection Menu – If User Defined is selected, Value field is available for input.
7. PROCESSING ORDER Menu
8. OPTICAL MEASUREMENT Menu

Figure 9-1. MEASUREMENT Menu and Related Submenus

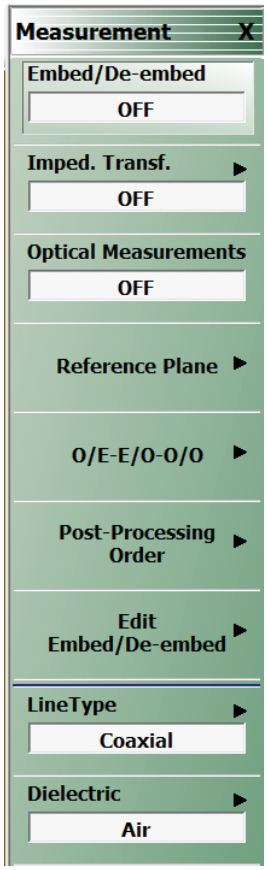
MEASUREMENT Menu

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Measurement | MEASUREMENT



Embed/De-embed (Off/On)

Select toggles the embedding/de-embedding function off and on.

If no successful calibration has been performed, select displays a warning message. Click OK to clear.

Imped Transf (Impedance Transformation)

Select displays the IMPED TRANSF menu.

- "IMPED. TRANSF. Menu" on page 9-4

Optical Measurements

Select toggles optical calibration off and on.

If no successful calibration and optical measurement have been performed, select displays a warning message. Click OK to clear.

Reference Plane

Select displays the REFERENCE PLANE menu.

- "REFERENCE PLANE Menu" on page 9-6

O/E-E/O-O/O

Select displays the OPTICAL MEASUREMENTS menu.

- "OPTICAL MEASUREMENTS Menu" on page 9-13

Post-Processing Order

Select displays the PROCESSING ORDER menu.

- "PROCESSING ORDER Menu" on page 9-21

Edit Embed/De-embed

Select displays the EMBEDDING menu.

- "EMBEDDING Menu" on page 9-22

Dielectric

Select displays the DIELECTRIC menu.

- "DIELECTRIC Menu" on page 9-32

Figure 9-2. MEASUREMENT Menu

IMPED. TRANSF. Menu

Full Name

- IMPEDANCE TRANSFORMATION Menu

Previous

- "MEASUREMENT Menu" on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | Imped Transf | IMPED TRANSF (IMPEDANCE TRANSFORMATION)

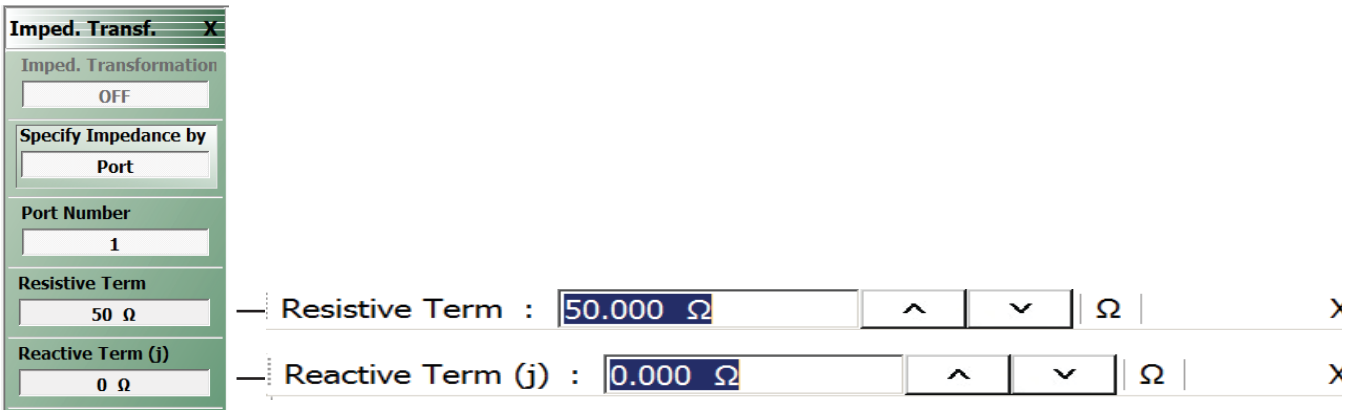


Figure 9-3. IMPED. TRANSF. (IMPEDANCE TRANSFORMATION) Menu – Specify Impedance by Port

Impedance Trans

Select toggles impedance transformation OFF and ON.

Specify Impedance by

Toggles between Port and Port Pair.

Port Number

Toggles between Port 1 or Port 2.

Resistive Term

Select displays the Resistive Term field toolbar and allows the user to define the resistive term in Ohms. The default value is 50.000 ohms.

Reactive Term (j) (Ohms)

Select displays the Reactive Term field toolbar and allows the user to define the reactive (j) term in Ohms.

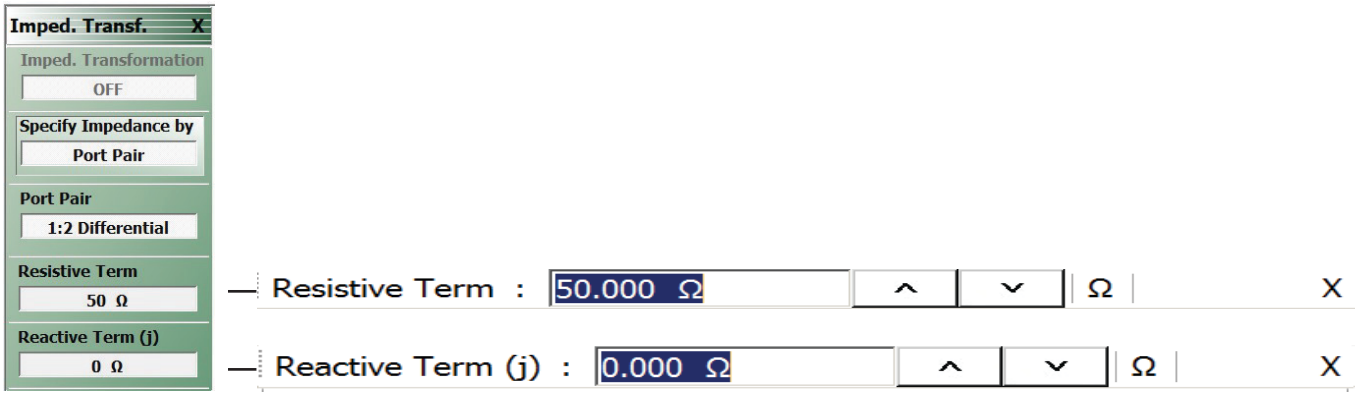


Figure 9-4. IMPED. TRANSF. (IMPEDANCE TRANSFORMATION: Specify Impedance by Port Pair) Menu – 2-Port VNA

Impedance Trans

Select toggles impedance transformation OFF and ON.

Specify Impedance by

Toggles between Port and Port Pair.

Port Pair

When the VNA is in 2-Port Mode, select toggles between 1:2 Common and 1:2 Differential.

Resistive Term

Select displays the Resistive Term field toolbar and allows the user to define the resistive term in Ohms. The default value is 50.000 ohms.

Reactive Term (j) (Ohms)

Select displays the Reactive Term field toolbar and allows the user to define the reactive (j) term in Ohms.

REFERENCE PLANE Menu

A simplified means of performing de-embedding (and embedding in some contexts) can be accomplished using reference plane control. The function of this control is to remove transmission line lengths from the data. By entering a time or distance, this length of line will be removed (negative lengths are allowed to effectively add length). Various dielectrics and the full dispersion choices are available.

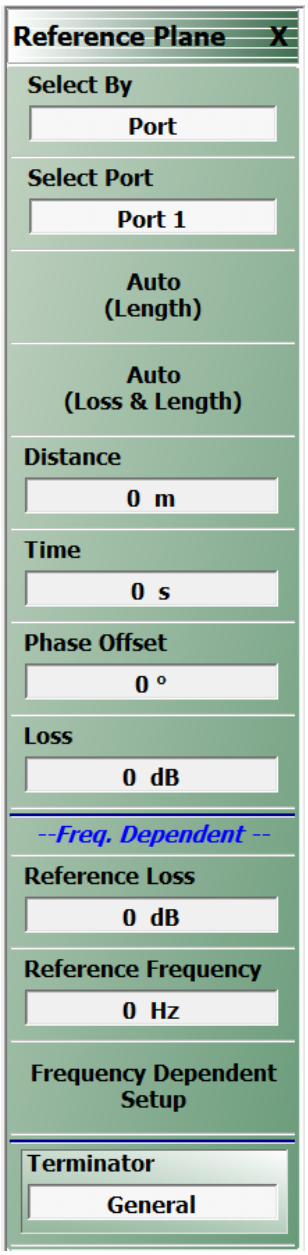
Previous

- "MEASUREMENT Menu" on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | Reference Plane | REFERENCE PLANE

Select By Port Enabled



Select By Trace Enabled

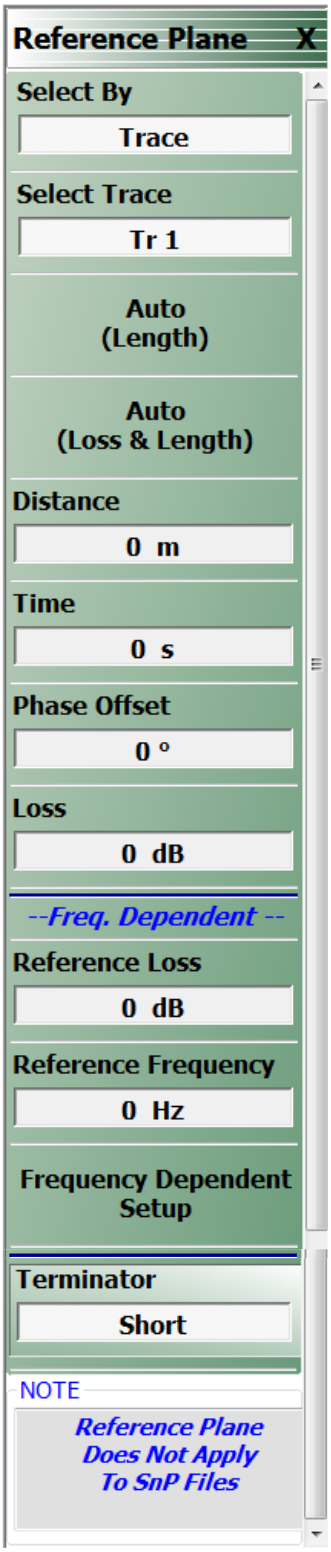


Figure 9-5. REFERENCE PLANE Menu

Select By (Port/Trace)

The Select By toggle button changes between Select Reference Plane By Port and Select Reference Plane By Trace. When the selection is changed, the name of the next button changes as:

- Select By = Port: The button below is set to Select Port. If Port is selected, reference plane adjustments are on a per-port basis.
- Select By = Trace: The button below is set to Select Trace. If Trace is selected, reference plane adjustments are on a per-trace basis.

Select Port (Port 1/Port 2)

This button is only present when the Select By button above is set to Port. If present, when the VNA is in 2-Port Mode, select toggles between Port 1 or Port 2. If present, when the VNA is in 4-Port Mode, select displays the SELECT PORT (REFERENCE PLANE) dialog box with large easy-to-select buttons. Selecting a port auto-returns to the REFERENCE PLANE menu.

Select Trace

This button is only present when the Select By button above is set to Trace. If present, the reference plane adjustments available in the buttons and toolbars following can be modified on a per-trace basis. Selecting the button displays the SELECT TRACE dialog box (below) where the trace number can be selected. After a trace is selected, the focus auto-returns to the REFERENCE PLANE menu.

Figure 9-6. Select Trace Dialog

Auto (Length)

The Auto (Length) button automatically extends the test port location by removing the effects of the electrical delay of a device.

Auto (Loss & Length)

When the Auto (Loss & Length) is used, fits are done on both the phase and the magnitude independently. Values for the fit parameters are entered in the appropriate menu fields and the adjustments applied to the trace data.

Distance (Reference Plane)

Select displays the Distance field toolbar. Allows the user to enter a distance in units of km (kilometers), m (meters), cm (centimeters), mm (millimeters), or um (micrometers).

Time (Reference Plane)

Select displays the Time field toolbar. Allows the user to enter a reference time in units of s (seconds), ms (milliseconds), us (microseconds), ns (nanoseconds), or ps (picoseconds).

Phase Offset (Degrees) (Reference Plane)

Select displays the Phase Offset field toolbar.Allows the user to enter a phase offset in degrees from –360º (degrees) to +360º in 0.01º increments.

Loss (dB) (Reference Plane)

Displays the Loss (dB) field toolbar. Allows the user to enter a loss factor in dB.

Freq. Dependent Fields

Reference Loss

Displays current Reference Loss setting in dB. Selecting this field opens the Reference Loss field toolbar.

Reference Frequency

Displays current Reference Frequency setting in dB. Selecting this field opens the Reference Frequency field toolbar.

Frequency Dependent Setup

Opens FREQUENCY DEPENDENT SETUP (by Port or by Trace) dialog box. This frequency-dependent loss aspect of reference plane extension can be useful for very simplified de-embedding of fixtures or cabling.

- “FREQUENCY DEPENDENT SETUP Dialog Box” on page 9-10

Terminator

Opens the SELECT TERMINATOR TYPE FOR PORT1/TRACE1 dialog box. Allows selection of terminator type from General, Open and Short.

FREQUENCY DEPENDENT SETUP Dialog Box

Depending on whether Select By Port or Select By Trace is selected on the REFERENCE PLANE menu, upon clicking Frequency Dependent Setup button, the appropriate FREQUENCY DEPENDENT SETUP dialog appears.

- MAIN | Measurement | MEASUREMENT | Reference Plane | REFERENCE PLANE | Frequency Dependent Setup | FREQUENCY DEPENDENT SETUP

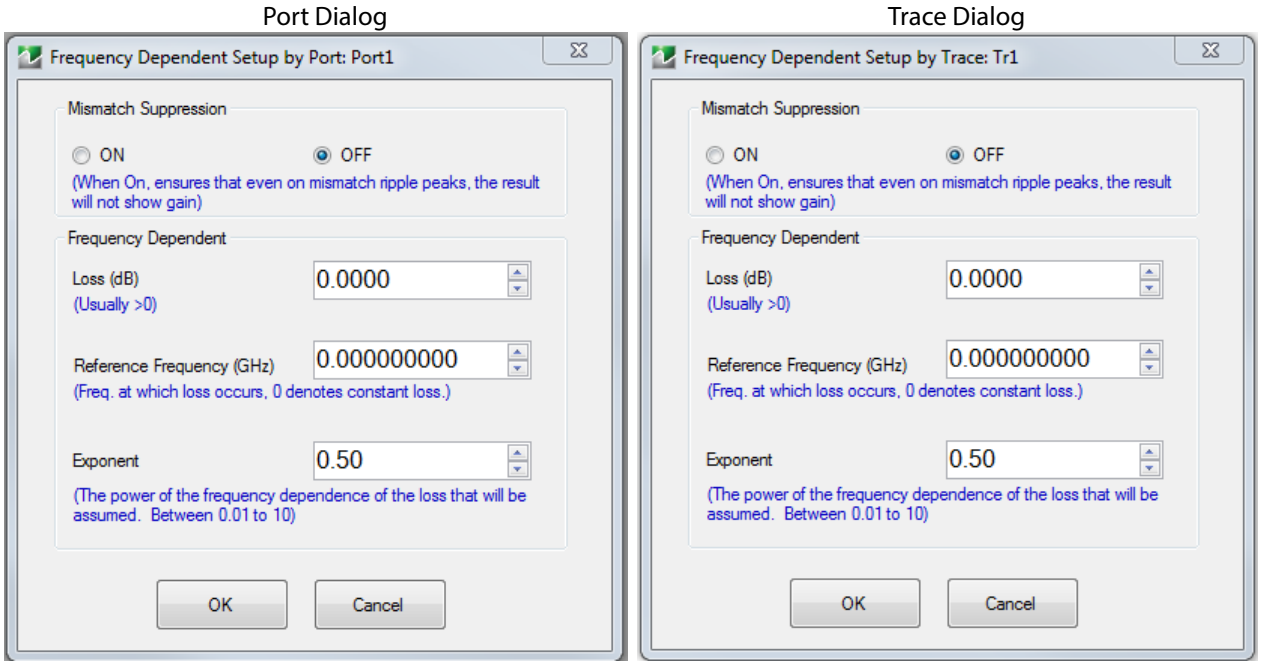


Figure 9-7. Frequency Dependent Setup Dialog

Mismatch Suppression

When Mismatch Suppression is activated, the fitting process is modified so any ripple peaks will stay below the nominal initial value of the parameter in question. The concept is to limit that amount of loss correction so that no ripple peaks in the adjusted result exceed the initial (lowest loss) value of the parameter. If the DUT has very low loss at low frequency, not suppressing the effect of mismatch-induced ripple could result in an adjusted parameter value above 0 dB which may be objectionable in some applications.

Frequency Dependent Settings:

Loss

Usually greater than zero (but can be negative for gain). This is the loss at some known frequency and then a loss at other frequencies will be calculated using the frequency raised to the 'exponent' power.

Reference Frequency

Frequency at which the loss specified above is defined. The loss at other frequencies is scaled by (frequency/(reference frequency))^n where n is the exponent specified next.

Exponent

Exponent has a default value of 0.5 which tends to describe loss in coaxial lines and in coplanar waveguide rather well for many materials. The exponent may be closer to 1 for microstrip structures and other values for other geometries. The allowed range for the exponent is 0.01 to 10 but it is fairly rare to get outside the range of 0.25 to 2.

SELECT TERMINATOR TYPE FOR PORT1 Dialog Box

Prerequisites

- REFERENCE PLANE | Select by Port

Navigation

- MAIN | Measurement | MEASUREMENT | Reference Plane | REFERENCE PLANE | Terminator

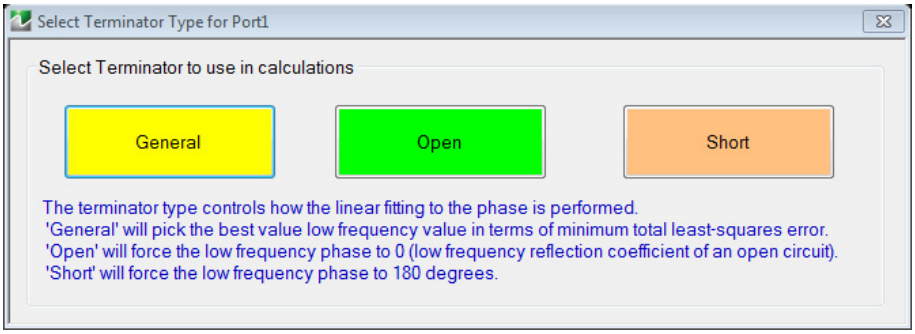


Figure 9-8. SELECT TERMINATOR TYPE FOR PORT1 Dialog

Select Terminator to Use in Calculations

The terminator type control how the linear fitting to the phase is performed.

- General – Picks the best value low frequency value in terms of minimum total least-squares error.
- Open – Forces the low frequency phase to 0 (low frequency reflection coefficient of an open circuit).
- Short – Forces the low frequency phase to 180 degrees.

SELECT TERMINATOR TYPE FOR TRACE1 Dialog Box

Prerequisites

- REFERENCE PLANE | Select by Trace

Navigation

- MAIN | Measurement | MEASUREMENT | Reference Plane | REFERENCE PLANE | Terminator

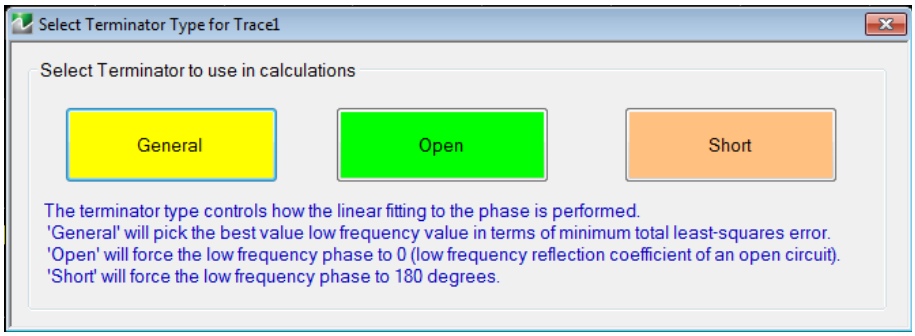


Figure 9-9. SELECT TERMINATOR TYPE FOR TRACE1 Dialog

Select Terminator to Use in Calculations

The terminator type control how the linear fitting to the phase is performed.

- General – Picks the best value low frequency value in terms of minimum total least-squares error.
- Open – Forces the low frequency phase to 0 (low frequency reflection coefficient of an open circuit).
- Short – Forces the low frequency phase to 180 degrees.

OPTICAL MEASUREMENTS Menu

Previous

- "MEASUREMENT Menu" on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | O/E-E/O-O/O | OPTICAL MEASUREMENTS

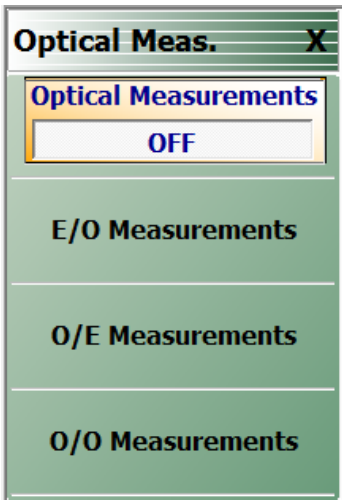


Figure 9-10. OPTICAL MEASUREMENTS Menu

Note	Depending on the EO_OE_OO status in the CHX file, and once the E/O, O/E, or O/O measurement setup through the OPTICAL MEASUREMENTS menu is complete, the Channel Status on the display will indicate an O/E, E/O, or O/O measuring state, as shown in Figure 9-11.

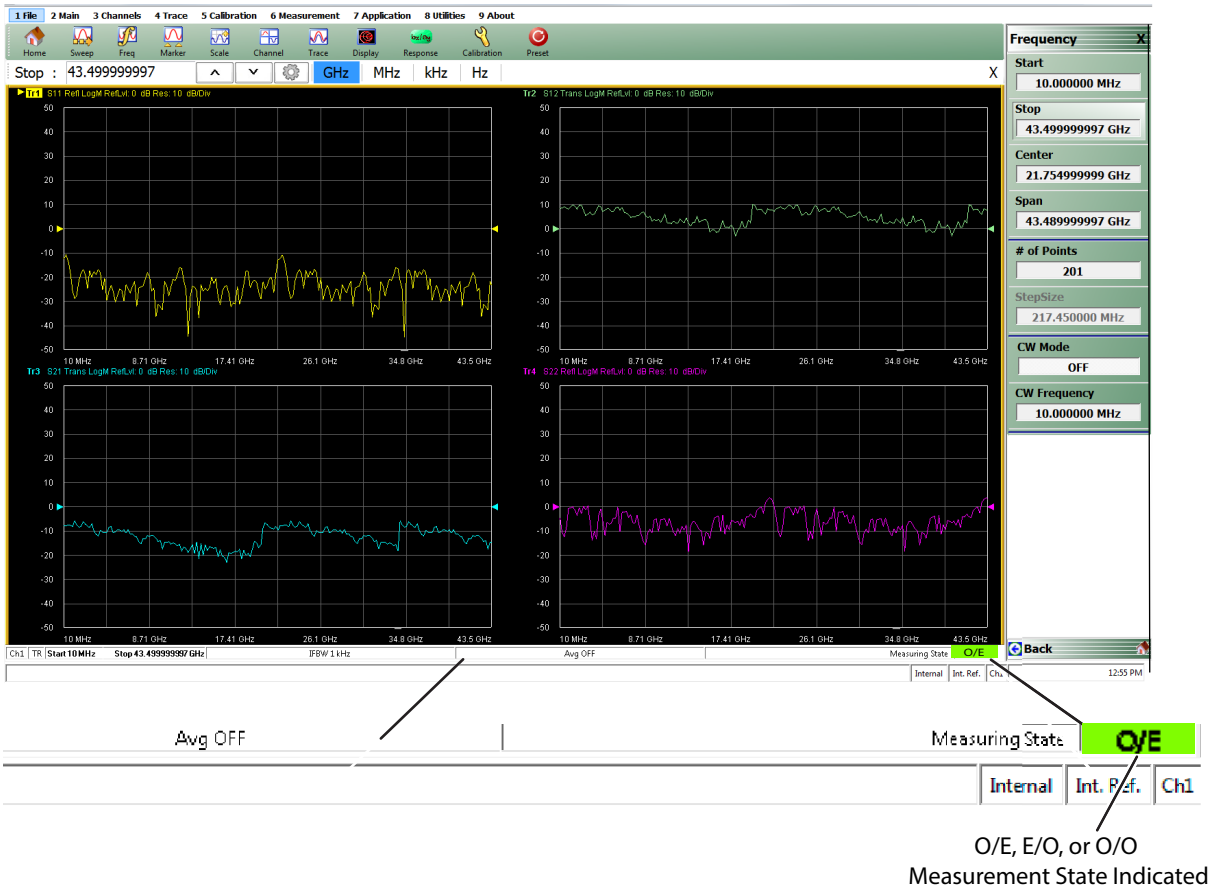


Figure 9-11. O/E – E/O – O/O Measuring State Indication

2-PORT E/O MEASUREMENT Dialog Box

Upon clicking E/O Measurements button, the 2-PORT E/O MEASUREMENT dialog appears.

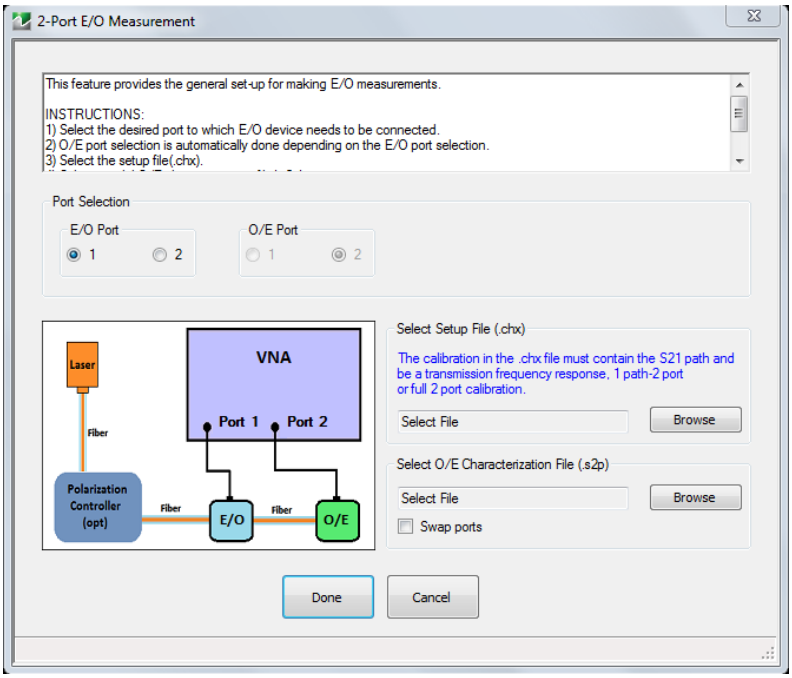


Figure 9-12. 2-Port E/O Measurement Dialog

Port Selection Radio Buttons

- Select a valid port configuration.

Select Setup File (.chx)

- Browse to CHX file and select.

Select O/E Characterization File (.s2p)

- Browse to file and select.

On clicking Done button, the calibration in the selected CHX file is loaded and the calibration error terms are modified using the.s2p file data.

Instructions

This feature provides the general set-up for making E/O measurements.

1. Select the desired port to which E/O device needs to be connected.
2. O/E port selection is automatically done depending on the E/O port selection.
3. Select the setup file(.chx).
4. Select a valid O/E characterization file(.s2p).
5. Check the Swap ports option if the S-parameters assignment present in the file need to be swapped.
6. Click Done to perform E/O measurement.

2-PORT O/E MEASUREMENT Dialog Box

Upon clicking the O/E Measurements button, the 2-PORT O/E MEASUREMENT dialog appears.

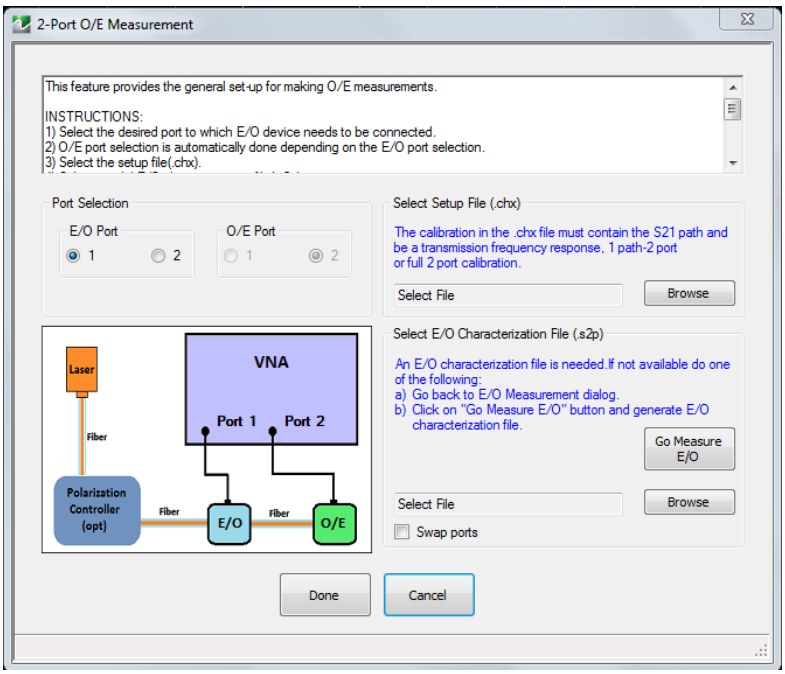


Figure 9-13. 2-Port O/E MEASUREMENT Dialog

Port Selection Radio Buttons

- Select a valid port configuration.

Select Setup File (.chx)

- Browse to CHX file and select.

Select O/E Characterization File (.s2p)

- Browse to file and select.

On clicking the Done button, the calibration in the selected CHX file is loaded and the calibration error terms are modified using the .s2p file data.

Note	If the E/O characterization file is not available, click the **Go Measure E/O** button and go to the **Measure E/O** dialog after selecting a valid port configuration and CHX file. In the spawned dialog, using the reference O/E file selected, the E/O data will be saved in a file (.s2p format). Now this saved E/O file is available for the O/E measurement in the parent dialog.

This feature provides the general set-up for making O/E measurements.

Instructions

1. Select the desired port to which E/O device needs to be connected.
2. O/E port selection is automatically done depending on the E/O port selection.
3. Select the setup file(.chx).
4. Select a valid E/O characterization file(.s2p).

5. If file not available do any one of the following:

a. Go back to E/O Measurement dialog and after performing E/O measurement, save the data in .s2p format. Select this saved .s2p file as the E/O characterization file in this dialog.

b. Click on Go Measure E/O button and generate .s2p file.

6. On returning to this dialog, the E/O characterization file selected will be displayed in the text-box.

7. Check the Swap ports option, if the S-parameters assignment present in the file need to be swapped.

8. Click Done to perform O/E measurement.

2-PORT O/O MEASUREMENT Dialog Box

Upon clicking the O/O Measurements button, the 2-PORT O/O MEASUREMENT dialog appears.The O/O MEASUREMENT dialog enables the user to determine the microwave frequency response characteristics of certain purely optical (O/O) components (couplers, amplifiers, filters, etc.). Although a fiber is shown as the only element between the detector and modulator in Figure 9-14, an optical DUT may be there for O/O measurements.

The O/O measurement is somewhat like the E/O and O/E measurement setups in series; both the detector and the modulator must be de-embedded to leave the reference planes in the optical domain. As suggested by Figure 9-14, if both .s2p files exist, their file names can be entered directly and the de-embedding will ensue

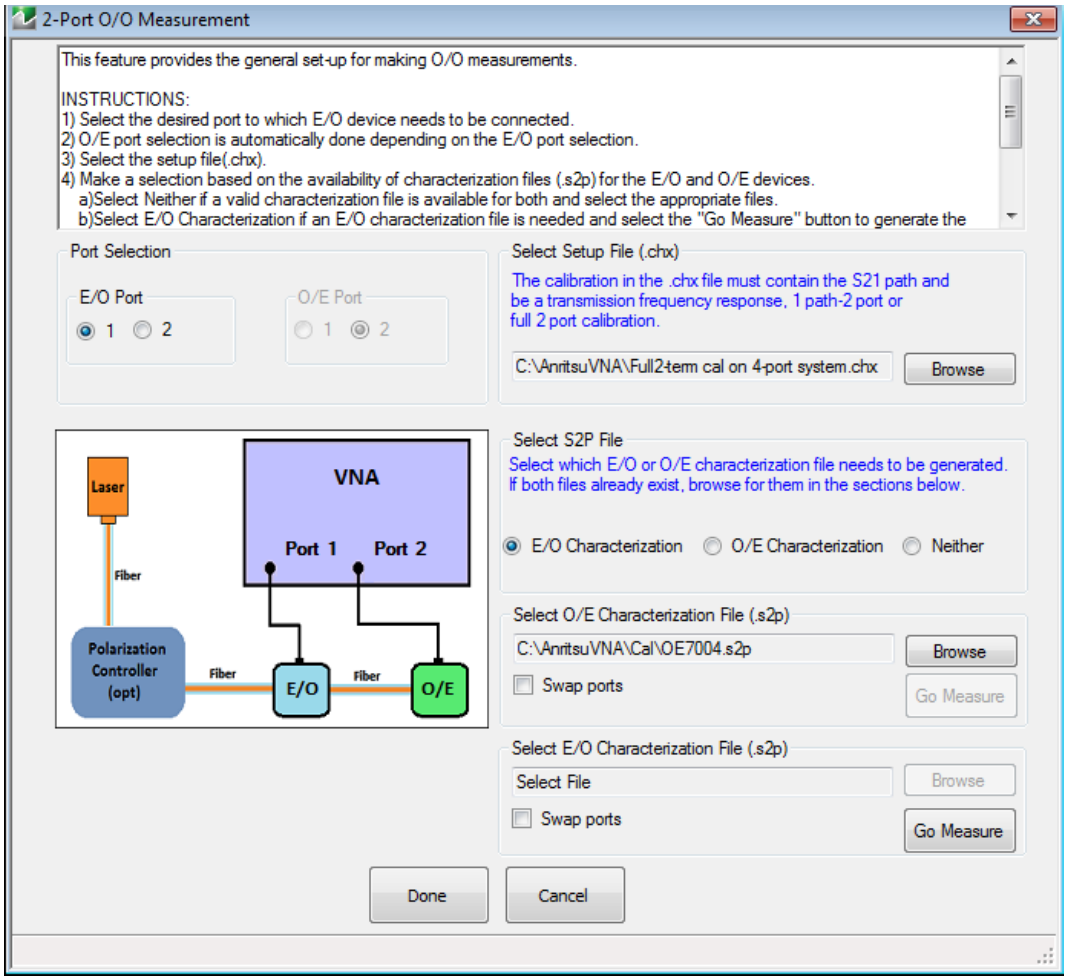


Figure 9-14. 2-Port O/O MEASUREMENT Dialog

When measuring O/O devices, the characteristics of both O/E and E/O devices must be known. If a file for one does not already exist, the GO MEASURE E/O dialog shown in Figure 9-15 can help in doing the intermediate measurement with the help of the file for the other device (usually a calibration O/E device such as the MN4765X). At least one converter must have a .s2p file to do the measurement. This Go Measure process allows one to enter the known device's file and to define the file name for the newly created file.

Note that the .s2p file name for the known device is assumed to be the same as that used on the main O/O dialog as this device normally doesn't change between Measure and O/O configuration steps. If a different device is to be used, the file name on the main O/O dialog can simply be changed after the Measure process is completed.

Port Selection Radio Buttons

- Select a valid port configuration.

Select Setup File (.chx)

- Browse to CHX file and select.

Select S2P File

- Browse to file and select.

Note	If the E/O or O/E characterization files are not available, click the **Go Measure** button and go to the **GO MEASURE** dialog (see Figure 9-15) after selecting a valid port configuration and CHX file. In the spawned dialog, using the reference O/E or E/O file selected, the E/O or O/E data will be saved in a file (.s2p format). Now this saved E/O or O/E file will be available for the O/O measurement in the parent dialog.

On clicking the Done button, the calibration in the selected CHX file is loaded and the calibration error terms are modified using the .s2p file data.

This feature provides the general set-up for making O/O measurements.

Instructions

1. Select the desired port to which E/O device needs to be connected.
2. O/E port selection is automatically done depending on the E/O port selection.
3. Select the setup file(.chx).
4. Make a selection based on the availability of characterization files (.s2p) for the E/O and O/E devices.
    a. Select Neither if a valid characterization file is available for both and select the appropriate files.
    b. Select E/O Characterization if an E/O characterization file is needed and click on the Go Measure button to generate the .s2p file. Enter the file name for the existing O/E file.
    c. Select O/E Characterization if an O/E characterization file is needed and click on the Go Measure button to generate the .s2p file. Enter the file name for the existing E/O file
5. Check the Swap ports option if the S-parameters assignment present in the file need to be swapped.
6. Click Done to perform O/O measurement.

2-Port MEASURE E/O (or MEASURE O/E) Dialog Box

On either the O/E Measurement or O/O MEASUREMENT dialog, clicking on a Go Measure button displays the MEASURE E/O (or MEASURE O/E) dialog shown in Figure 9-15.

The calibration in the selected CHX file is loaded and the S-parameters measured with the loaded calibration will be modified by the reference O/E characterization data when Measure Device is clicked. This modified S-parameter data is saved as a .s2p file in the location designated for E/O data..

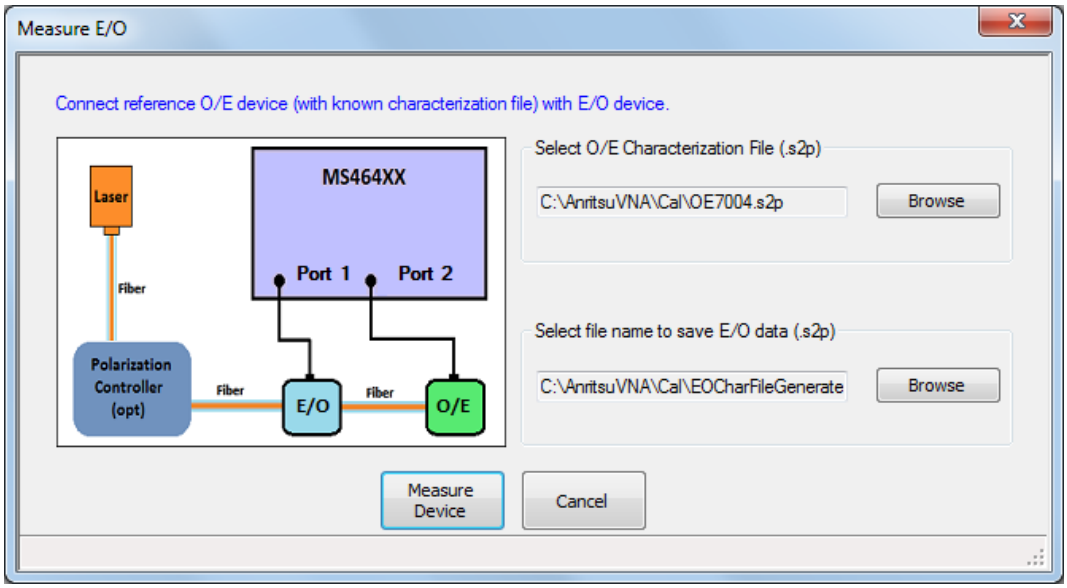


Figure 9-15. MEASURE E/O Dialog

Connect Reference O/E Device (that has a known characterization file) With E/O Device

- After connection, select OE file and enter or select EO file:

Select O/E Characterization File (.s2p)

- Browse to and select the reference O/E characterization file (.s2p).

Select File Name to Save E/O Data (.s2p)

- Browse to the desired location, then enter or select an existing (.s2p) file name for the E/O characterization file that will be generated.

Click on Measure Device

- After saving the E/O data, the user is returned to the parent O/E MEASUREMENT or O/O MEASUREMENT dialog to complete the measurement.

PROCESSING ORDER Menu

Previous

- "MEASUREMENT Menu" on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | Post-Processing Order | PROCESSING ORDER

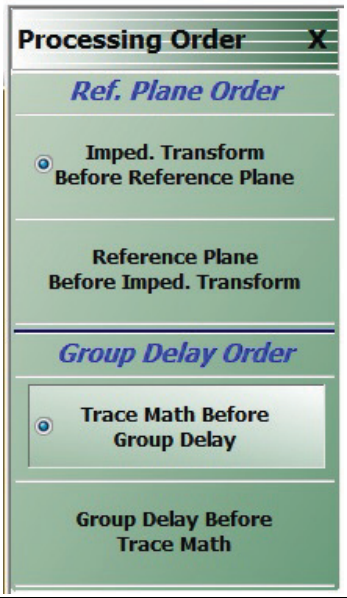


Figure 9-16. PROCESSING ORDER Menu

Imped. Transform Before Reference Plane

Select sets the processing order to first process the impedance transformation and then process the reference plane data. Click Back to return to the MEASUREMENT menu.

Reference Plane Before Imped. Transform

Select sets the processing order to first process the reference plane data and then process the impedance transformation. Click Back to return to the MEASUREMENT menu.

Trace Math Before Group Delay

Select sets the processing order to first process trace math and then process group delay. Click Back to return to the MEASUREMENT menu.

Group Delay Before Trace Math

Select sets the processing order to first process group delay and then process trace math. Click Back to return to the MEASUREMENT menu.

EMBEDDING Menu

Previous

- “MEASUREMENT Menu” on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING

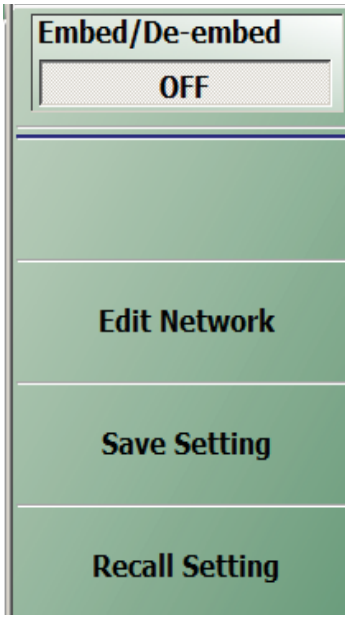


Figure 9-17. EMBEDDING Menu

Embed/De-Embed (Off/On)

Toggles embedding/de-embedding off and on.

If calibration has not been applied, and a toggle to ON is attempted, a Not Allowed warning message is displayed.

Edit Network (Embedding)

Select displays the EDIT EMBEDDING/DE-EMBEDDING (2 Port DUT) dialog box.

- “EDIT EMBEDDING/DE-EMBEDDING (2 Port DUT) Dialog Box” on page 9-23

Save Setting (Embedding)

Select displays the SAVE AS (Embed/De-Embed EDL File) dialog box.

- “SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box” on page 9-26

Recall Setting (Embedding)

Select displays the OPEN (Embed/De-Embed EDL File) dialog box.

- “OPEN (EMBED/DE-EMBED EDL File) Dialog Box” on page 9-27

EDIT EMBEDDING/DE-EMBEDDING (2 Port DUT) Dialog Box

Previous

- "EMBEDDING Menu" on page 9-22

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING | Edit Network | EDIT EMBEDDING/DE-EMBEDDING (DUT TYPE) Dialog Box

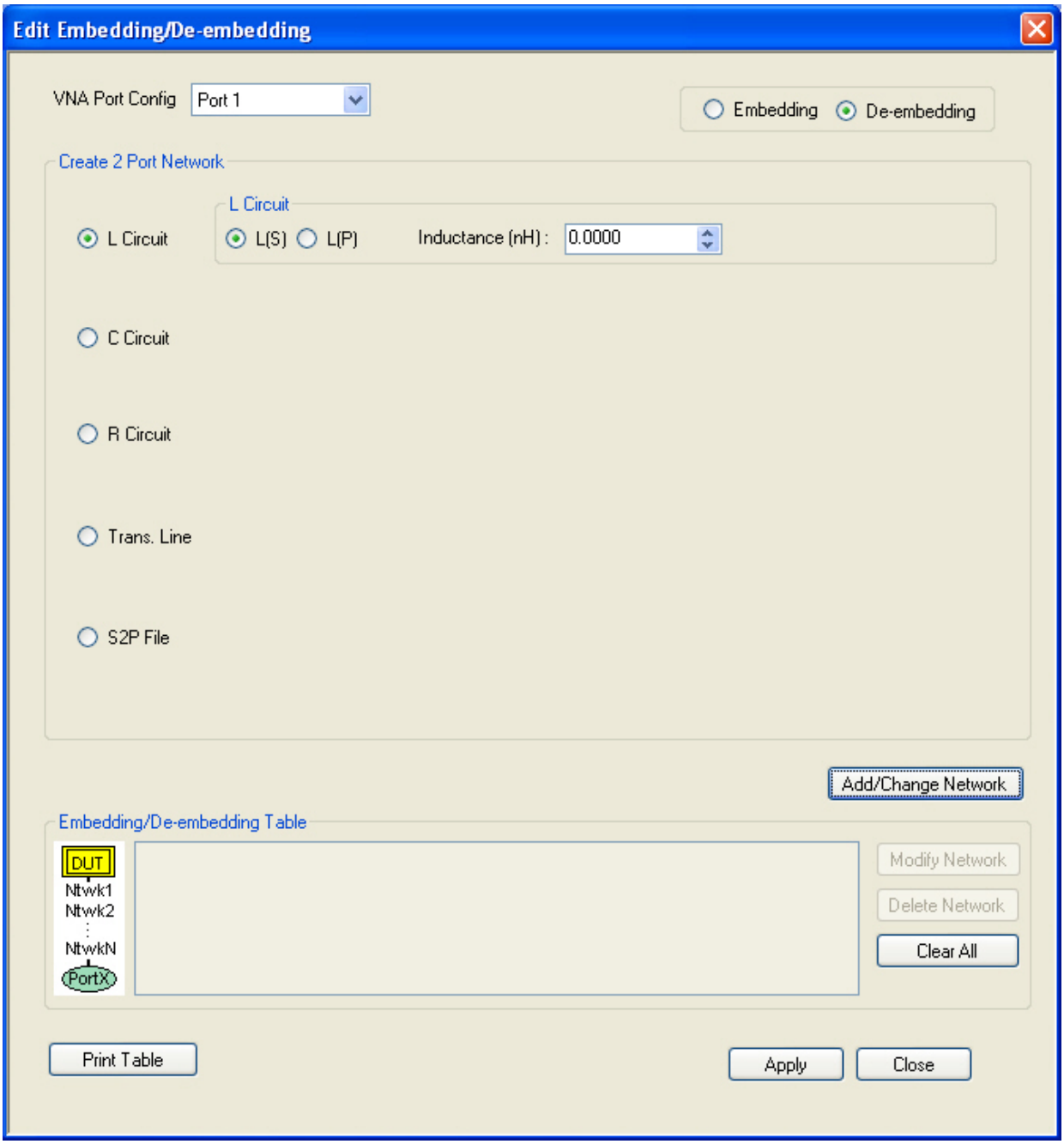


Figure 9-18. EDIT EMBEDDING/DE-EMBEDDING (DUT Type) Dialog Box

Overview

The dialog box allows user setup of the embedding/de-embedding for the DUT. The available parameters for each dialog box area are described below.

VNA Port Configuration

- Port 1
- Port 2
- Ports 1,2

Embedding/De-embedding Radio Buttons

The configuration can be set to either embedding or de-embedding.

- Embedding
- De-embedding

Create 2 Port Network

Allows user selection of a specific type of 2-Port Networks:

- L Circuit
- C Circuit
- R Circuit
- Trans. (Transmission) Line
- S2P File

Once an option above has been selected, other sub-options, described in the sections below, are available.

L Circuit Selected in Create 2 Port Network

If L Circuit is selected above in Create 2 Port Network, the L Circuit area appears with the following options:

- Radio button selections for L(S) or L(P)
- Input field for Inductance (nH)

C Circuit Selected in Create 2 Port Network

If C Circuit is selected above in Create 2 Port Network, the C Circuit area appears with the following options:

- Radio button selections for C(S) or C(P)
- Input field for Capacitance (pF)

R Circuit Selected in Create 2 Port Network

If R Circuit is selected above in Create 2 Port Network, the R Circuit area appears with the following options:

- Radio button selections for R(S) or R(P)
- Input field for Resistance (Ohms)

Trans. Line Circuit Selected in Create 2 Port Network

If Trans. Line is selected above in Create 2 Port Network, the Transmission Line area appears with the following options:

- Input field for Impedance (Ohms)
- Input field for Length (mm) or Calculator icon
  - The transmission line length can be directly input in millimeters.
  - If the Calculator icon is selected, the AIR EQUIVALENT LENGTH CONVERSION (from ps to mm) dialog appears. Enter the length in ps, enter dielectric constant, calculate equivalent air equivalent length, obtain the air equivalent length in millimeters. Click OK. The calculated value is entered into the Length field.
- Input field for Loss (dB/mm)
- Input field for @ Frequency (GHz)
- Input field for Dielectric constant:
  - Provides menu selections for Air (1.000649), Polyethylene (2.26), Teflon (2.10), Microporous Teflon (1.69), Other.
  - If other is selected, an Other input field is provided for a user-defined dielectric constant.

S2P File Selected in Create 2 Port Network

If S2P File is selected above in Create 2 Port Network, the following options are available:

- The Load S2P file button appears. Select displays the OPEN (Display S2P File) dialog box to allow the user to navigate to a previously saved S2P file. Once a file is selected, its path and file names appears in the field next to the button.
- Swap Port Assignment check box. Normally, the network's Port 2 will be nearer the DUT. If the Swap Port check box is selected, the port assignments are swapped.

Add/Change Network

As each network is configured, select the Add/Change Network button to add it to the Embedding/De-embedding table. The newest configured networks are entered closest to the Test Port.

To modify or delete a network, delete the network in the Embedding/De-embedding table. The Modify Network and Delete Network buttons become available. Use the Clear All button to clear all entries. Use the Print Table button to output a network table to a connected printer.

When all network changes are made, select Apply and then Close. On the EMBEDDING menu, select Save Setting to store the network configuration.

SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box

Previous

- “EMBEDDING Menu” on page 9-22

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING | Save Setting | SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box

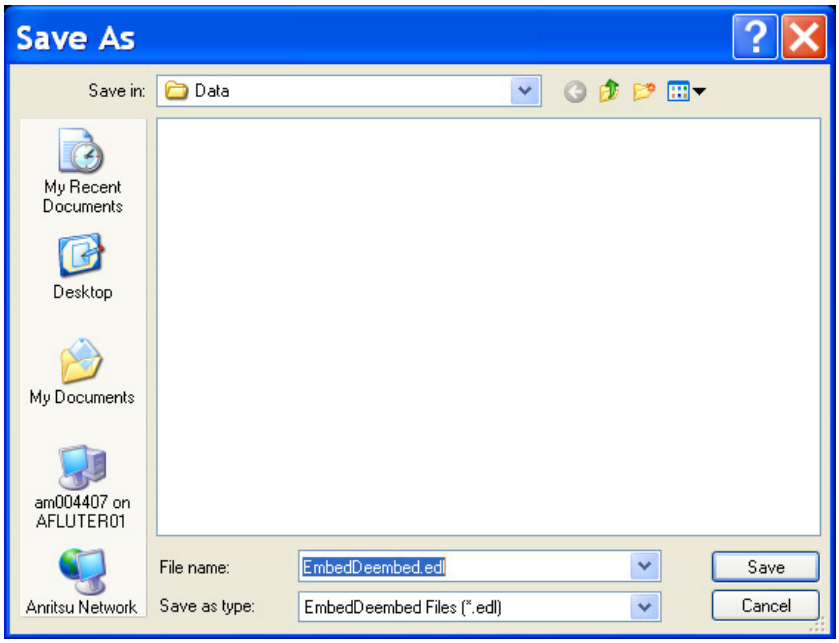


Figure 9-19. SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box

OPEN (EMBED/DE-EMBED EDL File) Dialog Box

Previous

- "EMBEDDING Menu" on page 9-22

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING | Recall Setting | OPEN (EMBED/DE-EMBED EDL FILE) Dialog Box

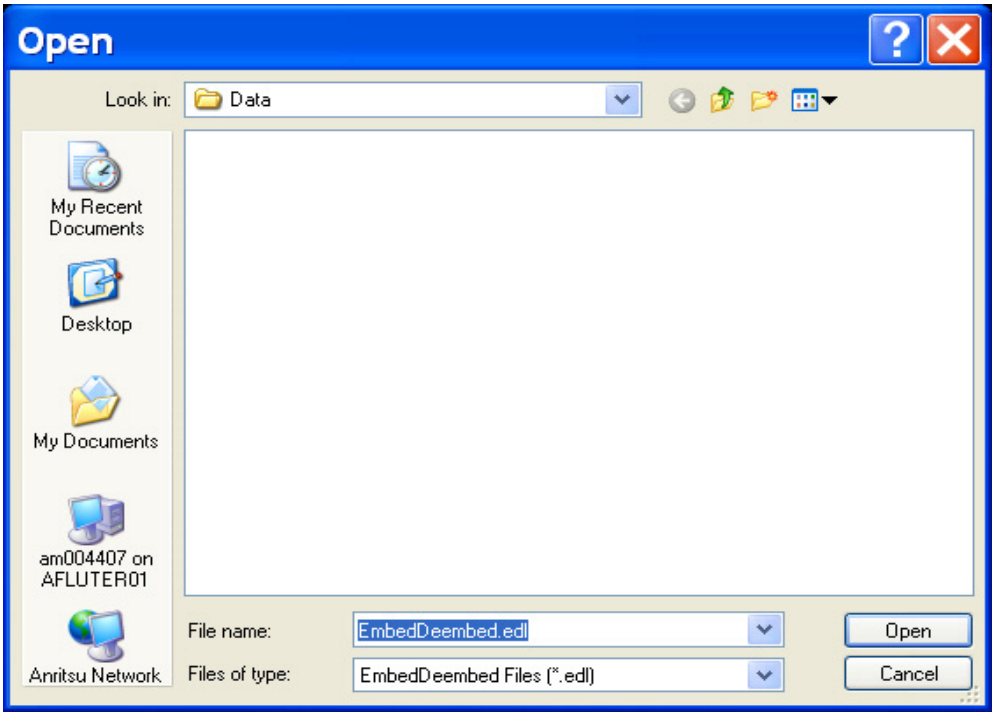


Figure 9-20. OPEN (EMBED/DE-EMBED EDL FILE) Dialog Box

LINE TYPE Dialog Box

Previous

- “MEASUREMENT Menu” on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | Line Type | LINE TYPE Dialog Box

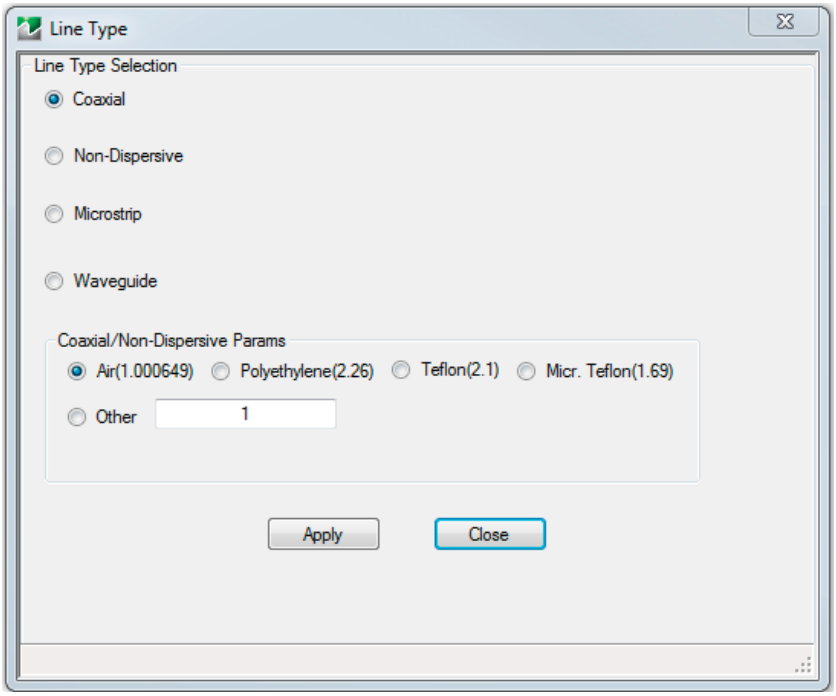


Figure 9-21. LINE TYPE Dialog Box – Coaxial, Non-Dispersive, Microstrip, or Waveguide

Line Type Selection Area

The Line Type Selection area allows user choice of four (4) different line types:

- Coaxial
  - Select causes the Coaxial/Non-Dispersive Line Type Area (described below) to appear.
- Non-Dispersive
  - Select causes the Coaxial/Non-Dispersive Line Type Area to appear.
- Microstrip
  - Select causes the Microstrip Parameters Area (described below) to appear.
- Waveguide
  - Select causes the Waveguide Line Type Area (described below) to appear.

The options and selectable parameters for each option are described in the sections below.

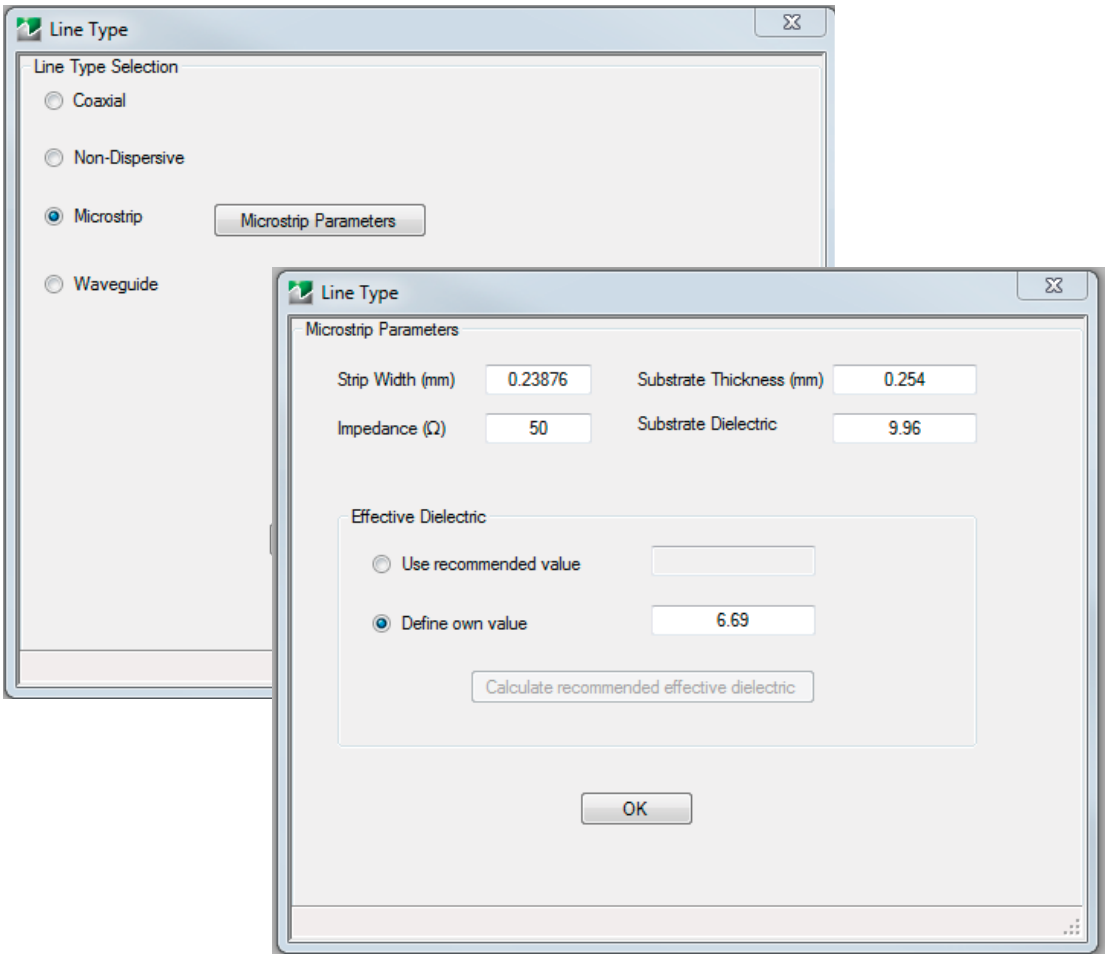
Coaxial or Non-Dispersive Line Types Area

If Coaxial or Non-Dispersive line type is selected, the Coaxial/Non-Dispersive Parameters area appears with a button selection group and selections of:

- Air (1.000649)
- Polyethylene (2.26)
- Teflon (2.1)
- Micr. Teflon (Microporous Teflon) (1.69)
- Other.
    - If other is selected, a field appears allowing user entry of a line type dielectric parameter between 0 (zero) and 99.

Microstrip Parameters Area

If Microstrip line type is selected, the Microstrip Parameters button appears (shown below at left). Clicking Microstrip Parameters displays an additional dialog with areas for Microstrip Parameters and Effective Dielectric (shown below at right).



1. Line Type Selector Area – Microstrip Selected
2. Microstrip Parameters Area – Microstrip Parameters for User-Defined Values

Figure 9-22. LINE TYPE Dialog Box – Microstrip Selected

Microstrip Params Area

The system default microstrip parameters are displayed:

- Strip width (mm): 0.23876
- Impedance (Ω): 50
- Substrate thickness (mm): 0.254
- Substrate dielectric: 9.96

To change a value, click in the field, and then enter the required parameter value.

Effective Dielectric Area

In the Effective Dielectric Area of the dialog box, select one of the two options:

- Use recommended value
- Define own value. If Define own value was selected, click in the field and enter the required dielectric value.

Click OK to close the Microstrip Parameters Area.

Waveguide Line Type Area

If Waveguide line type is selected, the Waveguide Parameters Area appears.

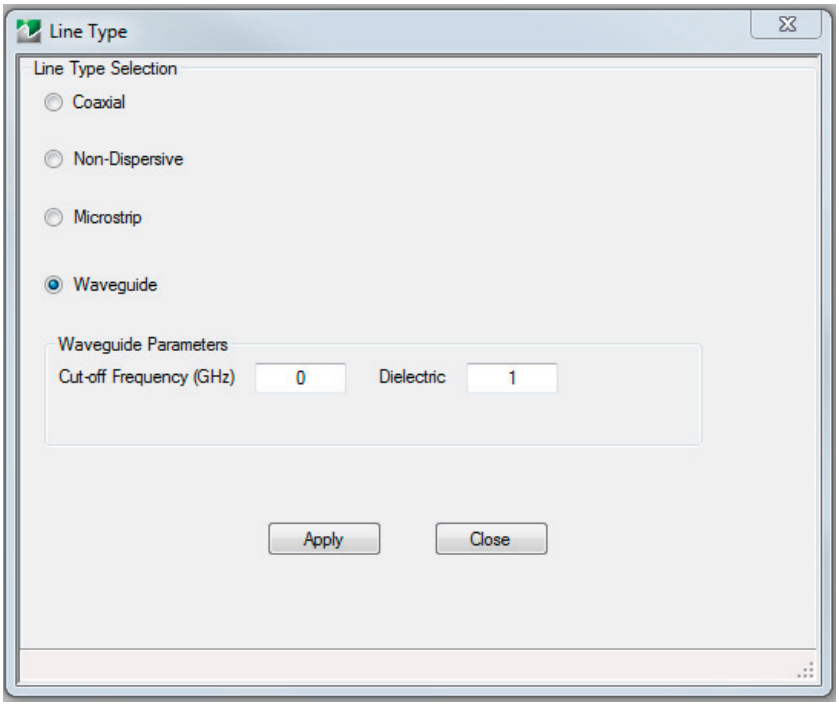


Figure 9-23. LINE TYPE Dialog Box -Waveguide Selected – Waveguide Parameters Area

Waveguide Parameters Area

Cut-off Frequency (GHz):

- User entry field

Dielectric value:

- User entry field

Applying Line Type Changes

1. After making a selection, you must click the Apply button to apply the changes made and then click Close.
2. On the MEASUREMENT menu, the read-only Line Type and Dielectric buttons show the entered values.
3. Clicking Close without clicking Apply abandons any changes and returns to the MEASUREMENT menu with the prior current instrument setting.

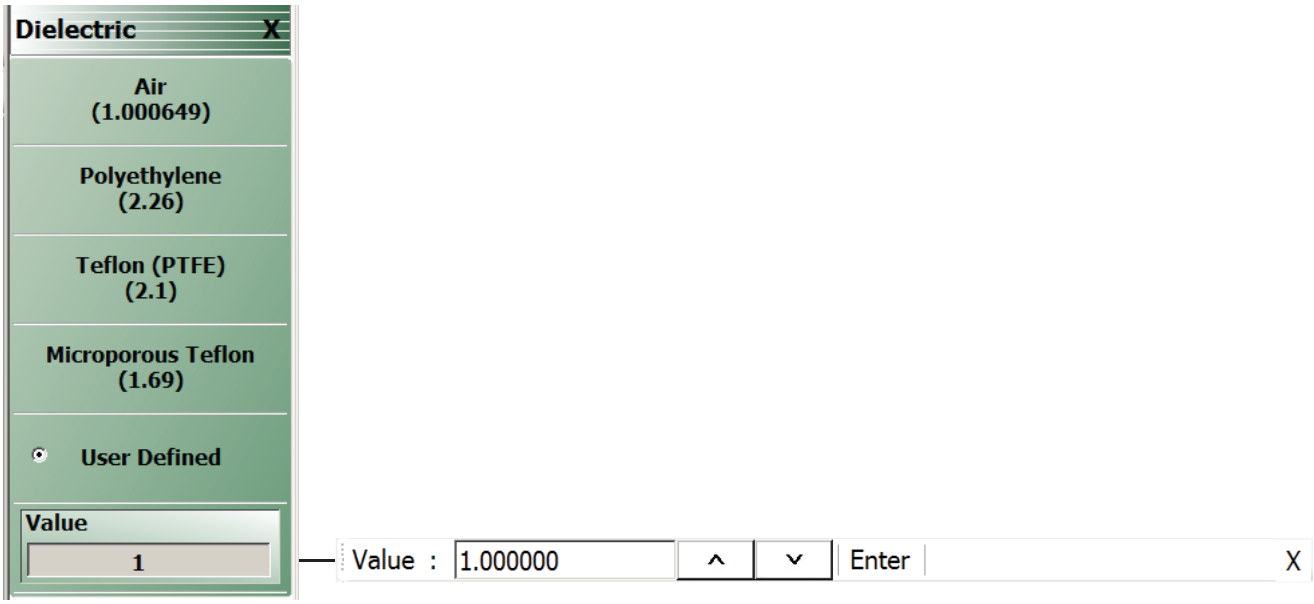
DIELECTRIC Menu

Previous

- "MEASUREMENT Menu" on page 9-3

Navigation

- MAIN | Measurement | MEASUREMENT | Dielectric | DIELECTRIC



Select the User Defined button to access the Value button and related Field Toolbar.

Figure 9-24. DIELECTRIC Menu

DIELECTRIC Menu Button Selection Group

The DIELECTRIC menu variably displays either five (5) or six (6) buttons that are all members of a button selection group. If any single button is selected, the other buttons are deselected.

If the User Defined (Dielectric) button is selected, a sixth button, Value (Dielectric) appears at the bottom of the menu and allows the user to enter a user-defined dielectric constant.

The dielectric material selected here is displayed in the MEASUREMENT menu in the read-only Dielectric button field.

- "MEASUREMENT Menu" on page 9-3
- MAIN | Measurement | MEASUREMENT

After selecting a dielectric value, click Back to return to the MEASURMENT menu.

Air (1.000649) (Dielectric)

Select sets the dielectric as air (1.000649) and de-selects Polyethylene, Teflon, Micr. Teflon, and User Defined.

Polyethylene (2.26) (Dielectric)

Select sets the dielectric as polyethylene (2.26) and de-selects Air, Teflon, Micr. Teflon, and User Defined.

Teflon (2.1) (Dielectric)

Select sets the dielectric as Teflon (2.1) and de-selects Air, Polyethylene, Micr. Teflon, and User Defined.

Micr. Teflon (1.69) (Dielectric)

Select sets the dielectric as Microporous Teflon (1.69) and de-selects Air, Polyethylene, Teflon, and User Defined.

User Defined (Dielectric)

Select sets the dielectric as User Defined (Dielectric) and de-selects Air, Polyethylene, Teflon, and Micr. Teflon. Select also displays the Value (Dielectric) button at the bottom of the menu.

Value (Dielectric)

The Value (Dielectric) button only appears if the User Defined button (above) has been selected. Once the Value (Dielectric) button is available, select displays the Value (Dielectric) field toolbar for entry of a user-defined dielectric constant.

Chapter 10 — Time Domain Menu

10-1 Chapter Overview

The Time Domain (TDOMAIN) menu provides a convenient way to access all time domain-related parameter setup items. Although these parameters are also accessible in other places throughout the ShockLine application, the user must shift among menus to reach them. Here, the Measurement Setup dialog collects all of them for access on one screen.

Note	The Time Domain option (Option -002) must be installed for the TDOMAIN menu to be available. For the MS46121A/B the Time Domain Measurement Setup dialog is standard and is the only method to access the time domain controls. The Domain menus found in the Chapter 14 — Display Menus are not available for the MS46121A/B.

10-2 Overview of the Time Domain Menu

The Time Domain menu offers the following selection buttons:

- "LOW PASS TIME DOMAIN CAL Dialog Box" on page 10-3
- "TIME DOMAIN MEASUREMENT SETUP Dialog Box" on page 10-4

10-3 Time Domain Icon on Icon Bar

Although Time Domain is an item on the MAIN MENU, it does not appear on the icon bar unless placed there manually. To do that:

1. Select UTILITIES menu.
2. Select Customize Toolbar.
3. In the CUSTOMIZE TOOLBAR dialog box, locate the Time Domain icon in the Available Buttons scroll list then click the center-located Add button to add it to the displayed icons list on the right.
4. If desired, use the Up/Down buttons to adjust icon position on toolbar.
5. Click Close to exit the dialog.

10-4 Time Domain Menu

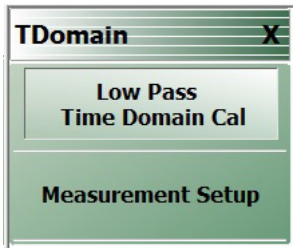
TIME DOMAIN Menu

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | Time Domain | TDOMAIN



Low Pass Time Domain Cal

Selection opens the NOTE dialog used to open the LOW PASS TIME DOMAIN CAL SETUP dialog.

- “LOW PASS TIME DOMAIN CAL Dialog Box” on page 10-3

Measurement Setup

Selection opens the dialog used to set up parameters for measurements supporting time domain results.

- “TIME DOMAIN MEASUREMENT SETUP Dialog Box” on page 10-4

Figure 10-1. TIME DOMAIN Menu

10-5 LOW PASS TIME DOMAIN CAL Dialog Box

Navigation

- MAIN | Time Domain | TDOMAIN | Low Pass Time Domain Cal | LOW PASS TIME DOMAIN CAL Dialog

LOW PASS TIME DOMAIN CAL Dialog

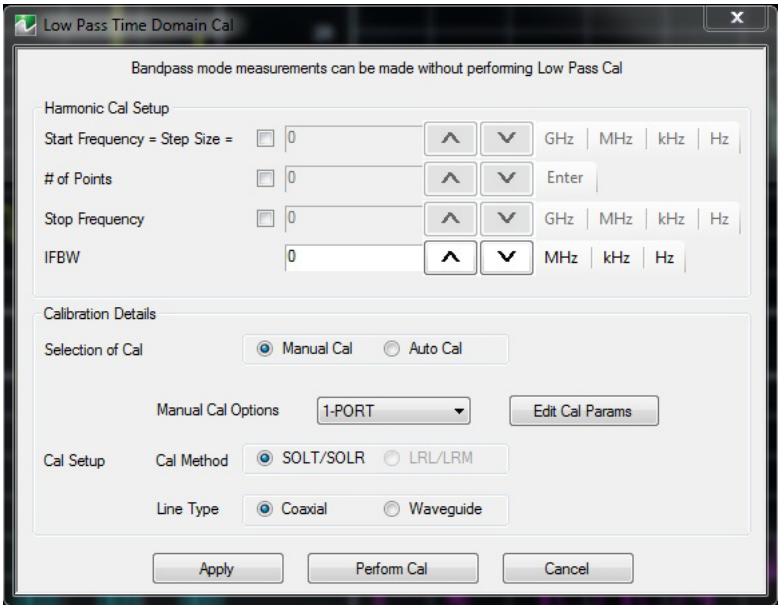


Figure 10-2. LOW PASS TIME DOMAIN CAL Dialog Box

The main sections of this dialog are:

Harmonic Cal Setup

This frame calculates the frequency sweep plan that satisfies the requirements for a low pass time domain measurement. The user sets two of the three sweep parameters and the calculator sets the third parameter such that the following equations are satisfied:

Stop frequency = start frequency * number of points

Start frequency = sweep step size

Also note that when any parameter hits its range limit, the adjustment of the other parameters may then be limited according to the constraints of the equation.

In this frame you can also set the IF measurement bandwidth.

Calibration Details

This sets the calibration parameters: Measurement type (Manual or Auto), number of ports, calibration method and line type).

Edit Cal Params – This button opens the same dynamically composed dialog that appears through this menu path:

Calibrate | Manual Cal | X-Port Cal (where X is the number of ports) | Modify Cal Setup | Edit Cal Params

Perform Cal – This button invokes a calibration; the application then asks you to complete the calibration using appropriate selections from the MANUAL CAL menu and its submenus.

10-6 TIME DOMAIN MEASUREMENT SETUP Dialog Box

This dialog contains setup parameters for time domain measurements. It replicates and gathers in one place a number of parameters occurring under various ShockLine menus. For explanations of some items, this chapter refers to other chapters where the topic is already covered under a particular menu. For example, many functions invoked by Time Domain controls in this dialog are discussed in Chapter 14 — Display Menus under DOMAIN. This dialog shows a tab for each trace in the current channel. There are four main controls frames on each tab.

- Domain Definition contains controls for selecting domain qualities.
- Response and Trace Definition controls are used to set up type of measurement and output formats.
- Range Setup controls the time or distance trace range of the DUT.
- Gate Setup controls the time or distance range for the notch or gate function.

Also, visual behavior of controls that are dependent on other settings matches the behavior in the menus. For example, Range Setup and Gate Setup are grayed out if Domain Mode Frequency with No Time Gate is active.

Navigation

- MAIN | Time Domain | TIME DOMAIN | Measurement Setup | TIME DOMAIN MEASUREMENT SETUP

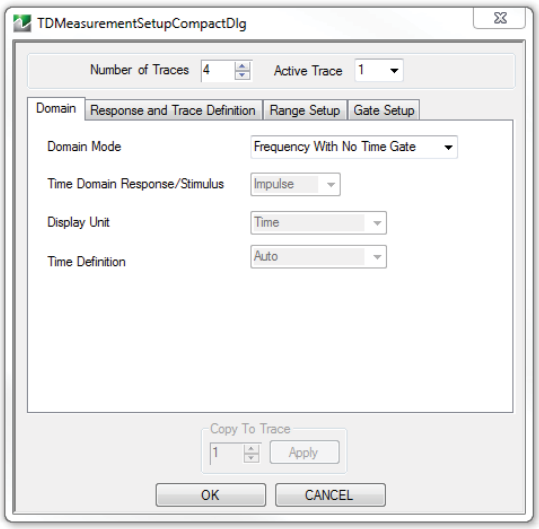


Figure 10-3. TIME DOMAIN MEASUREMENT SETUP

Domain Definition

To set the time domain type, select one of the four types (Time Domain – Low Pass; Time Domain – Band Pass; Frequency with Time Gate; or Frequency with No Time Gate). (Time Domain – Low Pass will not be enabled for selection until you have performed a Low Pass Time Domain calibration.

Display Unit: Button choices depend on the Domain Mode setting.

Time Definition: Button choices depend on the Domain Mode setting.

Next, set Time Domain Response/Stimulus as needed.

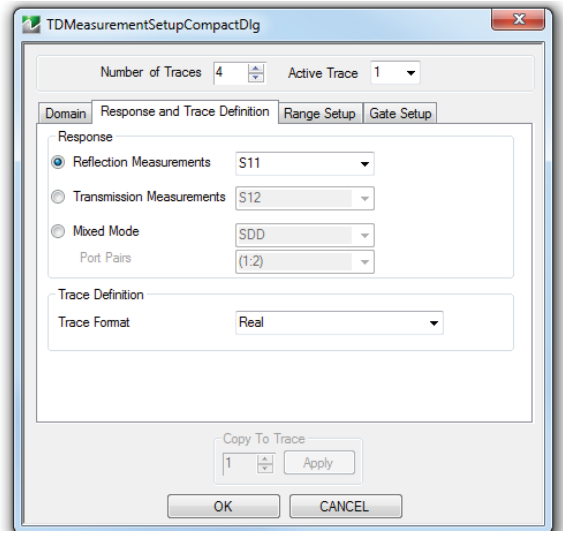


Figure 10-4. Response and Trace Definition Setup

Response and Trace Definition

The available choices here depend on the instrument model.

For 1-port model: MS46121A/B, parameter S11 is selectable.

For 2-port models: MS46122A/B and MS46322A/B parameters S11, S12, S21, and S22 are selectable.

Trace Format controls the display format for a trace. For information on all formats listed here, see Chapter 14 — Display Menus.

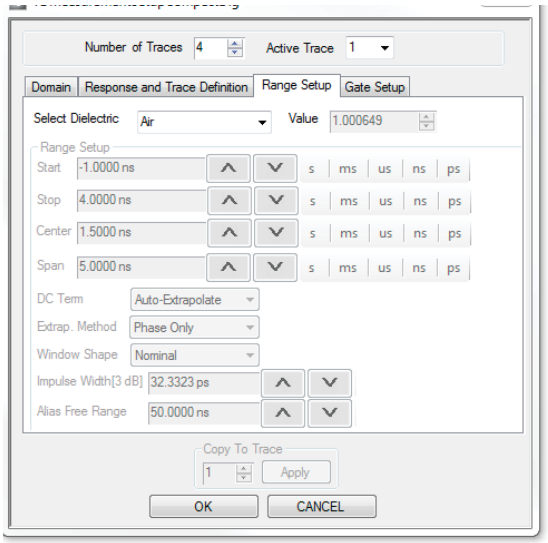


Figure 10-5. Time Domain Range Setup

DUT Definition

This frame's controls are:

Select Dielectric: This pull-down menu allows the user to select the type of dielectric.

There are four standard choices of dielectric and one button allowing entry of a user defined dielectric constant value.

Range Setup: These parameters are grayed out if Domain Mode is set to Frequency With No Time Gate.

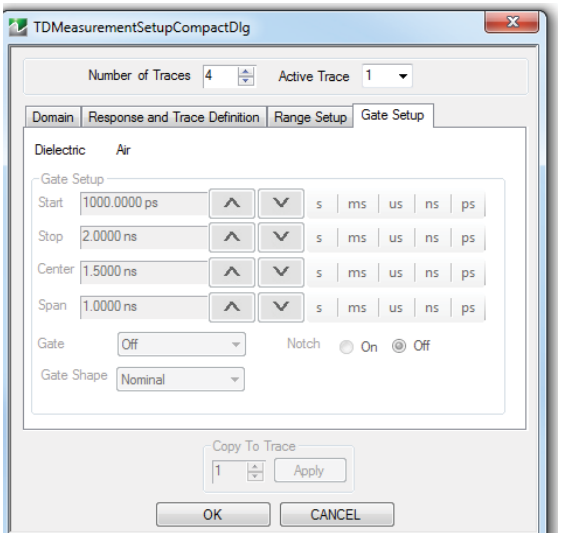


Figure 10-6. Gate Setup

Trace Coupling Definition, Gate Setup

Gate Setup: These parameters are grayed out if Domain Mode is set to Frequency With No Time Gate. This menu can be used to gate or notch unwanted DUT trace information.

Chapter 11 — Application Menu

11-1 Chapter Overview

This chapter provides information for the APPLICATION menu that is used for Receiver Configuration. The default measurement mode setting is for Standard S-Parameters.

APPLICATION Menu

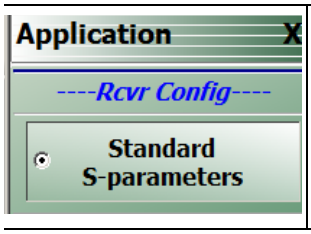
APPLICATION Menu (for Receiver Configuration)

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Application | APPLICATION



The controls on this menu are for Receiver Configuration (Rcvr Config).

Standard S-parameters

Use Standard S-Parameters receiver configuration. (This is the default setting).

Figure 11-1. APPLICATION Menu for Receiver Configuration

Chapter 12 — Trace Menus

12-1 Chapter Overview

This chapter provides information on traces. You can set the number of traces that appear for each channel and how those traces are arranged on the main display. Up to 16 traces can be defined and there are 22 available trace layouts. Traces can be detached as free-floating windows.

Trace memory and trace format are controlled under Display controls (see"DISPLAY Menu" on page 14-3.

12-2 Overview of Trace Menus

There are two (2) trace menus:

- "TRACE Menu" on page 12-2
- "TRACE LAYOUT Menu" on page 12-4

12-3 Trace Configuration

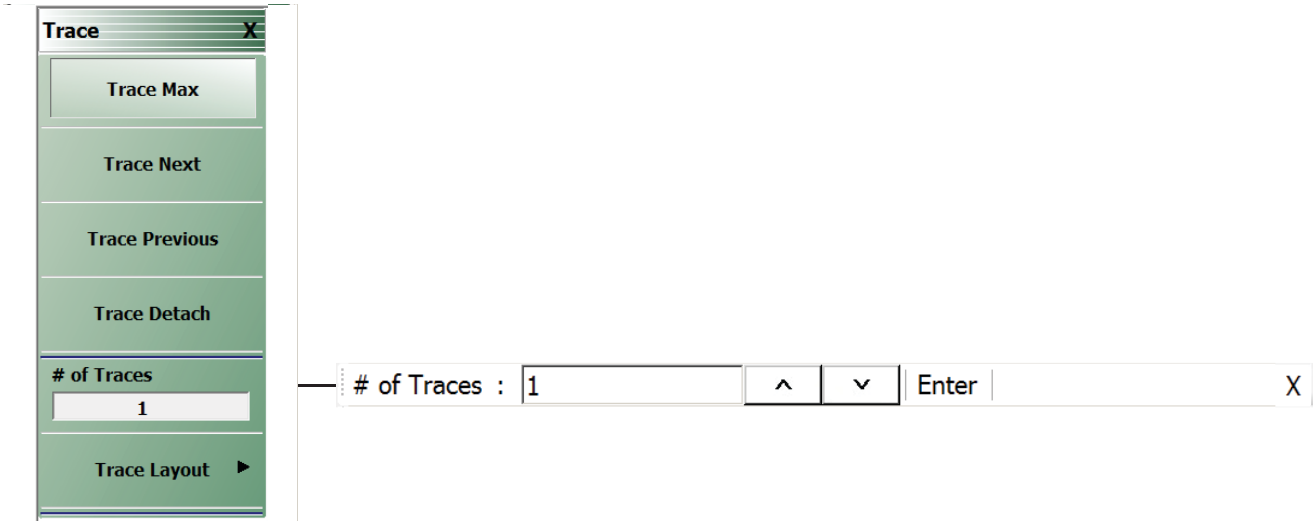
TRACE Menu

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | Trace | TRACE



1. TRACE Menu	2. # of Traces (Number of Traces) Field Toolbar

Figure 12-1. TRACE Menu

Trace Max

Select toggles between original trace layout and full screen display of the active trace.

Trace Next

Select activates adjacent traces in ascending order, looping to trace 1 from the highest trace number.

Trace Previous

Select activates adjacent traces in descending order, looping to the highest trace number from trace 1.

Trace Detach

Select allows traces to be detached and placed on remote monitors for viewing.

of Traces

Select activates the # of Traces (Number of Traces) field toolbar, allowing the user to specify the number of traces displayed, to a maximum of 16.

- When the number of traces specified is more than the number of trace displays in the layout, traces are overlaid sequentially with priority to the first display.
- If the number of traces specified is less than the number of displays in the current layout, the remainder of display areas are blank.

Trace Layout

Select displays the TRACE LAYOUT menu to change how the traces are displays on the screen.

- "TRACE LAYOUT Menu" on page 12-4

12-4 Trace Display Layout

TRACE LAYOUT Menu

The trace view buttons are not labeled, but instead provide a representation icon of the available view. Click the required view to select it. Click the Back button at the bottom of the TRACE LAYOUT menu to return to the TRACE menu. If more traces than trace layouts are specified, some or all of the trace layouts will show multiple overlaid trace displays. If more trace layouts than trace are specified, some trace layout positions will be empty.

Previous

- "TRACE Menu" on page 12-2

Navigation

- MAIN | Trace | TRACE | Trace Layout | TRACE LAYOUT

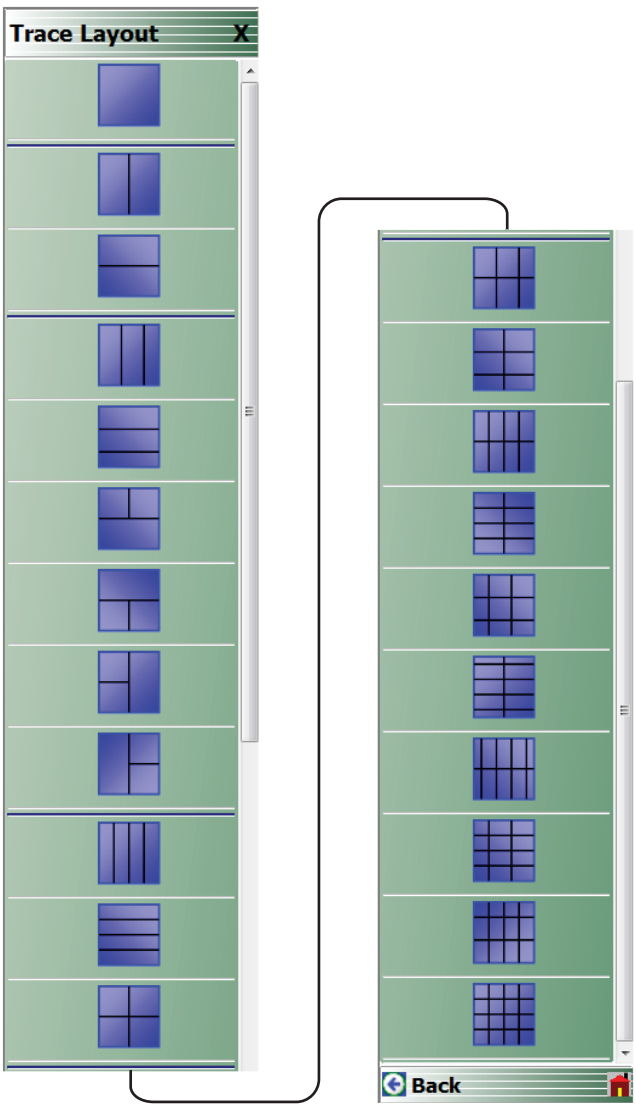


Figure 12-2. TRACE LAYOUT Menu (1 of 3)

	Single Trace View Click Back to return to the TRACE menu. If SCPI programming is used to control the VNA, the command parameter for this trace view is R1C1. The command parameters for the other trace layout views are listed with each trace view type below.
	Two Trace View – 2 Across x 1 Down Click Back to return to the TRACE menu. R1C2 for SCPI programs.
	Two Trace View – 1 Across x 2 Down Click Back to return to the TRACE menu. R2C1 for SCPI programs.
	Three Trace View – 3 Across Click Back to return to the TRACE menu. R1C3 for SCPI programs.
	Three Trace View – 3 Down Click Back to return to the TRACE menu. R3C1 for SCPI programs.
	Three Trace View – 2 on Top x 1 on Bottom Click Back to return to the TRACE menu. R2C2C1 for SCPI programs.
	Three Trace View – 1 on Top x 2 on Bottom Click Back to return to the TRACE menu. R2C1C2 for SCPI programs.
	Three Trace View – 2 on Left x 1 on Right Click Back to return to the TRACE menu. C2R2R1 for SCPI programs.
	Three Trace View – 1 on Left x 2 on Right Click Back to return to the TRACE menu. C2R1R2 for SCPI programs.
	Four Trace View – 4 Across Click Back to return to the TRACE menu. R1C4 for SCPI programs.
	Four Trace View – 4 Down Click Back to return to the TRACE menu. R4C1 for SCPI programs.
	Four Trace View – 2 Across x 2 Down Click Back to return to the TRACE menu. R2C2 for SCPI programs.
	Six Trace View – 3 Across x 2 Down Click Back to return to the TRACE menu. R2C3 for SCPI programs.

Figure 12-2. TRACE LAYOUT Menu (2 of 3)

	Six Trace View – 2 Across x 3 Down Click Back to return to the TRACE menu. R3C2 for SCPI programs.
	Eight Trace View – 4 Across x 2 Down Click Back to return to the TRACE menu. R2C4 for SCPI programs.
	Eight Trace View – 2 Across x 4 Down Click Back to return to the TRACE menu. R4C2 for SCPI programs.
	Nine Trace View – 3 Across x 3 Down Click Back to return to the TRACE menu. R3C3 for SCPI programs.
	Ten Trace View – 2 Across x 5 Down Click Back to return to the TRACE menu. R5C2 for SCPI programs.
	Ten Trace View – 5 Across x 2 Down Click Back to return to the TRACE menu. R2C5 for SCPI programs.
	Twelve Trace View – 3 Across x 4 Down Click Back to return to the TRACE menu. R4C3 for SCPI programs.
	Twelve Trace View – 4 Across x 3 Down Click Back to return to the TRACE menu. R3C4 for SCPI programs.
	Sixteen Trace View – 4 Across x 4 Down Click Back to return to the TRACE menu. R4C4 for SCPI programs.

Figure 12-2. TRACE LAYOUT Menu (3 of 3)

Chapter 13 — Response Menus: 1-Port and 2-Port VNAs

13-1 Chapter Overview

This chapter provides information on the 1- and 2-port VNA Response menus used to configure S-Parameters using standard options, or to configure user-defined parameters. Only 1-port-related Response menu items apply to the MS46121A/B, MS46131A, ME7868A, and ME7869A VNAs.

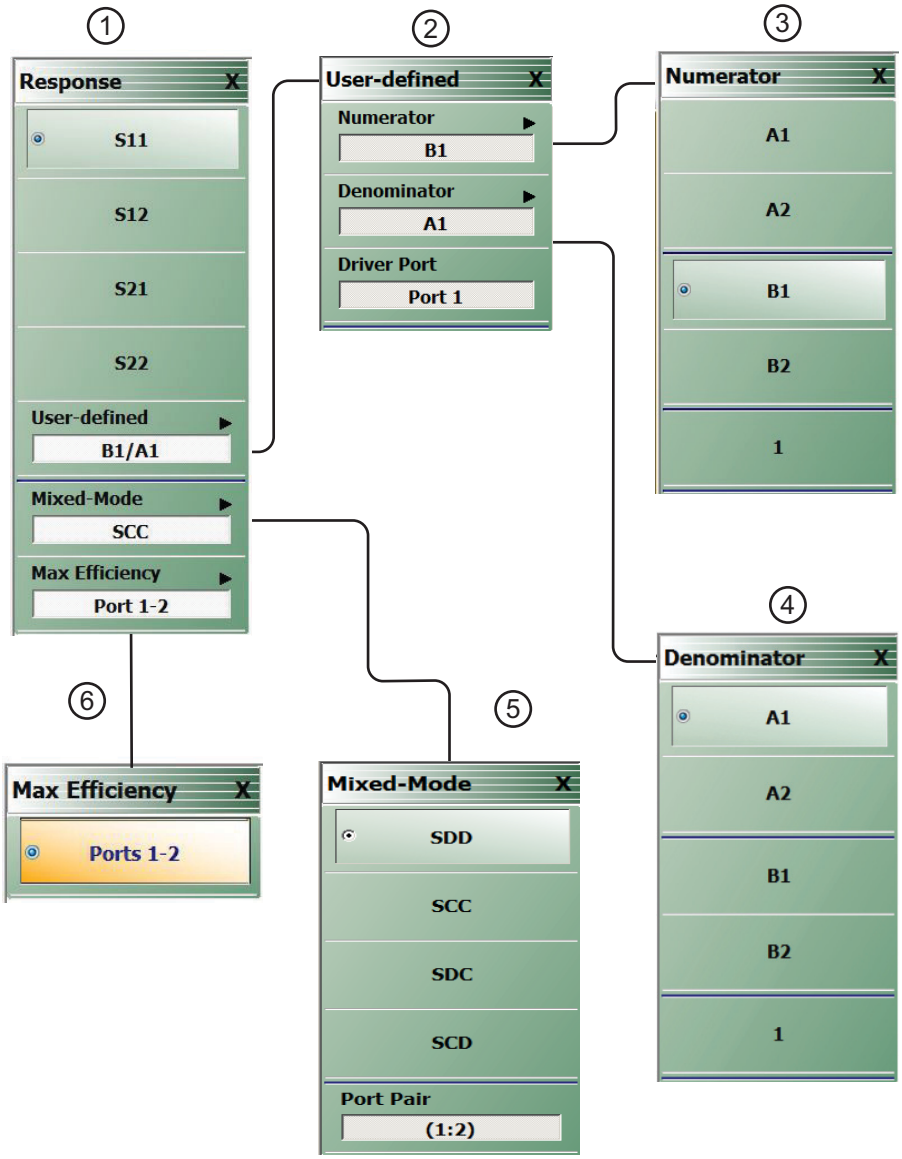
13-2 Overview of Response Menus

The available 2-port Response menus are:

- "RESPONSE Menu" on page 13-3
- "User-Defined Menu" on page 13-6
  - "NUMERATOR Menu" on page 13-8
  - "DENOMINATOR Menu" on page 13-9
- "MIXED-MODE Menu" on page 13-10

13-3 Response Menu Set

The USER-DEFINED menu provides options to select numerator and denominator values of a user-defined parameter, and to select a driver port.



1. RESPONSE Menu	4. DENOMINATOR Menu
2. USER-DEFINED Menu	5. MIXED MODE Menu
3. NUMERATOR Menu	6. MAX EFFECIENCY Menu

Figure 13-1. RESPONSE and USER-Defined Menu Set

13-4 Response Menu

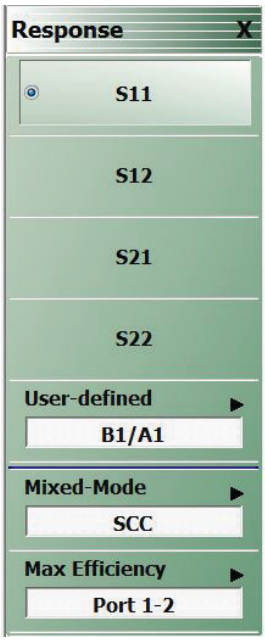
RESPONSE Menu

Previous

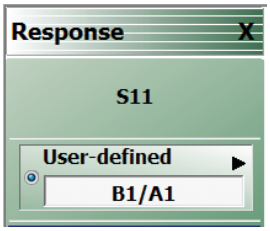
- "Main Menu" on page 2-6

Navigation

- MAIN | Response | RESPONSE

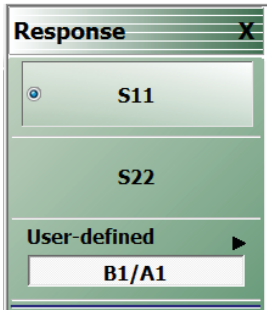


MS46121A/B, MS46122A/B, MS46322A/B, ME7868A, ME7869A

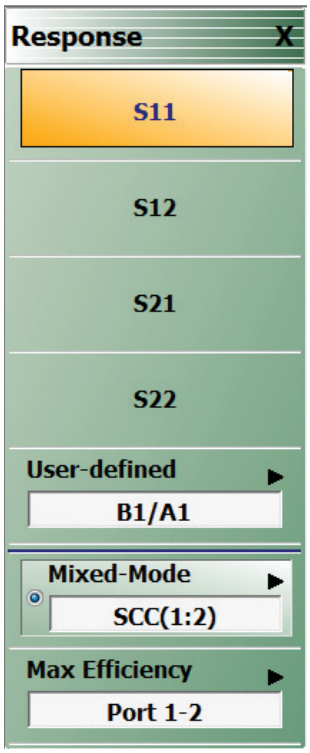


Single MS46131A

Figure 13-2. RESPONSE Menu (1 of 2)



Two MS46131As Without Option 012



ME7868A, ME7869A

Figure 13-2. RESPONSE Menu (2 of 2)

The RESPONSE menu provides access for setting S11, S12, S21, or S22 parameters to the active trace.

S11

Select sets the response to the input reflection coefficient (or S11 Forward Reflection).

S12

Select sets the response to the reverse transmission coefficient (or S12 Reverse Transmission).

S21

Select sets the response to the forward transmission coefficient (or S21 Forward Transmission).

S22

Select sets the response to the output reflection coefficient (or S22 Reverse Reflection).

User-defined

Select displays the USER-DEFINED menu.

- "USER-DEFINED Menu" on page 13-6

Mixed-Mode (Response 2-Port)

Select displays the MIXED-MODE menu where mixed-mode response options of SDD, SCC, SDC, and SCD are available with a Port Pair assignment of either 1:2 or 2:1. Select also de-selects S12, S21, S22, and User-Defined. Only available for ME7868A and ME7869A models.

- "MIXED-MODE Menu" on page 13-10

Max Efficiency

Select displays the kQ product measurement or maximum power efficiency for wireless power transfer. Only available for ME7868A and ME7869A models.

13-5 User-Defined Menu

USER-DEFINED Menu

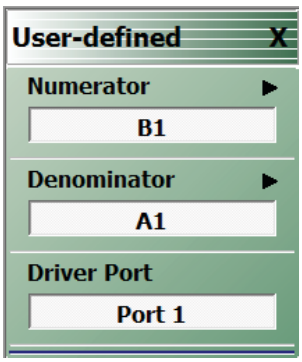
The USER DEFINED menu is used to establish various mathematical combinations of incident and reflected power values. See Table 13-1, "User-Defined Numerator/Denominator Combinations" for all possible combinations and definitions of common 2-port parameters.

Previous

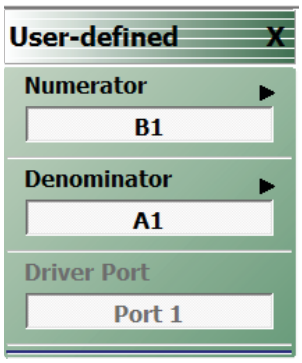
- "RESPONSE Menu" on page 13-3

Navigation

- MAIN | Response | RESPONSE | User Defined | USER DEFINED



Most VNA Models



Single MS46131A Only

Figure 13-3. USER DEFINED Menu

Numerator

Select displays the NUMERATOR menu.

- "NUMERATOR Menu" on page 13-8

Denominator

Select displays the DENOMINATOR menu.

- "DENOMINATOR Menu" on page 13-9

Driver Port (Port 1/Port 2)

Select toggles the driver port setting between Port 1 and Port 2.

Table 13-1. User-Defined Numerator/Denominator Combinations

Denominator	Numerator				
	A1	**A2**	**B1**	**B2**	**1**
A1	$\frac{A1}{A1} = 1$	$\frac{A2}{A1}$	$\frac{B1}{A1}$ S11 Forward Reflection	$\frac{B2}{A1}$ S21 Forward Transmission	$\frac{1}{A1}$
A2	$\frac{A1}{A2}$	$\frac{A2}{A2} = 1$	$\frac{B1}{A2}$ S12 Reverse Transmission	$\frac{B2}{A2}$ S22 Reverse Reflection	$\frac{1}{A2}$
B1	$\frac{A1}{B1}$	$\frac{A2}{B1}$	$\frac{B1}{B1} = 1$	$\frac{B2}{B1}$	$\frac{1}{B1}$
B2	$\frac{A1}{B2}$	$\frac{A2}{B2}$	$\frac{B1}{B2}$	$\frac{B2}{B2} = 1$	$\frac{1}{B2}$
1	$\frac{A1}{1} = A1$	$\frac{A2}{1} = A2$	$\frac{B1}{1} = B1$	$\frac{B2}{1} = B2$	$\frac{1}{1} = 1$

NUMERATOR Menu

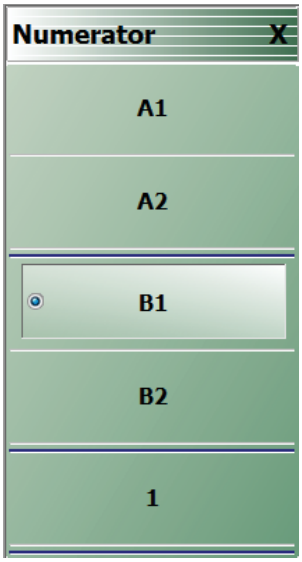
Sets the response to a user-defined mathematical fraction using the USER DEFINED menu to select S11, S12, S21, S22, or 1 (one) as a numerator over S11, S12, S21, S22, or 1 as the denominator.

Previous

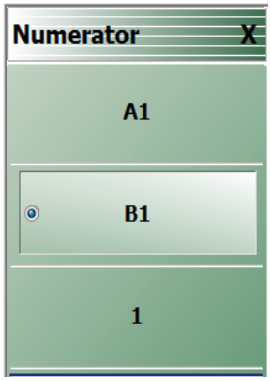
- "USER-DEFINED Menu" on page 13-6

Navigation

- MAIN | Response | RESPONSE | User Defined | USER DEFINED | Numerator | NUMERATOR



Most VNA Models



Single MS46131A Only

Figure 13-4. NUMERATOR Menu – 2-Port VNAs

A1

Select sets A1 incident power on port 1 as the numerator value.

A2

Select sets A2 incident power on port 2 as the numerator value.

B1

Select sets B1 received power on port 1 as the numerator value.

B2

Select sets B2 received power on port 2 as the numerator value.

1

Select sets 1 (one) as the numerator value.

Note	Mixed mode response is not currently supported on MS46131A without Option 012.

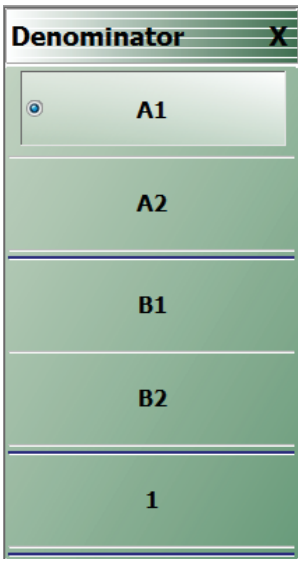
DENOMINATOR Menu

Previous

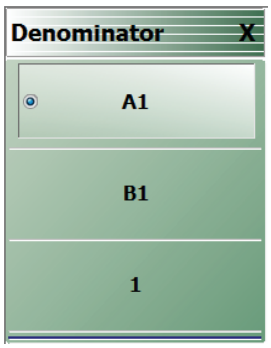
- "USER-DEFINED Menu" on page 13-6

Navigation

- MAIN | Response | RESPONSE | User Defined | USER DEFINED | Denominator | DENOMINATOR



Most VNA Models



Single MS46131A Only

Figure 13-5. DENOMINATOR Menu

A1

Select sets A1 incident power on port 1 as the denominator value.

A2

Select sets A2 incident power on port 2 as the denominator value.

B1

Select sets B1 received power on port 1 as the denominator value.

B2

Select sets B2 received power on port 2 as the denominator value.

1

Select sets 1 (one) as the denominator value.

Note

For MS46131A VNAs without 2-port operation enabled, the only valid user-defined parameters are:
- A1/B1, A1/1, B1/A1, B1/1 all driven by port 1
- A2/B2, A2/1, B2/A2, B2/1 all driven by port 2

Any cross ratios (Ax/By where x not equal to y) or where the opposite port is driving (i.e., for A1/B1 if port 2 was driving) are not valid.

MIXED-MODE Menu

Previous

- "RESPONSE Menu" on page 13-3

Navigation

- MAIN | Response | RESPONSE |Mixed-Mode | MIXED-MODE

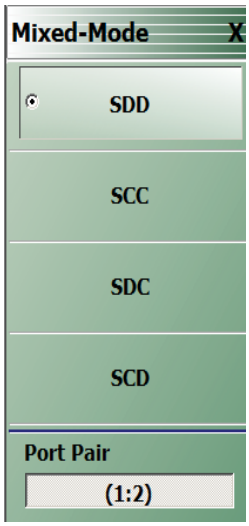


Figure 13-6. MIXED-MODE

SDD

Select sets the S-Parameter to differential reception with differential drive where the reception/driver ports are determined by the Port Pair button below.

SCC

Select sets the S-Parameter to common-mode reception with common-mode drive where the reception/driver ports are determined by the Port Pair button below.

SDC

Select sets the S-Parameter to differential reception with common-mode drive where the reception/driver ports are determined by the Port Pair button below.

SCD

Select sets the S-Parameter to common-mode reception with differential drive where the reception/driver ports are determined by the Port Pair button below.

Port Pair

Toggles the reception/driver port pair between 1:2 and 2:1.

Note

For MS46131A VNAs without Option 012, the only valid user-defined parameters are:

- A1/B1, A1/1, B1/A1, B1/1 all driven by port 1
- A2/B2, A2/1, B2/A2, B2/1 all driven by port 2

Any cross ratios (Ax/By where x not equal to y) or where the opposite port is driving (i.e., for A1/B1 if port 2 was driving) are not valid.

Max Efficiency

Previous

- “RESPONSE Menu” on page 13-3

Navigation

MAIN | Response | RESPONSE | Max Efficiency | Max Efficiency

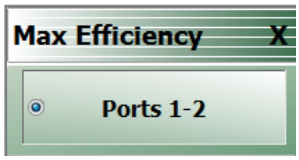


Figure 13-7. Max Efficiency

Port 1-2

Select measures the maximum power efficiency or kQ product using a wireless power transfer system between ports 1 and 2.

Chapter 14 — Display Menus

14-1 Chapter Overview

This chapter provides information for setup and configuration for the instrument displays. Selections provide control over the trace formats, with over nine different major display types. Each display type can be further modified with parameters applicable to that display format. The control also provides control for trace memory and trace math modifications. The trace limit functions allow maximum/minimum parameters to be set for each trace and provide visual and/or programmatic indications of pass/fail.

14-2 Overview of Display Menus and Dialog Boxes

The available display menus and dialog boxes are:

- "DISPLAY Menu" on page 14-3
- "DISPLAY Menu When Using Max Efficiency Response" on page 14-5
- "TRACE FORMAT Menu Using Max Efficiency in RESPONSE Menu" on page 14-7
- "TRACE FORMAT Menu" on page 14-8
- "IMPEDANCE Menu" on page 14-12
- "SMITH IMPEDANCE Menu" on page 14-14
- "VIEW TRACE Menu" on page 14-19
- "DATA-MEM. OP. Menu" on page 14-22
- "LIMIT Menu" on page 14-26
    - "EDIT LIMIT LINE Menu" on page 14-27
        - "Limit Line Type Setup Tableau Dialog" on page 14-29
        - "SAVE AS (LIMIT LINE LMT FILE) Dialog Box" on page 14-35
        - "OPEN (LIMIT LINE LMT FILE) Dialog Box" on page 14-36
- "RIPPLE LIMIT Menu" on page 14-37
    - "RIPPLE VALUE Menu" on page 14-38
    - "EDIT RIPPLE LIMIT Menu" on page 14-39
    - "Edit Ripple Limit Tableau Dialog" on page 14-41
    - "SAVE AS (RIPPLE LIMIT FILE) Dialog Box" on page 14-43
    - "OPEN (RIPPLE LIMIT FILE) Dialog Box" on page 14-44
- "LIMIT/RIPPLE (Display Location) Menu" on page 14-45
- "DOMAIN Frequency with No Time Gate Menu" on page 14-49
- "DOMAIN Frequency with Time Gate Menu" on page 14-50
- "DOMAIN Time Low Pass Menu" on page 14-51
- "DOMAIN Time Band Pass Menu" on page 14-53
- "TIME DEFINITION Menu" on page 14-55
- "RANGE SETUP Frequency with Time Gate Menu" on page 14-58
- "RANGE SETUP Time Band Pass Menu" on page 14-60
- "RANGE SETUP Time Low Pass Menu" on page 14-62
- "DC TERM Menu" on page 14-65
- "EXTRAPOLATION Menu" on page 14-67

- "WINDOW SHAPE Menu" on page 14-68
  - "ADVANCED WINDOW SHAPE SETUP Dialog Box" on page 14-69
- "GATE SETUP Menu" on page 14-71
- "GATE FUNCTION Menu" on page 14-74
  - "ADVANCED GATE SHAPE SETUP Dialog Box" on page 14-76
- "INTER-TRACE MATH Menu" on page 14-78
  - "EQUATION EDITOR Dialog Box" on page 14-82
  - "INTRA TRACE OP. Menu" on page 14-80
- "CONVERSION Menu" on page 14-88
- "DISPLAY AREA SETUP Menu" on page 14-90

14-3 Display Menu

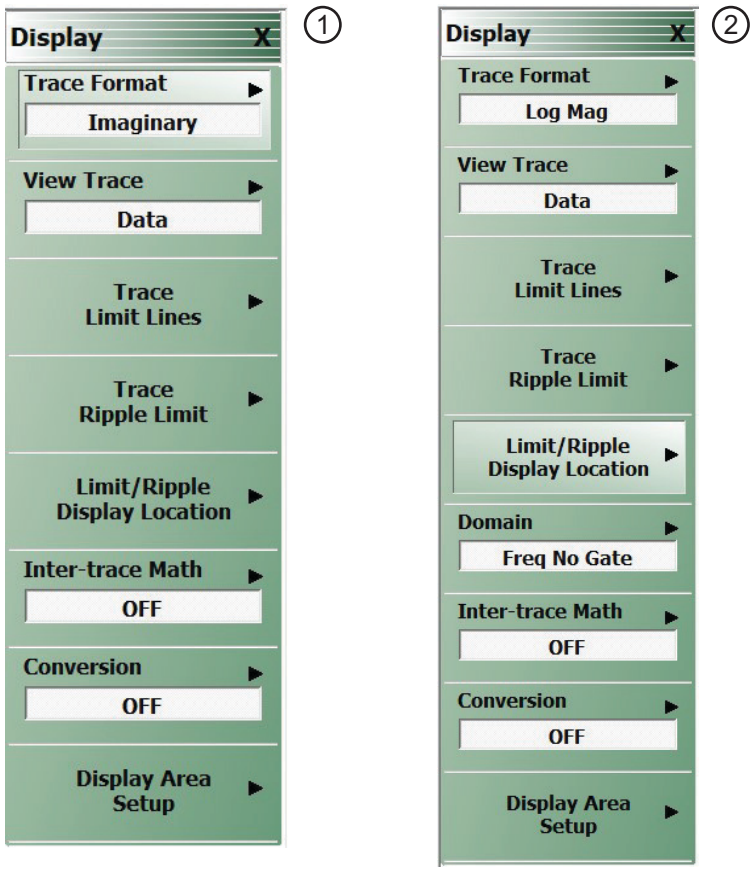
DISPLAY Menu

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | Display | DISPLAY



1. DISPLAY menu without Time Domain option.	2. DISPLAY menu with Time Domain option.

Figure 14-1. DISPLAY Menu

Trace Format

Displays the current trace format setting. Select displays the TRACE FORMAT menu.

- “TRACE FORMAT Menu” on page 14-8

Displays the kQ product menu when Max Efficiency is selected in the RESPONSE Menu

- “DISPLAY Menu When Using Max Efficiency Response” on page 14-5

View Trace

Select displays the VIEW TRACE menu.

- “VIEW TRACE Menu” on page 14-19

Trace Limit Lines

Select displays the LIMIT menu.

- “LIMIT Menu” on page 14-26
- “Domain Menu Appearance and Button Availability” on page 14-46

Trace Ripple Limit

Select displays the RIPPLE LIMIT menu.

- “Trace Ripple Limit Menus” on page 14-37

Limit /Ripple Display Location

Select displays the LIMIT/RIPPLE display location menu.

- LIMIT/RIPPLE (Display Location) Menu on page 14-45

Domain

Option 002 (Time Domain) must be installed for DOMAIN to be available. Once installed, select displays the DOMAIN menu.The appearance and button availability of the DOMAIN menu depends on settings on other menus. This menu is not applicable for the MS46121A/B.

- “Domain Menu Appearance and Button Availability” on page 14-46
- “DOMAIN Frequency with No Time Gate Menu” on page 14-49
- “DOMAIN Frequency with Time Gate Menu” on page 14-50
- “DOMAIN Time Low Pass Menu” on page 14-51
- “DOMAIN Time Band Pass Menu” on page 14-53

Inter-Trace Math

Select displays the INTER-TRACE MATH menu.

- “INTER-TRACE MATH Menu” on page 14-78

Conversion

Conversion is a selection item and provides access to the conversion submenu. The conversion submenu provides Impedance (Z) and Admittance (Y) submenus.

Display Area Setup

Select displays the DISPLAY SETUP menu.

- “DISPLAY AREA SETUP Menu” on page 14-90

DISPLAY Menu When Using Max Efficiency Response

Previous

- "Main Menu" on page 2-6

Prerequisite

- MAIN | Response | RESPONSE | Max Efficiency

Navigation

- MAIN | Display | DISPLAY

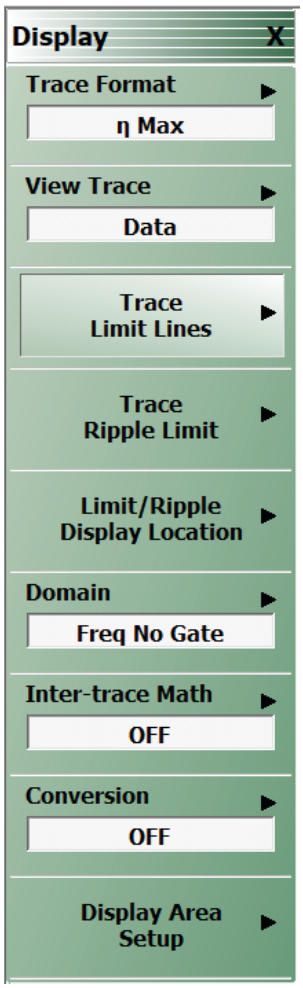


Figure 14-2. Display Menu Using Max Efficiency Response

Trace Format

Displays the kQ product menu when Max Efficiency is selected in the RESPONSE Menu

- "DISPLAY Menu When Using Max Efficiency Response" on page 14-5

View Trace

Select displays the VIEW TRACE menu.

- "VIEW TRACE Menu" on page 14-19

Trace Limit Lines

Select displays the LIMIT menu.

- "LIMIT Menu" on page 14-26
- Domain Menu Appearance and Button Availability on page 14-46

Trace Ripple Limit

Select displays the RIPPLE LIMIT menu.

- "Trace Ripple Limit Menus" on page 14-37

Limit /Ripple Display Location

Select displays the LIMIT/RIPPLE menu.

- LIMIT/RIPPLE (Display Location) Menu on page 14-45

Domain

Option 002 must be installed for DOMAIN to be available. Once installed, select displays the DOMAIN menu.The appearance and button availability of the DOMAIN menu depends on settings on other menus. This menu is not applicable for the MS46121A/B.

- "Domain Menu Appearance and Button Availability" on page 14-46
- "DOMAIN Frequency with No Time Gate Menu" on page 14-49
- "DOMAIN Frequency with Time Gate Menu" on page 14-50
- "DOMAIN Time Low Pass Menu" on page 14-51
- "DOMAIN Time Band Pass Menu" on page 14-53

Inter-Trace Math

Select displays the INTER-TRACE MATH menu.

- "INTER-TRACE MATH Menu" on page 14-78

Conversion

Conversion is a selection item and provides access to the Conversion submenu. The CONVERSION submenu provides Impedance (Z) and Admittance (Y) submenus.

Display Area Setup

Select displays the DISPLAY SETUP menu.

- "DISPLAY AREA SETUP Menu" on page 14-90

TRACE FORMAT Menu Using Max Efficiency in RESPONSE Menu

Previous

- “Main Menu” on page 2-6

Prerequisite

- MAIN | Response | RESPONSE | Max Efficiency

Navigation

MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT

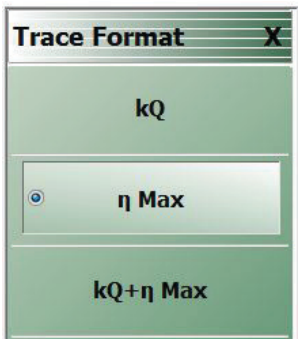


Figure 14-3. Trace Format Menu

kQ

Displays the kQ product (an index showing the performance of a wireless transfer).

η Max

Displays the maximum power transfer efficiency.

kQ + η Max

Displays both kQ product and maximum power transfer efficiency.

14-4 Trace Format and Parameter Menus

TRACE FORMAT Menu

Active Trace on Active Channel

- The trace format selections below apply only to the currently active trace.

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT

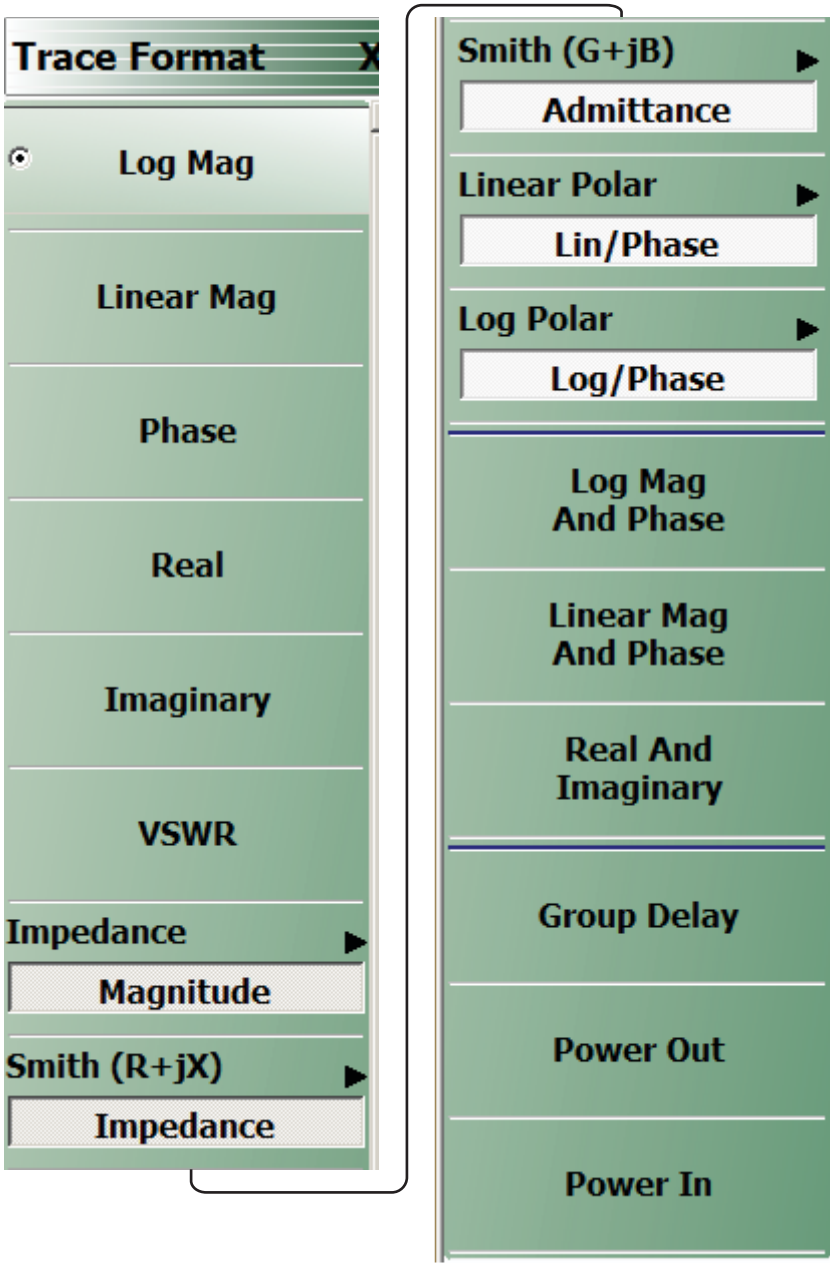


Figure 14-4. TRACE FORMAT Menu

Log Mag

Select sets a single rectilinear display. All other trace display graph types are deselected.

Linear Mag

Select sets a single rectilinear display.

Phase

Select sets a single rectilinear display.

Real

Select sets a single rectilinear display.

Imaginary

Select sets a single rectilinear display.

VSWR

Select sets a single rectilinear display.

Impedance

Select displays the IMPEDANCE submenu.

- "IMPEDANCE Menu" on page 14-12

Smith (R+jX)

Select displays the SMITH (with Impedance) submenu to configure the display of Smith Impedance charts.

- "SMITH IMPEDANCE Menu" on page 14-14

Smith (G+jB)

Select displays the SMITH (with Admittance) submenu to configure the display of Smith Impedance charts.

- "SMITH IMPEDANCE Menu" on page 14-14

Linear Polar

Select gives access to LINEAR POLAR submenu.

Log Polar

Select gives access to LOG POLAR submenu

Log Mag And Phase

Selects sets a dual Refl Log Mag and Phase Ref Level display.

Linear Mag And Phase

Select sets a dual Refl Linear Mag and Phase Ref Level display.

Real And Imaginary

Select sets a dual Refl Real and Imaginary Ref Level display.

Group Delay

Selects sets a single group delay display. Group Delay is not enabled for the MS46121A/B at this time.

Power In

Select sets a single rectilinear display measuring power input to the DUT.

Power Out

Select sets a single rectilinear display measuring power output of the DUT.

IMPEDANCE Menu

Previous

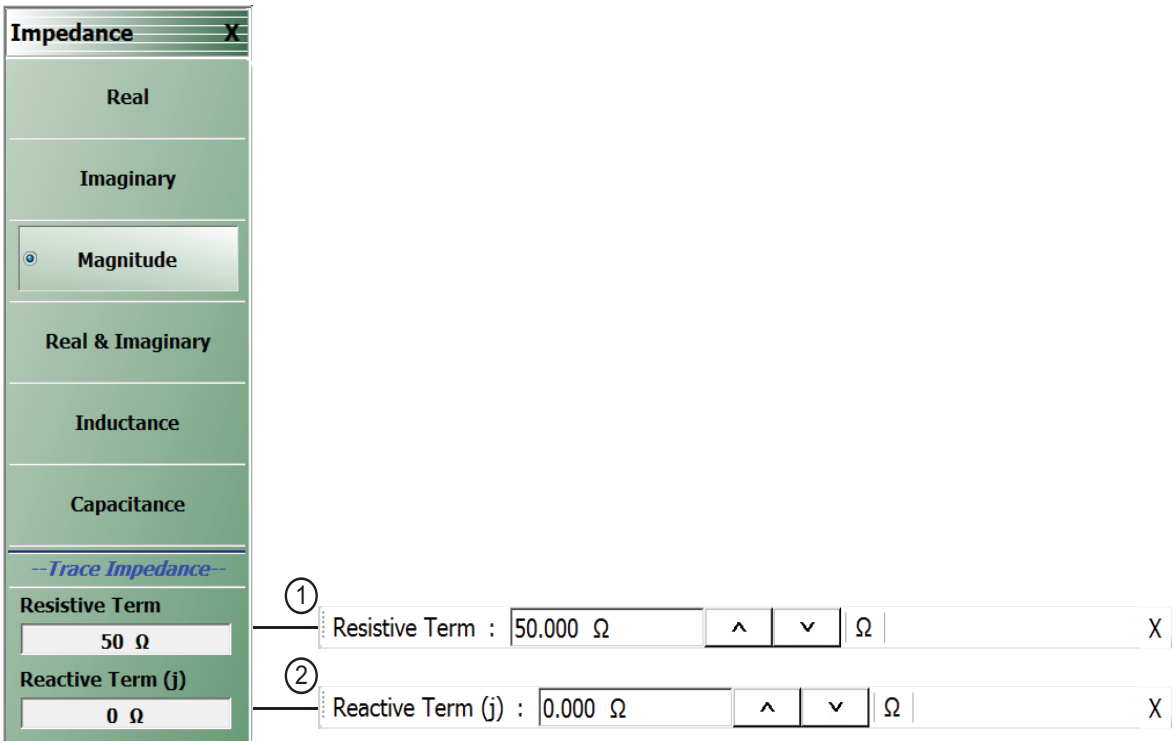
- "TRACE FORMAT Menu" on page 14-8

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Impedance | IMPEDANCE

Auto-Return Button Selection Group

- The first four (4) buttons (Real, Imaginary, Magnitude, and Real & Imaginary) on the IMPEDANCE menu are configured as a button selection group with an auto-return function, where selection of any one button de-selects the other three (3) buttons, and then auto-returns to the TRACE FORMAT menu.



1. Resistive Term Field Toolbar in Ohms.	2. Reactive (j) Term Field Toolbar in Ohms.

Figure 14-5. IMPEDANCE Menu

Real

Select sets a rectilinear display, and de-selects Imaginary, Magnitude, and Real & Imaginary and auto-returns to TRACE FORMAT menu.

Imaginary

Select sets a rectilinear display, and de-selects Real, Magnitude, and Real & Imaginary and auto-returns to TRACE FORMAT menu.

Magnitude

Select sets a rectilinear display, and de-selects Real, Imaginary, and Real & Imaginary and auto-returns to TRACE FORMAT menu.

Real & Imaginary

Select sets a dual rectilinear display with Real data in the upper graph and Imaginary data in the lower graph. Select also de-selects Real, Imaginary, and Magnitude and auto-returns to TRACE FORMAT menu.

Inductance

Select enables marker Inductance measurement readout.

Capacitance

Select enables marker Capacitance measurement readout.

Resistive Term

Select allows the user to enter the trace impedance in Ohms and displays the Resistive Term toolbar. Use the toolbar to enter the required impedance for the currently active trace. The default value is 50.000 Ohms.

Reactive Term (j)

Select allows the user to enter trace reactive term in Ohms and displays the Reactive Term (j) toolbar.

SMITH IMPEDANCE Menu

Previous

- "TRACE FORMAT Menu" on page 14-8

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX) | SMITH (IMPEDANCE)

Scaling

- Once the Smith Impedance display is selected, the scale of the display can be adjusted by using the SCALE menu.
- "SCALE Smith Chart Impedance Menu" on page 15-13
- MAIN | Scale | SCALE | Scale Selection | SMITH SCALING

Figure 14-6. SMITH (IMPEDANCE) Menu

Lin/Phase

Select creates a Smith Chart (Impedance) that plots with linear values and phase.

Log/Phase

Select creates a Smith Chart (Impedance) that plots with log values and phase.

Real/Imag

Select creates a Smith Chart (Impedance) that plots with real and imaginary values.

Impedance

Select creates a Smith Chart (Impedance) that plots only impedance.

R,L/C Marker

Select enables marker Reactance, Inductance or Capacitance measurement readout

SMITH ADMITTANCE Menu

Previous

- "TRACE FORMAT Menu" on page 14-8

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB) | SMITH (ADMITTANCE)

Scaling

- Once the Smith Admittance display is selected, the scale of the display can be adjusted by using the SCALE menu.
- "SCALE Smith Chart Impedance Menu" on page 15-13
- MAIN | Scale | SCALE | Scale Selection | SMITH SCALING

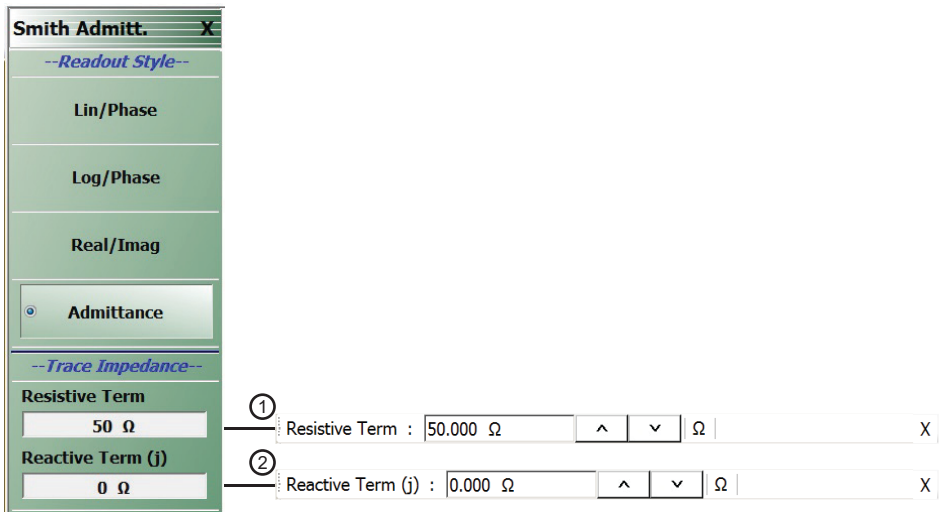


Figure 14-7. SMITH (ADMITTANCE) Menu

Lin/Phase

Select creates a Smith Chart (Admittance) that plots with linear values and phase.

Log/Phase

Select creates a Smith Chart (Admittance) that plots with log values and phase.

Real/Imag

Select creates a Smith Chart (Admittance) that plots with real and imaginary values.

Admittance

Select creates a Smith Chart (Admittance) that plots only admittance.

Resistive Term

Select allows the user to enter the trace impedance in Ohms and displays the Resistive Term toolbar. Use the toolbar to enter the required impedance for the currently active trace. The default value is 50.000 Ohms.

Reactive (j)

Select allows the user to enter trace reactive term in Ohms and displays the Reactive (j) toolbar.

Linear Polar Menu

Previous

- "TRACE FORMAT Menu" on page 14-8

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Linear Polar | LINEAR POLAR

Scaling

- Once the Linear Polar display is selected, the scale of the display can be adjusted by using the SCALE menu.
- "Scale Polar Chart Menus" on page 15-19

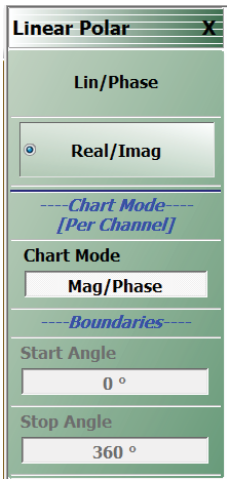


Figure 14-8. Linear Polar Menu

Lin/Phase

Select creates a Smith Chart (Impedance) that plots with linear values and phase.

Real/Imag

Select creates a Smith Chart (Impedance) that plots with real and imaginary values.

Chart Mode

Select allows toggle between Mag/Phase and Mag/Sweep Position.

Start Angle

Active when Mag/Sweep Position selected. Allows entry in the start angle field.

Stop Angle

Active when Mag/Sweep Position selected. Allows entry in the stop angle field.

Log Polar Menu

Previous

- "TRACE FORMAT Menu" on page 14-8

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Linear Polar | LINEAR POLAR

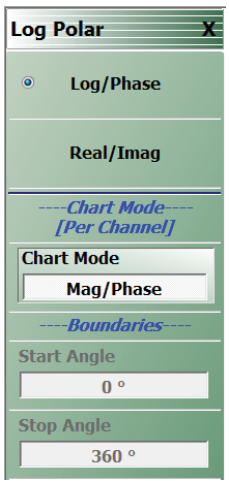


Figure 14-9. Log Polar Menu

Log/Phase

Select creates a Smith Chart (Impedance) that plots with linear values and phase.

Real/Imag

Select creates a Smith Chart (Impedance) that plots with real and imaginary values.

Chart Mode

Select allows toggle between Mag/Phase and Mag/Sweep Position.

Start Angle

Active when Mag/Sweep Position selected. Allows entry in the start angle field.

Stop Angle

Active when Mag/Sweep Position selected. Allows entry in the stop angle field.

VIEW TRACE Menu

Previous

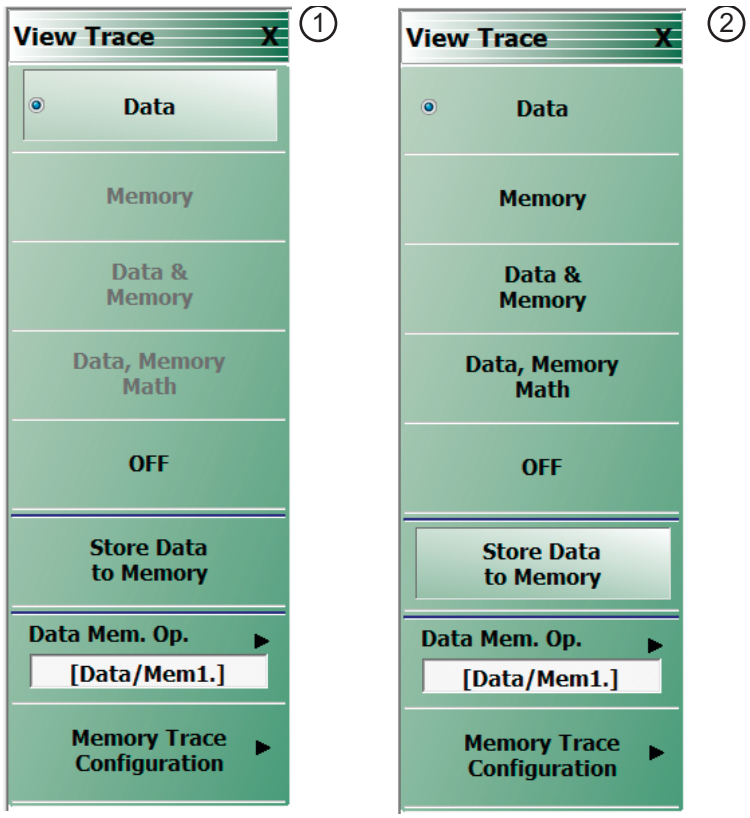
- "TRACE FORMAT Menu" on page 14-8

Navigation

- MAIN | Display | DISPLAY | View Trace | VIEW TRACE

Button Availability

- If trace data has not previously been stored to memory, only the Data, Off, Store Data to Memory, and Data Mem Op buttons (all described below) are available as shown left side of Figure 14-10 below.
- The Memory, Data & Memory, and Data, Memory Math buttons are unavailable.
- After one or more sweeps, select the Store Data to Memory button to enable the Memory, Data & Memory, Data Memory Math buttons.



1. VIEW TRACE menu button availability with no data stored to memory.
2. VIEW TRACE menu after one or more sweeps and Store Data to Memory has been selected.

Figure 14-10. VIEW TRACE Menu

View Trace Button Availability

If trace data has not previously been stored to memory, only the Data, Off, Store Data to Memory, and Data Mem Op buttons are available.

Data

The button is available but has no function until data has been stored as described below.

OFF (View Trace)

If OFF (View Trace) is selected, the active trace on the active channel is removed from the trace graph display.

Store Data to Memory

Select causes data to be stored to memory.

Data Mem. Op.

Select displays the DATA MEM OP menu.

- "DATA-MEM. OP. Menu" on page 14-22

After one or more sweeps, select the Store Data to Memory button to enable the Memory, Data & Memory, Data Memory Math buttons described below.

View Trace Menu Buttons

The Data, Memory, Data and Memory, Data, Memory Math, and OFF buttons become available when data has been saved to memory.

Data

Select records data to memory where it can be stored or further manipulated. The Store Data MemMath to Memory button (below) is unavailable.

Memory

Memory recalls data from memory where it is displayed or further manipulated. The Store Data MemMath to Memory button (below) is unavailable.

Data & Memory

Data & Memory recalls data and uses the active memory for display and/or further manipulation.

The Store Data MemMath to Memory button (below) is unavailable.

Data Memory Math

The Data Memory Math button enabled the Store Data MemMath to Memory button (below) is available where the selected math operation is applied to the stored data.

OFF (View Trace)

If OFF (View Trace) is selected, the active trace on the active channel is removed from the trace graph display. The Store Data MemMath to Memory button (below) is unavailable.

Store Data to Memory

Select enables data to be stored to memory.

Data Mem. Op.

Select displays the DATA MEM OP menu.

- "DATA-MEM. OP. Menu" on page 14-22

Memory Trace Configuration

- "MEMORY TRACE CONFIGURATION (Trx) Menu" on page 14-23

DATA-MEM. OP. Menu

Full Name

- DATA-MEMORY OPERATIONS Setup Menu

Previous

- "VIEW TRACE Menu" on page 14-19

Navigation

- MAIN | Display | DISPLAY | View Trace | VIEW TRACE | Data Mem Op | DATA MEM OP

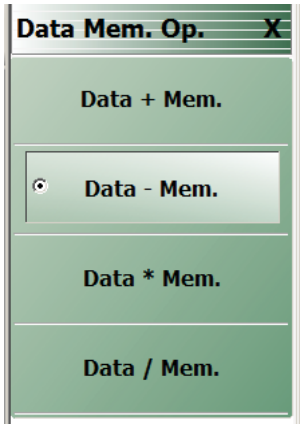


Figure 14-11. DATA-MEM. OP. (DATA-MEMORY OPERATIONS) Menu

Data + Mem.

Select adds data value to the memory value.

Data – Mem.

Select subtracts memory value from the data value.

Data * Mem.

Select multiplies data value times the memory value.

Data / Mem.

Select divides data value by the memory value.

MEMORY TRACE CONFIGURATION (Trx) Menu

Purpose

Select to display or turn-off each memory trace location.

Previous

- "VIEW TRACE Menu" on page 14-19

Navigation

- MAIN | Display | DISPLAY | View Trace | VIEW TRACE | Memory Trace Configuration | MEMORY TRACE CONFIGURATION

In the MEMORY TRACE CONFIGURATION dialog, select a memory trace to turn on or turn off each active memory trace location. The turned on active trace memory traces highlight green as shown in Figure 14-12.

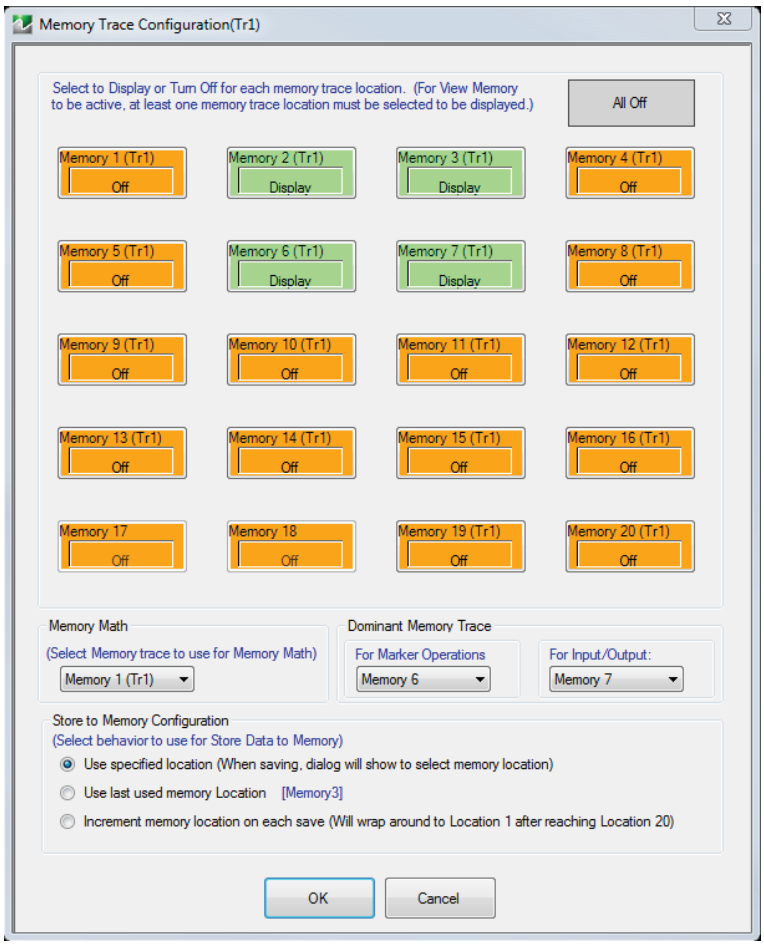


Figure 14-12. Memory Trace Configuration Dialog

Memory Math

Select Memory Trace to use for Memory Math.

Dominant Memory Trace

For Marker Operations – Drop-down menu list provides memory trace selections. Select a memory trace from the drop-down menu list for an active marker to follow.

For Input/Output – Select the trace memory location from the drop-down menu list to store, or can be used to assign a recalled trace memory location.

Store to Memory Configuration

Select the method to save trace data to a memory location. The three methods of storing a trace to a memory location are:

1. Use specified location (When saving, dialog will show to select memory location).

- Displays memory locations 1 through 20. If a memory location is containing data, a (Trx) is displayed within the memory trace. Note the colors of each memory location can be changed, see "COLOR SETUP Dialog Box" on page 17-6

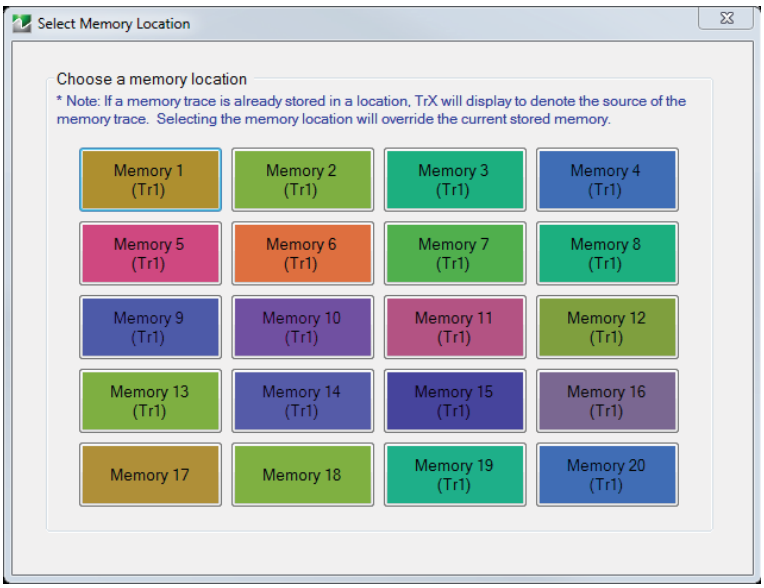


Figure 14-13. Select Memory Location

2. Use last used memory location.

- Displays the last stored data memory location. When selecting the "Use last used memory location" button, the most recent memory trace saved is displayed on screen. The Memory designator shown in Figure 14-14 indicates the Memory location displayed.

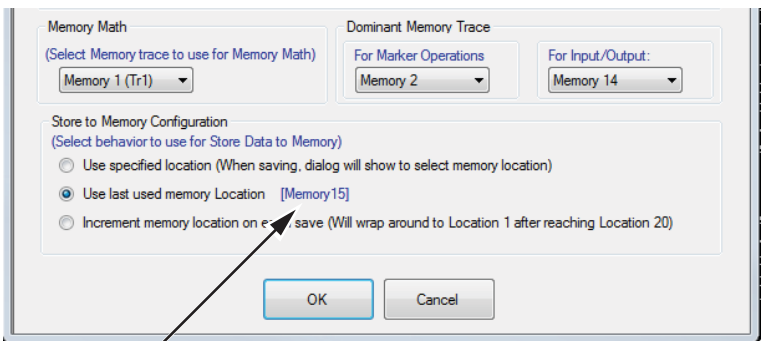


Figure 14-14. Last Memory Location

3. Increment memory location on each save. Select will continually increment the memory store location after each save. For example:
    - Select the Increment memory location on each save button.
    - From the View Trace menu, select Store Data to Memory to store six traces, each trace to a memory location.
    - From the View Trace menu select Memory Trace Configuration. You see six Memory Bocks highlighted in green corresponding to the six stored traces as shown in Figure 14-15.

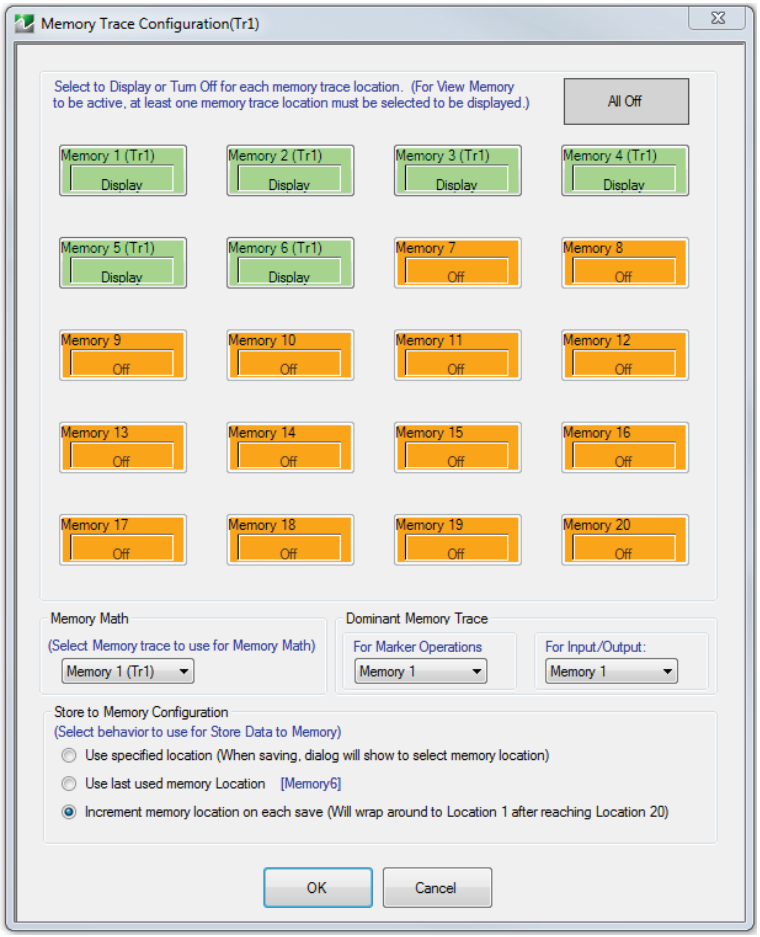


Figure 14-15. Six Stored Traces

- Note that after memory location 20 is filled, each subsequent Store Data to Memory selection will wrap and replace the memory locations starting from 1.

14-5 Trace Limit Line Control Menus and Dialog Boxes

LIMIT Menu

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT

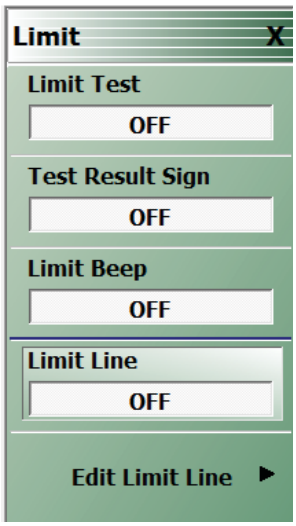


Figure 14-16. LIMIT Menu

Limit Test

On a per-system basis, select toggles Limit Test on and off.

Test Result Sign

On a per-system basis, toggles the Test Result Sign on and off. If the Test Result Sign is enabled, a failed test icon appears. If the Test Result Sign is enabled, a passed test icon appears.

Limit Beep

Select allows audible beep feature to be toggled on or off.

Limit Line

On a per-trace basis, toggles Limit Lines off and on.

Edit Limit Line

On a per-trace basis, displays the Edit Limit Line menu.

- "EDIT LIMIT LINE Menu" on page 14-27

EDIT LIMIT LINE Menu

When this menu is selected, the bottom of the display moves up and the "Limit Line Type Setup Tableau Dialog" is displayed. The number of limit lines that can be added depend on the type of display:

- Single rectangular trace displays can have up to 100 limit line segments per trace.
- Dual rectangular trace displays can have up to 100 limit line segments where each segment is the same on both trace displays.

Previous

- "LIMIT Menu" on page 14-26

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE

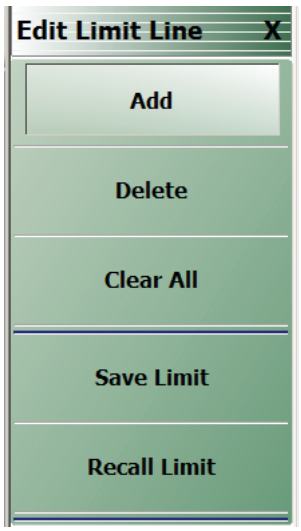


Figure 14-17. EDIT LIMIT LINE Menu

EDIT LIMIT LINE Menu Button Availability

The six (6) buttons of the EDIT LIMIT LINE menu are available to all rectangular, Smith Chart, and Polar Graph Chart displays.

Rectangular displays can have up to 100 limit line segments per trace. Smith Chart and Polar Graph circular displays can have an upper and lower limit only

Add

Select adds a new row of limit line information to the "Limit Line Type Setup Tableau Dialog" at the bottom of the display. For example, if four (4) limit lines are displayed, selecting Add creates a new limit line at position five (5).

- "Limit Line Type Setup Tableau Dialog" on page 14-29

Delete

After selecting a limit line row in the EDIT LIMIT LINE TABLEAU dialog, selecting the Delete button removes the limit line.

- "Limit Line Type Setup Tableau Dialog" on page 14-29

Clear All

Select deletes all recorded limit lint rows in the EDIT LIMIT LINE TABLEAU dialog.

- "Limit Line Type Setup Tableau Dialog" on page 14-29

Save Limit

Select displays the SAVE AS (LIMIT LINE LMT FILE) dialog box.

- "SAVE AS (LIMIT LINE LMT FILE) Dialog Box" on page 14-35

Recall Limit

Select displays the OPEN (LIMIT LINE LMT FILE) dialog box.

- "OPEN (LIMIT LINE LMT FILE) Dialog Box" on page 14-36

Limit Line Type Setup Tableau Dialog

When the EDIT LIMIT LINE menu is selected, the Limit Line Type Setup tableau dialog appears at the bottom of the display allowing creation of limit lines for each trace display. Both upper- and lower-segmented limits can be created by using the buttons in the EDIT LIMIT LINE menu and the segment controls in the tableau dialog.

Previous

- "EDIT LIMIT LINE Menu" on page 14-27

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE

Limit Line Rectangular Parameters

The following eight parameters are used to define each rectangular limit line:

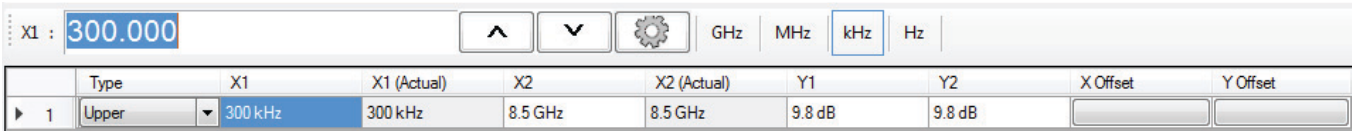
- Limit line segment number
- Limit line type. Each segment can be defined as an Upper limit, a Lower limit, or turned off.
- X1 = The X-axis segment start frequency.
- X2 = The X-axis segment stop frequency.
- Y1 = The Y-axis starting constraint for the segment. The units for Y1 change depending on the trace display type. For example, if the display is set Log Magnitude, the Y1 units are in dB. If the display is set to Power Out, the Y1 units are in dBm.
- Y2 = The Y-axis stopping constraint for the segment. As above, the Y2 units change depending on the trace display type.
- X Offset = The offset from the X1 value. This is useful if copying existing limit line segments where an incremental offset can be applied to a fundamental X1 value. Any offset is applied to both the X1 and X2 values.
- Y Offset = The offset from the Y1 value. As above, the offset is applied to both the Y1 and Y2 values.

Adding the First Limit Line

Assuming that no limit lines have been added during the current session, the dialog area appears as just a title bar. If unwanted limit lines from a previous configuration appear, on the EDIT LIMIT LINE menu, click the Clear All button.

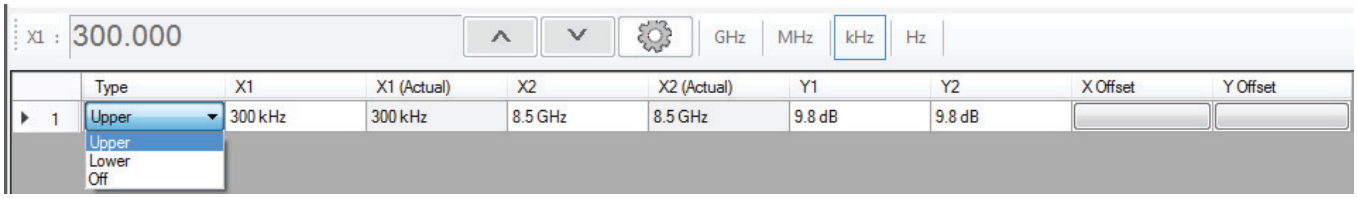
Adding a Limit Line Row

On the EDIT LIMIT LINE menu, click Add. A default limit line appears in the tableau at row 1.



Type Selection Field

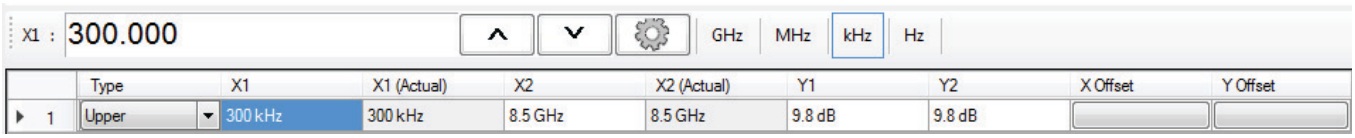
In the Type field, click the down button icon to select whether the limit will be an Upper or Lower limit line or if it will be OFF.



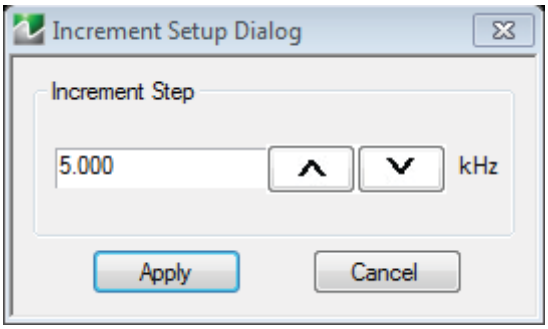
The OFF function is useful if you use a saved limit line file and want to temporarily disable some limits.

X1 Field

In the X1 column, click the X1 field which constrains the start point for the X-axis segment. Usually this will be frequency for linear, log, or segmented frequency-based sweeps. Alternatively, the units can be time (time domain) or power (CW power sweeps).



The up and down arrows can be used to adjust the field toolbar values in discrete increments. The increment step size can be adjusted using the INCREMENT SETUP dialog, which is accessed by clicking the gear icon.

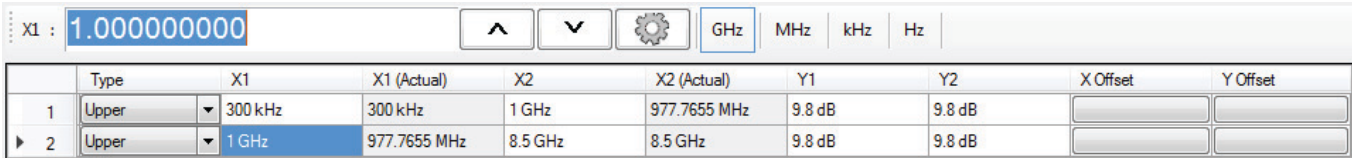


X1 Field Toolbar

As shown above, the X1 field toolbar appears immediately above the tableau header row. If the units are frequency, enter the required X1 frequency, using the field toolbar buttons to select the required units of GHz, MHz, kHz, or Hz. If the units are time or power, the general operation is the same.

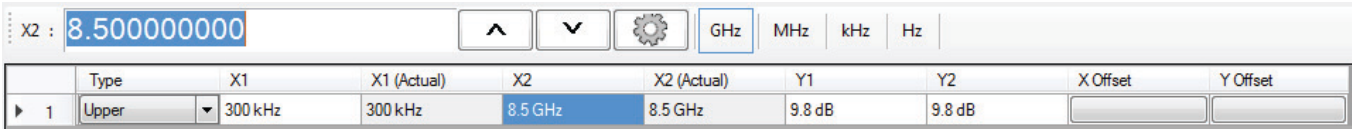
X1 (Actual) Field (Read-only)

The X1 (Actual) column indicates the actual X1 value selected by the instrument, based on the value entered by the user. This value indicates where the Limit Line is actually drawn on-screen, and the actual span used for judging pass/fail per point on a trace. User-entered X1 values for Limit Line Segments are rounded down to the nearest actual data point.



X2 Field

In the X2 column, click the X2 field which constrains the end point for the X-axis segment. As above, the X2 field toolbar appears immediately above the tableau header row with units of frequency, time, or power.



X2 Field Toolbar

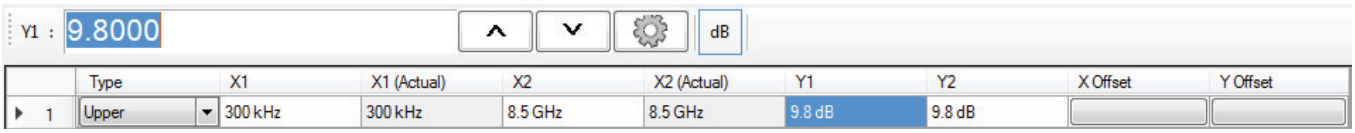
As shown above, use the toolbar to enter the required X2 value and units.

X2 (Actual) Field (Read-only)

The X2 (Actual) column indicates the actual X2 value selected by the instrument, based on the value entered by the user. This value indicates where the Limit Line is actually drawn on-screen, and the actual span used for judging pass/fail per point on a trace. User-entered X1 values for Limit Line Segments are rounded down to the nearest actual data point.

Y1 Field

The Y1 and Y2 fields constrain the limit segment in the trace display Y-axis. The units used will match those of the selected trace display. In the Y1 column, click the Y1 field. The Y1 field toolbar appears immediately above the header row.

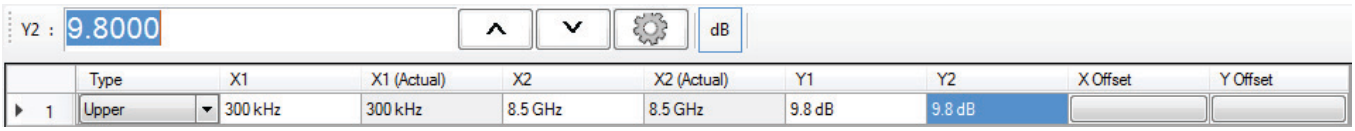


Y1 Field Toolbar

As shown above, use the toolbar to enter the Y1 value and units.

Y2 Field

In the Y2 column, click the Y2 field. As above in the Y1 field, the Y2 field toolbar appears immediately above the header row.

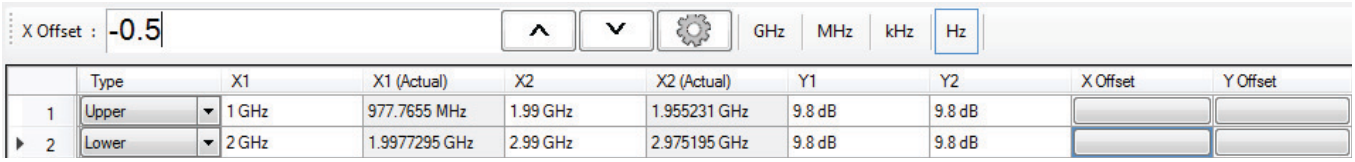


Y2 Field Toolbar

As shown above, use the field toolbar to enter the required Y2 value and units.

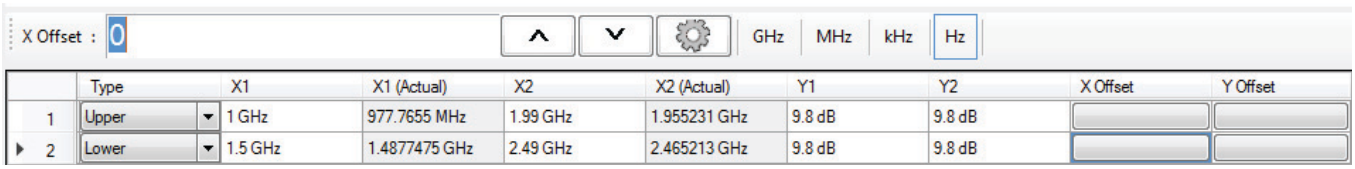
X Offset Button

On a per-row basis, the X Offset and Y Offset buttons allow the user to offset indices by a constant amount. This is useful for copying multiple rows and incrementing by a fixed frequency offset. In the X Offset column, click the X Offset button for the appropriate row. The X Offset field toolbar appears immediately above the tableau header row. Use the toolbar to enter the required value and units. When the units button is selected, the offset is applied to the X1 and X2 values. In the example in row 2 below, a lower limit line has already been established for X1 = 2.0 GHz and X2 = 2.99 GHz. To offset these by the same amount, select row 2, and then click the X Offset button. In the example, the offset required is –0.5 GHz. With row 2 selected, click the X Offset button and the X Offset field toolbar appears. Enter the required value and units.



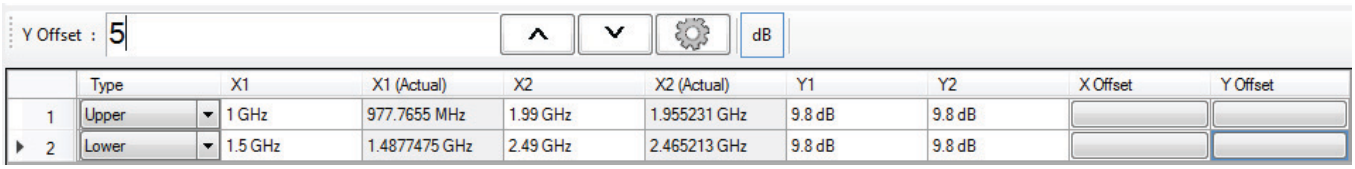
X Offset Field Toolbar

As shown above, use the field toolbar to enter the required X Offset value and units.



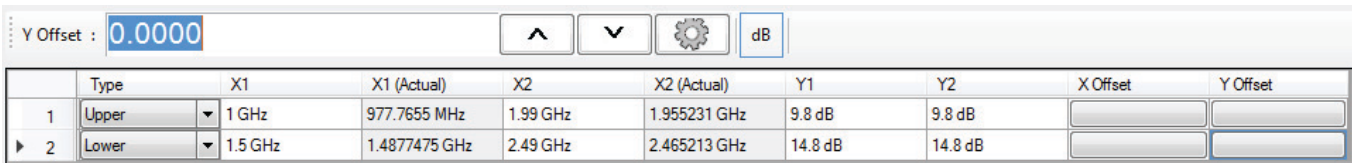
Y Offset Button

The Y Offset button and field toolbar function the same as the X Offset button described above. Under the Y Offset column heading, click the Y Offset button. The Y Offset field toolbar appears immediately above the tableau header row.



Y Offset Field Toolbar

As shown above, use the field toolbar to enter the required Y Offset value and units. Once the units button has been selected, the Y1 and Y2 fields for row 1 are changed as shown below.



Adding a Limit Line Row

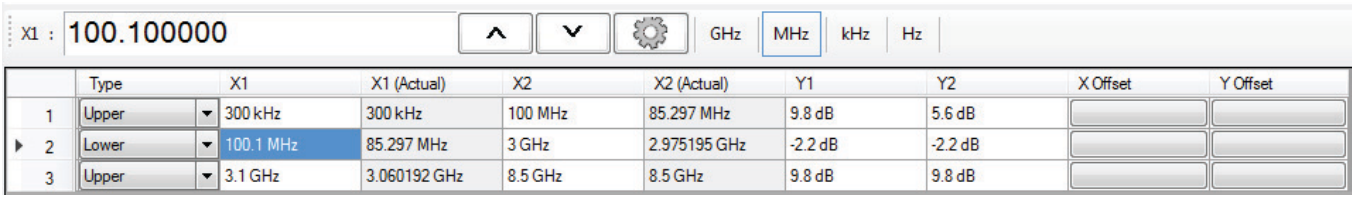
To add more rows to the bottom of the Limit Line Type Setup table area, use the Add button on the EDIT LIMIT LINE menu and then complete the X1, X2, Y1, Y2, and offset parameters as described above.

If no rows are present, Add creates a new row 1 at the top of the tableau using the trace settings for X1 start and X2 stop values.

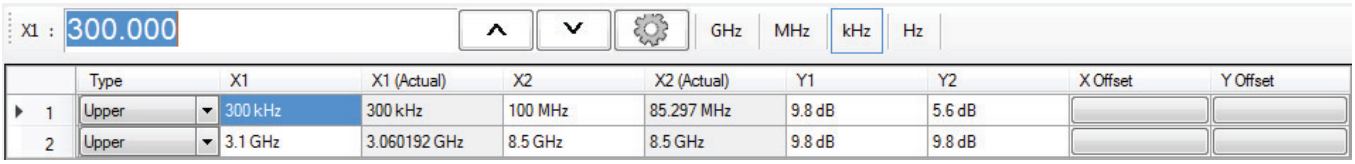
- If one or more rows are present, the Add button places each new row at the bottom of the tableau.
- If no rows are present or the field of an existing row is selected, the Insert does not function.
- If one or more rows are present and the entire row is selected by selecting the row number, Insert adds a row at the cursor position and pushes the current row and all those below down.

Deleting a Limit Line

To delete a limit line, select it as above, and then on the EDIT LIMIT LINE menu, select the Delete button on the EDIT LIMIT LINE menu. In the example below, row 1 is selected and ready to be deleted.



After the Delete button is selected, the row is removed and all rows below move up as shown below.



Limit Line Smith Chart and Polar Parameters

The following eight parameters are used to define each Smith Chart and Polar limit line:

- Limit line segment number
- Limit line type. Each segment can be defined as an Upper limit, a Lower limit, or turned off.
- Radius: Each segment can be defined.

Adding the First Limit Line

Assuming that no limit lines have been added during the current session, the dialog area appears as just a title bar. If unwanted limit lines from a previous configuration appear, on the EDIT LIMIT LINE menu, click the Clear All button.

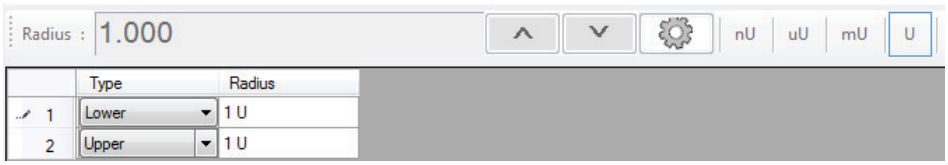


Figure 14-18. Smith Chart and Polar Edit Lines

On the EDIT LIMIT LINE menu, click Add. A default limit line appears in the tableau at row 1.

Type Selection Field

In the Type field, click the down button icon to select whether the limit will be an Upper or Lower limit line or if it will be OFF.

Figure 14-19. Edit Line Entry

Radius Field Toolbar

As shown above, the Radius field toolbar appears immediately above the tableau header row. If the units are time or power, enter the units using the field toolbar buttons to select the required units of nU, uU, mU, U or kU.

SAVE AS (LIMIT LINE LMT FILE) Dialog Box

Previous

- "EDIT LIMIT LINE Menu" on page 14-27

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE | Save Limit | SAVE AS (LIMIT LINE LMT FILE) Dialog Box

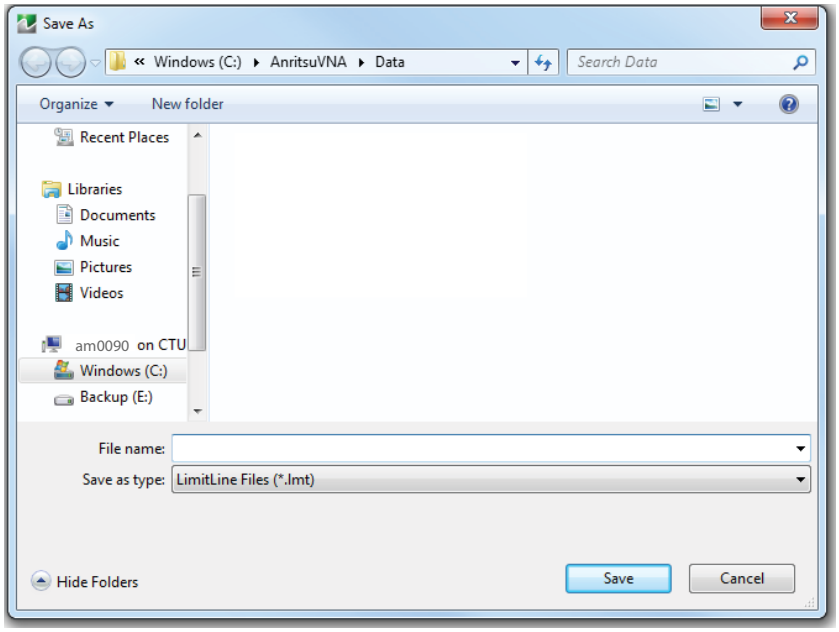


Figure 14-20. SAVE AS (LIMIT LINE LMT FILE) Dialog Box

Instructions

Use the Save As dialog box to save the limit line settings as a Limit Line (LMT) file.

OPEN (LIMIT LINE LMT FILE) Dialog Box

Previous

- "EDIT LIMIT LINE Menu" on page 14-27

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE | Recall Limit | OPEN (LIMIT LINE LMT FILE) Dialog Box

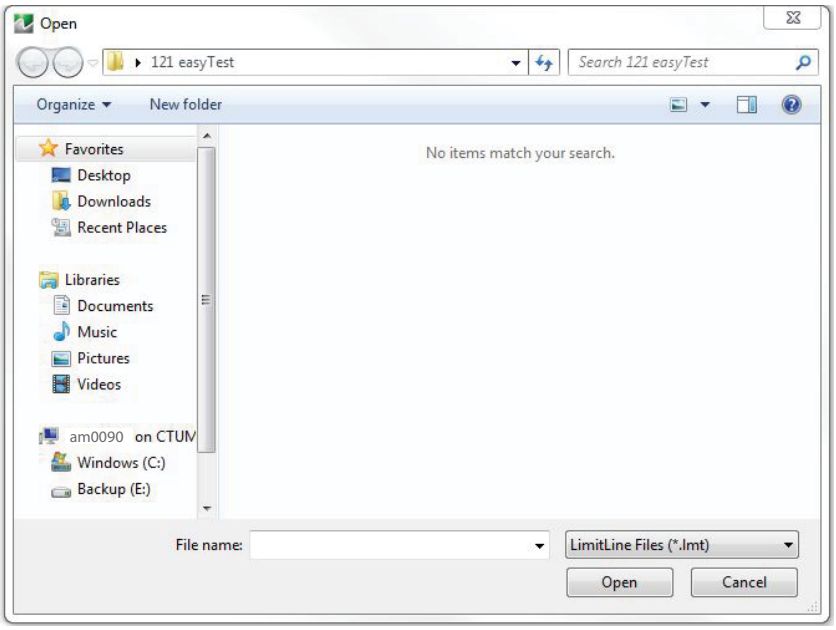


Figure 14-21. OPEN (LIMIT LINE LMT FILE) Dialog Box

Instructions

Select the required LMT file and then click Open.

14-6 Trace Ripple Limit Menus

RIPPLE LIMIT Menu

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT

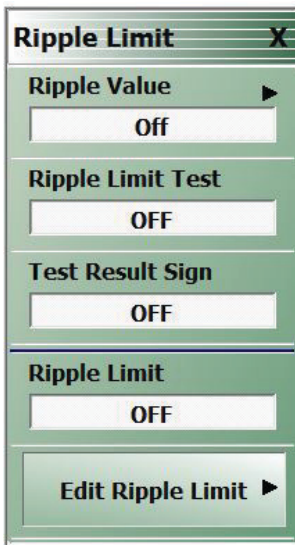


Figure 14-22. RIPPLE LIMIT Menu

Ripple Value

Displays "RIPPLE VALUE Menu" on page 14-38.

Ripple Limit Test

Select activates ripple test and displays the readout on the corner of the active screen as Ripl: with either Pass or Fail.

Test Result Sign

On a per-trace basis, select ON or OFF toggles the PASS or FAIL message displayed in the center of the monitor screen when Test Result Sign is ON. Note that Ripple Limit Test must be toggled ON for Test Result Sign to be active.

Ripple Limit

On a per-trace basis, toggles the Ripple Limit Lines ON or OFF.

Edit Ripple Limit

On a per-trace basis, displays the "EDIT RIPPLE LIMIT Menu" on page 14-39.

RIPPLE VALUE Menu

Previous

- "RIPPLE LIMIT Menu" on page 14-37

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Ripple Value | RIPPLE VALUE

Figure 14-23. EDIT LIMIT LINE Menu

Off

Turns off Ripple Value setting(s).

Absolute Value

Displays the ripple Absolute Value (min-max).

Margin

Displays the ripple difference relative within the ripple limit lines.

Flatness

Displays ripple flatness limit lines based on maximum value in the band.

EDIT RIPPLE LIMIT Menu

When this menu is selected, the bottom of the display moves up and the "Edit Ripple Limit Tableau Dialog" on page 14-41 is displayed.

Previous

- "RIPPLE LIMIT Menu" on page 14-37

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit | EDIT RIPPLE L

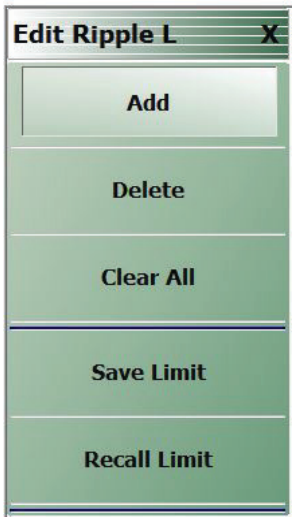


Figure 14-24. EDIT RIPPLE LIMIT Menu

EDIT RIPPLE LIMIT Menu Button Availability

The five (5) buttons of the EDIT RIPPLE LIMIT menu are available to all rectangular, Smith Chart, and Polar Graph Chart displays.

Add

Select adds a new row of ripple limit information to the "Edit Ripple Limit Tableau Dialog" on page 14-41 at the bottom of the display. For example, if three (3) limit lines are displayed, selecting Add creates a new limit line at position four (4).

Delete

The Delete button removes the selected ripple limit line.

Clear All

Select deletes all recorded limit line rows in the EDIT RIPPLE LIMIT tableau dialog.

Save Limit

Select displays the SAVE AS (LIMIT LINE LMT FILE) dialog box.

- "SAVE AS (RIPPLE LIMIT FILE) Dialog Box" on page 14-43

Recall Limit

Select displays the OPEN (LIMIT LINE LMT FILE) dialog box.

- "OPEN (RIPPLE LIMIT FILE) Dialog Box" on page 14-44

Edit Ripple Limit Tableau Dialog

When the EDIT RIPPLE LIMIT menu is selected, the Edit Ripple Limit tableau appears at the bottom of the display, allowing creation of ripple limit lines for each trace display. Both upper- segmented and lower-segmented limits can be created by using the buttons in the RIPPLE EDIT LIMIT menu and the segment controls in the tableau dialog.

Previous

- "EDIT RIPPLE LIMIT Menu" on page 14-39

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit

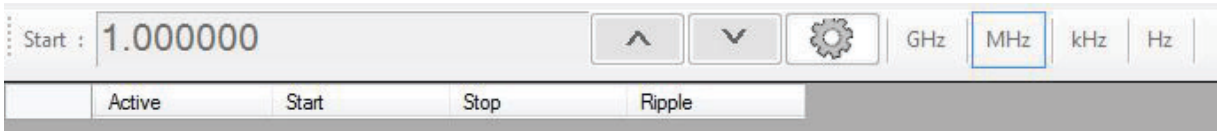
Limit Line Rectangular Parameters

The following eight parameters are used to define each rectangular limit line:

- Ripple Limit segment number
- Active – Each segment can be defined as an Upper limit, a Lower limit, or turned off
- Start – Enter segment start frequency
- Stop – Enter segment start frequency
- Ripple – Enter ripple variation limit line for the start frequency and stop frequency

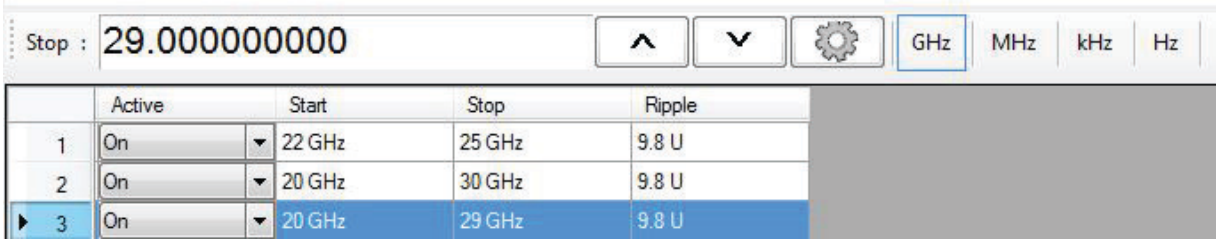
Adding the First Limit Line

Assuming that no limit lines have been added during the current session, the dialog area appears as just a title bar. If unwanted limit lines from a previous configuration appear, on the EDIT LIMIT LINE menu, click the Clear All button.



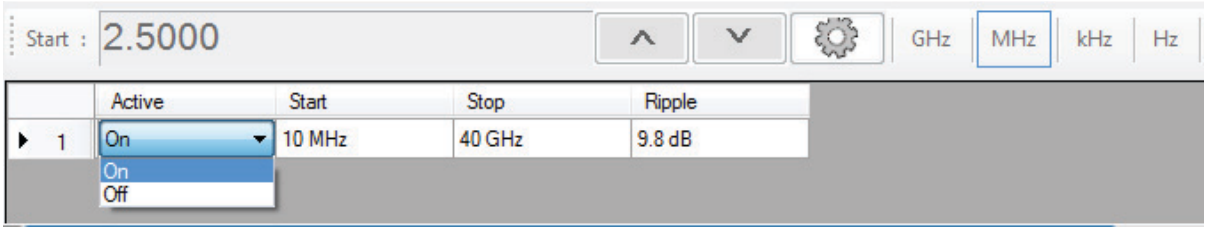
Adding a Limit Line Row

On the EDIT RIPPLE LIMIT menu, click Add. Up to 50 lines can be added.



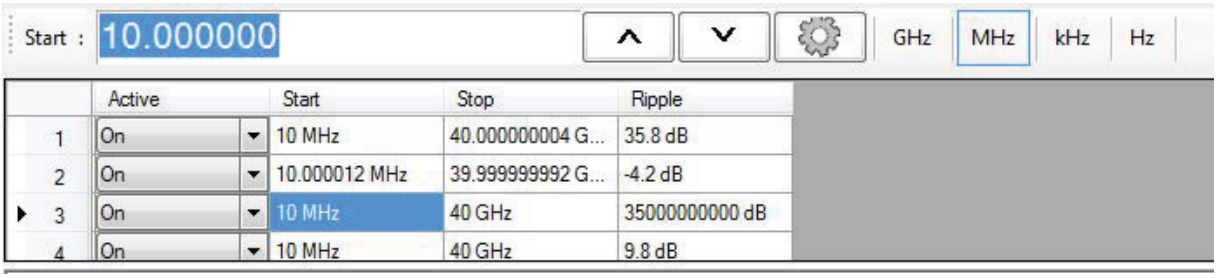
Active Selection Field

In the Active field, click the down button icon to select the ripple limit ON or OFF.



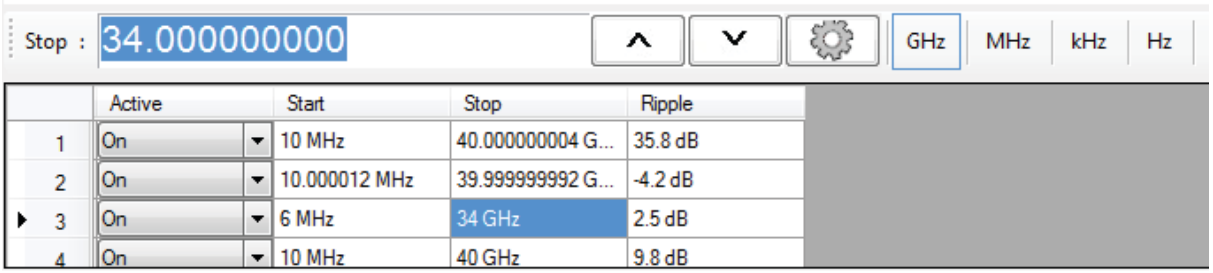
Start Selection Field

In the Start column, select and click the Start button icon to activate the start frequency ripple limit. Type in the start frequency of the ripple edit limit. Select either GHz, MHz, kHz or Hz to complete the frequency entry of the start frequency of the ripple limit.



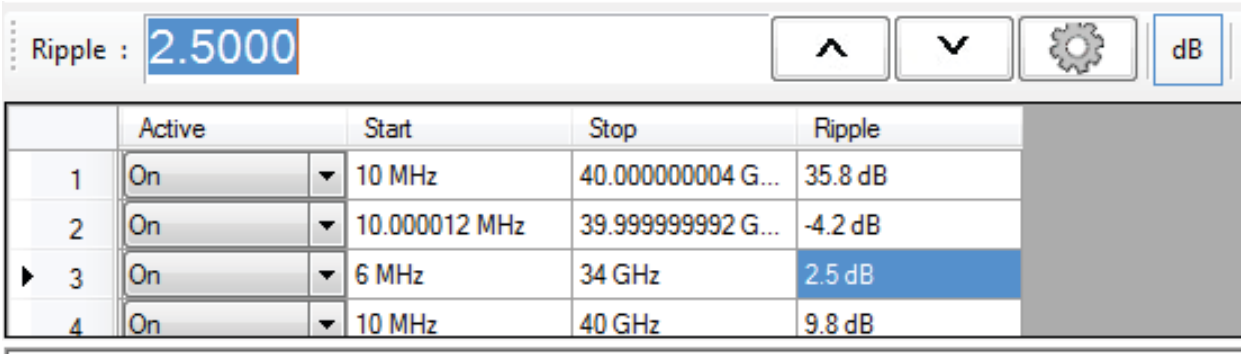
Stop Selection Field

In the Stop column, select and click the Stop button icon to activate the stop frequency ripple limit. Type in the stop frequency of the ripple edit limit. Select either GHz, MHz, kHz or Hz to complete the frequency entry of the Stop frequency of the ripple limit.



Ripple Selection Field

In the Ripple column, select and click the Ripple button icon to activate the ripple limit range. Type in the ripple limit.



SAVE AS (RIPPLE LIMIT FILE) Dialog Box

Previous

- “EDIT RIPPLE LIMIT Menu” on page 14-39

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit | SAVE LIMIT | SAVE AS (RIPPLE LIMIT LMT FILE) Dialog Box

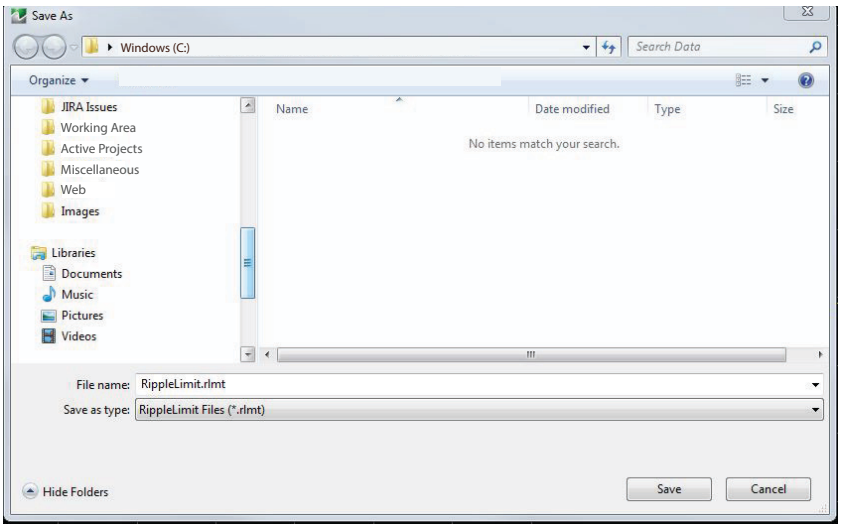


Figure 14-25. SAVE AS (RIPPLE LIMIT FILE) Dialog Box

Instructions

Use the Save As dialog box to save the ripple limit settings as a Ripple Limit (.rlmt) file.

OPEN (RIPPLE LIMIT FILE) Dialog Box

Previous

- “EDIT RIPPLE LIMIT Menu” on page 14-39

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit | Recall Limit | OPEN (LIMIT LINE LMT FILE) Dialog Box

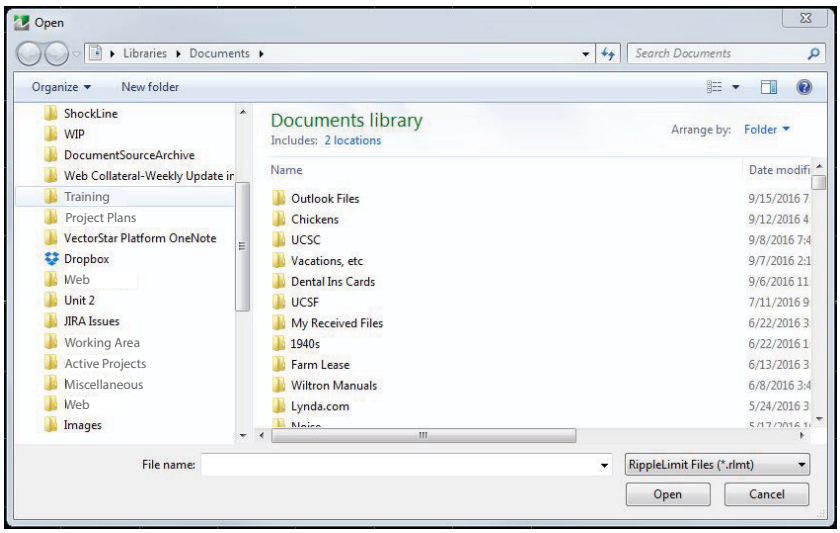


Figure 14-26. OPEN (RIPPLE LIMIT FILE) Dialog Box

Instructions

Select the required RLMT file and then click Open.

14-7 Limit/Ripple Display Location Menu

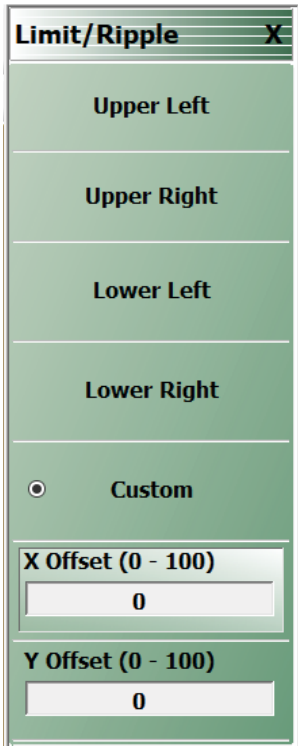
LIMIT/RIPPLE (Display Location) Menu

Previous

- DISPLAY Menu on page 14-3

Navigation

- MAIN | Display | DISPLAY | Limit/Ripple Display Location | LIMIT/RIPPLE



Limit/Ripple

Allows the user to position the Limit/Ripple display data to one of the following locations:

- Upper Left
- Upper Right
- Lower Left
- Lower Right
- Custom

  Select activates the X Offset and Y Offset coordinates listed below and allows the user to click-drag-drop the Limit/Ripple value within the display.

  As the Limit/Ripple data display is clicked-dragged-dropped, the X Offset and Y Offset fields track its position relative to the top-left corner of the trace. Alternatively, these fields could also be set for setting the position of Limit/Ripple data display.

X Offset (0-100)

The X Offset coordinate field becomes active when Custom is selected and displays the Limit/Ripple value X coordinate value.

When the Limit/Ripple value display is clicked-dragged-dropped within the trace display area, the X coordinate value tracks the position of the Limit/Ripple value display.

Y Offset (0-100)

The Y Offset coordinate field becomes active when Custom is selected and displays the Limit/Ripple value Y coordinate value.

When the Limit/Ripple value display is clicked-dragged-dropped within the trace display area, the Y coordinate value tracks the position of the Limit/Ripple value display.

Figure 14-27. LIMIT/RIPPLE Menu

The functionality of this menu only works when there is a limit line already on the trace and the limit/ripple readout is set to be on.

14-8 Domain Menu Appearance and Button Availability

The presence and availability of the DOMAIN menu buttons depends on whether or not the Time Domain option (-002) is installed on the VNA. The selections on the SWEEP TYPE and FREQUENCY menus also affect the DOMAIN menu display. Use the descriptions below to determine which menu is currently present and then use the link to navigate to the correct menu description. The DOMAIN menu is not available when using the MS46121A/B. All domain menu features must be accessed through the TIME DOMAIN menu.

DOMAIN Menu Button Selection Group

The top four (4) buttons on the DOMAIN menu form a button selection group where the selection of one (1) button de-selects the other three (3) buttons.

- Frequency, with No Time Gate
- Frequency, with Time Gate
- Time, Low Pass
- Time, Band Pass

DOMAIN Menu Variants

Each DOMAIN menu variant is shown in the sections below.

- Time Domain, Frequency with No Time Gate
- Time Domain, Frequency with Time Gate
- Time Domain, Time Gate Low Pass
- Time Domain, Time Gate Band Pass

DOMAIN Frequency with No Time Gate Menu

The DOMAIN Frequency with No Time Gate menu has only the Frequency with No Time Gate button available. No other menu options are available.

Menu Description

- "DOMAIN Frequency with No Time Gate Menu" on page 14-49

Prerequisites

- SWEEP TYPES = Power (CW Freq).
- "SWEEP TYPES Menu" on page 6-6
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Power (CW Freq)

DOMAIN Frequency with Time Gate

The DOMAIN Frequency with Time Gate menu has the Frequency with Time Gate button available.

Menu Description

- "DOMAIN Frequency with Time Gate Menu" on page 14-50

Prerequisites

- SWEEP TYPES = Freq Sweep (Linear) or Segmented Sweep (Freq-based)
- "SWEEP TYPES Menu" on page 6-6
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Freq Sweep (Linear)
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Segmented Sweep (Freq-based)

DOMAIN Time Gate Low Pass Menu

The DOMAIN Time Gate Low Pass menu and the Time, Low Pass button is only available as a selection under certain conditions when a harmonic sweep condition is established. Sweep must be set to a frequency-based sweep: Frequency Sweep (Linear) or Segmented sweep (Frequency-based).

Menu Unavailable

- The Time, Low Pass button is unavailable if:
  - A power-based sweep of Power Sweep (CW Frequency) is set.
  - A Segmented Sweep (Index-Based) is set.

Menu Description

- "DOMAIN Time Low Pass Menu" on page 14-51

Prerequisites

- SWEEP TYPES = Freq Sweep (Linear) or Segmented Sweep (Freq-based)
  - "SWEEP TYPES Menu" on page 6-6
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Freq Sweep (Linear)
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Segmented Sweep (Freq-based)

- For example, at the FREQUENCY menu, set the following:
  - Start point of 1 GHz
  - Stop point of 10 GHz
  - # of Points set to 10
  - The Time, Low Pass button available.
  - “Frequency Menu for Frequency-Based Segmented Sweep Mode” on page 4-5
  - MAIN | Frequency | FREQUENCY

DOMAIN Time Gate Band Pass Menu

The DOMAIN Time Gate Band Pass menu and the Time, Band Pass button is only available as a selection when a frequency-based sweep: Frequency Sweep (Linear) or Segmented sweep (Frequency-based).

Menu Unavailable

- The Time, Band Pass button is unavailable if:
  - A power-based sweep of Power Sweep (CW Frequency) is set.
  - A Segmented Sweep (Index-Based) is set.

Menu Description

- “DOMAIN Time Band Pass Menu” on page 14-53

Prerequisites

- SWEEP TYPES = Freq Sweep (Linear), or Segmented Sweep (Freq-based)
  - “SWEEP TYPES Menu” on page 6-6
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES

DOMAIN Frequency with No Time Gate Menu

Menu Identification and Variants

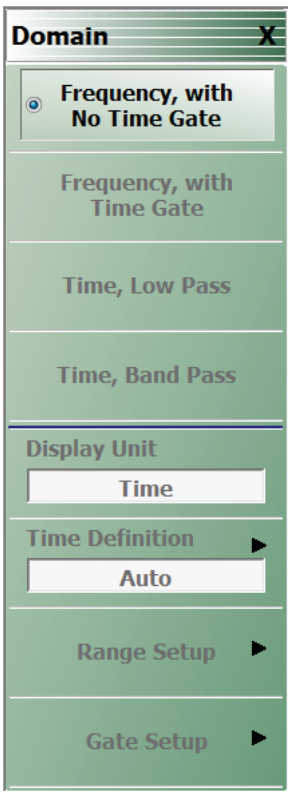
- The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP menu.
- Consult the section above for menu identification and prerequisites.
- "Domain Menu Appearance and Button Availability" on page 14-46

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with No Time Gate



Frequency, with No Time Gate

If the Frequency, with No Time Gate button is selected:

- The following time domain options are deselected and unavailable:
  - Frequency, with Time Gate
  - Time, Low Pass
  - Time, Band Pass
- No other menu buttons are available.

Figure 14-28. DOMAIN Frequency with No Time Gate Menu

DOMAIN Frequency with Time Gate Menu

Menu Identification and Variants

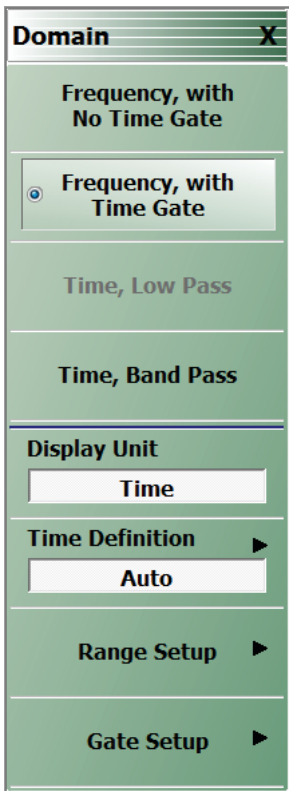
- The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP menu.
- Consult the section above for menu identification and prerequisites.
- "Domain Menu Appearance and Button Availability" on page 14-46

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN



Frequency with Time Gate

If the Frequency, with Time Gate button is selected:

- The following time domain options are deselected and unavailable:
  - Frequency, with No Time Gate
  - Time, Low Pass
  - Time, Band Pass
- The following time domain options are available:
  - The Display Unit, Time Definition, Range Setup, and Gate Setup buttons are available.

Display Unit

This button is available if the Frequency, with Time Gate button (above) has been selected. Select toggles the display units between time and distance.

Time Definition

This button is available if the Frequency, with Time Gate button (above) has been selected. Select displays the TIME DEFINITION menu.

- "TIME DEFINITION Menu" on page 14-55

Range Setup

This button is available if the Frequency, with Time Gate button (above) has been selected. Select displays the RANGE SETUP menu.

- "RANGE SETUP Frequency with Time Gate Menu" on page 14-58

Gate Setup

This button is available if the Frequency, with Time Gate button (above) has been selected. Select displays the GATE SETUP menu.

- "GATE SETUP Menu" on page 14-71

Figure 14-29. DOMAIN Frequency with Time Gate Menu

DOMAIN Time Low Pass Menu

The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP and FREQUENCY menus. Consult the section above at "Domain Menu Appearance and Button Availability" on page 14-46 for menu identification and prerequisites.

Prerequisites

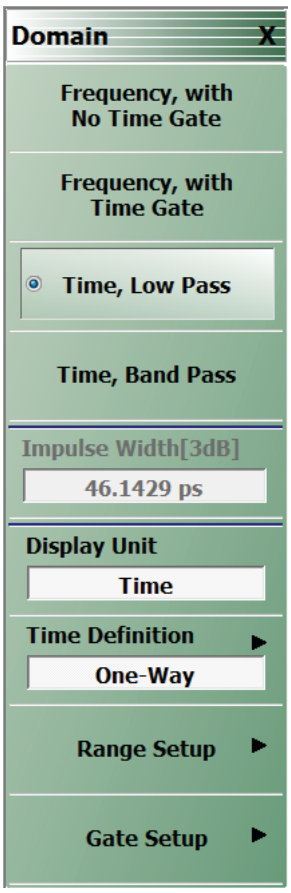
- The Time, Low Pass button is only available as a selection under certain conditions when a harmonic sweep condition is established.
- For example, at the FREQUENCY menu, a Start point of 1 GHz, a Stop point of 10 GHz, and the # of Points set to 10 makes the Time, Low Pass button available.
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time Low Pass



Time, Low Pass

If the Time, Low Pass button is selected:

- The following time domain options are deselected and unavailable:
  - Frequency, with No Time Gate
  - Frequency, with Time Gate
  - Time, Band Pass
- If the Time Band Pass button is selected:
  - The read-only Impulse Width [3dB] display button appears.
  - The Display Unit, Time Definition, Range Setup, and Gate Setup buttons are available.

Impulse Width [3dB]

The read-only display button is only available if the Time, Low Pass button (above) has been selected. The units in the Impulse Width display change to match the setting on the Display Units button.

Display Unit

This button is available if the Time, Low Pass button (above) has been selected. Select toggles the display units between time and distance.

Time Definition

This button is available if the Time, Low Pass button (above) has been selected. Select displays the TIME DEFINITION menu.

- "TIME DEFINITION Menu" on page 14-55

Figure 14-30. DOMAIN Time Low Pass Menu (1 of 2)

	Range Setup This button is available if the Time, Low Pass button (above) has been selected. Select displays the RANGE SETUP menu. • "RANGE SETUP Time Low Pass Menu" on page 14-62 **Gate Setup** This button is available if the Time, Low Pass button (above) has been selected. Select displays the GATE SETUP menu. • "GATE SETUP Menu" on page 14-71

Figure 14-30. DOMAIN Time Low Pass Menu (2 of 2)

DOMAIN Time Band Pass Menu

Menu Identification and Variants

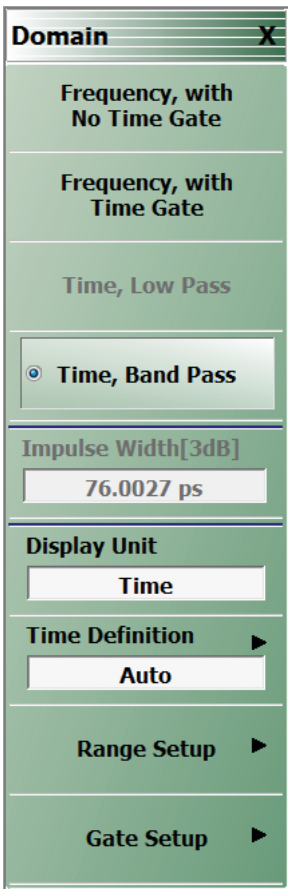
- The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP menu.
- Consult the section above for menu identification and prerequisites.
- "Domain Menu Appearance and Button Availability" on page 14-46

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass



Time, Band Pass

If the Time, Band Pass button is selected:

- The following time domain options are deselected and unavailable:
  - Frequency, with No Time Gate
  - Frequency, with Time Gate
  - Time, Low Pass
- These options are available:
  - The read-only Impulse Width [3dB] display button appears.
  - The Display Unit, Time Definition, Range Setup, and Gate Setup buttons are available.

Impulse Width [3dB]

This display button is only available if the Time Band Pass button (above) has been selected. The units in the Impulse Width display changes to match the setting on the Display Units button.

Display Unit

This button is available if the Time Band Pass button (above) has been selected. Select toggles the display units between time and distance.

Time Definition

This button is available if the Time Band Pass button (above) has been selected. Select displays the TIME DEFINITION menu.

- "TIME DEFINITION Menu" on page 14-55

Range Setup

This button is available if the Time Band Pass button (above) has been selected. Select displays the RANGE SETUP menu.

- "RANGE SETUP Frequency with Time Gate Menu" on page 14-58

Figure 14-31. DOMAIN Time Band Pass Menu (1 of 2)

	Gate Setup This button is available if the Time Band Pass button (above) has been selected. Select displays the GATE SETUP menu. • "GATE SETUP Menu" on page 14-71

Figure 14-31. DOMAIN Time Band Pass Menu (2 of 2)

14-9 Domain Time Definition Menu

TIME DEFINITION Menu

Prerequisites

- The DOMAIN menu must be set to one of the following: Frequency, with Time Gate; Time, Low Pass; Time, Band Pass.

Previous

- "DOMAIN Frequency with Time Gate Menu" on page 14-50
- "DOMAIN Time Low Pass Menu" on page 14-51
- "DOMAIN Time Band Pass Menu" on page 14-53

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with Time Gate | Time Definition | TIME DEFINITION
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Low Pass | Time Definition | TIME DEFINITION
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass | Time Definition | TIME DEFINITION

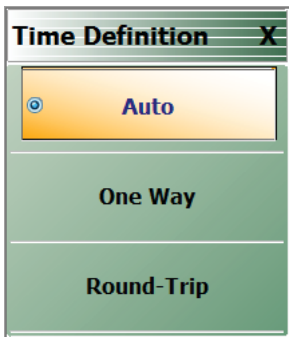


Figure 14-32. TIME DEFINITION Menu

Auto

Selecting the Auto button de-selects the One Way and the Round-Trip buttons and auto-returns to the DOMAIN menu.

One Way

Selecting the One Way button de-selects the Auto and the Round-Trip buttons and auto-returns to the DOMAIN menu.

Round-Trip

Selecting the Round-Trip button de-selects the Auto and the One Way buttons and auto-returns to the DOMAIN menu.

14-10 Range Setup Menus and Dialog Boxes

Range Setup Button Unavailable

If the Domain Type on the DOMAIN menu is set to Frequency, with No Time Gate, the Range Setup button and the underlying RANGE SETUP menu are unavailable.

- "DOMAIN Frequency with No Time Gate Menu" on page 14-49
- MAIN | Display | DISPLAY | Domain | DOMAIN

RANGE SETUP Menu Availability

In order to view the RANGE SETUP menu, the Domain Type on the DOMAIN menu must be set to one of the following: Frequency, with Time Gate; Time, Low Pass; Time, Band Pass.

The Time, Low Pass button on the DOMAIN menu is only available if a harmonic sweep is set on the FREQUENCY menu such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points.

- "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
- MAIN | Frequency | FREQUENCY

RANGE SETUP Menu Variants

The Time Domain type set in the DOMAIN menu affects which functions are displayed in buttons on the RANGE SETUP menu:

RANGE SETUP Menu When Time Domain is Set to Frequency with Time Gate

If the Domain Type is set to Frequency, with Time Gate, the RANGE SETUP menu has these seven buttons: Display Unit, Start, Stop, Center, Span, Window Shape, and Alias Free Range.

Menu Description

- "RANGE SETUP Frequency with Time Gate Menu" on page 14-58

Prerequisites

- Domain Type = Frequency with Time Gate

RANGE SETUP Menu When Time Domain is Set to Time Band Pass

If the Domain Type is set to Time, Band Pass, the RANGE SETUP menu has these eight buttons: Display Unit, Start, Stop, Center, Span, Phasor Impulse, Window Shape, and Alias Free Range.

Menu Description

- "RANGE SETUP Time Band Pass Menu" on page 14-60

Prerequisites

- Domain Type = Time Band Pass

RANGE SETUP Menu When Time Domain is Set to Time Low Pass

If the Domain Type is set to Time, Low Pass, the RANGE SETUP menu has these nine buttons: Display Unit, Start, Stop, Center, Span, Response, DC Term, Window Shape, and Alias Free Range.

Menu Description

- "RANGE SETUP Time Low Pass Menu" on page 14-62

Prerequisites

- Domain Type = Time Low Pass

The Display Unit Button Changes the Range Setup Menu Button Units

The setting of the Display Unit toggle button on each RANGE SETUP menu changes the units of the RANGE SETUP menu. It changes the Start, Stop, Center, and Span buttons between Distance or Time. The RANGE SETUP (DISTANCE) menu is shown in the following section.

- See also the GATE SETUP menu, "GATE SETUP Menu" on page 14-71, for an example of time setup values in a menu.
- MAIN | Display | DISPLAY | Domain | DOMAIN | Gate Setup | GATE SETUP

RANGE SETUP Frequency with Time Gate Menu

Menu Identification and Variants

- The appearance and button availability of the RANGE SETUP (Frequency with Time Gate) menu depends on settings on DOMAIN menu.
- The RANGE SETUP Frequency with Time Gate menu has seven (7) buttons.
- "Range Setup Menus and Dialog Boxes" on page 14-56

Prerequisites

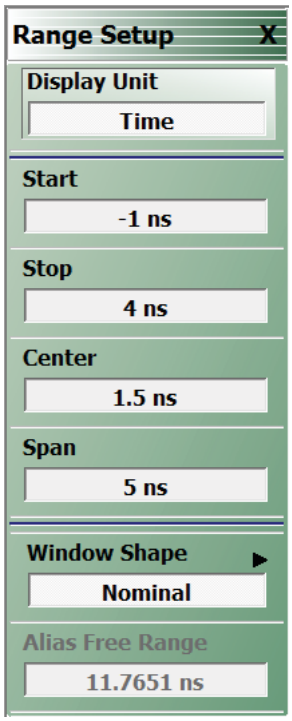
- On the DOMAIN menu, Domain Type is set to Frequency, with Time Gate

Previous

- "DOMAIN Frequency with Time Gate Menu" on page 14-50

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with Time Gate | Range Setup | RANGE SETUP Frequency with Time Gate



Display Unit

The RANGE SETUP and the GATE SETUP menus use the same Display Unit toggle button setting. Changing the Display Unit setting on one menu changes the other menu setting to an identical setting.

Select toggles between distance and time.

- When toggled to Distance, the Start, Stop, Center, and Span button fields show distance values as described in the buttons below.
- When toggled to Time, the Start, Stop, Center, and Span button fields show time values as described in the buttons below.

Start

If the Display Unit toggle button is set to distance, select displays the Start (Distance) toolbar.

If the Display Unit toggle button is set to time, select displays the Start (Time) toolbar.

Stop

Select either displays the Stop (Distance) or Stop (Time) toolbar.

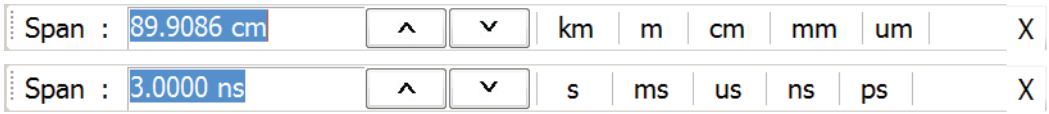
Figure 14-33. RANGE SETUP Frequency with Time Gate Menu (1 of 2)

Center

Select either displays the Center (Distance) or Center (Time) toolbar.

Span

Select either displays the Span (Distance) or Span (Time) toolbar.



Window Shape

Select displays the WINDOW SHAPE menu where four (4) standard shapes of Rectangular, Nominal, Low Side Lobe, and Min Side Lobe can be selected. A fifth advanced selection provides an additional menu where configurable Kaiser-Bessel or Dolph-Chebyshev window types are available.

- "WINDOW SHAPE Menu" on page 14-68

Alias Free Range

Read-only display button. The units are the same as those set by the Display Unit button above. Displays the length or time period that can be measured without repeating a discontinuity response. This is a function of the inverse of the frequency sweep step size.

Figure 14-33. RANGE SETUP Frequency with Time Gate Menu (2 of 2)

RANGE SETUP Time Band Pass Menu

Menu Identification and Variants

- The appearance and button availability of the RANGE SETUP (Time Band Pass) menu depends on settings on DOMAIN menu.
- This RANGE SETUP (Time Band Pass) menu has eight (8) buttons.
- "Range Setup Menus and Dialog Boxes" on page 14-56

Prerequisites

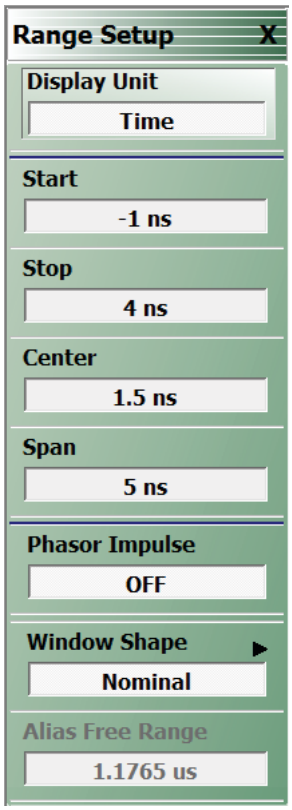
- On the DOMAIN menu, Domain Type is set to Time, Band Pass

Previous

- "DOMAIN Time Band Pass Menu" on page 14-53

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time, Band Pass | Range Setup | RANGE SETUP Time Band Pass



Display Unit

The RANGE SETUP and the GATE SETUP menus use the same Display Unit toggle button setting. Changing the Display Unit setting on one menu changes the other menu setting to an identical setting.

Select toggles between distance and time.

- When toggled to Distance, the Start, Stop, Center, and Span button fields show distance values as described in the buttons below.
- When toggled to Time, the Start, Stop, Center, and Span button fields show time values as described in the buttons below.

Start

If the Display Unit toggle button is set to distance, select displays the Start (Distance) toolbar.

If the Display Unit toggle button is set to time, select displays the Start (Time) toolbar.

Figure 14-34. RANGE SETUP Time Band Pass Menu – 8 Buttons (1 of 2)

Stop

Select either displays the Stop (Distance) or Stop (Time) toolbar.

Center

Select either displays the Center (Distance) or Center (Time) toolbar.

Span

Select either displays the Span (Distance) or Span (Time) toolbar.

Phasor Impulse

Select toggles the phasor impulse OFF or ON.

Window Shape

Select displays the WINDOW SHAPE menu to allow changing the window shape between rectangular, nominal, low side lobe, minimum side load, or addition advanced selections.

- "WINDOW SHAPE Menu" on page 14-68

Alias Free Range

Read-only display button. The units are the same as those set by the Display Unit button above. Displays the length or time period that can be measured without repeating a discontinuity response. This is a function of the inverse of the frequency sweep step size

Figure 14-34. RANGE SETUP Time Band Pass Menu – 8 Buttons (2 of 2)

RANGE SETUP Time Low Pass Menu

Menu Identification and Variants

- The appearance and button availability of the RANGE SETUP (Time Band Pass) menu depends on settings on DOMAIN menu.
- This RANGE SETUP (Time Low Pass) menu has nine (9) buttons.
- "Range Setup Menus and Dialog Boxes" on page 14-56

Prerequisites

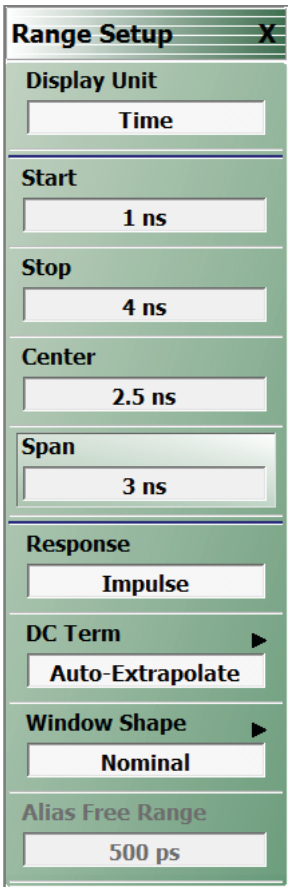
- On the FREQUENCY menu, a harmonic sweep must be set such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY
- On the DOMAIN menu, Domain Type is set to Time, Low Pass

Previous

- "DOMAIN Time Low Pass Menu" on page 14-51

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time, Low Pass | Range Setup | RANGE SETUP Time Low Pass



Display Unit

The RANGE SETUP and the GATE SETUP menus use the same Display Unit toggle button setting. Changing the Display Unit setting on one menu changes the other menu setting to an identical setting.

Select toggles between distance and time.

- When toggled to Distance, the Start, Stop, Center, and Span button fields show distance values as described in the buttons below.
- When toggled to Time, the Start, Stop, Center, and Span button fields show time values as described in the buttons below.

Start

If the Display Unit toggle button is set to distance, select displays the Start (Distance) toolbar.

If the Display Unit toggle button is set to time, select displays the Start (Time) toolbar.

Stop

Select either displays the Stop (Distance) or Stop (Time) toolbar.

Center

Select either displays the Center (Distance) or Center (Time) toolbar.

Span

Select either displays the Span (Distance) or Span (Time) toolbar.

Response

Select toggles response between Impulse and Step.

Start Step at 0

Note: Start Step at 0 appears only if the Response button is toggled to Step. When toggled ON, starts the Step calculation at Time = 0 seconds rather than at the current start of the range.

Figure 14-35. RANGE SETUP Time Gate Low Pass Menu – Nine Buttons (1 of 2)

	DC Term Select displays the DC TERM menu where Auto-Extrapolate or other extrapolation methods can be selected. • "DC TERM Menu" on page 14-65 **Window Shape** Select displays the WINDOW SHAPE menu to allow changing the window shape between rectangular, nominal, low side lobe, minimum side load, or addition advanced selections. • "WINDOW SHAPE Menu" on page 14-68 **Alias Free Range** Read-only display button. The units are the same as those set by the Display Unit button above. Displays the length or time period that can be measured without repeating a discontinuity response. This is a function of the inverse of the frequency sweep step size.

Figure 14-35. RANGE SETUP Time Gate Low Pass Menu – Nine Buttons (2 of 2)

DC TERM Menu

Prerequisites

- On the FREQUENCY menu, a harmonic sweep must be set such as:
  - Start Frequency = 10 MHz
  - Stop Frequency = 50 MHz
  - # of Points = 5 points
- FREQUENCY Menus
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY
- On the DOMAIN menu, Domain Type is set to Time, Low Pass

Previous

- "RANGE SETUP Time Low Pass Menu" on page 14-62

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time, Low Pass | Range Setup | RANGE SETUP Time Low Pass | DC Term | DC TERM

Menu Button Availability

The availability of buttons on the DC TERM menu change based on the setting on the Auto-Extrapolate and Other buttons. These two buttons also form a button selection group where the selection of one button de-selects the other button.

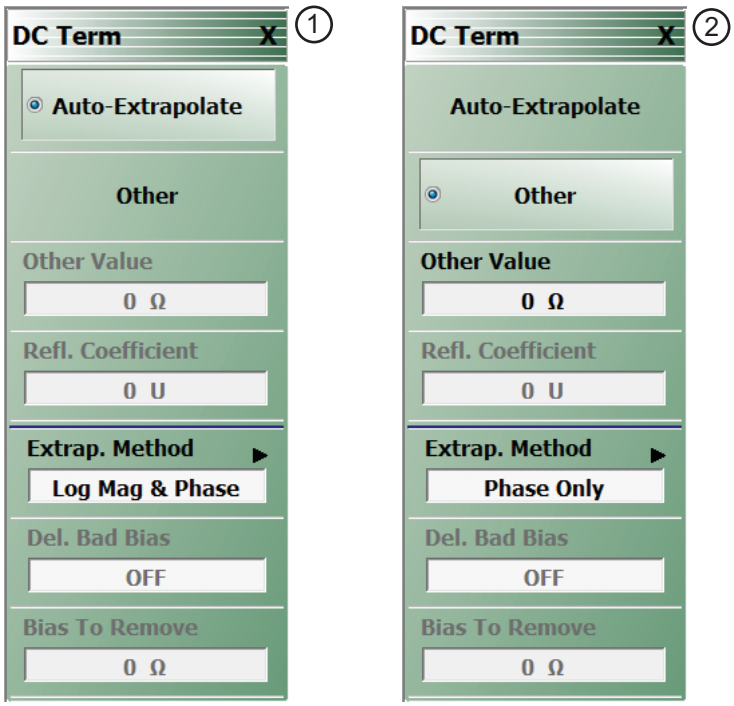


Figure 14-36. DC TERM Menu (1 of 2)

1. DC TERM menu with Auto-Extrapolate option selected. See below for button function descriptions.	2. DC TERM menu with Other option selected and Other Value field button now available. See below for button function descriptions.

Figure 14-36. DC TERM Menu (2 of 2)

Auto-Extrapolate

Selection of the Auto-Extrapolate button de-selects the Other button (below) and sets the DC Term extrapolation to the method currently set in the Extrap Method button (described below).

Other

Selection of the Other button de-selects the Auto-Extrapolate button and enables the Other Value button below for input of a user-defined DC Term.

Other Value

This button is only available if the Other button above is selected. Displays the currently user-defined Other Value DC Term in Ohms. Select displays the Other Value (Ohms) field toolbar which allows user input of a custom user-defined DC Term in Ohms.

Refl. Coefficient

Reflection Coefficient button. Read-only display. The Reflection Coefficient display shows the calculated coefficient in Units.

Extrap Method

Extrapolation Method button. The Extrapolation Method button displays the currently selection DC term extrapolation method. Available options on the displayed EXTRAPOLATION menu are Log Mag & Phase, Phase Only, and User Defined.

- "EXTRAPOLATION Menu" on page 14-67

Del. Bad Bias

The Delete Bad Bias toggle button is not available.

Bias To Remove

The Bias to Remove button and the related Bias to Remove (Ohms) field toolbar are not available.

EXTRAPOLATION Menu

Prerequisites

- On the FREQUENCY menu, a harmonic sweep must be set such as:
  - Start Frequency = 10 MHz
  - Stop Frequency = 50 MHz
  - # of Points = 5 points
- FREQUENCY Menus
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY
- On the DOMAIN menu, Domain Type is set to Time, Low Pass

Previous

- "DC TERM Menu" on page 14-65

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time, Low Pass | Range Setup | RANGE SETUP Time Low Pass | DC Term | DC TERM | Extrap Method | EXTRAPOLATION

Log Mag & Phase

Selection sets the method as Log Mag & Phase.

Phase Only

Selection sets the method as Phase Only.

User Defined

Option unavailable.

Figure 14-37. EXTRAPOLATION Menu

14-11 Time Domain Window Shape and Gate Setup Menus

WINDOW SHAPE Menu

Prerequisites

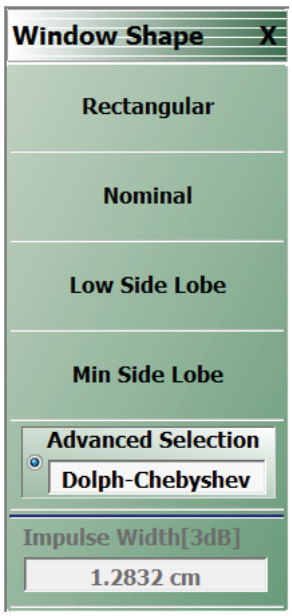
- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass.
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- "RANGE SETUP Frequency with Time Gate Menu" on page 14-58
- "RANGE SETUP Time Band Pass Menu" on page 14-60
- "RANGE SETUP Time Low Pass Menu" on page 14-62

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with Time Gate | Range Setup | RANGE SETUP Frequency with Time Gate | Window Shape | WINDOW SHAPE
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass | Range Setup | RANGE SETUP Time Band Pass | Window Shape | WINDOW SHAPE
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Low Pass | Range Setup | RANGE SETUP Time Low Pass



Rectangular

Select sets the window shape to rectangular.

Nominal

Select sets the window shape to nominal.

Low Side Lobe

Select sets the window shape to low side lobe.

Min Side Lobe

Select sets the window shape to the minimum side lobe.

Advanced Selection

Selects displays the ADVANCED WINDOW SETUP dialog box that allows selection of configurable Kaiser-Bessel or Dolph-Chebyshev window types.

- "ADVANCED WINDOW SHAPE SETUP Dialog Box" on page 14-69

Impulse Width [3dB]

Read-only display. Shows the calculated width of the window at **3 dB**.

Figure 14-38. WINDOW SHAPE Menu

ADVANCED WINDOW SHAPE SETUP Dialog Box

Prerequisites

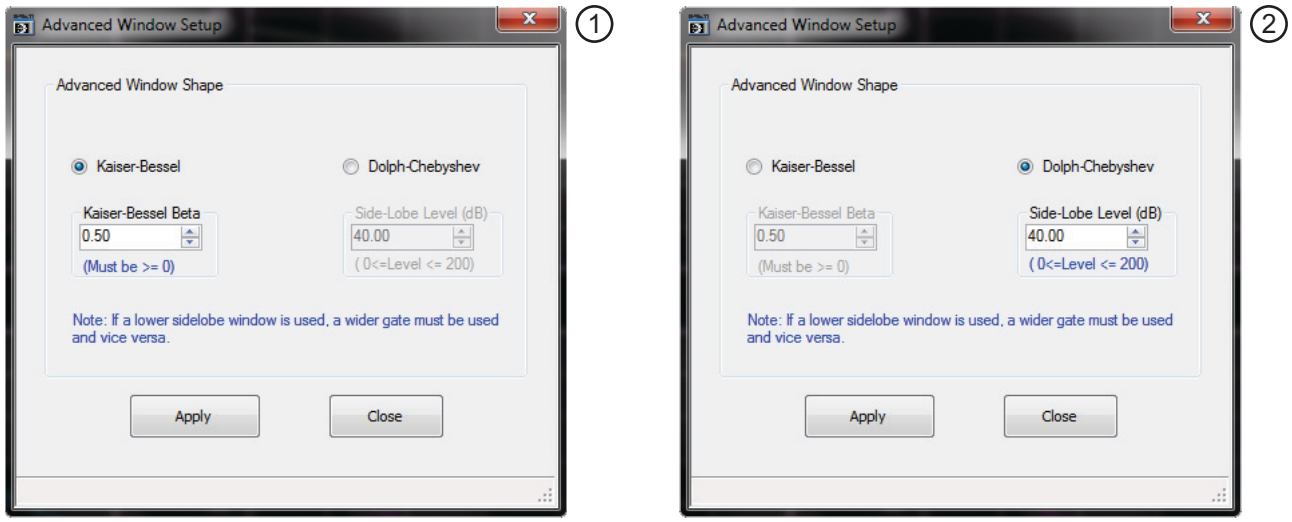
- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep set such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- "WINDOW SHAPE Menu" on page 14-68

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with Time Gate | Range Setup | RANGE SETUP Frequency with Time Gate | Window Shape | WINDOW SHAPE | Advanced Selection | ADVANCED WINDOW SHAPE SETUP Dialog Box
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass | Range Setup | RANGE SETUP Time Band Pass | Window Shape | WINDOW SHAPE | Advanced Selection | ADVANCED WINDOW SHAPE SETUP Dialog Box
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Low Pass | Range Setup | RANGE SETUP Time Low Pass | Window Shape | WINDOW SHAPE | Advanced Selection | ADVANCED WINDOW SHAPE SETUP Dialog Box



1. ADVANCED WINDOW SETUP – Advanced Window Shape dialog box for Kaiser-Bessel at left.	2. ADVANCED WINDOW SETUP – Advanced Window Shape dialog box for Dolph-Chebyshev at right.

Figure 14-39. ADVANCED WINDOW SHAPE SETUP Dialog Box

Instructions

The Advanced Window Shape area provides the option to select Kaiser-Bessel or Dolph-Chebyshev window shapes.

Note	If a lower side-lobe window is used, a wider gate must be used. If a higher side-lobe window is used, a narrower gate must be used.

1. Select Kaiser-Bessel to enter a Kaiser-Bessel Beta value:
   - Use the up/down arrows to select a pre-defined value, or enter a custom value.
   - Note that the input value must be ≥ 0 (greater than or equal to zero).
2. Select Dolph-Chebyshev to enter a Side-Lobe Level (dB) value:
   - Use the up/down arrows to select a pre-defined value, or enter a custom value.
   - Note that the input value must be 0 ≥ Level ≥ 200 (greater than or equal to zero and less than or equal to 200).
3. Click Apply to set the changes.
   - If you click Close without clicking the Apply button, any dialog box changes are discarded and the prior window shape state is retained.
4. Click Close to close the dialog box and return to the ADVANCED WINDOW SHAPE SETUP dialog box.
   - "ADVANCED WINDOW SHAPE SETUP Dialog Box" on page 14-69

GATE SETUP Menu

Prerequisites

- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass.
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep set such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- "DOMAIN Frequency with Time Gate Menu" on page 14-50
- "DOMAIN Time Low Pass Menu" on page 14-51
- "DOMAIN Time Band Pass Menu" on page 14-53

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with Time Gate | Gate Setup | GATE SETUP
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass | Gate Setup | GATE SETUP
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Low Pass | Gate Setup | GATE SETUP

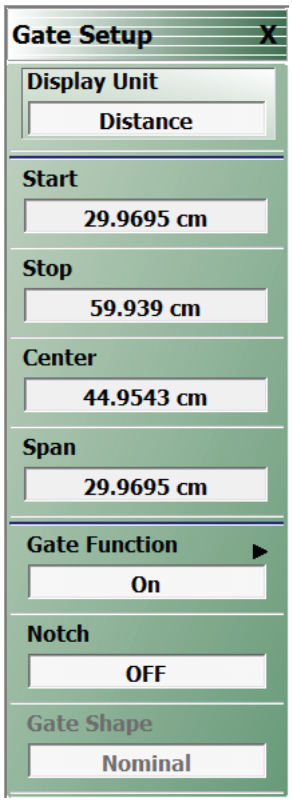


Figure 14-40. GATE SETUP Menu

GATE SETUP Menu Button Units

The units of the GATE SETUP menu and its Start, Stop, Center, and Span buttons change between Distance or Time, depending on the setting of the Display Unit toggle button. This button is shared by the GATE SETUP and the RANGE SETUP menus. The GATE SETUP (Distance) menu is shown at left.

- See the RANGE SETUP menu above for an example of time setup values in a menu.
- "RANGE SETUP Frequency with Time Gate Menu" on page 14-58

Display Unit

The RANGE SETUP and the GATE SETUP menus use the same Display Unit button setting. Changing the Display Unit setting on one menu changes the other menu setting to an identical setting.

Select toggles between distance and time. When toggled to Distance, the Start, Stop, Center, and Span button fields show distance values as described in the buttons below.

Start

If the Display Unit toggle button is set to distance, select displays the Start (Distance) toolbar.

If the Display Unit toggle button is set to time, select displays the Start (Time) toolbar.

Stop

Select either displays the Stop (Distance) or Stop (Time) toolbar.

Center

Select either displays the Center (Distance) or Center (Time) toolbar.

Span

Select either the Span (Distance) or Span (Time) toolbar.

Gate Function (Off/On)

Select displays the GATE FUNCTION menu.

- "GATE FUNCTION Menu" on page 14-74

Notch (Off/On)

Select toggles notch between off and on.

Gate Shape

Read-only display of the Gate Slope setting.

GATE FUNCTION Menu

Prerequisites

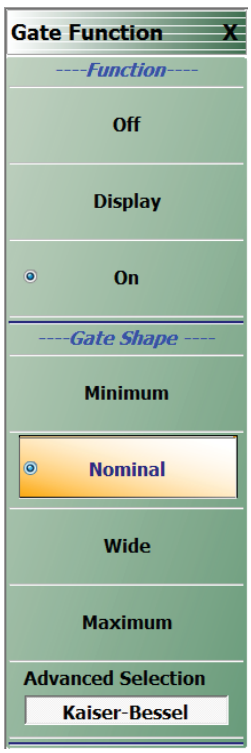
- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass.
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep set such as:
  - Start Frequency = 10 MHz
  - Stop Frequency = 50 MHz
  - # of Points = 5 points
- FREQUENCY Menus
  - "Frequency Menu for Frequency-Based Segmented Sweep Mode" on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- "GATE SETUP Menu" on page 14-71

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Frequency with Time Gate | Gate Setup | GATE SETUP | Gate Function | GATE FUNCTION
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass | Gate Setup | GATE SETUP | Gate Function | GATE FUNCTION
- MAIN | Display | DISPLAY | Domain | DOMAIN Time Low Pass | Gate Setup | GATE SETUP | Gate Function | GATE FUNCTION



—Function—

Off

Select turns OFF gate function on the active trace.

Display

Select displays gate function on the active trace

On

Select turns ON gate function on the active trace.

—Gate Shape—

Minimum

Select sets gate function to its minimum setting.

Nominal

Select sets gate function to its nominal setting.

Wide

Select sets gate function to its widest setting.

Figure 14-41. GATE FUNCTION Menu (1 of 2)

	Maximum Select sets gate function to its maximum setting. **Advanced Selection** Select displays the ADVANCED GATE (SHAPE) SETUP dialog box which allows selection either of a Kaiser-Bessel or Dolph-Chebyshev shaped gate. Each gate option allows selectable parameters. • "ADVANCED GATE SHAPE SETUP Dialog Box" on page 14-76

Figure 14-41. GATE FUNCTION Menu (2 of 2)

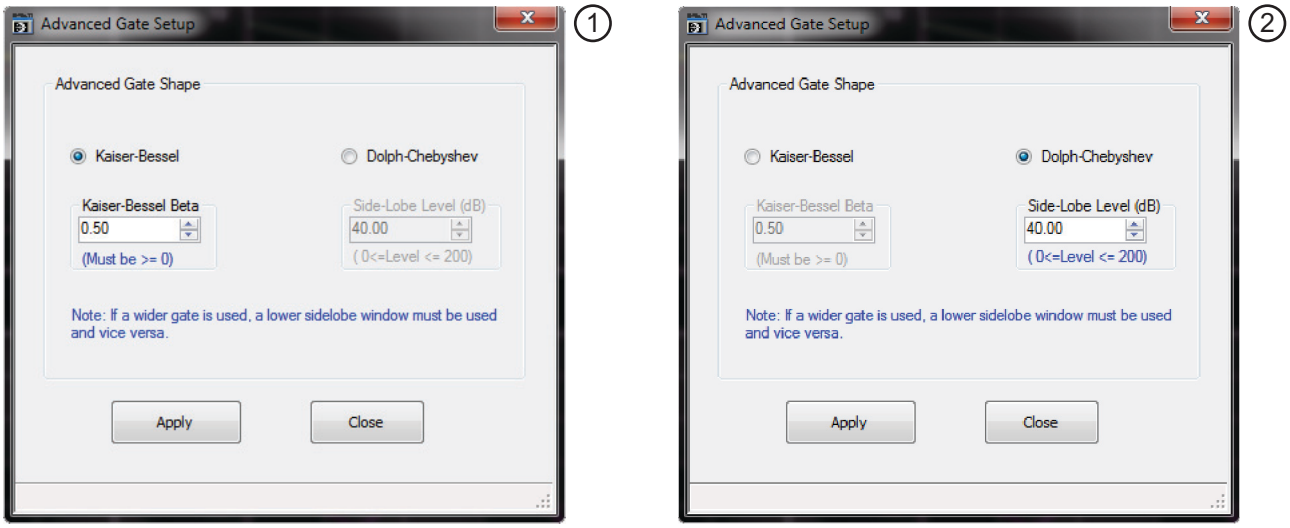
ADVANCED GATE SHAPE SETUP Dialog Box

Previous

- "GATE FUNCTION Menu" on page 14-74

Navigation

- MAIN | Display | DISPLAY | Domain | TIME DOMAIN | Gate Setup | GATE SETUP | Gate Function | GATE FUNCTION | Advanced Selection | ADVANCED GATE (SHAPE) SETUP Dialog Box



1. ADVANCED WINDOW SETUP – Advanced Gate Shape dialog box for Kaiser-Bessel at left.	2. ADVANCED WINDOW SETUP – Advanced Gate Shape dialog box for Dolph-Chebyshev at right.

Figure 14-42. ADVANCED GATE SHAPE SETUP Dialog Box

Instructions

The Advanced Gate Shape area provides a two-button selection group (Kaiser-Bessel or Dolph-Chebyshev) where the selection of one button deselects the other button. If selected, each button provides an additional configuration parameter.

Note	If a lower side-lobe window is used, a wider gate must be used. If a higher side-lobe window is used, a narrower gate must be used.

1. Make a selection of one of the two available choices.
   - Kaiser-Bessel, shown at left at #1 in Figure 14-42 above.
   - Dolph-Chebyshev, shown at right at #2 in Figure 14-42 above.
2. If Kaiser-Bessel is selected, the Kaiser-Bessel Beta area below the button becomes available.
   - Either use the up/down arrows to select a pre-defined value, or enter a value from the keyboard.
   - Note that the input value must be ≥ 0 (greater than or equal to zero).
3. If Dolph-Chebyshev is selected, the Side-Lobe Level (dB) area button becomes available.
   - Either use the up/down arrows to select a pre-defined value, or enter a value from the keyboard.
   - Note that the input value must be 0 ≥ Level ≥ 200 (greater than or equal to zero and less than or equal to 200).

4. Click Apply to set the changes.
    - If you click Close without clicking the Apply button, any dialog box changes are discarded and the prior window shape state is retained.
5. Click Close to close the dialog box and return to the ADVANCED GATE (SHAPE) SETUP dialog box.

14-12 Inter- and Intra-Trace Math and Operand Setup Menus

INTER-TRACE MATH Menu

This menu allows operand setting and then mathematical comparisons between a user-defined trace 1 (one) and trace 2 (two). The two traces' values can be added together, subtracted from each other, multiplied, or divided. If using Equation Editor, multiple traces can be operated upon.

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Inter-Trace Math | INTER-TRACE MATH

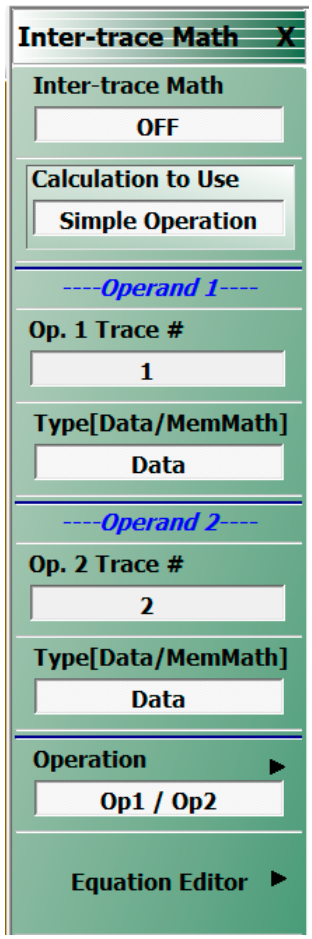


Figure 14-43. INTER-TRACE MATH Menu

Inter-Trace Math (Off/On)

Toggles Inter-Trace Math off and on.

Calculation to Use

Allows toggling between using the Simple Operation (default) or the Equation Editor function (defined by equation editor at bottom of menu).

Operand 1 Area

Op. 1 Trace

Operand 1 Trace Number. Select displays the Op 1 Trace # field toolbar which allows selection of the trace number of trace math operand 1 (one).

(Op. 1) Type (Data/MemMath)

The Operand 1 Type toggle button switches between DataMemMath and Data for Operand 1.

Operand 2 Area

Op. 2 Trace

Operand 2 Trace Number. Select displays the Op 2 Trace # field toolbar which allows selection of the trace number of trace math operand 2 (two).

(Op. 2) Type (Data/MemMath)

The Operand 2 Type toggle button switches between DataMemMath and Data for Operand 2.

Operation Area

Operation

Select displays the INTRA TRACE OP. menu.

- “INTRA TRACE OP. Menu” on page 14-80

INTRA TRACE OP. Menu

Full Name

- INTRA-TRACE OPERAND Menu

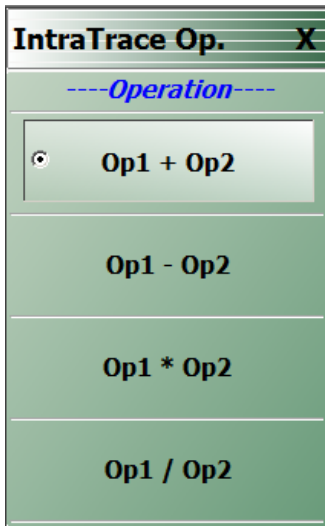
The menu provides mathematical operations between the values on two separate traces.

Previous

- "INTER-TRACE MATH Menu" on page 14-78

Navigation

- MAIN | Display | DISPLAY | Inter-trace Math | INTER-TRACE MATH | Operation | INTRA-TRACE OP



See below for button function descriptions.

Figure 14-44. INTRA-TRACE OP. (INTRA TRACE OPERAND) Menu

INTRA TRACE OP. Menu Button Selection Group

The four (4) buttons of the INTRA TRACE OPERATIONS menu form a button selection group where the selection of any one (1) button de-selects the other three (3) buttons.

Operation Area

Op1 + Op2 (Operand Plus)

The trace value assigned to Operand 1 is added to the trace value assigned to Operand 2.

Op1 – Op2 (Operand Subtraction)

The trace value assigned to Operand 2 is subtracted from the trace value assigned to Operand 1.

Op1 * Op2 (Operand Multiplication)

The trace value assigned to Operand 1 is multiplied times the trace value assigned to Operand 2.

Op1 / Op2 (Operand Division)

The trace value assigned to Operand 1 is divided by the trace value assigned to Operand 2.

EQUATION EDITOR Dialog Box

The EQUATION EDITOR allows a much more complete set of operations between trace data sets (and S-parameter sets) than does the Simple Operation inter-trace math. The main dialog is shown in Figure 14-45 and consists of a selection of functions, input variables (traces and S-parameters in various formats) and scalar entry along with some editing tools.

A central concept is that the entire equation is based on complex vectors of length equal to the number of points. Scalars (real or complex) can be used throughout but, where necessary, will be automatically vectorized (same value at each position in a vector of length equal to the number of points).

Previous

- "INTER-TRACE MATH Menu" on page 14-78

Navigation

- MAIN | Display | DISPLAY | Inter-Trace Math | INTER-TRACE MATH | Equation Editor | EQUATION EDITOR FOR TRx Dialog Box

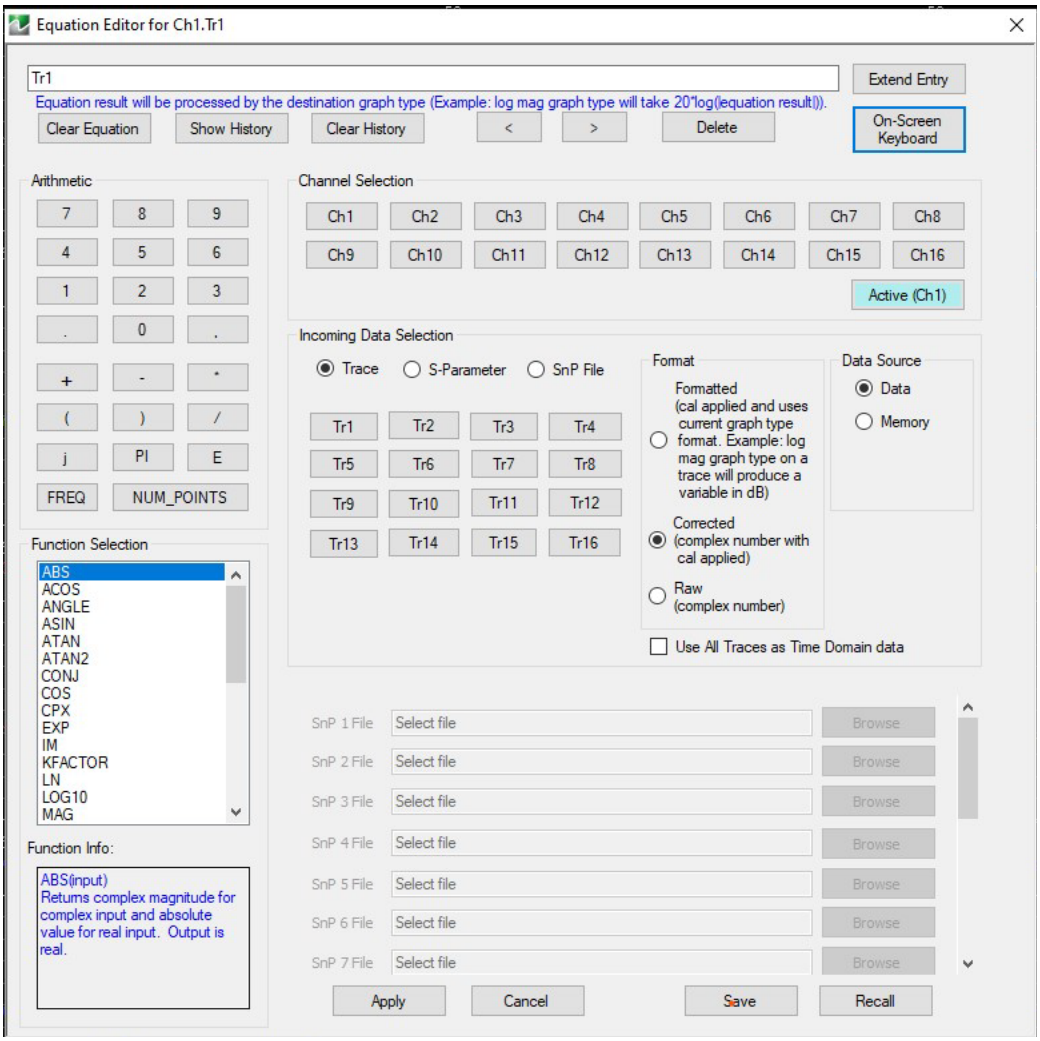


Figure 14-45. Inter-Trace Math Equation Editor

Note	Syntax errors will be flagged if parentheses are not used to resolve precedence problems (e.g., Tr1 * –T2 will not be accepted, but Tr1 * (–Tr2) will be).

Equation Editor Contents:

Clear Equation Button

- Clears equation entry bar above.

Show History Button

- Clicking button opens window showing equation history (equation controls are hidden). Clicking again returns user to equation controls.

Clear History Button

- Clears equation history.

< and > Buttons

- Moves the cursor either left or right within the equation entry bar.

Extend Entry Button

- Clicking Extend Entry opens a larger text edit field for directly typing in longer or more complex equations.

Function Selection Area

Following are descriptions of the functions supported (the output of the function is complex unless otherwise noted).

- ABS() – Complex magnitude for complex input and absolute value for real input. Output is real.
- ACOS() – Arccosine, radian output. This will accept complex arguments and uses the standard branch cut.
- ANGLE() – Phase of complex input; radian output. Output is real.
- ASIN() – Arcsine, radian output. This will accept complex arguments and uses the standard branch cut.
- ATAN() – Arctangent, radian output. This will accept complex arguments and uses the standard branch cut.
- ATAN2() – Arctangent with the ability to properly resolve quadrants. The argument is complex and it is internally split into real and imaginary components with sign checking. Radian output
- CONJ() – Conjugate
- COS() – Cosine, radian input. Note that this function will accept complex inputs and treat them as such. Commonly one would use this function only with a formatted trace set up for phase and then multiplied by pi/180 to convert to radians.
- CPX(a,b) – Complex equivalent taking two real inputs; output is a+jb. If the inputs are complex, the real part of each is taken prior to combination into a new complex variable.
- EXP() – Exponential
- IM() – Imaginary part of a complex input. Output is real.
- KFACTOR() – Stability factor accepting four complex inputs (generally representing S11, S12, S21, and S22).

- KFACTOR(Tr1,Tr2,Tr3,Tr4) produces:

$$\frac{1-|Tr1|^2-|Tr4|^2+|Tr1\cdot Tr4-Tr2\cdot Tr3|^2}{2|Tr2\cdot Tr3|}$$

Output is real.

Equation 14-1.

- LN() – Natural log; standard branch cut
- LOG10() – Log base 10; standard branch cut
- MAG() – Magnitude accepting complex input (same as ABS). Output is real.
- MAX() – Maximum value of the MAGNITUDE of the variable selected. (Note that this updates only after a sweep completes so there may be a one sweep delay until the value propagates to a plotted equation). Output is real.
- MAX_HOLD() Accumulates maximum value of the MAGNITUDE of the argument sweep-to-sweep. The process is reset by clearing the equation or turning inter-trace math off. (Note that this updates only after a sweep completes so there may be a one sweep delay until the value propagates to a plotted equation). Output is real.
- MEAN() – Average value in a complex sense; (Note that this updates only after a sweep completes so there may be a one sweep delay until the value propagates to a plotted equation)
- MEDIAN() – Median value of the MAGNITUDE of the argument; (Note that this updates only after a sweep completes so there may be a one sweep delay until the value propagates to a plotted equation). Output is real.
- MIN() – Minimum value of the MAGNITUDE of the argument; (Note that this updates only after a sweep completes so there may be a one sweep delay until the value propagates to a plotted equation). Output is real.
- MIN_HOLD() – Accumulates maximum value of the MAGNITUDE of the argument sweep-to-sweep. The process is reset by clearing the equation or turning inter-trace math off. (Note that this updates only after a sweep completes so there may be a one sweep delay until the value propagates to a plotted equation). Output is real.
- MRKX() – Readout of active maker on entered trace, x-value. If no marker is on, a 0 will be returned. If more than one marker is on, the active marker will be used. Output is real. Since this function relies on a trace marker value, the argument can be ONLY a trace and not a function involving a trace.
- MRKY() – Readout of active maker on entered trace, y-value. If no marker is on, a 0 will be returned. If more than one marker is on, the active marker will be used. Since this function relies on a trace marker value, the argument can be ONLY a trace and not a function involving a trace.
- MU: mu stability factor accepting 4 complex inputs (generally representing S11, S12, S21, and S22).
  - MU(Tr1,Tr2,Tr3,Tr4) produces:

$$\frac{1-|Tr1|^2}{|Tr1-Tr4^*(Tr1\cdot Tr4-Tr2\cdot Tr3)|+|Tr2\cdot Tr3|}$$

(where the * denotes conjugate)

Output is real.

Equation 14-2.

- PHASE() – Same as ANGLE but degree output. Output is real.
- POW(z,n) – Raises a complex variable z to the nth power. n is a scalar.
- RE() – Returns real part of a complex input. Output is real.

- REWRAP() – Rewraps phase of a complex variable when range was truncated (often by a power function). The calculation is based on slope of low frequency data.
- SDEV() – Standard deviation of input data. This is evaluated only at sweep completion so there may be a one sweep delay for values to propagate to a displayed equation.
    - This calculation is based on the equation below where N is the number of points. Output is real.

$$SDEV = \sqrt{\frac{\sum_{k=1}^{N} |y_k - MEAN|^2}{N-1}}$$

Equation 14-3.

- SIN() – Sine; (Note that this function will accept complex inputs and treat them as such). Commonly one would use this function only with a formatted trace set up for phase and then multiplied by pi/180 to convert to radians.
- SQRT() – Square root; standard branch cut
- TAN() – Tangent. (Note that this function will accept complex inputs and treat them as such). Commonly one would use this function only with a formatted trace set up for phase and then multiplied by pi/180 to convert to radians.
- XAXISARRAY() – Generates the vector corresponding to the current sweep variable. Output is real.

Channel Selection Area

Data (and memory and processed results) from other channels may be used in the calculation for the active channel. Specified parameters from the highlighted channel will be used in the equation. All channels being used are required to have the same number of sweep points. Default selection is Active channel.

Trace Selection Area

Format

- **Formatted**

  If Formatted is selected, the current graph type format will be used so the vector may be purely real.

- **Raw and Corrected**

  If the trace selection format is selected as Raw or Corrected, the variable will enter the equation as a linear complex number (either with or without calibration applied; Note that receiver calibrations are applied to all).

Data Source Selections

- **Data –** Current trace data.
- **Memory –** Data stored in trace memory.

Trace Radio Button

- Select enables buttons for selection of traces Tr1 through Tr16:

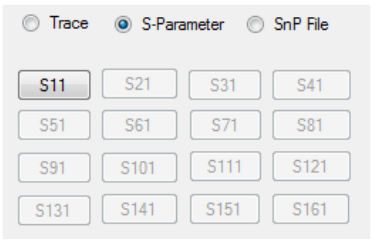
S-Parameter Radio Button (MS46122AB, MS46322AB)

- Select enables buttons for selection of S-parameters:

S-Parameter Radio Button (MS46121AB)

Note	S-parameter selection can be used for up to a maximum of four MS46121s.

- Select enables buttons for selection of S-parameters:



- The available S-parameters for each channel depend on the number of MS46121s connected and whether the MS46121 has been equipped with Option 021. That is, the S-parameter selection will show what is available on the RESPONSE menu (this changes based on the number of MS46121s connected to the PC). The number of MS46121s connected determines how many channels are present.

  When multiple one-port instruments are connected, all channel frequency plans must be identical for scalar transmission measurements to function properly

- For example, without the scalar transmission option (Option 021):

  With one MS46121: S11.

  With two MS46121s: S11 in channel 1, S22 in channel 2.

  With three MS46121s: S11 in channel 1, S22 in channel 2, S33 in channel 3.

  With four MS46121s: S11 in channel 1, S22 in channel 2, S33 in channel 3, S44 in channel 4.

- With the scalar transmission option (Option 021):

  With one MS46121: S11.

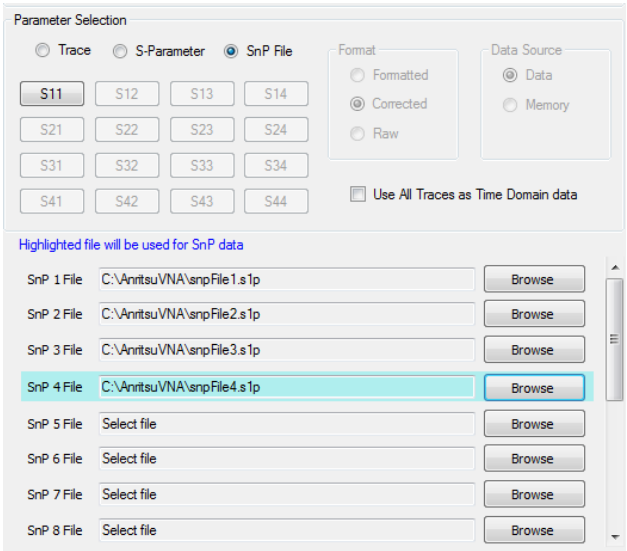
  With two MS46121s: S11, S21 in channel 1;. S22, S12 in channel 2.

  With three MS46121s: S11, S21, S31 in channel 1; S22, S12, S13 in channel 2; S33, S13, S23 in channel 3.

  With four MS46121s: S11, S21, S31, S41 in channel 1;. S22, S12, S32, S42 in channel 2; S33, S13, S23, S43 in channel 3; S44, S14, S24, S34 in channel 4.

SnP File Radio Button

- Select enables fields for browsing to and selecting .sNp files. The highlighted file will be used for SnP data. A maximum of 16 .sNp files can be loaded; they are shared per system.



Arithmetic Keypad Area

- Constant ***π*** (PI) is available and the '**j**' button is used for entering complex scalars. The scientific notation exponent marker '**E**' is also available (e.g., 1E9 for 1,000,000,000).

Use All Traces as Time Domain Data

- If the time domain checkbox is selected, all traces and parameters will be processed into time domain in the background if they are not already displayed that way. Lowpass Processing will be used if the current frequency list supports it, but otherwise Bandpass Process will be used. Trace time domain parameters will be used which may be at default if not already configured. It is recommended to configure desired variables in time domain so the results are predictable. See the *Measurement Guide* (10410-00218) for more information.

Save Equation

- Saves existing equation to a designated location as a .eqn file.

Recall Equation

- Recalls an existing equation .eqn file from its saved location.

Note	Trace memory and trace math can be used as the incoming variables.

CONVERSION Menu

Previous

- “TRACE FORMAT Menu” on page 14-8

Navigation

- MAIN | Display | DISPLAY | Conversion | CONVERSION |

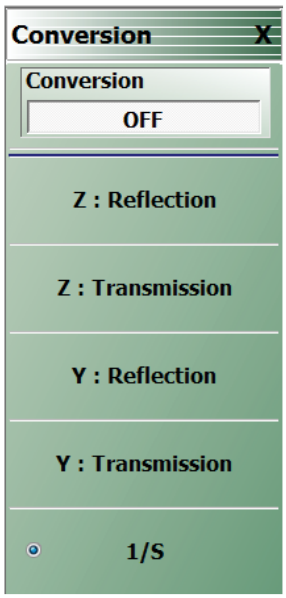


Figure 14-46. Conversion Menu

Conversion (Off/On)

Select toggles conversion OFF and ON.

CONVERSION Menu Reflection/Transmission Button Selection Group

The five (5) reflection, transmission, and 1/S buttons form a button selection group where the selection of any one button de-selects the other four buttons.

Z: Reflection

Select Z: Reflection de-selects the Z: Transmission, Y: Reflection, and 1/S buttons.

Z: Transmission

Select de-selects the Z: Reflection, Y: Reflection, and 1/S buttons.

Y: Reflection

Select Y: Reflection de-selects the Z: Reflection, Z: Transmission, and 1/S buttons.

Y: Transmission

Select Y: Transmission de-selects the Z: Reflection, Z: Transmission, and 1/S buttons.

1/S (One Divided By S)

Select 1/S (One/S) de-selects the Z: Reflection, Z: Transmission, Y: Reflection, and the Z: Transmission buttons.

14-13 Display Area Setup Menu

DISPLAY AREA SETUP Menu

This menu allows the display area to be customized.

Previous

- "DISPLAY Menu" on page 14-3

Navigation

- MAIN | Display | DISPLAY | Display Area Setup | DISPLAY SETUP

Figure 14-47. DISPLAY SETUP Menu

Edit Chan. Title

Select displays the channel title field toolbar which allows entry of a custom title.

Channel Title

Toggles the channel title display ON or OFF.

X-Axis Labels

Toggles the trace X-axis labels ON or OFF.

X-Axis Time (CW Only)

Toggles the trace X-axis time labels ON or OFF. When the X-Axis Time (CW Only) button is ON and CW mode is set, the Bandwidth, Notch, and Search Range buttons are disabled in the ADVANCED SEARCH menu, and the X-axis will be in units of time. When data is saved in .txt, .csv, .tdf, or .tdu formats, time units will be shown instead of frequencies.

All X-Axis Labels

Toggles the trace X-axis labels ON or OFF.

All Chan. Freq Label

All Channel Frequency Label button. Select toggles the frequency labels for all channels OFF and ON. The frequency labels appear at the bottom of each channel display. When ON, the labels typically show starting and stopping frequencies and IFBW settings. When OFF, the frequency labels are removed.

Edit Alternate Trace Name

Select displays the alternate trace name field toolbar, which allows entry of a custom trace name.

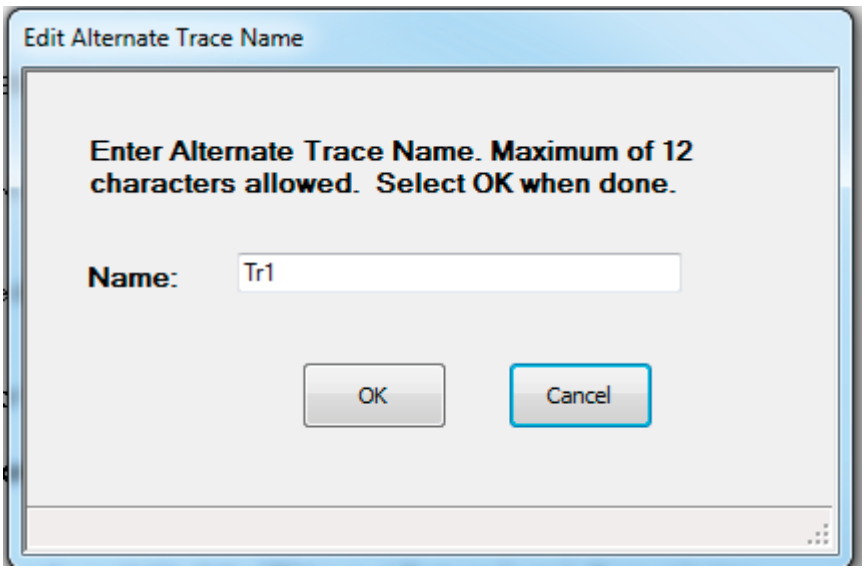


Figure 14-48. EDIT TRACE NAME Dialog

Alternate Trace Name

Toggles the alternate trace name display ON or OFF.

Chapter 15 — Scale Menus

15-1 Chapter Overview

This chapter provides information about the button controls for the SCALE menu variants. SCALE menus provide trace display control of settings such as resolution, reference value, and the scale of units. The number of buttons on a SCALE menu depends on the settings on the TRACE FORMAT menu.

The bottom three (3) buttons on the SCALE menu, always the same, apply settings to the active trace, and also control of the number of display vertical divisions.

15-2 Scale Menus Appearance, Common Buttons, and Units

Appearance

The appearance of the SCALE menu label buttons, their units, and the menu area names change depending on the trace type selected in the TRACE FORMAT menu.

- "Trace Display Layout" on page 12-4
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT

Common SCALE Menu Buttons

In all SCALE menus, the bottom three (3) buttons on the SCALE menu are always the same and described at the end of this section. The five common buttons are:

- Auto Scale Active Trace
- Auto Scale Active Channel
- Auto Scale All Channels
- # of Vert. Divisions
- Apply # of Div. to All Channels

The description of these buttons is found at:

- Section 15-12 "Scale Menu Common Buttons" on page 15-35

SCALE Menu Units

The table below summarizes the displayed fields and units available in the SCALE menu variants.

Table 15-1. SCALE Menu Parameter Buttons (1 of 2)

Scale	Resolution Button and Field Toolbar	Reference Value Button and Field Toolbar	Reference Position Button and Field Toolbar	Wrap Offset Button and Field Toolbar	Aperture Button and Field Toolbar	Auto Scale Active Trace Button	Auto Scale All Traces Button	# of Vert Div. Button and Field Toolbar
Notes	**YES** – The button or link to submenu APPEARS on the menu. **NO** – The button DOES NOT APPEAR on the menu **#** – A number without units is entered. **NA** – The button appears on the menu but is not available (is grayed out). **Time Units** – The available time units are **s** (seconds), **ms** (milliseconds), **us** (microseconds), **ns** (nanoseconds, and **ps** (picoseconds). **Dual Entries** – Table cells with dual entries are for SCALE menus that have separate controls for dual displays with upper and lower traces. For example, the SCALE menu for Log Mag and Phase, a dual display, has an upper menu area titled Log Mag with these buttons: Resolution (dB/Division), Reference Value (dB), and Reference Position (Number). The lower menu area is titled Phase with these buttons: Resolution (Deg/Division), Reference Value (dB), Reference Position (Number), and Wrap Offset (Deg)							
Log Mag	dB/Division	# dB	#	NO	NO	YES	YES	#
Lin Mag	Units/Division	# Units	#	NO	NO	YES	YES	#
Phase	Deg/Division	# Deg	#	NO	NO	YES	YES	#
Real	Units/Division	# Units	#	NO	NO	YES	YES	#
Imaginary	Units/Division	# Units	#	NO	NO	YES	YES	#
VSWR	Units/Division	# Units	#	NO	NO	YES	YES	#
Impedance: Real	Ohms/Division	# Ohms	#	NO	NO	YES	YES	#
Impedance: Imaginary	Ohms/Division	# Ohms	#	NO	NO	YES	YES	#
Impedance: Magnitude	Ohms/Division	# Ohms	#	NO	NO	YES	YES	#
Impedance: Real & Imaginary (dual display)	Ohms/Division Ohms/Division	# Ohms # Ohms	# #	NO NO	NO NO	YES	YES	#
Smith Chart Impedance: Lin/Phase, Log/Phase, Real/Imaginary, Impedance	NA	NA	NA	# Deg	NO	YES	YES	#
Linear Polar: Lin/Phase, Real/Imag	Units/Division	# Units	NA	Deg	NO	YES	YES	#
Log Polar: Log/Phase and Real/Imag	Units/Division	# Units	NA	Deg	NO	YES	YES	#
Log Mag and Phase (dual display)	dB/Division Deg/Division	# dB # Deg	# #	NO # Deg	NO	YES	YES	#

Table 15-1. SCALE Menu Parameter Buttons (2 of 2)

Scale	Resolution Button and Field Toolbar	Reference Value Button and Field Toolbar	Reference Position Button and Field Toolbar	Wrap Offset Button and Field Toolbar	Aperture Button and Field Toolbar	Auto Scale Active Trace Button	Auto Scale All Traces Button	# of Vert Div. Button and Field Toolbar
Notes	**YES** – The button or link to submenu APPEARS on the menu. **NO** – The button DOES NOT APPEAR on the menu **#** – A number without units is entered. **NA** – The button appears on the menu but is not available (is grayed out). **Time Units** – The available time units are **s** (seconds), **ms** (milliseconds), **us** (microseconds), **ns** (nanoseconds, and **ps** (picoseconds). **Dual Entries** – Table cells with dual entries are for SCALE menus that have separate controls for dual displays with upper and lower traces. For example, the SCALE menu for Log Mag and Phase, a dual display, has an upper menu area titled Log Mag with these buttons: Resolution (dB/Division), Reference Value (dB), and Reference Position (Number). The lower menu area is titled Phase with these buttons: Resolution (Deg/Division), Reference Value (dB), Reference Position (Number), and Wrap Offset (Deg)							
Linear Mag and Phase (dual display)	dB/Division Deg/Division	# dB # Deg	# #	NO # Deg	NO	YES	YES	#
Real and Imaginary (dual display)	Units/Division Units/Division	# Units # Units	# #	NO	NO	YES	YES	#
Group Delay	Time/Division	Time Units	#	NO	% of Sweep	YES	YES	#

15-3 Overview of Scale Menu Variants

All SCALE menu variants are shown in the sections and links below:

- "Scale Magnitude Menus" on page 15-5
  - "SCALE Log Magnitude Menu" on page 15-5
  - "SCALE Linear Magnitude Menu" on page 15-6
- "Scale Phase Menu" on page 15-8
  - "SCALE Phase Menu" on page 15-8
- "Scale Real or Imaginary Menus" on page 15-10
  - "SCALE Real Magnitude Menu" on page 15-10
  - "SCALE Imaginary Menu" on page 15-11
- "Scale SWR Menu" on page 15-12
  - "SCALE Standing Wave Ratio Menu" on page 15-12
- "Scale Smith Chart Menus" on page 15-13
  - "SCALE Smith Chart Impedance Menu" on page 15-13
- "Scale Smith Chart Menus" on page 15-13
  - "SCALE Smith Chart Impedance Menu" on page 15-13
- "Scale Menu Common Buttons" on page 15-35

15-4 Scale Magnitude Menus

SCALE Log Magnitude Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu.
- Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

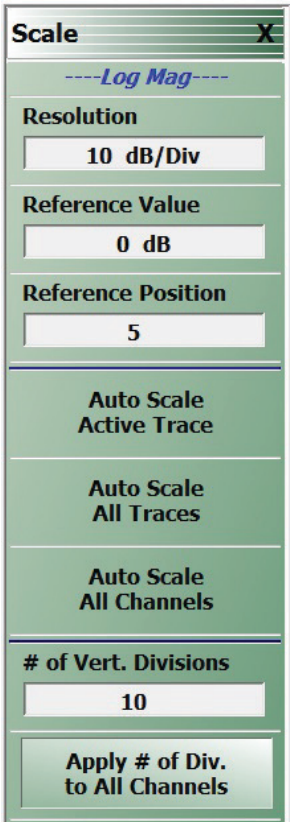
- TRACE FORMAT is set to Log Mag
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Log Mag

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Log Magnitude) Menu

This menu is available when TRACE FORMAT is set to Log Magnitude. Button units are set to:

- Button Units: dB

Resolution

Select displays the Resolution (dB) toolbar with units in dB per division.

Reference Value

Select displays the Reference Value toolbar.

Reference Position

Select displays the Reference Position toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-1. SCALE Log Magnitude Menu

SCALE Linear Magnitude Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

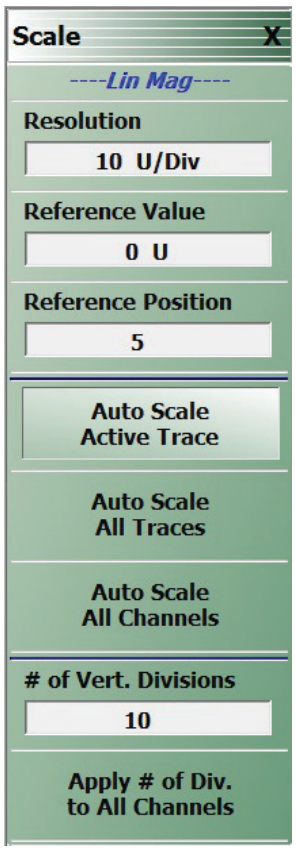
- TRACE FORMAT is set to Lin Mag
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Lin Mag

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Linear Magnitude) Menu

This menu is available when TRACE FORMAT is set to Linear Magnitude. Button units are set to:

- Button Units: U (Units)

Resolution

Select displays the Resolution (Units/Division) toolbar with units of units per division.

Reference Value

Select displays the Reference Value (Units) toolbar.

Reference Position (Number)

Select displays the Reference Position toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-2. SCALE Linear Magnitude Menu

SCALE kQ Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

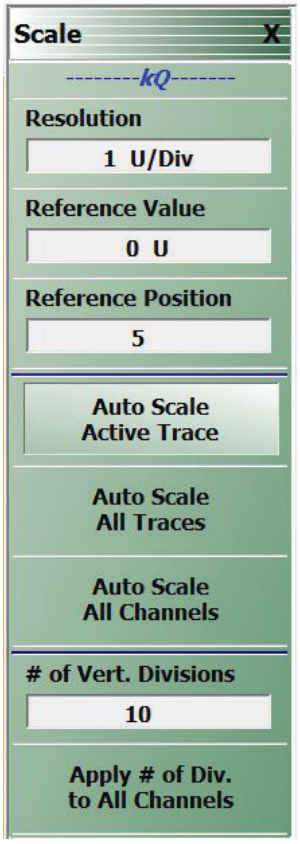
- TRACE FORMAT is set to kQ
- MAIN | Response | RESPONCE | Max Efficiency
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | kQ

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE Menu

This menu is available when TRACE FORMAT is set to kQ.

Resolution

Select displays the Resolution (Units/Division) toolbar with units of units per division.

Reference Value

Select displays the Reference Value (Units) toolbar.

Reference Position (Number)

Select displays the Reference Position toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-3. SCALE kQ Menu

15-5 Scale Phase Menu

SCALE Phase Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

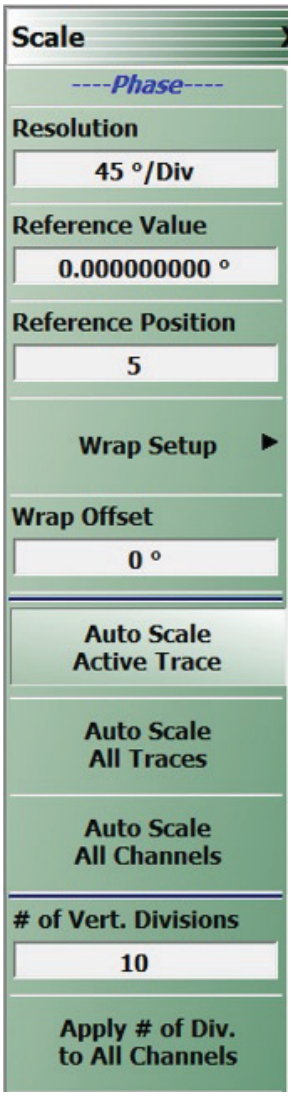
- TRACE FORMAT is set to Phase
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Phase

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Phase) Menu

This menu is available when TRACE FORMAT is set to Phase. Button units are set to:

- Button Units: ° (Degrees)

Resolution

Select displays the Resolution (Degrees/Division) toolbar with units in degrees per division.

Reference Value (Degrees)

Select displays the Reference Value (Degrees) toolbar.

Reference Position (Number)

Select displays the Reference Position toolbar.

Wrap Setup

Select opens the WRAP SETUP menu.

- "WRAP Setup Menu" on page 15-22

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-4. SCALE Phase Menu

15-6 Scale Real or Imaginary Menus

SCALE Real Magnitude Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

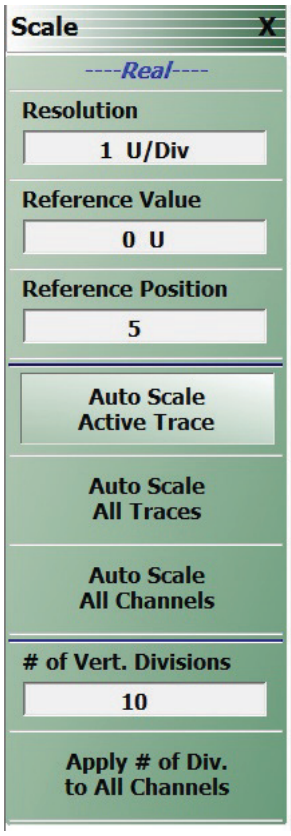
- TRACE FORMAT is set to Real
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Real

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE Menu

This menu is available when TRACE FORMAT is set to Real. Button units are set to:

- Button Units: U (Units)

Resolution

Select displays the Resolution (Units/Division) toolbar with units of units per division.

Reference Value (Units)

Select displays the Reference Value (Units) toolbar.

Reference Position (Number)

Select displays the Reference Position toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-5. SCALE Real Menu

SCALE Imaginary Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

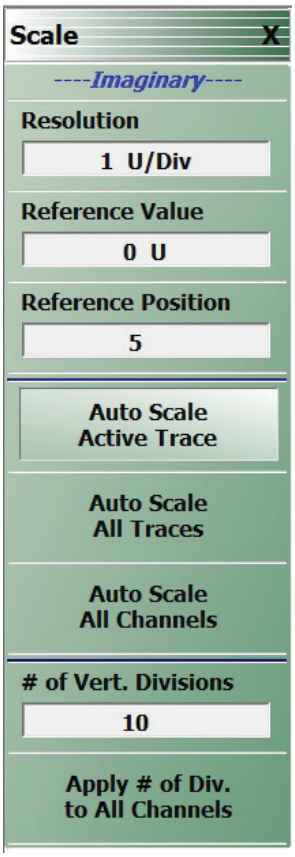
- TRACE FORMAT is set to Imaginary
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Imaginary

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Impedance Real) Menu

This menu is available when TRACE FORMAT is set to Impedance – Magnitude. Button units are set to:

- Button Units: Ω (Ohms)

Resolution

Select displays the Resolution toolbar with units of nU, uU, mU, or U units per division.

Reference Value (Units)

Select displays the Reference Value toolbar units of nU, uU, mU, or U.

Reference Position (Number)

Select displays the Reference Position toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-6. SCALE Imaginary Menu

15-7 Scale SWR Menu

SCALE Standing Wave Ratio Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

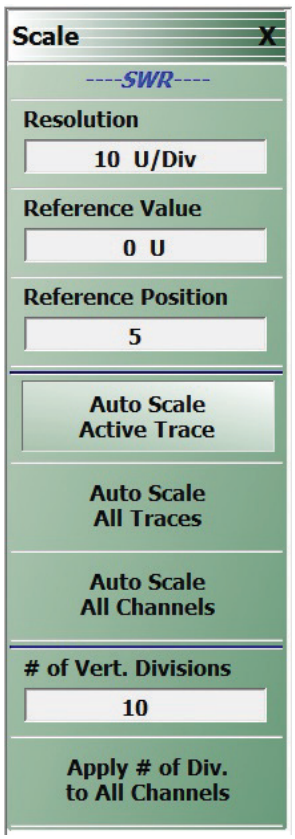
- TRACE FORMAT is set to VSWR
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | VSWR

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Standing Wave Ratio SWR) Menu

This menu is available when TRACE FORMAT is set to SWR. Button units are set to:

- Button Units: U (Units)

Resolution

Select displays the Resolution (Units/Division) toolbar with units of nU, uU, mU, or U per division.

Reference Value (Units)

Select displays the Reference Value (Units) toolbar with units of nU, uU, mU, or U.

Reference Position (Number)

Select displays the Reference Position toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-7. SCALE SWR (Standing Wave Ratio) Menu

15-8 Scale Smith Chart Menus

The SCALE menu for Smith Charts contain two unique buttons to control the display scale (Scale Selection) and control of the phase wrapping (Wrap Setup). Both are described in the sections below.

SCALE Smith Chart Impedance Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisites

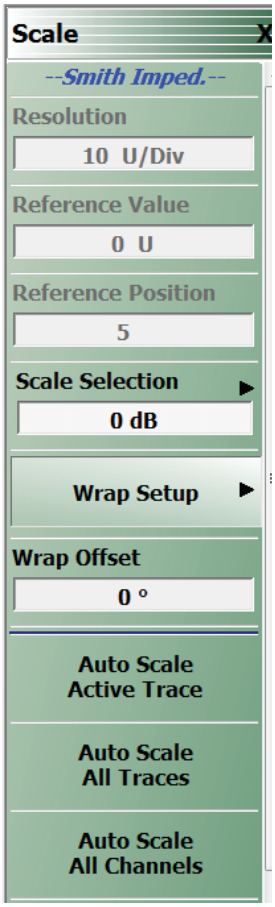
- TRACE FORMAT is set to Smith (R+jX Impedance)
  - "DISPLAY Menu" on page 14-3
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX)
- SMITH readout style is set to Linear/Phase, Log/Phase, Real/Imaginary, or Impedance
  - "SMITH IMPEDANCE Menu" on page 14-14
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX) | SMITH IMPED.

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Smith Impedance) Menu

This menu is available when TRACE FORMAT is set to:

- Smith (R+jX Impedance) and either.
- Linear/Phase, Log/Phase, Real/Imaginary, or Impedance is selected.

Reference Value

Reference Value button is unavailable.

Reference Position

Reference Position button is unavailable.

Scale Selection

The button displays the Smith Chart scale in dB. Select displays the SMITH SCALING menu.

- "SMITH SCALING Menu" on page 15-17.

Wrap Setup

Select opens the WRAP SETUP menu.

- "WRAP Setup Menu" on page 15-22

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-8. SCALE Smith Impedance Menu

SCALE Smith Chart Admittance Menu

Menu Appearance

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisites

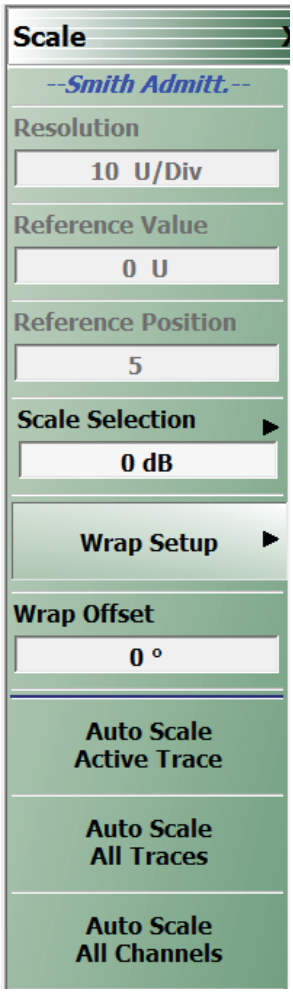
- TRACE FORMAT is set to Smith (G+jB Admittance)
  - "DISPLAY Menu" on page 14-3
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB)
- SMITH readout style is set to Linear/Phase, Log/Phase, Real/Imaginary, or Admittance
  - "SMITH IMPEDANCE Menu" on page 14-14
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB) | SMITH ADMITT.

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Smith Admittance) Menu

This menu is available when TRACE FORMAT is set to Smith (G+jB Admittance) and either Linear/Phase, Log/Phase, Real/Imaginary, or Impedance is selected. Button units are set to:

- Button Units: ° (Degrees)

Reference Value

Reference Value button is unavailable.

Reference Position

Reference Position button is unavailable.

Scale Selection

Opens the "SMITH SCALING Menu" on page 15-17.

Wrap Setup

Select displays the WRAP SETUP menu which allows the user to define if wrapping of on or off, and if on, the wrap offset in degrees.

- "WRAP Setup Menu" on page 15-22

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-9. SCALE Smith Admittance Menu

SMITH SCALING Menu

Menu Appearance

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisites

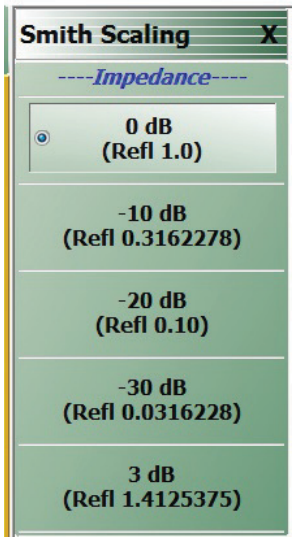
- TRACE FORMAT is set to Smith (R+jX Impedance) or Smith (G+jB Admittance)
  - "DISPLAY Menu" on page 14-3
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX)
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB)
- SMITH readout style is set to Linear/Phase, Log/Phase, Real/Imaginary, Impedance or Admittance
  - "SMITH IMPEDANCE Menu" on page 14-14
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX) | SMITH IMPED.
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB) | SMITH ADMITT.

Previous

- "SCALE Smith Chart Impedance Menu" on page 15-13
- "SCALE Smith Chart Admittance Menu" on page 15-15

Navigation

- MAIN | Scale | SCALE



SCALE Menu

This menu is available when TRACE FORMAT is set to Smith (G+jB Admittance) and either Linear/Phase, Log/Phase, Real/Imaginary, or Impedance is selected. Button units are set to:

- Button Units: º (Degrees)

0 dB (Refl 1.0)

The default Smith Chart Impedance scale is 0 dB with a reflection coefficient of 1.0.

–10 dB (Refl 0.3162278)

Expands the Smith Chart Impedance trace display and sets the scale to –10 dB with a reflection coefficient of 0.3162278.

–20 dB (Refl 0.10)

Expands the Smith Chart Impedance trace display and sets the scale to –20 dB with a reflection coefficient of 0.10.

–30 dB (Refl 0.0316228)

Expands the Smith Chart Impedance trace display and sets the scale to –30 dB with a reflection coefficient of 0.03162278.

+3 dB (Refl 1.4125375)

Compresses the Smith Chart Impedance trace display and sets the scale to +3 dB with a reflection coefficient of 1.4125375.)

Figure 15-10. SMITH SCALING Menu

15-9 Scale Polar Chart Menus

SCALE Linear Polar Chart Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisites

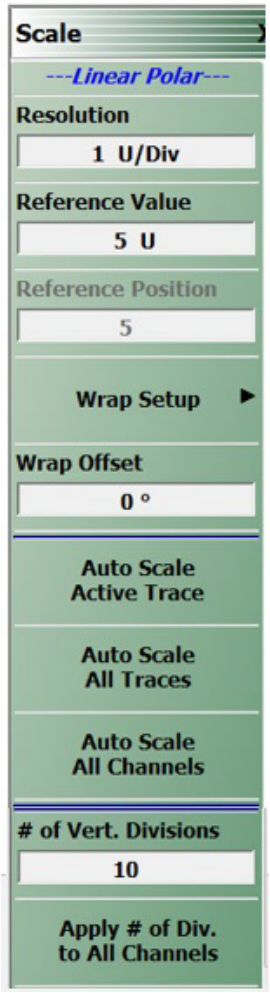
- The SCALE (Linear Polar) menu is available when TRACE FORMAT on the Display menu is set to either Linear Polar (Linear/Phase) or Linear Polar (Real/Imaginary).
- Button Units: U (Units)
- Button Units: ° (Degrees)
- The Reference Position button is unavailable.

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



Resolution (Units/Div)

Select displays the Resolution (Units/Division) toolbar with units of units per division.

Resolution (Units/Division) Field Toolbar

Reference Value (Units)

Select displays the Reference Value (Units) toolbar.

Reference Value (Units) Field Toolbar

Reference Position (Number)

The Reference Position button is unavailable.

Wrap Offset (Degrees)

Select allows the user to define the phase offset in degrees and displays the Wrap Offset field toolbar.

Wrap Offset (Degrees) Field Toolbar

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-11. SCALE Linear Polar Menu

SCALE Log Polar Chart Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisites

- The SCALE (Log Polar) menu is available when TRACE FORMAT is set to either Log Polar (Linear/Phase) or Log Polar (Real/Imaginary).
- Button Units: dB
- Button Units: ° (Degrees)

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE

Resolution (dB/Div)

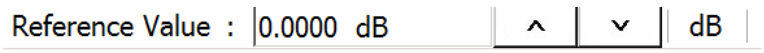
Select displays the Resolution (dB) toolbar with units in dB per division.

Resolution (dB/Division) Field Toolbar

Reference Value (dB)

Select displays the Reference Value (dB) toolbar.

Reference Value (dB) Field Toolbar



Reference Position (Number)

The Reference Position button is unavailable.

Wrap Setup

Select displays the WRAP SETUP menu which allows the user to define if wrapping of on or off, and if on, the wrap offset in degrees.

- "WRAP Setup Menu" on page 15-22

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-12. SCALE Log Polar Menu

WRAP Setup Menu

Prerequisites

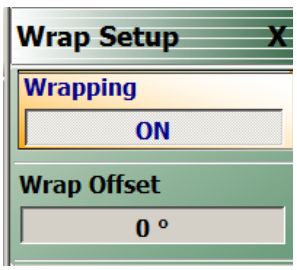
- The WRAP SETUP submenu is linked to the SCALE Smith Impedance or the SCALE Smith Admittance menus and is only available if the DISPLAY menu is set to a Smith Impedance (R+jX) or Smith Admittance (G+jB) trace display.
- "DISPLAY Menu" on page 14-3

Previous

- "SCALE Smith Chart Impedance Menu" on page 15-13
- "SCALE Smith Chart Admittance Menu" on page 15-15

Navigation

- MAIN | Scale | SCALE Smith Impedance | Wrap Setup | WRAP SETUP
- MAIN | Scale | SCALE Smith Admittance | Wrap Setup | WRAP SETUP



Wrapping (On/Off)

Select toggles Smith chart phase wrapping on and off, with the current state displayed in the button field.

Wrap Offset (Degrees)

Select displays the Wrap Offset field toolbar where the user can define the phase offset in degrees from 0 degrees to 360 degrees.

Wrap Offset (Degrees) Field Toolbar

Figure 15-13. WRAP SETUP Menu

15-10 Scale Dual-Trace Display Menus

SCALE Impedance Real and Imaginary Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

- TRACE FORMAT is set to Real&Imaginary
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Impedance | IMPEDANCE | Real&Imaginary

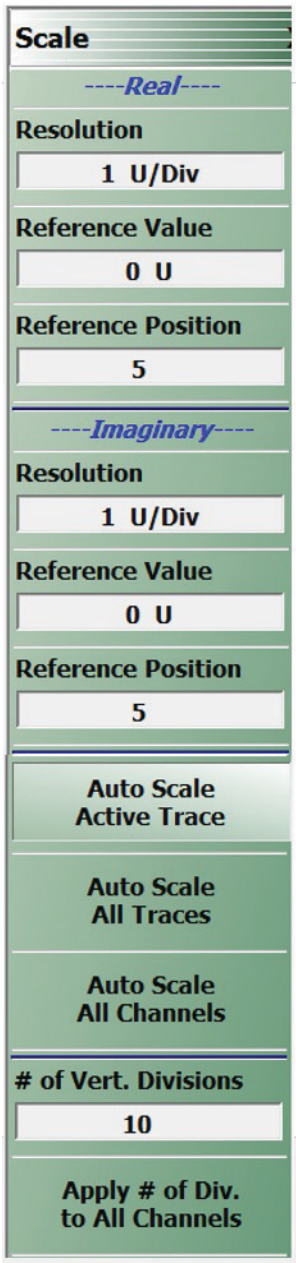
Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE

SCALE Impedance Real and Impedance Imaginary Menu



SCALE (Impedance Real and Impedance Imaginary) Menu

This menu is available when TRACE FORMAT is set to Impedance – Real & Impedance – Imaginary. There are separate button sets for Impedance-Real and Impedance-Imaginary. Button units are set to:

- Button Units: Ω (Ohms)

Resolution

Select displays the Resolution toolbar with units in Ω (Ohms) per division.

Reference Value

Select displays the Reference Value toolbar with units in Ω (Ohms).

Reference Position

Select allows the user to define a reference position and displays the Reference Position field toolbar.

Impedance Imaginary Button Set

Resolution (Ohms/Div)

Select displays the Resolution (Ohms/Division) toolbar with units in Ohms per division.

Resolution

Select displays the Resolution toolbar with units in Ω (Ohms) per division.

Reference Value

Select displays the Reference Value toolbar with units in Ω (Ohms).

Figure 15-14. SCALE Impedance Real and Impedance Imaginary Menu (1 of 2)

Reference Position

Select allows the user to define a reference position and displays the Reference Position field toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-14. SCALE Impedance Real and Impedance Imaginary Menu (2 of 2)

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

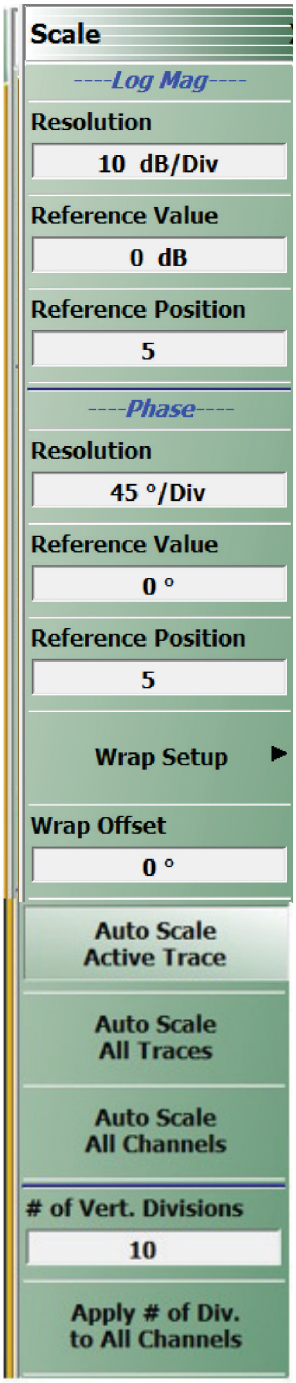
- TRACE FORMAT is set to Log Mag And Phase
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Log Mag And Phase

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Log Magnitude & Phase) Menu

This menu is available when TRACE FORMAT is set to Log Magnitude and Phase. There are separate button sets for Log Magnitude and Phase. Button units are set to:

- Button Units: dB
- Button Units: ° (Degrees)

Resolution

Select displays the Resolution toolbar with units in dB per division.

Reference Value

Select displays the Reference Value toolbar with units in dB.

Reference Position

Select displays the Reference Position toolbar.

Phase Area Button Set

Resolution (Degs/Div)

Select displays the Resolution (Degrees/Division) toolbar with units in degrees per division.

Resolution

Select displays the Resolution toolbar with units in degrees per division.

Reference Value

Select displays the Reference Value toolbar with units in degrees.

Reference Position

Select displays the Reference Position toolbar.

Figure 15-15. SCALE Log Magnitude and Phase Menu (1 of 2)

Wrap Setup

Select opens the WRAP SETUP menu.

- "WRAP Setup Menu" on page 15-22

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-15. SCALE Log Magnitude and Phase Menu (2 of 2)

SCALE Linear Magnitude and Phase Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- “Scale Menus Appearance, Common Buttons, and Units” on page 15-1

Prerequisite

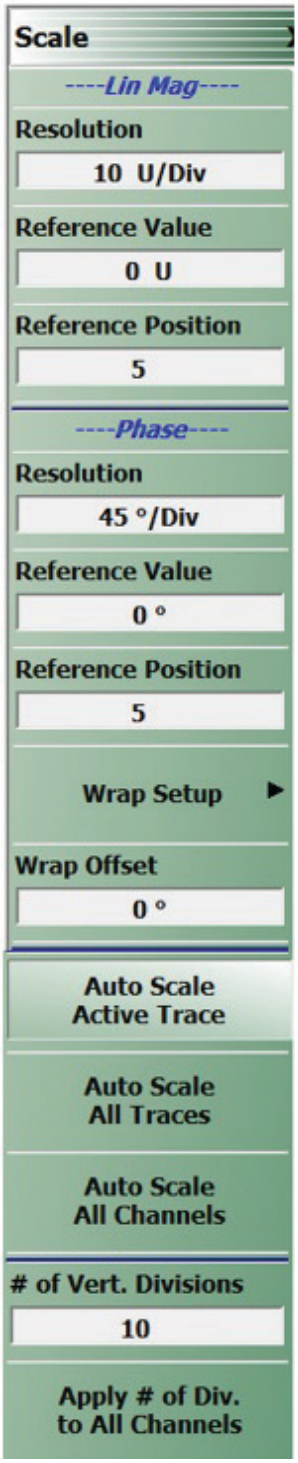
- TRACE FORMAT is set to Lin Mag And Phase
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Lin Mag And Phase

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE Menu

This menu is available when TRACE FORMAT is set to Linear Magnitude and Phase. Button units are set to:

- Button Units: U (Units)
- Button Units: ° (Degrees)

There are separate button sets for Linear Magnitude and Phase.

Resolution

Select displays the Resolution toolbar with units in dB per division.

Reference Value

Select displays the Reference Value toolbar with units in dB.

Reference Position

Select displays the Reference Position toolbar.

Phase Area Button Set

Resolution (Degs/Div)

Select displays the Resolution (Degrees/Division) toolbar with units in degrees per division.

Resolution

Select displays the Resolution toolbar with units in degrees per division.

Reference Value

Select displays the Reference Value toolbar with units in degrees.

Reference Position

Select displays the Reference Position toolbar.

Figure 15-16. SCALE Linear Magnitude and Phase Menu (1 of 2)

Wrap Setup

Select opens the WRAP SETUP menu.

- "WRAP Setup Menu" on page 15-22

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-16. SCALE Linear Magnitude and Phase Menu (2 of 2)

SCALE Real and Imaginary Menu

Menu Identification

The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.

- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

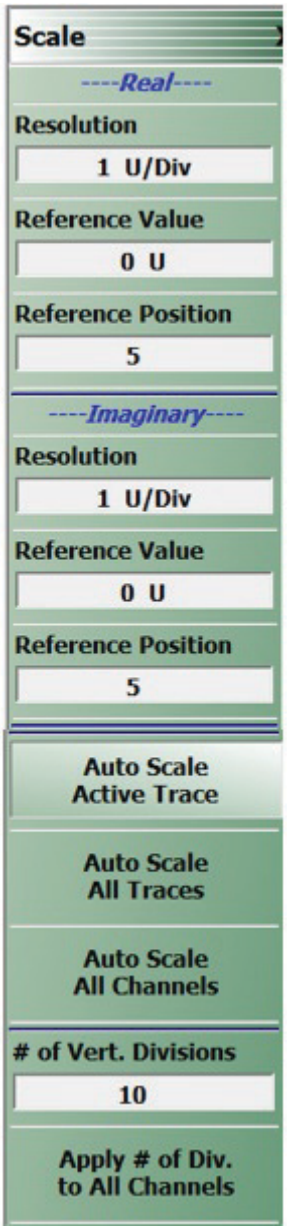
- TRACE FORMAT is set to Real And Imaginary
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Real And Imaginary

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Real & Imaginary) Menu

This menu is available when TRACE FORMAT is set to Real and Imaginary. Button units are set to:

- Button Units: U (Units)

There are separate button sets for Real and Imaginary.

Resolution

Select displays the Resolution toolbar with units in Ω (Ohms) per division.

Reference Value

Select displays the Reference Value toolbar with units in Ω (Ohms).

Reference Position

Select allows the user to define a reference position and displays the Reference Position field toolbar.

Imaginary Area Button Set

Resolution (Units/Div)

Select displays the Resolution (Units/Division) toolbar with units of units per division.

Resolution

Select displays the Resolution toolbar with units in Ω (Ohms) per division.

Reference Value

Select displays the Reference Value toolbar with units in Ω (Ohms).

Reference Position

Select allows the user to define a reference position and displays the Reference Position field toolbar.

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-17. SCALE Real and Imaginary Menu

15-11 Scale Group Delay Menu

SCALE Group Delay Menu

Menu Identification

- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Prerequisite

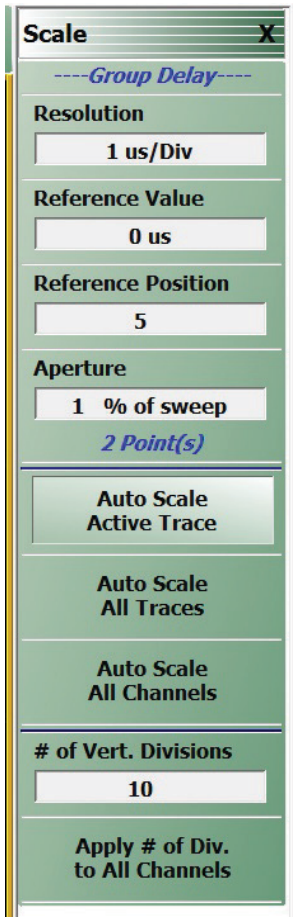
- TRACE FORMAT is set to Group Delay
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Group Delay

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE (Group Delay) Menu

This menu is available when TRACE FORMAT is set to Group Delay. Button units are set to:

- Button Units: s (seconds), ms (milliseconds), us (microseconds), ns (nanoseconds), ps (picoseconds)
- Button Units:% (Percentage)

Resolution

Select displays the Resolution toolbar with available units of s (seconds), ms (milliseconds), us (microseconds), ns (nanoseconds), or ps (picoseconds) per division.

Reference Value

Select displays the Reference Value toolbar with available units of s (seconds), ms (milliseconds), us (microseconds), ns (nanoseconds), or ps (picoseconds) per division.

Reference Position

Select displays the Reference Position toolbar.

Figure 15-18. SCALE Group Delay Menu (1 of 2)

Aperture

Select displays the Aperture % toolbar that provides control of the width of sweep frequency used in the group delay calculation, where group delay is the integrated slope of the signal measurement.r

Additional Common Buttons

- "Scale Menu Common Buttons" on page 15-35

Figure 15-18. SCALE Group Delay Menu (1 of 2)

15-12 Scale Menu Common Buttons

The button descriptions below apply to all SCALE menus.

Menu Identification

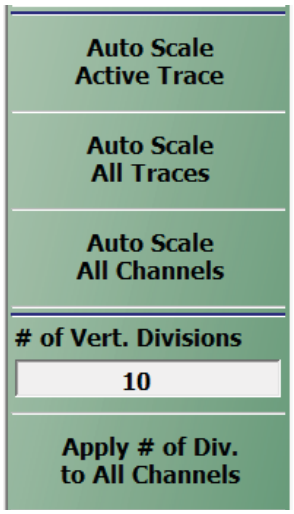
- The appearance and button availability of the SCALE menu depends on the settings on the DISPLAY menu. Consult the section above for SCALE menu identification and prerequisites.
- "Scale Menus Appearance, Common Buttons, and Units" on page 15-1

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Scale | SCALE



SCALE Menu Common Buttons

These buttons appear on all SCALE menus.

Auto Scale Active Trace

Select applies the auto scale function to the active trace only and de-selects the Auto Scale Active Channel and Auto Scale Active Channel buttons.

Auto Scale All Traces

Select applies the auto scale function to all traces on the active channel only and de-selects the Auto Scale Active Trace and Auto Scale Active Channel buttons.

Auto Scale All Channels

Select applies the auto scale function to all traces on all channels and de-selects the Auto Scale Active Trace and Auto Scale Active Channel buttons.

# of Vert. Divisions (Number)

Select displays the Number of Vertical Divisions field toolbar.

Apply # of Div. to All Channels

The Apply Number of Divisions to All Channels button applies the division selection made by the button above to all channels.

Figure 15-19. SCALE Menu – Common Buttons

Chapter 16 — Marker Menus

16-1 Chapter Overview

This chapter provides information for configuring and controlling the marker functions. The instrument provides up to thirteen markers per trace of which twelve can be direct markers and one a reference marker. Each marker can be individually controlled on/off and positioned as required. 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. Other functions for display options and various types of single-peak search are available.

16-2 Overview of Marker Menus, Dialog Boxes, and Toolbars

The available menus and dialog boxes are:

- "MARKERS [1] Menu" on page 16-4
- "MARKERS [2] Menu" on page 16-6
- "MARKER SETUP Menu" on page 16-7
    - "MARKER TABLE DISPLAY Tableau" on page 16-10
- "Mkr. Data Display Menu" on page 16-9
- "MARKER SEARCH Menu" on page 16-11
- "PEAK (Marker) Menu" on page 16-12
- "TARGET (Marker) Menu" on page 16-13
- "ADVANCED SEARCH Markers Menu" on page 16-14
- "MULTI PEAK Marker Search Menu" on page 16-15
- "MULTI TARGET Marker Search Menu" on page 16-16
- "SEARCH RANGE Marker Menu" on page 16-17
- "BANDED SEARCH RANGE CONFIGURATION Dialog Box" on page 16-18
- "BANDWIDTH Marker Search Menu" on page 16-22
- "NOTCH Marker Search Menu" on page 16-24

16-3 Marker Menu Overview

Marker Button Label Changes

The labels for marker buttons 1 through 12 change depending on whether they are on or off and whether the Ref. Mkr function (described below) is on or off.

Marker Unit Changes

The marker units change depending on the selected instrument sweep setting on the SWEEP TYPES menu and settings on the DOMAIN and RANGE menus:

- Frequency Sweep:
  - Marker units set to frequency (GHz, MHz, kHz, Hz)
- Segmented Sweep (Frequency-Based):
  - Marker units set to frequency (GHz, MHz, kHz, Hz)
- Segmented Sweep (Index-Based):
  - Marker units set to Index number.
- Power Sweep (CW Frequency):
  - Marker units set to power (dBm)

Reference Marker Off or On

If Ref. Mkr is set to OFF, the label is formatted as:

- Mkr # [OFF] if the marker is off (where # is the marker number).
- Mkr # [ON] if the marker is on.
- For example, Marker 1 would be labeled either Mkr #1 [OFF] or Mkr #1 [ON].

If Ref. Mkr. is set to ON, the label is formatted as:

- Mkr#-Ref [OFF] if the marker is off.
- Mkr#-Ref [ON] if the marker is on.
- For example, Marker 1 would be labeled either Mkr#1-Ref [OFF] or Mkr#1-Ref [ON].

Turning Individual Markers Off and On

The MARKERS [1] menu described below is shown with Marker 1 (Mkr 1) through Marker 4 (Mkr 4) turned off. Individual markers can turned off manually by clicking their buttons.

Turning All Markers On

All markers can be turned on either manually one-by-one (as above) or at the MARKERS [2] menu, by clicking the All Markers On button.

Note that selecting Inductance/Capacitance on the SMITH (IMPEDANCE) menu enables marker Inductance or Capacitance measurement readout. The navigation of that is:

MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX) | SMITH (IMPEDANCE)

Navigation

- MAIN | Markers | MARKERS | More Markers | MARKERS [2] | All Markers On

Turning All Markers Off

All markers can be turned off either manually one-by-one or at the MARKERS [2] menu, by clicking the All Markers Off button.

Navigation

- MAIN | Markers | MARKERS [1] | More Markers | MARKERS [2] | All Markers Off

Click-Drag-Drop Marker(s)

A single marker data display or an array of marker data displays within a measurement window can be clicked-dragged-dropped within the measurement window, providing an unobstructed view of the measurement signal trace.

Naming Conventions for Marker Buttons and Toolbars

The following conventions are used to label the marker buttons and toolbars in this section.

Marker Buttons

- Mkr # [Ref] [OFF/ON] is used for all button names (where # is the number of the marker).
- For example, Mkr1 [Ref] [OFF/ON] is used for the Marker 1 button when it is labeled Mkr 1 [OFF], Mkr 1 [ON], Mkr1-Ref [OFF], or Mkr1-Ref [ON].

Marker Toolbars

- Mkr # [Ref] [ON] is used for all marker toolbars (where # is the number of the marker).
- For example, Mkr1-[Ref] [ON] is used for the Marker 1 toolbar when it is labeled Mkr 1 [ON] or Mkr1-Ref [ON].
- Note the marker must be on for the toolbar to be available.

16-4 Primary Marker Menus

MARKERS [1] Menu

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | Marker | MARKERS [1]

Mkr 1 [Ref] [OFF/ON]

The Marker 1 Button appearance depends on instrument settings:

- If the label reads Mkr 1 [OFF], Marker 1 is set to OFF.
- If the label reads Mkr 1 [ON], Marker 1 is set to ON.
- If the label reads Mkr1-Ref [OFF], the Ref. Mkr button (described below) is set to ON, and Marker 1 is set to OFF.
- If the label reads Mkr1-Ref [ON], the Ref. Mkr button is set to ON, and Marker 1 is set to ON.
- If the marker button reads Mkr1-Ref1[ON], the Mkr1-Ref [ON] Toolbar is available. Allows input of frequency value (dBm).

Mkr 2 [Ref] [OFF/ON]

Used to control Marker 2.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 3 [Ref] [OFF/ON]

Used to control Marker 3.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 4 [Ref] [OFF/ON]

Used to control Marker 4.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Figure 16-1. MARKERS [1] Menu (1 of 2)

Ref. Mkr [OFF/ON]

Select toggles the reference marker off and on.

Ref. Mkr ON

If toggled to ON, a user-defined reference value can be entered and:

- The labels for the Mkr 1, Mkr 2, Mkr 3, and Mkr 4 buttons (described above) change to Mkr1-Ref, Mkr2-Ref, Mkr3-Ref, and Mkr4-Ref.
- The labels for Mkr 5 and Mkr 6 on the Markers [2] menu (described below) are changed to Mkr5-Ref and Mkr6-Ref.
- The Ref. Mkr [ON] toolbar appears below the icon toolbar.
- The units in the reference marker toolbar depend on the sweep, domain, and time/distance settings.

Ref. Mkr OFF

If toggled to OFF:

- The labels for the Mkr1-Ref, Mkr2-Ref, Mkr3-Ref, and Mkr4-Ref buttons change to Mkr 1, Mkr 2, Mkr 3, and Mkr 4.
- The labels for Mkr5-Ref and Mkr6-Ref. on the Markers [2] menu change to Mkr 5 and Mkr 6.

More Markers

Select displays the MARKERS [2] menu and the controls for Marker 5 and Marker 6. The button labels for these markers are the same as Marker 1 through Marker 4.

- "MARKERS [2] Menu" on page 16-6

Markers Setup

Select displays the MARKER SETUP menu.

- "MARKER SETUP Menu" on page 16-7

Markers Search

Select displays the MARKER SEARCH button.

- "MARKER SEARCH Menu" on page 16-11

Figure 16-1. MARKERS [1] Menu (2 of 2)

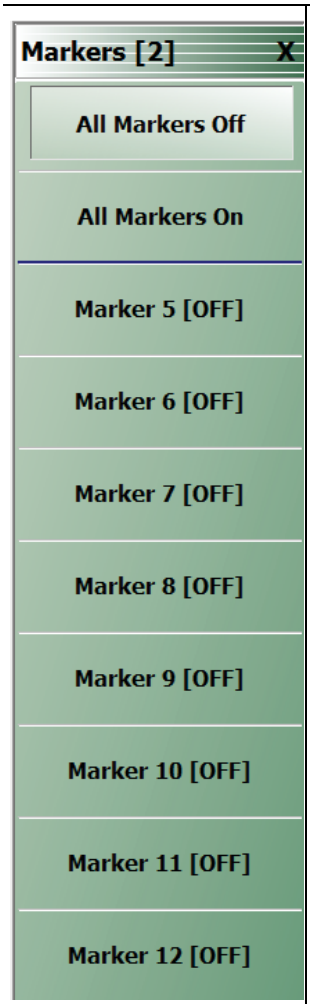
MARKERS [2] Menu

Previous

- "MARKERS [1] Menu" on page 16-4

Navigation

- MAIN | Marker | MARKERS [1] | More Markers | MARKERS [2]



All Markers Off

Select toggles all 12 regular markers OFF. If ON, Reference Marker is turned off.

All Markers On

Select toggles all 12 regular markers ON. If OFF, the Reference Marker is not turned on. If ON, the Reference Marker is not affected.

Mkr 5 [Ref] [OFF/ON]

Used to control Marker 5.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 6 [Ref] [OFF/ON]

Used to control Marker 6.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 7 [Ref] [OFF/ON]

Used to control Marker 7.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 8 [Ref] [OFF/ON]

Used to control Marker 8.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 9 [Ref] [OFF/ON]

Used to control Marker 9.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 10 [Ref] [OFF/ON]

Used to control Marker 10.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 11 [Ref] [OFF/ON]

Used to control Marker 11.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Mkr 12 [Ref] [OFF/ON]

Used to control Marker 12.

- "Mkr 1 [Ref] [OFF/ON]" on page 16-4

Figure 16-2. MARKERS [2] Menu

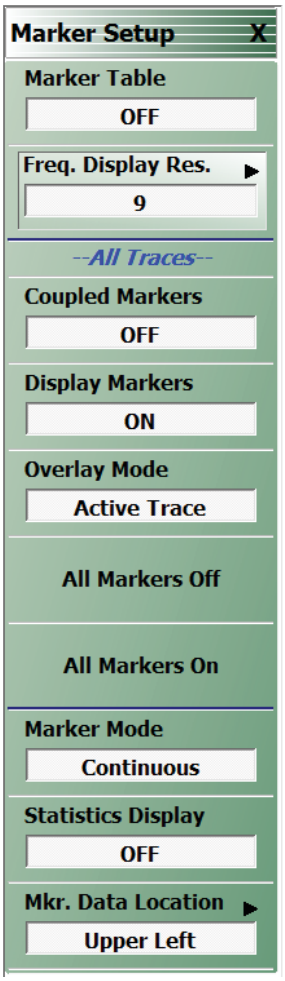
MARKER SETUP Menu

Previous

- "MARKERS [1] Menu" on page 16-4

Navigation

- MAIN | Marker | MARKERS [1] | Marker Setup | MARKER SETUP



Marker Table

Select toggles the marker table off and on. When OFF is selected, the Marker Table display area is not present. When ON is selected, the display area is shortened, and the marker table appears below the main display.

- "MARKER TABLE DISPLAY Tableau" on page 16-10

Frequency Display Resolution

Sets the number of decimal points for the marker frequency value in the Marker Table display area. Options are 3, 6, and 9.

Coupled Markers (Off/On)

Select toggles the marker coupling off and on for a per channel basis.

- In Coupled Markers ON mode, moving a specific marker in one trace display moves the same numbered marker in all other trace displays in that channel.
- In Coupled Markers OFF mode, markers can be moved independently in each trace without affecting the position of other markers in other traces.

Display Markers (OFF/ON)

Select toggles the markers display OFF and ON. The number and position of displayed markers is not changed when the display is turned back on.

Overlay Mode

Select toggles between All Traces Mode and Active Trace Mode.

- In All Traces mode, all the trace's active markers are displayed when Display Markers is ON.
- In Active Trace mode, only the selected trace displays the active markers.

All Markers Off

Select toggles all markers OFF. If on, the Reference Marker is also turned OFF.

All Markers On

Select toggles all 6 regular markers ON. If OFF, the Reference Marker is not turned on. If ON, the Reference Marker is not affected.

Figure 16-3. MARKER SETUP Menu (1 of 2)

	Marker Mode Select toggles between Discrete Marker Mode and Continuous Marker Mode. • In Discrete Mode, markers can only be moved from measured point to measured point and cannot be set between measured points. • In Continuous Mode, markers can be moved between measured points. If a non-measured position is selected, the instrument interpolates the measurement value. **Statistics Display** Select toggles the statistics display off and on. **Mkr Data Location** Select opens the "Mkr. Data Display Menu" on page 16-9

Figure 16-3. MARKER SETUP Menu (2 of 2)

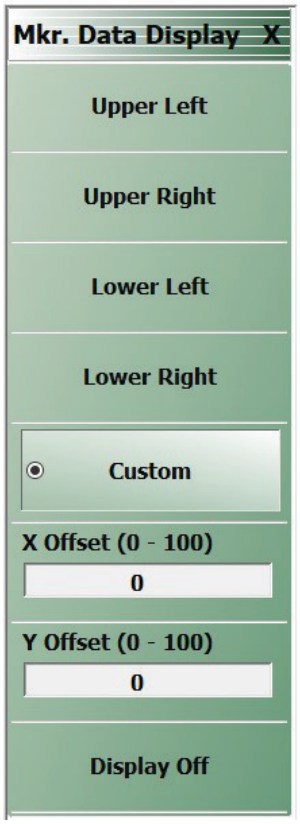
Mkr. Data Display Menu

Previous

- "MARKER SETUP Menu" on page 16-7

Navigation

- MAIN | Marker | MARKERS [1] | Marker Setup | MARKER SETUP | Mrk Location | MRK. POSITION



Marker Data Display

Allows the user to position the marker display data to one of the following locations:

- Upper Left
- Upper Right
- Lower Left
- Lower Right
- Custom

  Select allows the user to click-drag-drop the marker(s) within the measurement trace display. The marker's display can obstruct the view of a displayed signal; therefore, the user can avoid the marker obstruction of signal responses in the display area by moving the marker(s) within the trace window.

  Select activates the X Offset and Y Offset coordinates listed below.

X Offset (0-100)

The X Offset coordinate field becomes active when Custom is selected and displays the marker X coordinate value. This value can be changed manually by entering a value in the X Offset field to reposition the marker(s).

When the marker(s) are clicked-dragged-dropped within the trace display area, the X coordinate value tracks the position of the marker(s).

Y Offset (0-100)

The Y Offset coordinate field becomes active when Custom is selected and displays the marker Y coordinate value. This value can be changed manually by entering a value in the Y Offset field to reposition the marker(s).

When the marker(s) are clicked-dragged-dropped within the trace display area, the Y coordinate value tracks the position of the marker(s).

Display Off

Removes the marker measurement display but the markers are still present.

Figure 16-4. MARKER SETUP Menu

MARKER TABLE DISPLAY Tableau

Previous

- "MARKER SETUP Menu" on page 16-7

Navigation

- MAIN | Marker | MARKERS [1] | Marker Setup | MARKER SETUP | Marker Table Display

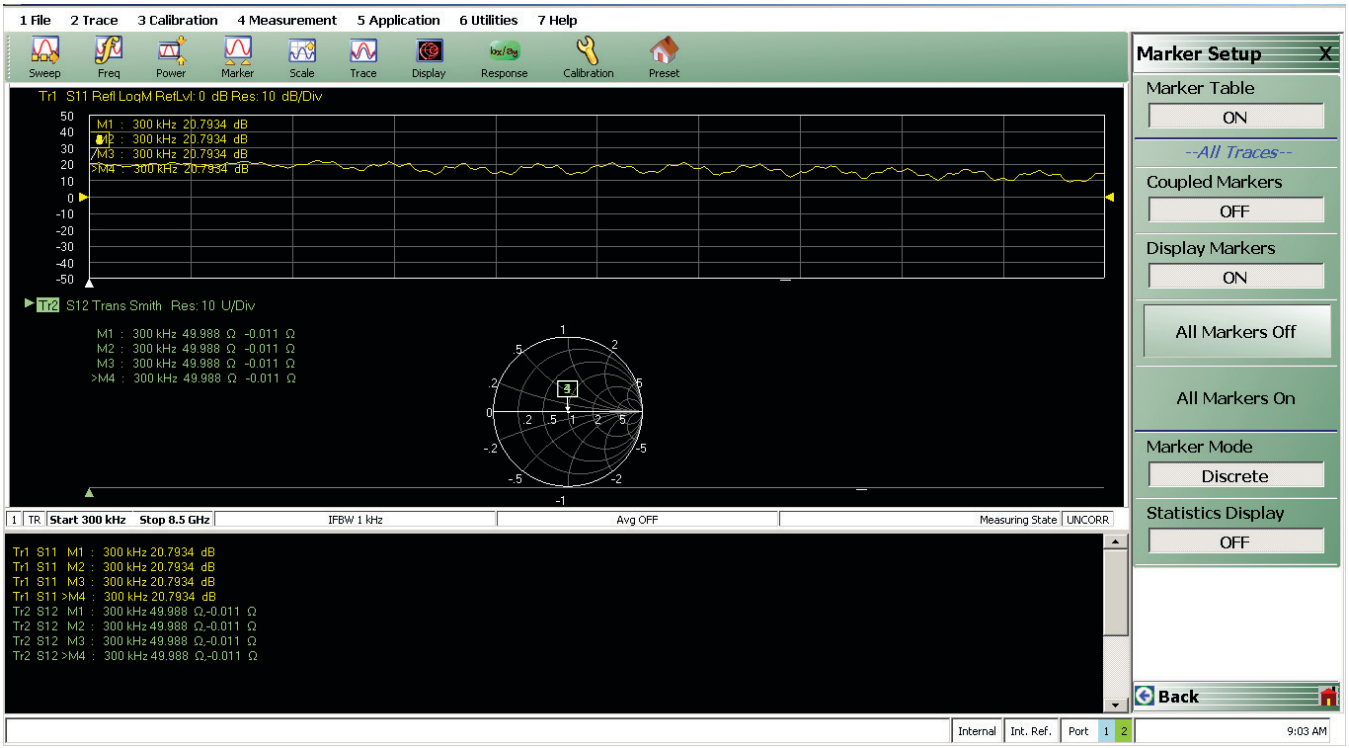


Figure 16-5. MARKER TABLE DISPLAY Tableau

Marker Labels

Marker labels in the Marker Table display show the response type set for the Trace. For example, if S11 is selected in the RESPONSE Menus, the Marker Table listing starts with S11.

16-5 Marker Search Menus

MARKER SEARCH Menu

Previous

- "MARKERS [1] Menu" on page 16-4

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH

MARKER SEARCH Menu Button Selection Group

The Max, Min, Peak, and Target buttons form a four (4) button selection group where the selection of any one button de-selects the other three (3) buttons.

Max (Marker)

Select sets marker search to Maximum values and de-selects Min, Peak, and Target.

Min (Marker)

Select sets marker search to Minimum values and de-selects Max, Peak, and Target.

Peak (Marker)

Select sets marker search to Peak values, de-selects Max, Min, and Target, and then displays the PEAK menu.

- "PEAK (Marker) Menu" on page 16-12

Target (Marker)

Select sets marker search to Target values, de-selects Max, Min, and Peak, and then displays the TARGET menu.

- "TARGET (Marker) Menu" on page 16-13

Tracking

Select retains marker at the current location based on selection of Max, Min, or Peak. Operates on a per marker basis.

Advanced Search

Select displays the ADVANCED SEARCH menu.

- "ADVANCED SEARCH Markers Menu" on page 16-14

Figure 16-6. MARKER SEARCH Menu

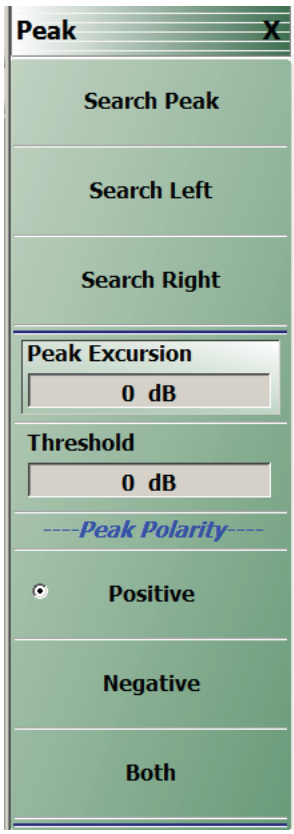
PEAK (Marker) Menu

Previous

- "MARKER SEARCH Menu" on page 16-11

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Peak | PEAK



Search Peak

Select moves the active marker to the peak with the highest absolute value that matches the selected Peak Excursion, Threshold, and Polarity values.

Search Left

Select moves the active marker to the target that is nearest on its left to the peak value that matches the selected Peak Excursion, Threshold, and Polarity values.

Search Right

Select moves the active marker to the target that is nearest on its right to the peak value that matches the selected Peak Excursion, Threshold, and Polarity values.

Peak Excursion

Select displays the Peak Excursion field toolbar and allows the user to enter the peak excursion value in dB, dBm, Degrees, or Units, depends on trace display settings and instrument settings.

Threshold

Select displays the Threshold field toolbar and allows the user to enter the peak threshold value in dB, dBm, Degrees, or Units (U) depending on instrument settings.

—Peak Polarity—

Positive

Sets the peak search object polarity to positive.

Negative

Sets the peak search object polarity to negative.

Both

Sets the peak search object polarity to either positive or negative.

Figure 16-7. PEAK (Marker) Menu

TARGET (Marker) Menu

Previous

- "MARKER SEARCH Menu" on page 16-11

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Target | TARGET

TARGET Search Button Selection Group

The Search Target, Search Left, and the Search Right buttons form a button selection group where selection of any one button de-selects the other two (2) buttons.

Search Target (Marker)

Select moves the active marker to the marker that matches the target value and polarity.

Search Left (Marker)

Select moves the active marker to the marker that is nearest on its left that matches the target value and polarity.

Search Right (Marker)

Select moves the active marker to the marker that is nearest on its right that matches the target value and polarity.

Target Value (Marker)

Select displays the Target Value field toolbar and allows the user to enter the target value in dB, dBm, Degrees, or Units (U), depends on trace display and instrument settings.

—Target Transition—

Positive (Marker Target)

Sets the target transition to search for a positive transition.

Negative (Marker Target)

Sets the target transition to search for a negative transition.

Both (Marker Target)

Sets the target transition to search for either a positive or negative transition.

Figure 16-8. TARGET (Marker) Menu

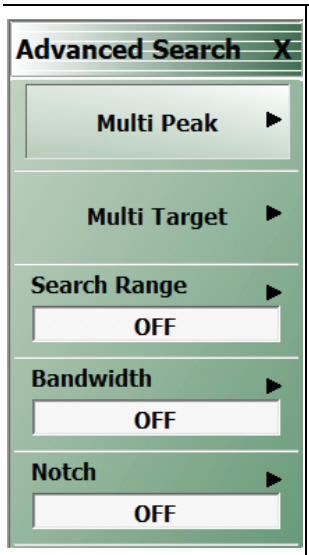
ADVANCED SEARCH Markers Menu

Previous

- MARKER SEARCH Menu on page 16-11

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH



Multi Peak

Select displays the Multi Peak menu.

- "MULTI PEAK Marker Search Menu" on page 16-15

Multi Target

Select displays the Multi Target menu.

- "MULTI TARGET Marker Search Menu" on page 16-16

Search Range

Select displays the Search Range menu.

- "SEARCH RANGE Marker Menu" on page 16-17

Bandwidth

Select displays the Bandwidth menu.

- "BANDWIDTH Marker Search Menu" on page 16-22

Notch

Select displays the Notch menu.

- "NOTCH Marker Search Menu" on page 16-24

Figure 16-9. ADVANCED SEARCH (Marker) Menu

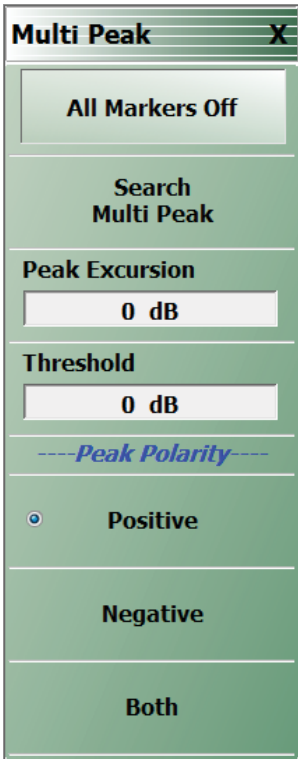
MULTI PEAK Marker Search Menu

Previous

- "ADVANCED SEARCH Markers Menu" on page 16-14

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH | Multi Peak | MULTI PEAK



All Markers Off

Select turns all markers OFF.

Search

Select starts the defined marker search.

Peak Excursion

Select displays the Peak Excursion toolbar and allows entry of the peak excursion value in dB, dBm, Degrees, or Units (U) depending on instrument settings.

Threshold

Select displays the Threshold field toolbar and allows the user to enter the peak excursion value in dB, dBm, Degrees, or Units (U) depending on instrument settings.

—Peak Polarity—

Positive Polarity

Sets the peak search object polarity to positive.

Negative Polarity

Sets the peak search object polarity to negative.

Both Polarity

Sets the peak search object polarity to either positive or negative.

Figure 16-10. MULTI PEAK (Marker) Menu

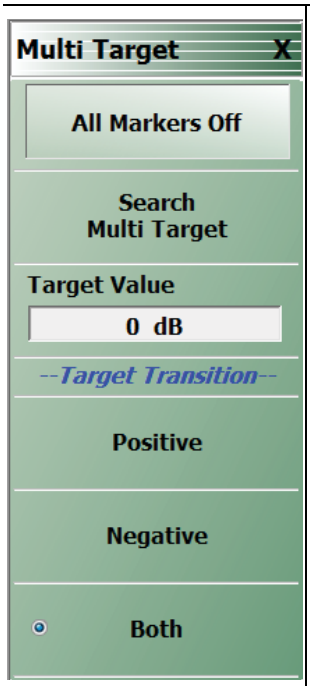
MULTI TARGET Marker Search Menu

Previous

- “ADVANCED SEARCH Markers Menu” on page 16-14

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH | Multi Target | MULTI TARGET



All Markers Off

Select turns all markers OFF.

Search Multi Target

Select starts the defined multi peak marker search with search units in dB, dBm, Degrees, or Units depending on the instrument settings.

----Target Transition----

Positive

Sets the target transition to search for a positive transition.

Negative

Sets the target transition to search for a negative transition.

Both

Sets the target transition to search for either a positive or negative transition.

Figure 16-11. MULTI TARGET (Marker) Menu

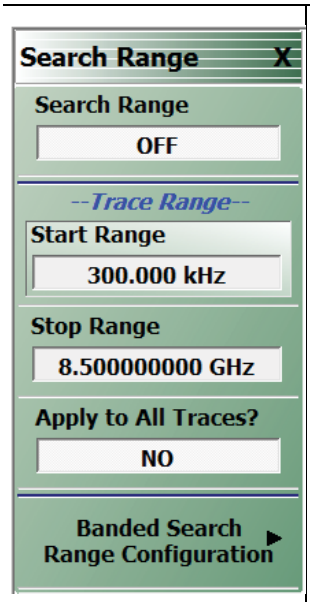
SEARCH RANGE Marker Menu

Previous

- "ADVANCED SEARCH Markers Menu" on page 16-14

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH | Search Range | SEARCH RANGE



Search Range

Select toggles the search range OFF and ON.

Marker Search Range Units

The marker search range units can vary depending on the settings in the SWEEP TYPES menu and in the DOMAIN menu. The button descriptions below and their related field toolbars reflect a marker units setting of frequency in Hertz. Marker units can also be set in:

- dBm
- Distance (km to um)
- Frequency (GHz to Hz)
- Number (Index Number)
- Time (s to ps)

Start Range

Select displays the Start Range field toolbar and allows entry of a starting search point in the appropriate units.

Stop Range

Select displays the Stop Range field toolbar and allows entry of a stop search point in the appropriate units.

Apply to All Traces?

Select toggles Apply to All Traces NO and YES.

- If YES, the trace search range is applied to all traces.
- If NO, the trace search range applies to the active trace.

Banded Search Range Configuration

Select opens the "BANDED SEARCH RANGE CONFIGURATION Dialog Box" on page 16-18.

Figure 16-12. SEARCH RANGE (Marker) Menu

BANDED SEARCH RANGE CONFIGURATION Dialog Box

Previous

- "SEARCH RANGE Marker Menu" on page 16-17

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH | Search Range | SEARCH RANGE | Banded Search Range Configuration | BANDED SEARCH RANGE CONFIGURATION Dialog Box

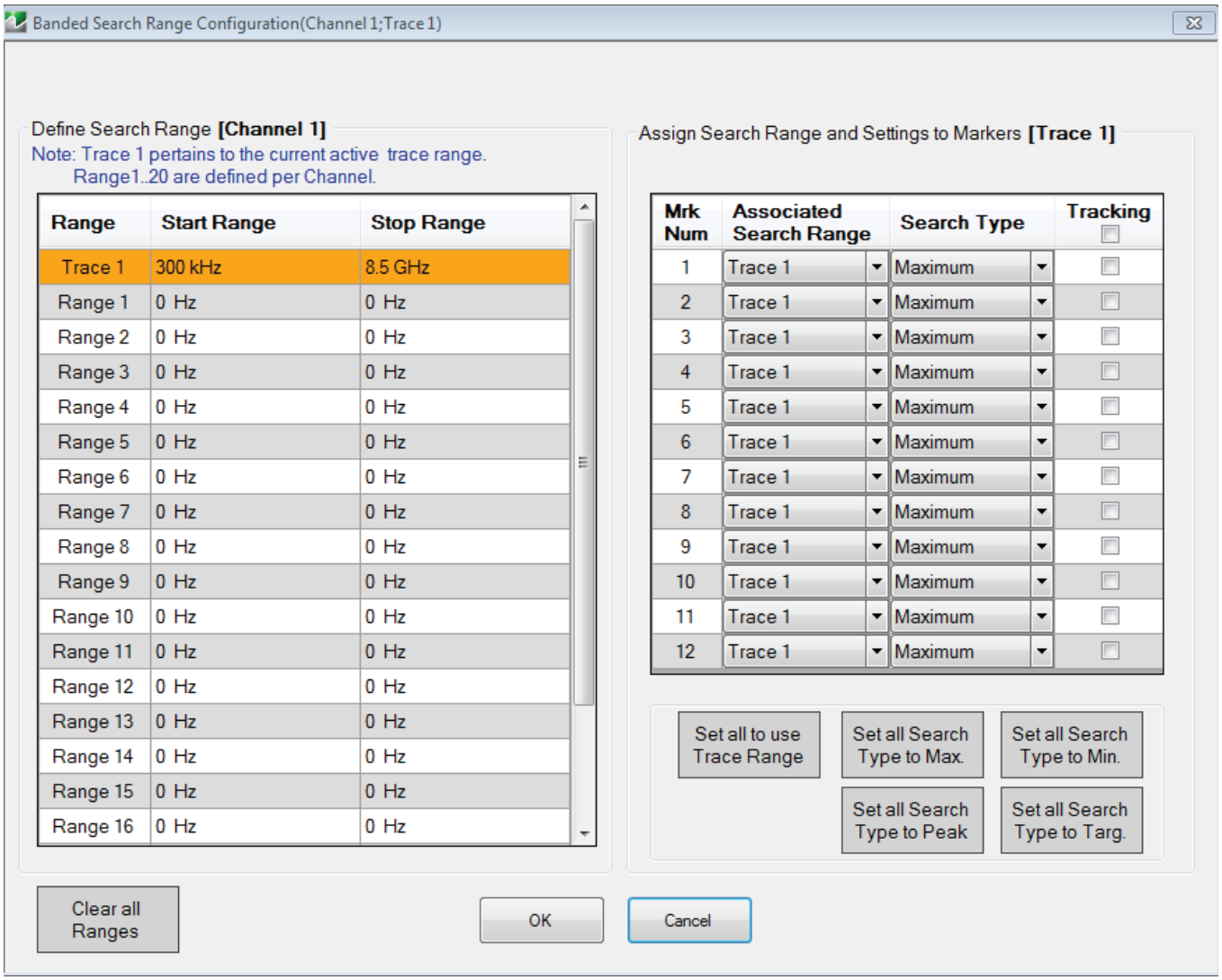


Figure 16-13. Banded Search Range Configuration Dialog Box – Frequency Sweep Example (1 of 2)

Define Search Range (for active Channel 1)

Trace X, where X signifies the active trace number. Range 1...20 are defined per channel.

Each channel can define up to 20 search ranges that are shared by all traces within that channel.

Trace Start range defaults to system min frequency. Trace Stop range defaults to system max. frequency. Range Start and Stop default to 0.

Start Range – Select displays the Start Range toolbar (see Figure 16-14). Allows entry of a start range value in values that are based on the active trace domain.

Stop Range – similar to Start Range.

Clear All Ranges Button

Resets all range to default values.

Assign Search Range to Markers (for active Trace 1)

Use to define settings for Trace 1 markers.

Associated Search Range – Allows selection of Trace 1, Range 1, ... Range 20 (see Figure 16-14).

Search Type – Allows selection of Maximum, Minimum, Peak, and Target (see Figure 16-14).

Tracking – Allows marker tracking to be enabled. Selecting the Tracking header checkbox applies the selection to all markers.

Quick Action Buttons

Set all to use Trace Range – All markers will use the trace range as the search range.

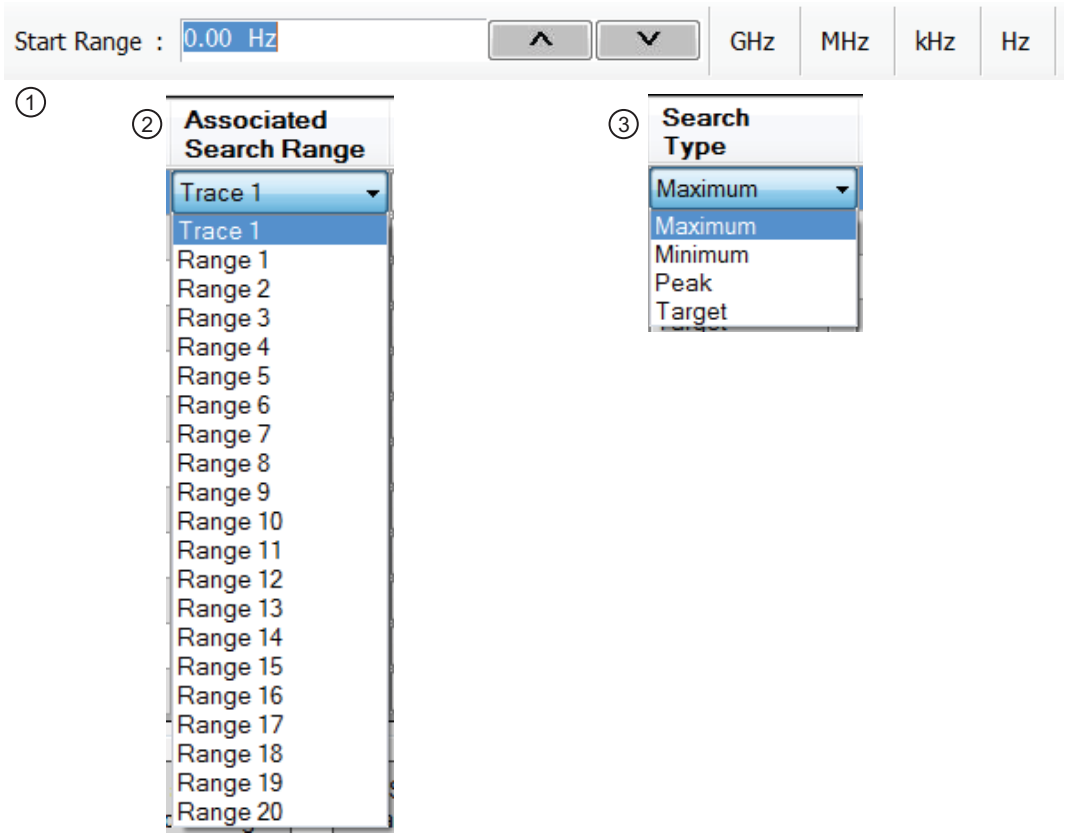
Set all Search Type to Max. – Sets the search type for all markers to be 'maximum' (i.e., maximum trace value in the specified range).

Set all Search Type to Min. – Sets the search type for all markers to be 'minimum', i.e., minimum trace value in the specified range).

Set all Search Type to Peak – Sets the search type to 'peak' for all markers. Peak parameters defined on the peak search menu.

Set all Search Type to Targ. – Sets the search type to target value for all markers. Target parameters defined on the relevant menu.

Figure 16-13. Banded Search Range Configuration Dialog Box – Frequency Sweep Example (2 of 2)

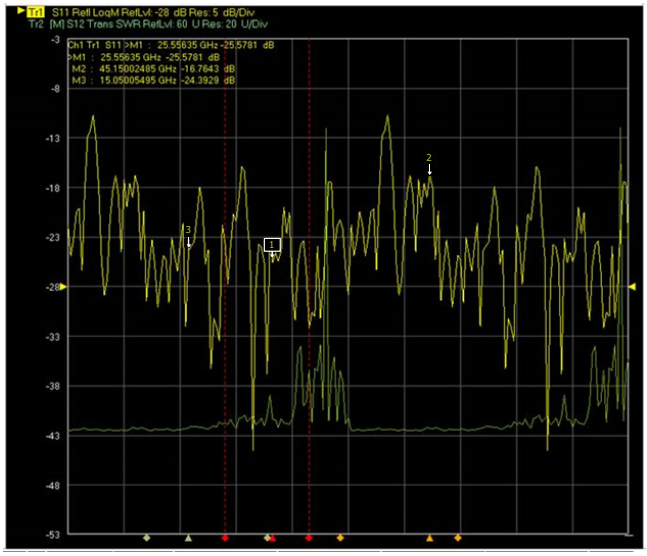


1. Start Range Toolbar: Frequency Domain example. Stop Range Toolbar is similar.	2. ASSOCIATED SEARCH RANGE Drop-down Menu 3. SEARCH TYPE Drop-down Menu

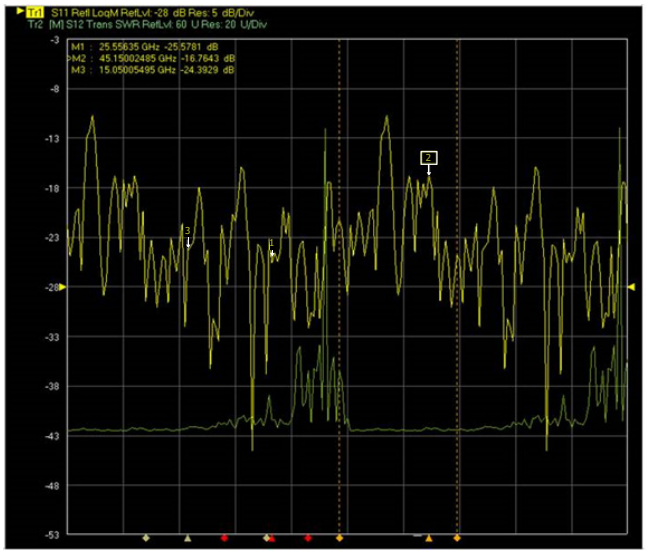
Figure 16-14. Banded Search Range Configuration Dialog Box Toolbar and Drop-Down Menus

For the display:

- The search range ticks are diamond shaped.
- The marker tick is triangular.
- The marker tick is the same color as the search tick of that marker.
- The tick color is per marker. Tick color is pre-defined.
- The search line color matches the tick color. Search lines are shown for the active marker.
- If search range is off, the marker tick will be white.

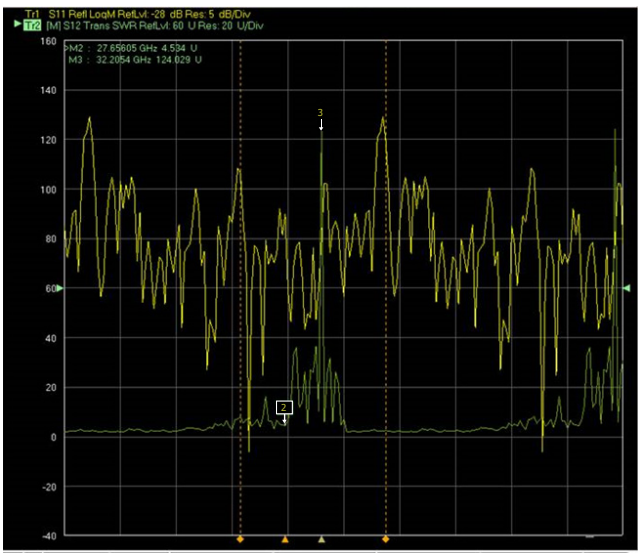


Trace 1, Marker 1 Active



Trace 1, Marker 2 Active

Figure 16-15. Banded Marker Search Range – Examples 1 and 2



Trace 2, Marker 3 Active

Marker 2 and Marker 3 share the same search range.

Figure 16-16. Banded Marker Search Range – Example 3

The statistics calculations can be a function of the search range. The statistical calculations are as follows:

- If the reference marker is on, the statistics will be calculated from the reference marker to the marker.
- If the reference marker is off and the search range is on, the statistics calculation will be based on the search range of the active marker.
- If reference marker is off and the search range is off, the statistics calculation will be based on the entire sweep range.

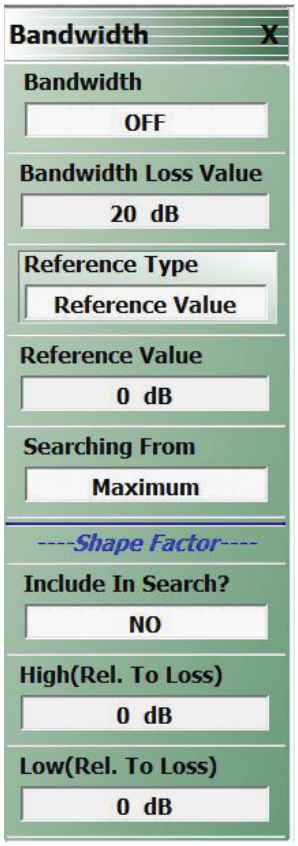
BANDWIDTH Marker Search Menu

Previous

- "ADVANCED SEARCH Markers Menu" on page 16-14

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH | Bandwidth | BANDWIDTH



Bandwidth

Select toggles the bandwidth marker search OFF or ON.

Bandwidth Loss Value

Select displays the Bandwidth Loss Value field toolbar and allows entry of a loss value in dB (shown below), dBm, or Units (U).

Reference Type

Select toggles between Reference Value and Marker (default is Marker).

- When Reference Type is set to Marker, the search reference will be the marker value entered.
- When Reference Type is set to Reference Value, the search reference will be the reference value entered.

Reference Value

Available when Reference Type is toggled to Reference Value. Select displays the Reference Value toolbar and allows entry of the reference value is dB, dBm or Units (U).

Searching From

Available when Reference Type is set to Reference Value. Select toggles between Maximum and Beginning.

- When Maximum is selected, the algorithm will first search for the maximum value, and then start searching left and right for the target value from the start of the IF search range.
- When Beginning is selected, the algorithm will search for the target value from the starting point.

Figure 16-17. BANDWIDTH (Marker) Menu (1 of 2)

----Shape Factor----

Include in Search?

Select toggles YES or NO to specify whether the shape factor will be included in the marker search.

High (Rel. To Loss)

Select displays the High (Relative to Loss) field toolbar and allows entry of a high loss value in dB. Depending on instrument settings, this search function can be in units of dB, dBm (not shown), Degrees, or Units.

Low (Rel. To Loss)

Select displays the Low (Relative to Loss) field toolbar and allows entry of a low loss value in dB. Depending on instrument settings, this search function can be in units of dB, dBm (not shown), Degrees, or Units.

Figure 16-17. BANDWIDTH (Marker) Menu (2 of 2)

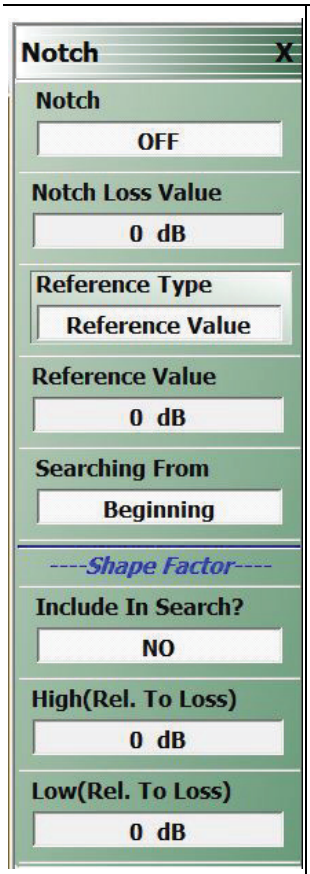
NOTCH Marker Search Menu

Previous

- "ADVANCED SEARCH Markers Menu" on page 16-14

Navigation

- MAIN | Marker | MARKERS [1] | Marker Search | MARKER SEARCH | Advanced Search | ADVANCED SEARCH | Notch | NOTCH



Notch

Select toggles the bandwidth marker search OFF or ON.

Notch Loss Value

Select displays the Notch Loss Value field toolbar and allows entry of a loss value in dB, Degrees, or Units.

Reference Type

Select toggles between Reference Value and Marker (default is Marker).

- When Reference Type is set to Marker, the search reference will be the marker value entered.
- When Reference Type is set to Reference Value, the search reference will be the reference value entered.

Reference Value

Available when Reference Type is toggled to Reference Value. Select displays the Reference Value toolbar and allows entry of the reference value is dB, dBm or Units (U).

Searching From

Available when Reference Type is set to Reference Value. Select toggles between Minimum and Beginning.

- When Minimum is selected, the algorithm will first search for the minimum value, and then start searching left and right for the target value from the start of the IF search range.
- When Beginning is selected, the algorithm will search for the target value from the starting point.

Figure 16-18. NOTCH (Marker) Menu (1 of 2)

----Shape Factor----

Include in Search?

Select toggles YES or NO to specify whether the notch factor will be included in the search.

High (Rel. To Loss) (dB) (Marker)

Select displays the High (Relative to Loss) (Notch) field toolbar and allows entry of a high loss value in dB, dBm (not shown), Degrees, or Units.

Low (Rel. To Loss)

Select displays the Low (Relative to Loss) (Notch) field toolbar and allows entry of a high loss value in dB, dBm (not shown), Degrees, or Units.

Figure 16-18. NOTCH (Marker) Menu (2 of 2)

MKR FUNCTIONS Menu

Full Name

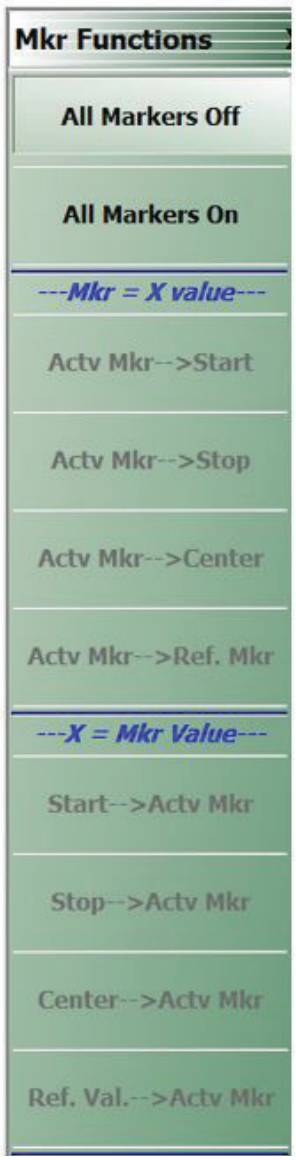
- Marker Functions Menu

Previous

- "MARKERS [1] Menu" on page 16-4

Navigation

- MAIN | Marker | MARKERS [1] | Marker Functions | MKR FUNCTIONS



All Markers Off/On Button Selection Group

The All Markers Off and All Markers On buttons form a two (2) button selection group where the selection of one button de-selects the other button.

All Markers Off

On a per-channel basis, if the All Markers Off button is selected, all markers (Marker 1 through Marker 12) are turned OFF, including the Reference Marker (Ref. Mkr [OFF]).

All Markers On

On a per-channel basis, if the All Markers On button is selected, all markers (Marker 1) through Marker 12) are turned ON. If OFF, the Reference Marker (Ref. Mkr [OFF]) is left OFF. If ON, Ref. Mkr [ON]) is left ON.

Marker = X Value Area

The buttons in this area set the value of the currently selected marker to that of the specified start, stop, center, or reference marker.

Actv. Mkr-->Start

Sets the value of the active marker on the active trace to that of the start range. If All Markers Off is set, the button is unavailable.

Actv. Mkr-->Stop

Sets the value of the active marker on the active trace to that of the stop range. If All Markers Off is set, the button is unavailable.

Actv. Mkr-->Center

Sets the value of the active marker on the active trace to that of the center range. If All Markers Off is set, the button is unavailable.

Actv. Mkr-->Ref. Mkr

Sets the value of the active marker on the active trace to that of the reference marker.

Figure 16-19. Marker Functions Menu (1 of 2)

X Value Area = Mkr Value

The buttons in this area set the value of the currently specified start, stop, center, or reference marker to the selected marker.

Start-->Actv. Mkr

Sets the value of the start frequency to that of the active marker on the active trace. If All Markers Off is set, the button is unavailable.

Stop-->Actv. Mkr

Sets the value of the stop frequency to that of the active marker on the active trace. If All Markers Off is set, the button is unavailable.

Center-->Actv. Mkr

Sets the value of the center frequency to that of the active marker on the active trace. If All Markers Off is set, the button is unavailable.

Ref. Val-->Actv. Mkr

Sets the value of the reference line to that of the active marker on the active trace. If All Markers Off is set, the button is unavailable.

Figure 16-19. Marker Functions Menu (2 of 2)

Chapter 17 — System Menus

17-1 Chapter Overview

This chapter provides information for various system and instrument management and configuration functions including initial setup, power-on options, preset options, network interface, self-test, and diagnostics.

17-2 System Menus, Buttons, and Dialog Boxes

- "System Menus" on page 17-2
- "SETUP Menu" on page 17-3
  - "Clock Setup" on page 17-3
  - "COLOR SETUP Dialog Box" on page 17-6
  - "FONT DIALOG Box" on page 17-9
  - "TRACE THICKNESS SETUP Dialog Box" on page 17-10
  - "MISC SETUP Menu" on page 17-11
    - "SNP SETUP Dialog Box" on page 17-12
  - "AUTOCAL UTILITY Menu" on page 17-17
- "UTILITY Menu" on page 17-15
- "NETWORK INTERFACE Menu" on page 17-19
  - "NETWORK CONNECTIONS Dialog Box" on page 17-20
- "SELF TEST Dialog Box" on page 17-21
- "EVENT VIEWER Dialog Box" on page 17-22
- "DIAGNOSTICS ACCESS Dialog Box" on page 17-24
- "Upgrade FPGA Button" on page 17-24

17-3 System Menus

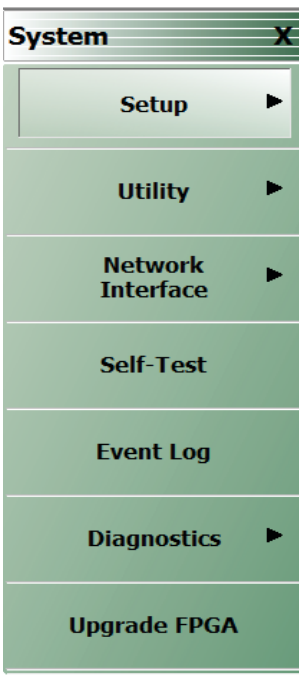
SYSTEM MENU

Previous

- “Main Menu” on page 2-6

Navigation

- MAIN | System | SYSTEM



Setup

Select displays the SETUP menu.

- “SETUP Menu” on page 17-3

Utility

Select displays the UTILITY menu.

- “UTILITY Menu” on page 17-15

Network Interface

Select displays the NETWORK INTERFACE menu.

- “NETWORK INTERFACE Menu” on page 17-19

Self-Test

Select displays the SELF TEST dialog box.

- “SELF TEST Dialog Box” on page 17-21

Event Log

Select displays the EVENT VIEWER dialog box.

- “EVENT VIEWER Dialog Box” on page 17-22

Diagnostics

Select displays the DIAGNOSTICS ACCESS dialog box.

- “DIAGNOSTICS ACCESS Dialog Box” on page 17-24

Upgrade FPGA

Select initiates a firmware update. FOR FACTORY SERVICE USE ONLY.

Figure 17-1. SYSTEM MENU Menu

SETUP Menu

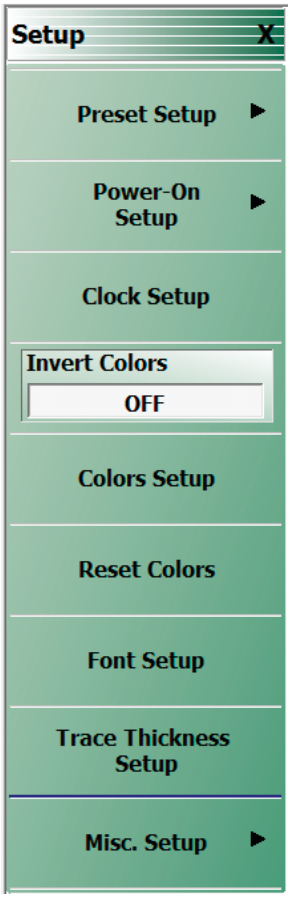
Provides a variety of setup functions.

Previous

- "System Menus" on page 17-2

Navigation

- MAIN | System | SYSTEM | Setup | SETUP



Preset Setup

Opens the "PRESET SETUP Menu" on page 17-4

Power-On Setup

Opens the"POWER-ON SETUP Menu" on page 17-5

Clock Setup

Opens standard Windows DATE AND TIME control panel.

Invert Colors

Toggles inversion of display colors ON and OFF.

Colors Setup

Opens COLOR SETUP dialog box for options to change trace and background colors.

- "COLOR SETUP Dialog Box" on page 17-6

Reset Colors

Opens RESET COLORS dialog box for option to reset color changes made in COLOR SETUP dialog box.

Font Setup

Opens FONT SETUP dialog box for option to change font style.

- "FONT DIALOG Box" on page 17-9

Trace Thickness Setup

Opens TRACE THICKNESS SETUP dialog box for option to change the thickness of the GUI trace display.

- "MISC SETUP Menu" on page 17-11

Misc. Setup

Opens MISC SETUP dialog box for options for frequency and data file setup options.

- "MAIN | System | SYSTEM MISC SETUP Menu in 2-Port VNAs" on page 17-11

Figure 17-2. SETUP Menu

PRESET SETUP Menu

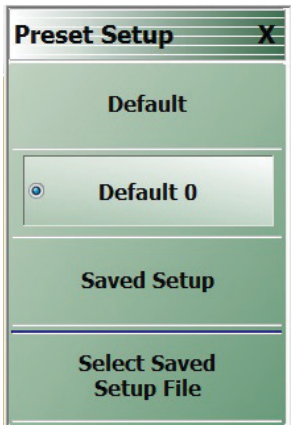
Provides a variety of setup functions.

Previous

- "SETUP Menu" on page 17-3

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Preset Setup | PRESET SETUP



Default

If selected, Default selection loads the factory as-shipped preset configuration, which is one channel with four traces displayed on a two-row and two-column trace display.

Default 0

The Default 0 button operates identical to the Default button (above) with the addition of removing any Cal Kits and/or Characterization Coefficient files from instrument memory. Once used, all connector coefficients are then returned to the factory as-shipped default values. Note that any Cal Kit and/or Characterization Coefficient files resident on the instrument hard drive are not deleted and remain in place. If this command is used, the user must re-load into memory all required Cal Kit and other Characterization Coefficient files.

Saved Setup

If selected, the Saved Setup selection loads the setup file selected in the resulting dialog box below. If the Saved Setup button is clicked when no prior Setup File has been saved, a NO FILE SELECTED dialog box appears with the message: "There is currently no saved setup selected. This selection requires a file selection. Would you like to select the file now?"

Select Saved Setup File

Use this button to display a dialog to recall a previously saved setup file. Once recalled, the file settings can be implemented by selecting the Saved Setup button above.

Figure 17-3. PRESET SETUP Menu

POWER-ON SETUP Menu

Provides a variety of setup functions.

Previous

- "SETUP Menu" on page 17-3

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Power-On Setup | POWER-ON SETUP

Default

Select sets the factory default as-shipped power-on setup settings. This setting is always available.

Last Setup

For many users in general purpose work, this setting is the user-selected default. Select sets the power-on setup to be from the last operational state including frequencies, channels, traces, markers, and limit lines.

Saved Setup

Select sets the power-on settings to a previously saved user-defined setup file, useful for repeated identical settings in a line production mode. If the Saved Setup button is selected when no prior Setup File has been saved, a NO FILE SELECTED dialog box appears with the message: "There is currently no saved setup selected. This selection requires a file selection. Would you like to select the file now?"

Select Saved Setup File

Use this button to display a dialog to recall a previously saved setup file. Once recalled, the file settings can be implemented by selecting the Saved Setup button above.

Figure 17-4. POWER-ON SETUP Menu

COLOR SETUP Dialog Box

Previous

- "SETUP Menu" on page 17-3

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Colors Setup | COLOR SETUP

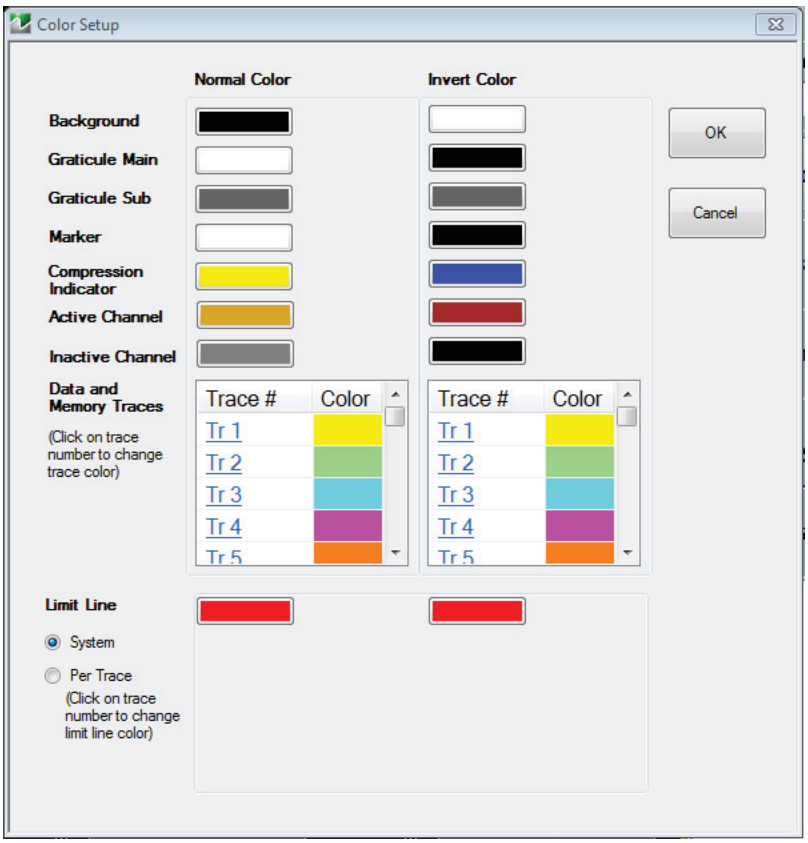


Figure 17-5. COLOR SETUP Menu – Limit Line Color Per System

Modifying Default Colors

Use the Color Setup dialog box to assign colors in:

- Normal Mode for Background, Graticule Main, Graticule Sub, Limit Lines, each trace, and Limit Lines for each (or all) traces.
- Invert Color Mode for the same elements.

Normal Color

Provides controls for changing default colors of display elements.

Invert Color

Provides controls for changing default colors of display element colors inverted using the Invert Colors button.

Limit Line

Select either:

- System – One color set (Normal and Invert) is used for all limit lines for all traces (see Figure 17-5).

- Per Trace – The limit line colors for each trace (Normal and Invert) can be selected individually (see Figure 17-6).

Color Setup

To change Background, Graticule Main, Graticule Sub, Marker, Compression Indicator, Active Channel, and Inactive Channel colors, click on the color block to display the COLOR PALLET dialog box.

To change the Data and Memory Trace or Limit Line colors, click on the trace number, such as Tr1.

To save a color assignment, click OK, or click Cancel to exit.

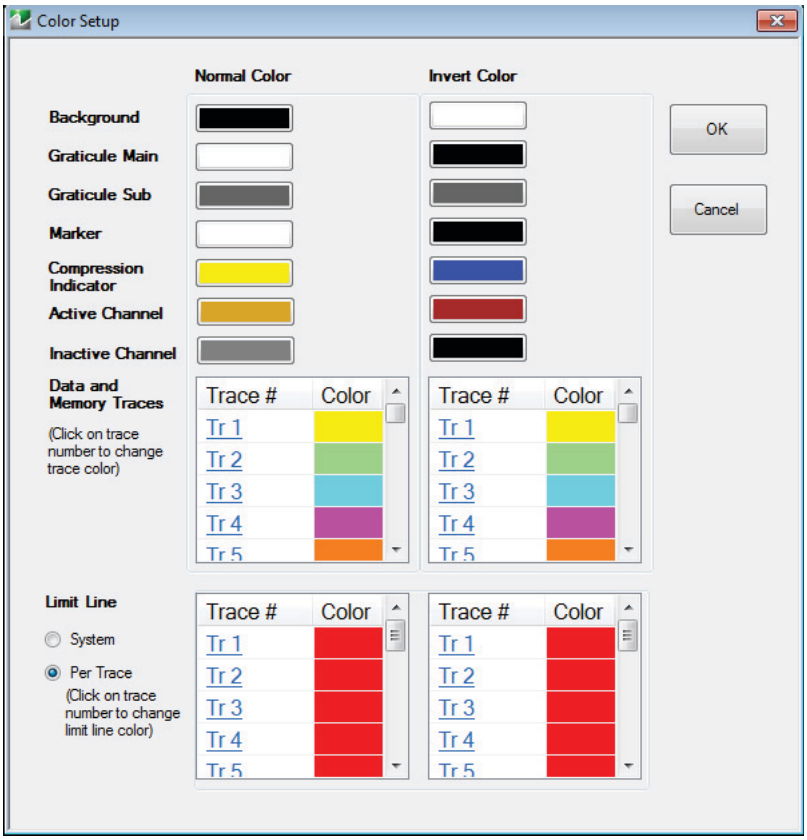


Figure 17-6. COLOR SETUP Menu – Limit Line Color Per Trace

COLOR Palette Dialog Box

Previous

- “COLOR SETUP Dialog Box” on page 17-6

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Color Setup | COLOR SETUP Dialog Box | Color Block | COLOR Picker Dialog Box

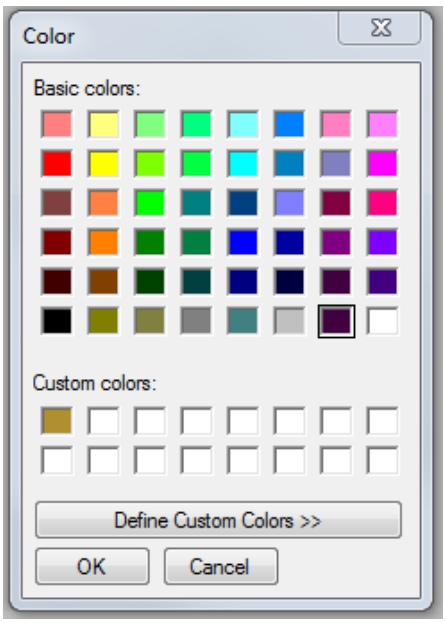


Figure 17-7. COLOR PALLET Dialog Box

Color Reset

To reset all colors to the factory-default setting, click the Reset Colors button.

- MAIN | System | SYSTEM | Setup | SETUP | Reset Colors

FONT DIALOG Box

Previous

- "NETWORK INTERFACE Menu" on page 17-19

Navigation

- MAIN | System | SYSTEM | System | Font Setup | Font Dialog Box

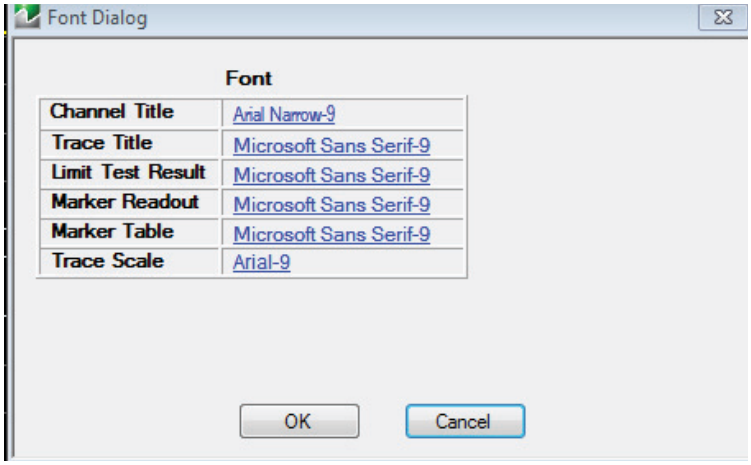


Figure 17-8. FONT CONNECTIONS Dialog Box

Instructions

1. Select the GUI display link to change the font setting. The FONT menu appears. See Figure 17-9.

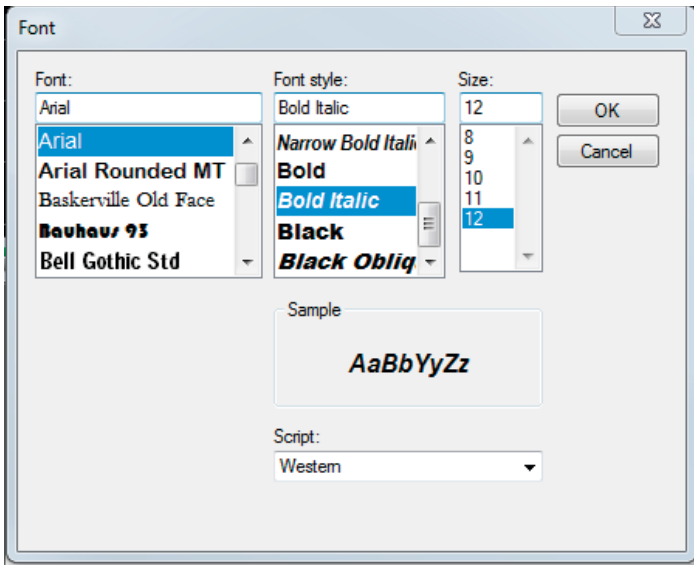


Figure 17-9. FONT Menu

2. Select the font options that you want to change.
3. Select OK to close each dialog box to save or select Cancel to not save the changes.

Note	Selecting Reset will not undo Font settings. Font settings can be changed manually.

TRACE THICKNESS SETUP Dialog Box

Previous

- “NETWORK INTERFACE Menu” on page 17-19

Navigation

- MAIN | System | SYSTEM | System | SETUP | Setup | Trace Thickness Setup | Trace Thickness Setup Dialog Box

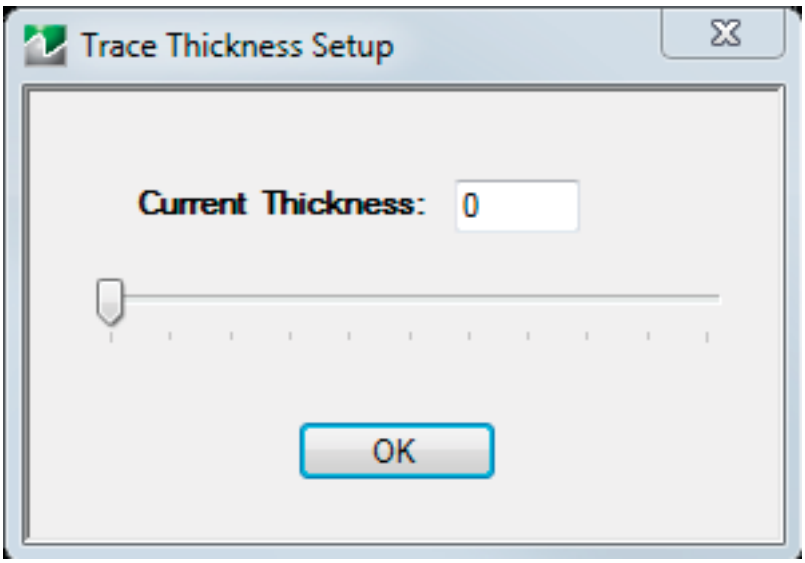


Figure 17-10. TRACE THICKNESS SETUP Dialog Box

Instructions

Move the scroll bar left to right to increase the GUI Trace thickness. The thickness can also be adjusted by entering a number from 1-10 in the Current Thickness field and then select OK to save.

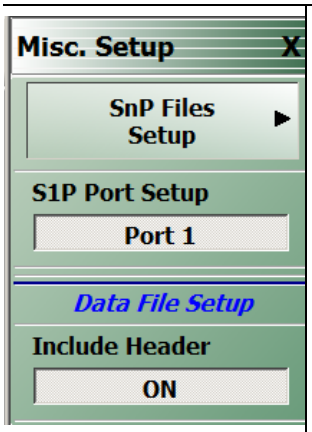
MISC SETUP Menu

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | System | SYSTEM MISC SETUP Menu in 2-Port VNAs



SnP Files Setup

Select displays the SNP SETUP menu where the frequency units and output format of the .sNp files is set.

- "SNP SETUP Dialog Box" on page 17-12
- "SNP SETUP Dialog Box" on page 17-12

S1P Port Setup

Toggles between Port 1 and Port 2.

—**Data File Setup** —

Include Header

Toggle ON to include header information in the data file.

Figure 17-11. MISC SETUP Menu in 2-Port VNAs

SNP SETUP Dialog Box

The SNP SETUP dialog box varies depending on the VNA model's maximum number of ports. The following presents information for the model series covered by this manual.

Prerequisites

- The VNA is in 2-Port Mode

Previous

- "MISC SETUP Menu" on page 17-11

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Misc. Setup | MISC. SETUP | SnP Files Setup | SNP SETUP Dialog Box

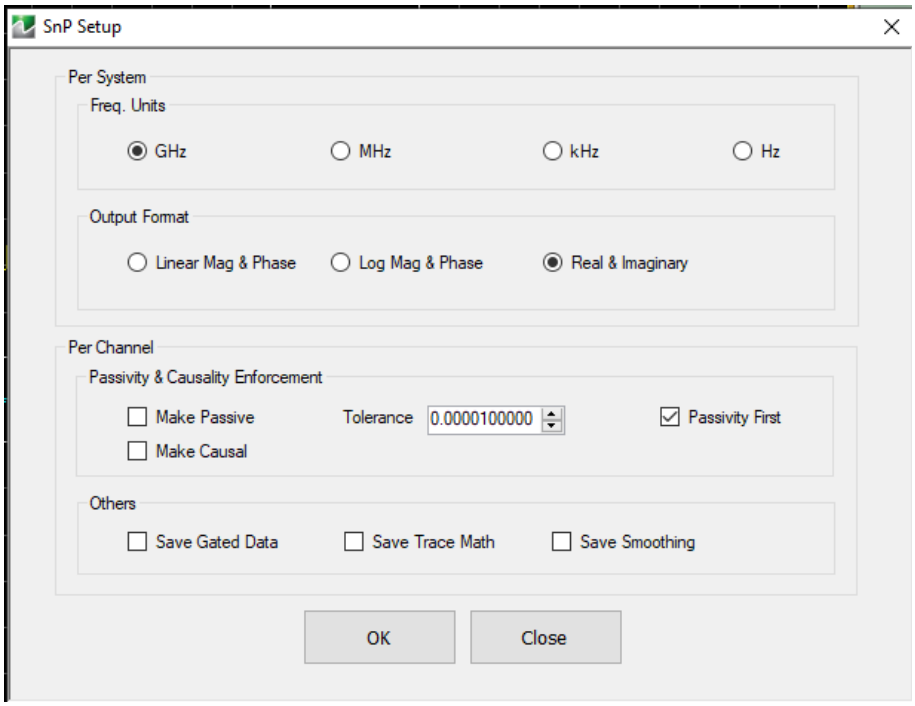


Figure 17-12. SNP SETUP Dialog Box – 2-Port VNAs – MS46122B, MS46131A, MS46322B, ME7868A, ME7869A

Instructions

The controls in the SNP SETUP dialog box allow for configuration of file output for all .sNp file types.

Per System Area

The Per System area contains the Freq. Units and Output Format button selection groups.

Frequency Units Button Selection Group

In the Freq Units button selection group, the four frequency units buttons (GHz, MHz, kHz, and Hz) form a button selection group where the selection of one button de-selects the other three buttons.

On a per-system basis, allows the frequency units to be set as:

- GHz
- MHz
- kHz
- Hz

Output Format Button Selection Group

In the Output Format button selection group, the three buttons form a button selection group where the selection of one button de-selects the other two buttons.

On a per-system basis, allows the output format to be set as:

- Linear magnitude and phase
- Log magnitude and phase
- Real and imaginary numbers

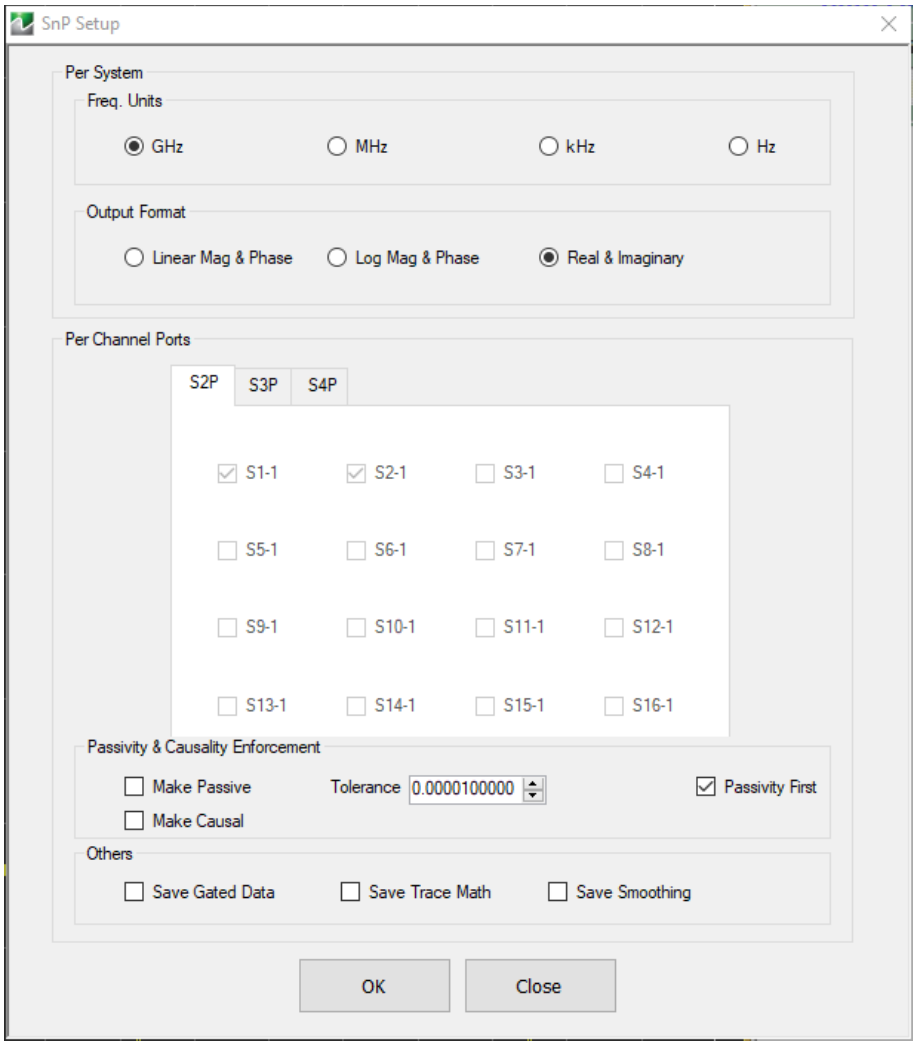


Figure 17-13. SNP SETUP Dialog – 1-Port VNAs – MS46121B

Per Channel (Ports) Area

The Per Channel (Ports) area of the menu contains three SnP tabs (MS46121B only) and the Others area.

Passivity and Causality Enforcement Area:

- **Make Passive Checkbox**

  When selected, during the .SnP file save process, the following occurs:

  At each frequency point, evaluates the eigenvalues of the S matrix. If the largest magnitude of eigenvalues is <1, does nothing and proceeds to the next frequency. If the largest exceeds 1, scales all S-parameters at that frequency in a self-consistent way to ensure the maximum eigenvalue magnitude is <1.

- **Passivity Tolerance**

  Describes how close to 1 (in magnitude) the largest eigenvalue is allowed to get before action is taken (1-sqrt(tolerance) is the limit used). This may need to be changed if the VNA data is being used in a simulator/model analyzer with a different numerical definition of passivity (based on resolution, convergence requirements, etc.). The default value is 0.00001. Generally values are not used outside the range of 0.0000001 to 0.001.

- **Passivity First Checkbox**

  When both 'Make Passive' and 'Make Causal' boxes are checked, this checkbox determines which process is done first. The default is to perform 'Make Passive' first.

- **Make Causal Checkbox**

  When selected, during the .SnP file save process, the following occurs:

  A transform process is applied on each parameter to ensure minimal energy is present in the signal before the equivalent time t=0. Kramers-Kronig relations are enforced which does require reasonably fast decay of the parameter magnitude with frequency and certain aspects of analyticity. See the Calibration and Measurement Guide for more information. It is recommended to only use this function if there are observed problems when using saved data in a time domain simulator.

SnP Tabs – MS46121B only

In the Per Channel Ports areas of the menu, there are tabs for S1P, S2P, and S3P, which are only available for the MS46121B. In each tab, select which MS46121B VNA will be used for the s2p, s3p, or s4p data.

The selection indicates where the S-parameters are taken from: for S2P a minimum of two MS46121B VNAs is required, and up to 16 MS46121B VNAs can be connected. The first MS46121B is always selected (i.e., S1-1 is always selected and cannot be changed). The same applies to the S3P tab (requires data from three MS46121B VNAs) and the S4P tab (requires data from four MS46121B VNAs).

The selections are disabled if the appropriate number of MS46121B VNAs are not connected; i.e., if there is one MS46121B VNA connected, the choices are pre-selected (i.e., for the S2P tab, S1-1, S2-1 are selected).

Others Area

In the Others area, the options can be selected independently of each other.

Save Gated Data: When an .snp file is saved with " Save Gated Data enabled, a comment line ("`! GATING applied`") will be added to the generated .snp file, indicating gating is applied. The Save Gated Data option is only available if the Time Domain option (Option -002) is present. The Save Gated Data option is NOT available in CW power sweep mode.

Save Trace Math: When an .snp file is saved with Save Trace Math enabled, a comment line ("`! Trace Math applied for: Sxy;`") will be added to the generated .snp file, indicating trace math is applied.

Save Smoothing: .When an .snp file is saved with " Save Smoothing enabled, a comment line ("`! Smoothing applied`") will be added to the generated .snp file, indicating smoothing is applied.

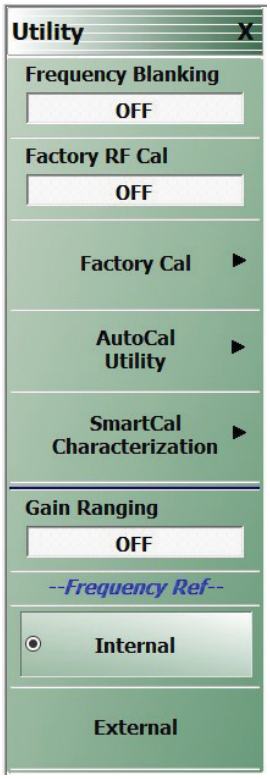
UTILITY Menu

Previous

- "System Menus" on page 17-2

Navigation

- MAIN | System | SYSTEM | Utility | UTILITY



Frequency Blanking

The default state is OFF where frequency values are displayed on the main display and on all menus, buttons, and dialogs. Select changes the button state to ON, and replaces all frequency displays with "Xs" as "XXXX" which includes all frequency displays on all buttons, menus, and dialogs such as all MARKER [1] menu frequency displays.

Factory RF Cal

Toggles on/off use of factory RF calibration.

Factory Cal (ME7868A and ME7869A only)

Select displays the FACTORY CAL menu.

- "FACTORY CAL Menu (ME7868A and ME7869A only)" on page 17-16

AutoCal Utility

Select displays the AUTOCAL UTILITY menu.

- "AUTOCAL UTILITY Menu" on page 17-17

SmartCal Characterization

Select displays the SMARTCAL menu.

- "SMARTCAL CHARAC. Menu" on page 17-18

Gain Ranging (ME7868A, ME7869A only)

Toggles on/off use of gain ranging. Default is OFF.

Internal and External Buttons

Internal and External frequency reference buttons select internal or external 10 MHz reference source for the unit.

Figure 17-14. UTILITY Menu

FACTORY CAL Menu (ME7868A and ME7869A only)

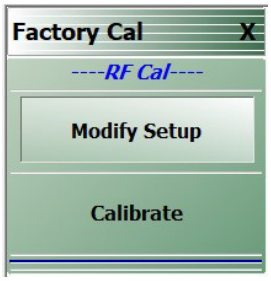
The best practice recommendation is to return the AutoCal module to Anritsu annually for an in-factory .

Previous

- “UTILITY Menu” on page 17-15

Navigation

- MAIN | System | SYSTEM | Utility | UTILITY | Factory Cal | FACTORY CAL



Modify Setup

Select displays the Factory RF Cal Setup dialog. Use it to configure the Thru parameters, then select Apply.

Calibrate

Select starts the Factory Cal.

Figure 17-15. AUTOCAL UTILITY Menu

FACTORY RF CAL SETUP Dialog (ME7868A and ME7869A only)

The FACTORY CAL RF SETUP dialog allows the user to configure the Thru parameters before starting a Factory Calibration.

Previous

- “FACTORY CAL Menu (ME7868A and ME7869A only)” on page 17-16

Navigation

- MAIN | System | SYSTEM | Utility | UTILITY | Factory Cal | FACTORY CAL | Modify Setup | FACTORY RF CAL SETUP

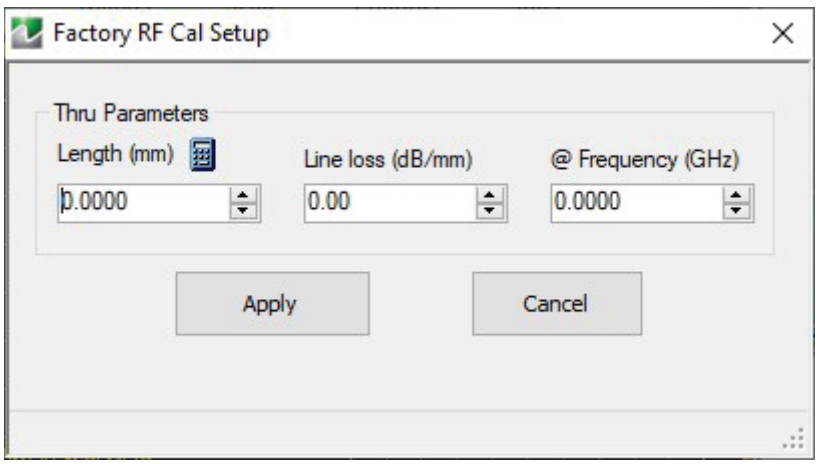


Figure 17-16. FACTORY RF CAL SETUP Menu

AUTOCAL UTILITY Menu

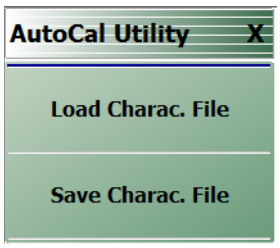
The best practice recommendation is to return the AutoCal module to Anritsu annually for an in-factory characterization. If a factory re-characterization is not possible, you can use this menu to re-characterize the module. Note that the re-characterization will be only as good as the prior instrument manual full calibration procedure. The recommended manual calibration is a Full Two Port calibration (12 Term Cal). For more information, contact Anritsu Customer Service.

Previous

- "UTILITY Menu" on page 17-15

Navigation

- MAIN | System | SYSTEM | Utility | UTILITY | AutoCal Utility | AUTOCAL UTILITY



Load Charac. File

Selecting the Load Characterization File button displays a Windows file OPEN dialog. Use it to select a file, then click Open in the dialog.

Save Charac. File

Select displays a Windows file SAVE dialog. In it, enter a file name, then click Save in the dialog.

Figure 17-17. AUTOCAL UTILITY Menu

SMARTCAL CHARAC. Menu

Full Name

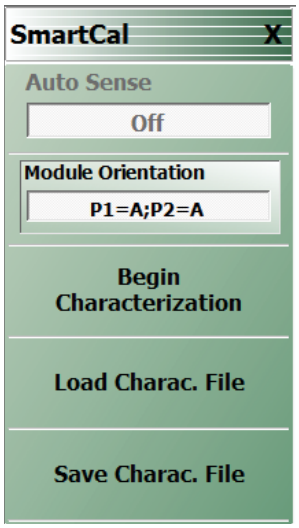
- SmartCal Characterization Menu

Previous

- "UTILITY Menu" on page 17-15

Navigation

- MAIN | System | SYSTEM | Utility | UTILITY | SmartCal Characterization | SMARTCAL



Auto Sense

If shown to be ON, the SmartCal Module determines the orientation assignments.

Module Orientation

Select the VNA Port orientation and assignment for the SmartCal procedure for Ports 1 and 2.

Begin Characterization

Select starts the characterization process.

Load Charac. File

Selecting the Load Characterization File button displays a Windows file OPEN dialog. Use it to select a file, then click Open in the dialog.

Save Charac. File

Select displays a Windows file SAVE dialog. In it, enter a file name, then click Save in the dialog.

Figure 17-18. SMARTCAL Menu

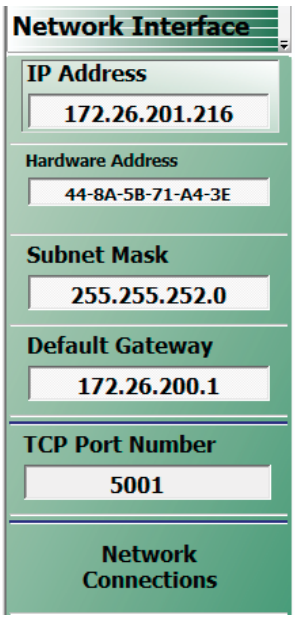
NETWORK INTERFACE Menu

Previous

- "System Menus" on page 17-2

Navigation

- MAIN | System | SYSTEM | Network Interface | NETWORK INTERF.



IP Address

A read-only display. Shows the IP address of the instrument.

Hardware Address

A read-only display. Shows the internal network interface card hardware address.

Subnet Mask

A read-only display. Shows the network subnet mask value.

Default Gateway

A read-only display. Shows the network default gateway address.

TCP Port Number

A read-only display. Shows the network TCP port number.

Network Connections

Select displays the NETWORK CONNECTIONS dialog box which is part of the Microsoft® Windows Operating System.

- "NETWORK CONNECTIONS Dialog Box" on page 17-20

Figure 17-19. AUTOCAL CHARAC. (AUTOCAL CHARACTERIZATION) Menu

NETWORK CONNECTIONS Dialog Box

Previous

- “NETWORK INTERFACE Menu” on page 17-19

Navigation

- MAIN | System | SYSTEM | Network Interface | NETWORK INTERF. | Network Connections | NETWORK CONNECTIONS Dialog Box

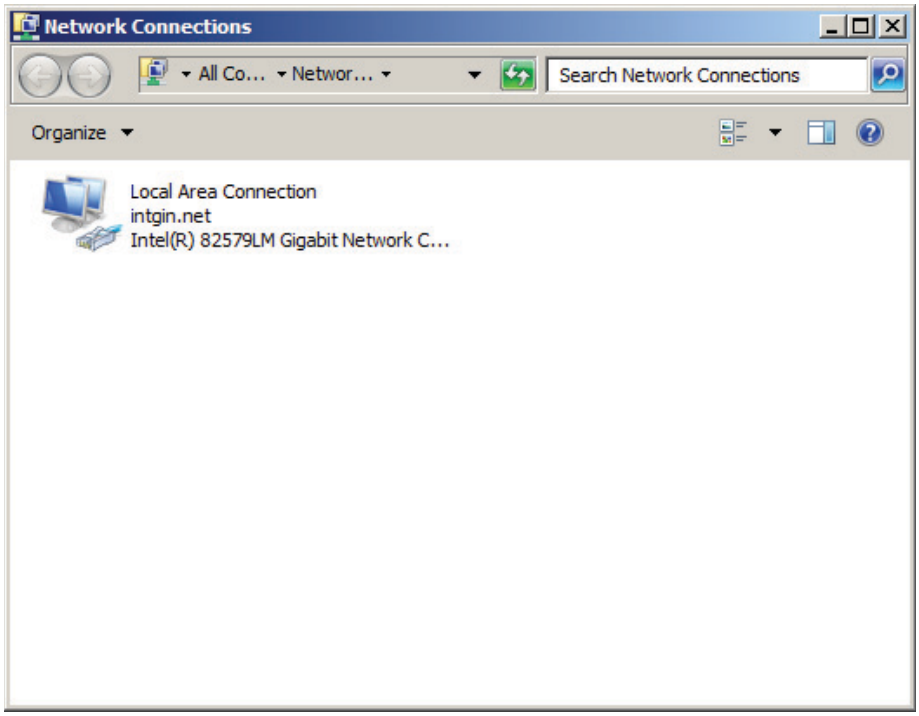


Figure 17-20. NETWORK CONNECTIONS Dialog Box

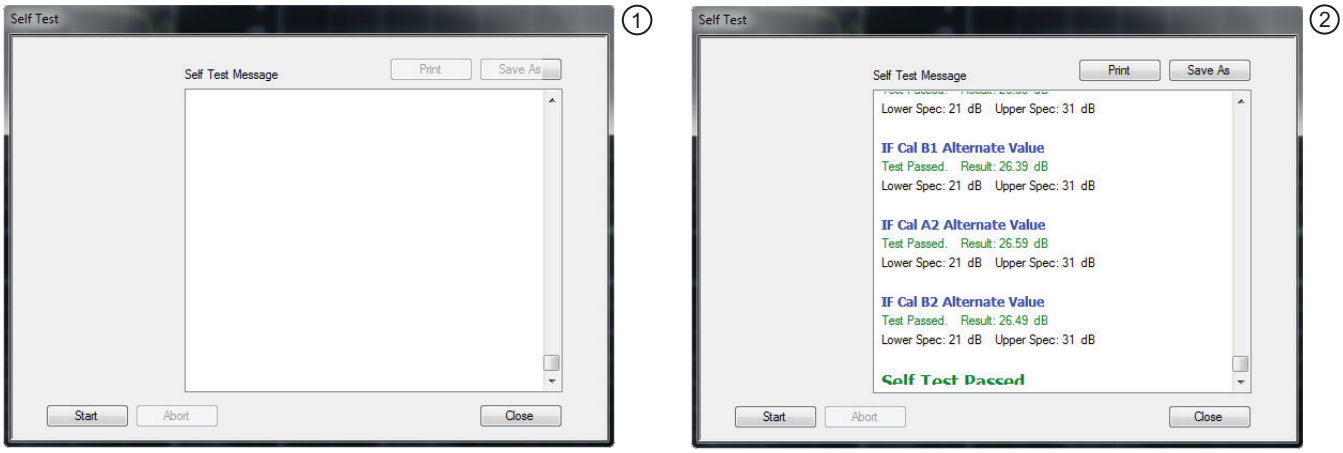
SELF TEST Dialog Box

Previous

- “System Menus” on page 17-2

Navigation

- MAIN | System | SYSTEM | Diagnostics | DIAGNOSTICS | Self-Test | SELF TEST Dialog Box



1. SELF TEST Dialog Box – Test Not Started.	2. SELF TEST Dialog Box – Test Passed.

Figure 17-21. SELF TEST Dialog Box

Instructions

1. Select any combination of tests from the available check boxes:

- Source
- Analog IF
- RF Deck Ctrl
- DSP/PV

2. The Select All button selects all tests. The Clear All button de-selects all tests.

3. Once selections are made, click Start to run the tests. Click Abort to cancel in-process tests.

4. Test results are displayed in the Self Test Message area.

5. A normal message is Self Test Passed.

6. Click Print to print to the local printer through an open Print dialog box. Click Save As to save as a Self Test Result TXT file typically located in `C:\AnritsuVNA\Data`. Click Close to close the dialog box.

EVENT VIEWER Dialog Box

Previous

- “System Menus” on page 17-2

Navigation

- MAIN | System | SYSTEM | Event Log | EVENT VIEWER Dialog Box

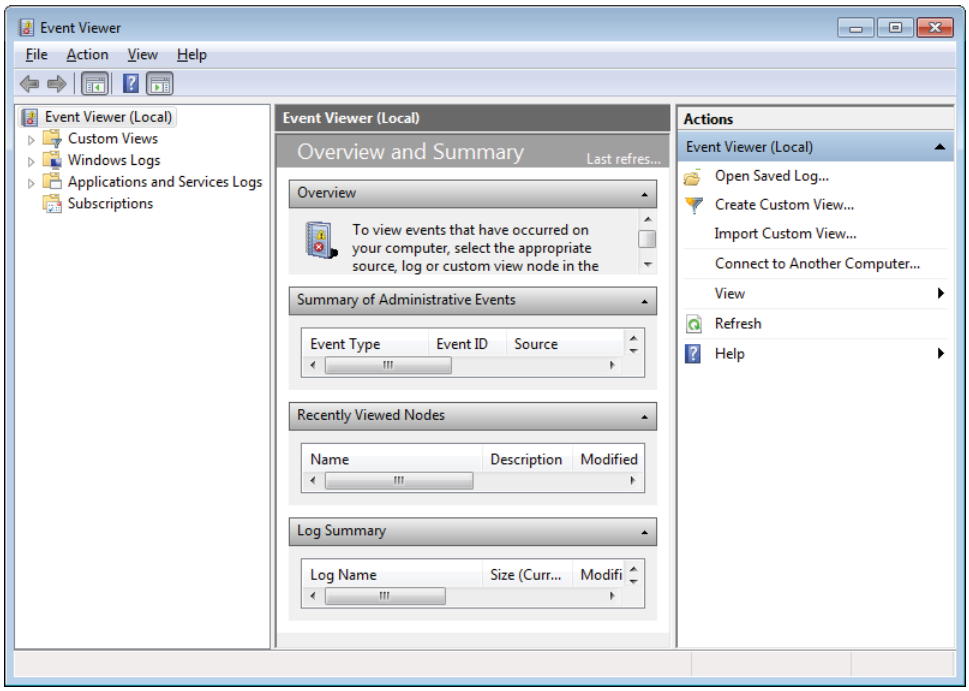


Figure 17-22. EVENT VIEWER Dialog Box

Instructions

Options on the menu bar are:

- File
  - Options: Displays the Options dialog box with additional system functions.
  - Exit: Closes the dialog box and returns to the Diagnostics menu
- Action
  - Connect to another computer
  - Open saved log
  - Create Custom View
  - Import Custom View
  - Refresh
  - Help
- View
  - Show Analytic and Debug Logs
  - Customize

- Help
    - Help Topics
    - TechCenter Web Site
    - About Microsoft Management Console
    - About Event Viewer

DIAGNOSTICS ACCESS Dialog Box

Previous

- “System Menus” on page 17-2

Navigation

- MAIN | System | SYSTEM | Diagnostics | DIAGNOSTICS ACCESS Dialog Box

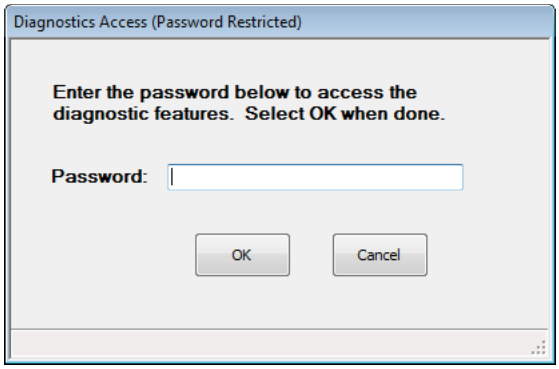


Figure 17-23. DIAGNOSTICS ACCESS Dialog Box

Instructions

An instrument-specific password is required to enter the DIAGNOSTICS ACCESS dialog box

Upgrade FPGA Button

This is a factory service control and is not supported for customer use.

Chapter 18 — File Management Menus

18-1 Chapter Overview

This chapter provides information for management of various system output and configuration files including Active channel TXT files, Active channel S2P files, Active channel CSV files, Active trace data (Formatted), and Active trace data (Unformatted).

18-2 Overview of File Management Menus and Dialog Boxes

There is one available menu with multiple related dialog boxes:

- "FILE Menu" on page 18-2
  - "RECALL SETUP Dialog Box" on page 18-6
  - "RECALL DATA Dialog Box" on page 18-8
  - "SAVE SETUP Dialog Box" on page 18-10
  - "SAVE DATA Dialog Box" on page 18-11

18-3 File Menus and Dialog Boxes

FILE Menu

Previous

- "Main Menu" on page 2-6

Navigation

- MAIN | File | FILE

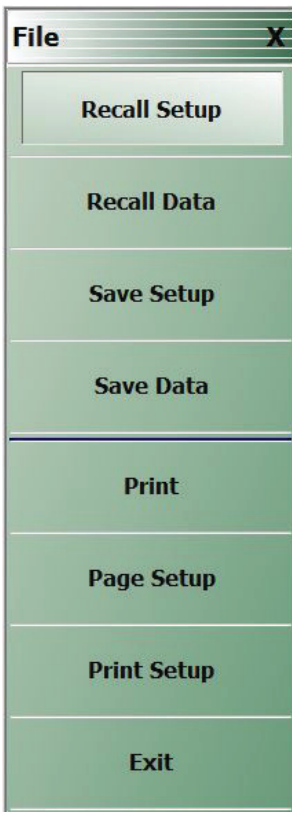


Figure 18-1. FILE Menu – Data Save/Recall Functions – Print Functions

Recall Setup

Select displays the RECALL SETUP dialog box which allows recalling of previously saved setup files.

- "RECALL SETUP Dialog Box" on page 18-6

Recall Data

Select displays the RECALL DATA dialog box.

- "RECALL DATA Dialog Box" on page 18-8

Save Setup

Use the Save Setup button to save variations of the current instrument setup. The configurations that can be saved are of the following types:

- Active Channel Setup and Calibration CHX files
- Active Channel Setup STX files

Select displays the SAVE SETUP dialog box.

- "SAVE SETUP Dialog Box" on page 18-10

Save Data

Use the Save Data button to save the active channel data in several different formats and different purposes. For example, save data as a TXT file for use in another application such as a spreadsheet or word processor. Note the TXT data cannot be imported back into the instrument. Available formats are:

- Active Channel TXT files
- Active Channel S1P files
- Active Channel S2P files
- Active Channel S3P files
- Active Channel S4P files
- Active Channel CSV files
- Active Channel BMP files
- Active Channel PNG files
- Active Channel JPEG files
- Active Trace Data (Formatted) TDF files
- Active Trace Data (Unformatted) TDU files

Select displays the Save Data dialog box.

- "SAVE DATA Dialog Box" on page 18-11

Print

Select prints the current main display to the default printer using a standard Windows PRINT dialog box. Print confirmation dialogs appear as the print job is spooled to the default printer. Note that the default printer and its configuration is set from the Windows Desktop using the PRINTERS AND FAX dialog box. If the VNA is standalone and not on a network, the attached printer is used. If the VNA is networked, any network printer can be used.

Page Setup

Select displays the PAGE SETUP dialog box where the paper size, margins, paper orientation, and other printer parameters can be set. "PAGE SETUP DATA Dialog Box" on page 18-13

Print Setup

Select displays the PRINT SETUP dialog box where various print output parameters can be configured and set. "PAGE SETUP DATA Dialog Box" on page 18-14

Print Dialog Boxes

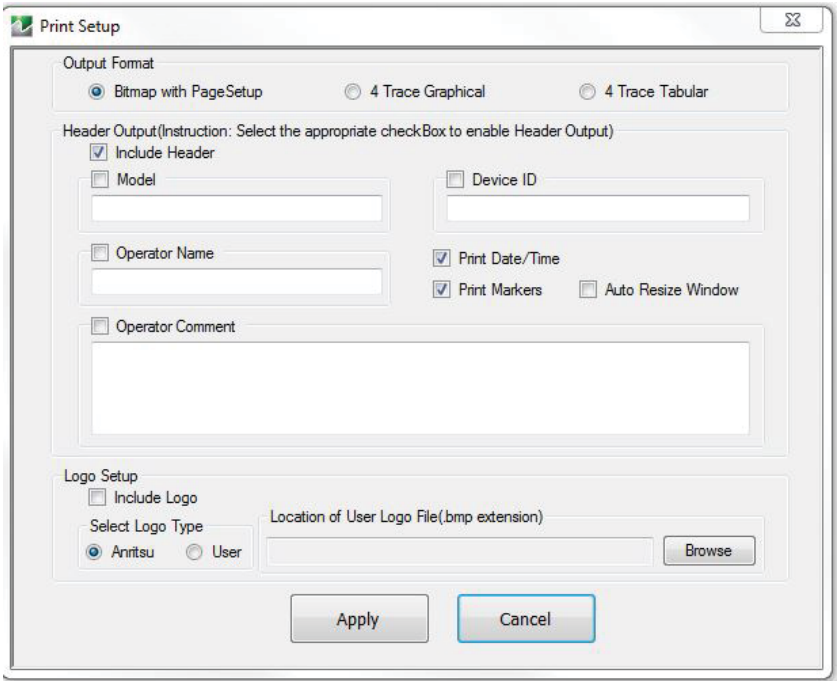


Figure 18-2. Print Dialog Box

Instructions

Select displays the standard Windows PRINT dialog box to print the current main display.

- If the VNA is networked, allows printing to any compatible networked printer. If a USB printer is attached, allows printing to any compatible USB printer.
- If the Graphics Header information is configured, selecting PRINT outputs the display data along with any user-defined parameters.
- If the header is set to OFF, no header is printed, and the standard PAGE SETUP and then the PRINT dialog are displayed.
- PRINT SETUP dialog box

Menu Bar

- • MENU BAR | File | Print Setup

Previous

- “File Menus and Dialog Boxes” on page 18-2

Navigation

- • MAIN | File | FILE | Print Setup | PRINT SETUP Dialog Box

PRINT Dialog Boxes

The PRINT SETUP dialog box allows user configuration of various print output options described below.

Output Format

This button selection group allows three choices of print output:

- Bitmap (BMP) with Page Setup information
- 4 Trace Graphical Display
- 4 Trace Tabular Listing

Header Output

The header output area provides control of which display elements are to appear on the output, and the contents of each.

Include Header

- When the check box is selected, all selected header elements below are included in the output type above. When the check box is not selected, no header fields are included in the output.

Model

- Typically the VNA Model Number, but it can be any alphanumeric string. It may be selected for inclusion in the output or not selected.

Device ID

- Typically the identification of the DUT, but it can be any alphanumeric string. It may be selected for inclusion in the output or not selected.

Operator Name

- Typically the identification of the test operator, but it can be any alphanumeric string. It may be selected for inclusion in the output or not selected.

Operator Comment

- Any free form comment from the test operator as alphanumeric strings. It may be selected for inclusion in the output or not selected.

Logo Setup

This area allows the inclusion of a logo on the output report. If not selected, the logo does not appear in the output.

Select Logo Type

- The output can be configured to output the Anritsu Logo or a user defined logo. If the user defined logo is selected, it must be added to the VNA system as a BMP (Bit Mapped Graphic) File to a known location on the Solid State Drive (SSD).
- To load a user defined logo, copy the logo to a known SSD location. Then select the User radio button, and then browse to the logo location.
- The logo will remain until changed.
- If necessary, multiple logos can be added to the system and changed as needed.

Exit

Select displays an exit warning, and if confirmed, ends all ShockLine application processes, and exits the VNA application to the Windows operating system desktop.

RECALL SETUP Dialog Box

Use the RECALL SETUP dialog to recall one of several types of previously saved setup for general instrument configuration.

Power-On Configuration Setup

- Note that this dialog does not set the power-on configuration setting.
- Power-on settings are configured in the POWER-ON SETUP menu located within the SYSTEM menus.
- MAIN | System | SYSTEM | Power-On Setup | POWER-ON SETUP

Previous

- "FILE Menu" on page 18-2

Navigation

- MAIN | File | FILE | Recall Setup | RECALL SETUP Dialog Box

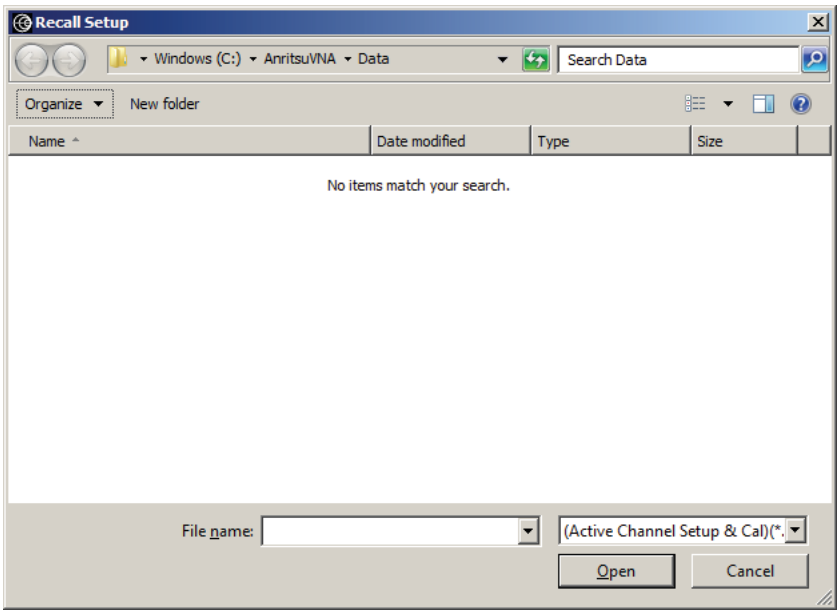


Figure 18-3. RECALL SETUP Dialog Box

Instructions

Use this dialog to select a previously stored setup configuration file.

1. Navigate to the FILE menu and the RECALL SETUP dialog box.
   - MAIN | File | FILE | Recall Setup | RECALL SETUP Dialog Box
2. The RECALL SETUP dialog box appears.
3. Navigate to the required folder (recommend `C:\AnritsuVNA` folder) and locate the required setup file:
   - Active Channel Setup and Calibration CHX files
   - Active Channel Setup STX files
4. Once the appropriate file is selected, click Open.

5. The selected setup file is now available for use on the PRESET SETUP menu if the Saved Setup button is selected.

- MAIN | System | SYSTEM | Preset Setup | PRESET SETUP

RECALL DATA Dialog Box

Previous

- "FILE Menu" on page 18-2

Navigation

- MAIN | File | FILE | Recall Data | RECALL DATA Dialog Box

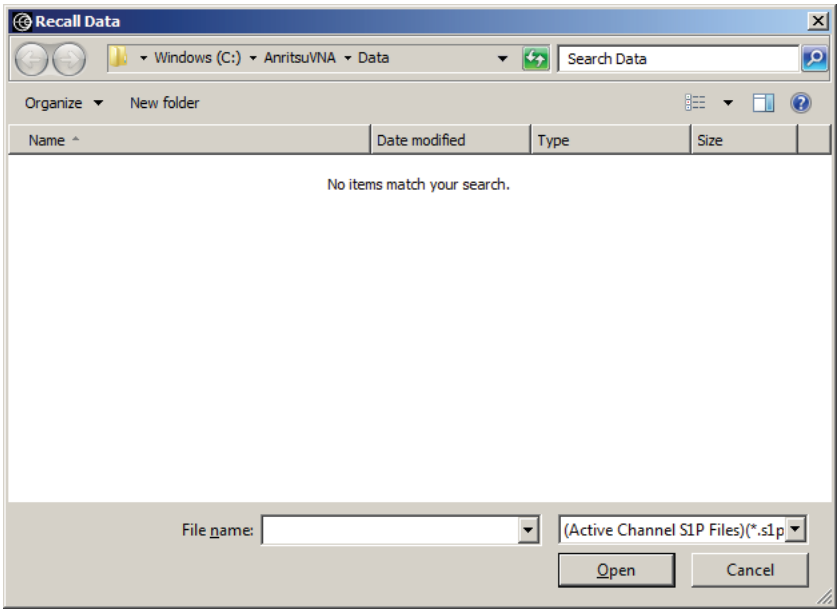


Figure 18-4. RECALL DATA Dialog Box

Instructions

Use this dialog to select a previously stored data configuration file. If the system is on hold, recall a TBF formatted file to overwrite the active trace memory. If system is not on hold, recall a TBF or TBU formatted file to overwrite the active trace memory. Note that the Active Channel TXT file cannot be imported back into the instrument.

Procedure

1. Navigate to the required folder and locate the required data file:
   - Active Channel S1P files
   - Active Channel S2P files
   - Active Channel S3P files
   - Active Channel S4P files
   - Active Trace Data (Formatted) TDF files
   - Active Trace Data (Unformatted) TDU files
   - Active Trace Memory (Formatted) TDF files
   - Active Trace Memory (Unformatted) TDU files
2. Best practices recommend the `C:\AnritsuVNA` folder.

3. Once the appropriate file is selected, click Open.

4. The selected data file is applied depending on the file type.

SAVE SETUP Dialog Box

Previous

- “FILE Menu” on page 18-2

Navigation

- MAIN | File | FILE | Save Setup | SAVE SETUP Dialog Box

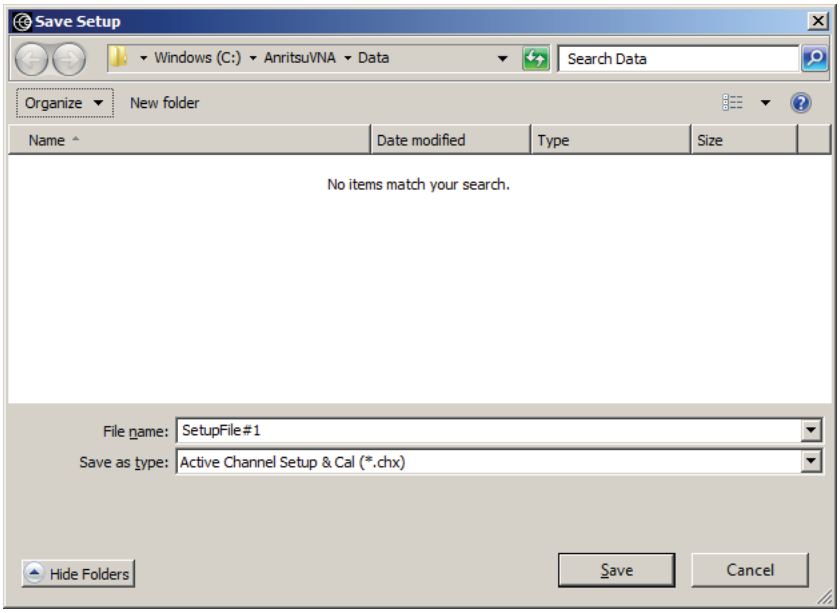


Figure 18-5. SAVE SETUP Dialog Box

Instructions

Use this dialog to select a previously stored setup configuration file.

1. Navigate to the required folder to save the setup file.
   - Best practices recommend the `C:\AnritsuVNA` folder.
2. Select the file type from the pull-down menu in the dialog box:
   - Active Channel CHX files
   - Active Channel STX files
3. Once the appropriate file type and location is selected, click Save.

SAVE DATA Dialog Box

Previous

- "FILE Menu" on page 18-2

Navigation

- MAIN | File | FILE | Save Data | SAVE DATA Dialog Box

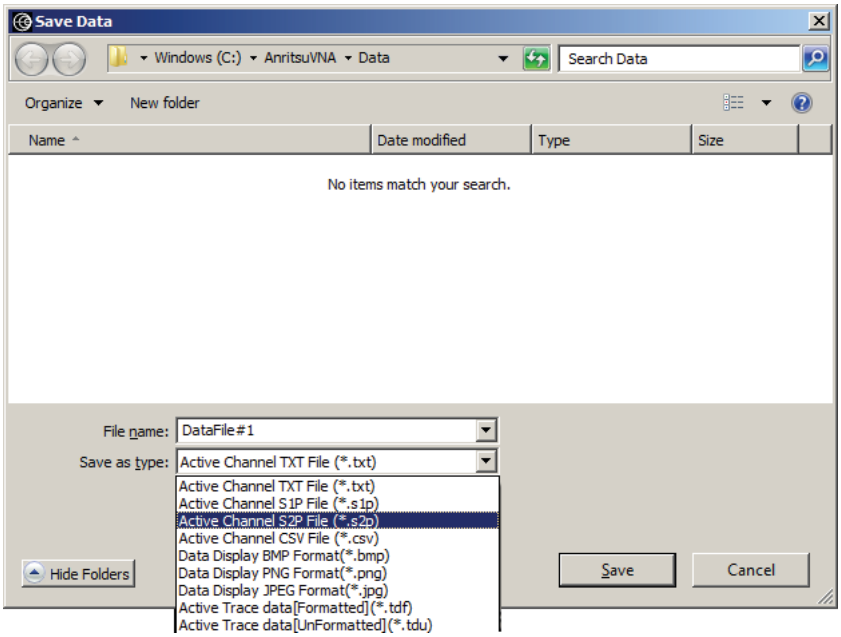


Figure 18-6. SAVE DATA Dialog Box

Note	Not all file data types are available in all application modes. For example, the S2P file type is not available for saving Pulse Profile or Pulse-to-Pulse data. The "Save as type" selection list automatically limits the available selections as appropriate for the current operating mode and data being saved.

Instructions

Use this dialog to save a data configuration file.

1. Navigate to the required folder.
   - Best practices recommend the `C:\AnritsuVNA` folder.
2. Select the data file type from the pull-down menu:
   - Active Channel TXT files
   - Active Channel S1P files
   - Active Channel S2P files
   - Active Channel S3P files
   - Active Channel S4P files
   - Active Channel CSV files
   - Active Channel BMP files
   - Active Channel PNG files

- Active Channel JPEG files
- Active Trace Data (Formatted) TDF files
- Active Trace Data (Unformatted) TDU files

3. Once the appropriate file type is selected, click Save.

4. The selected data file is saved.

PAGE SETUP DATA Dialog Box

Previous

- “FILE Menu” on page 18-2

Navigation

- MAIN | File | FILE | Print | PAGE SETUP Dialog Box

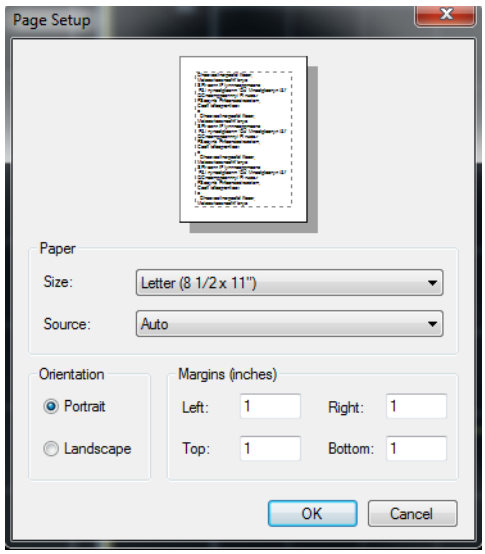


Figure 18-7. Page Setup Dialog Box

Instructions

Use this dialog to configure how the traces will print.

1. Select paper size and source from PAPER menu radio buttons.
2. Select portrait or landscape from ORIENTATION menu radio buttons.
3. Select left, right, top and bottom margins lengths from MARGIN menu.

PAGE SETUP DATA Dialog Box

Previous

"FILE Menu" on page 18-2

Navigation

- MAIN | File | FILE | Print | PAGE SETUP Dialog Box

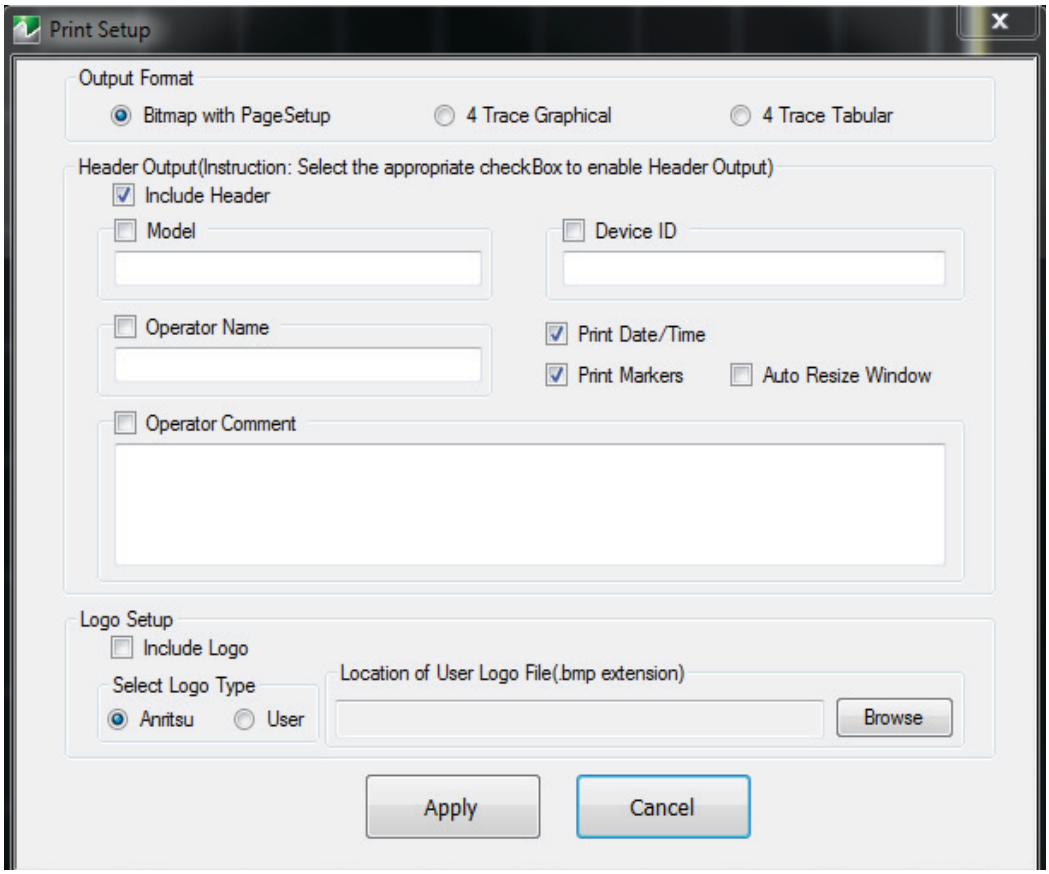


Figure 18-8. PRINT SETUP Dialog Box

Instructions

Use this dialog to configure how the traces will print.

1. Select the type of graphical output from the Output Format radio buttons.
2. Select header information from the HEADER OUTPUT menu.
3. Select logo information from the LOGO SETUP menu.

Appendix A — File Specifications

A-1 Default File Directory Structure

This appendix defines the file directory structure used on default-configuration ShockLine Series VNAs and provides the general file extensions and specifications used in the instrument.

The following is the standard directory structure:

```
C:\AnritsuVNA
              \AutoCal
              \Cal
              \Data
              \Temp
```

A-2 File Extension Definitions

The following file types are used to support the instrument. The typical location provided is the default installation location.

Table A-1. File Extension Definitions (1 of 6)

Extension	Name	Definition
.acd	Precision Automatic Calibrator (AutoCal) Module Characterization File AutoCal Characterization File	Each AutoCal module has an associated characterization file that contains parametric data about the module. When AutoCal starts up, it looks for any files in the current directory with the extension .acd. If more than one file is found, the user is prompted for which file to use.
.ahc	All Hardware Calibration File	Saves all hardware calibration data on a per-system basis.
.aic	AIC Analog-In Calibration File	Saves analog-in calibration data on a per-system basis.
.alc	ALC Calibration File	Saves all available ALC calibration for all ports, per system.
.bmp	Bit-mapped Graphics File	A Windows-compatible graphic file. In the ShockLine Series VNAs, the graphic capture of the main display results in a .bmp file that includes the running graphics display,
.ccf	Calibration Kit Coefficients File	For ShockLine Series VNA. A calibration kit coefficients file comes with each calibration kit, usually on a USB memory device. These files can be loaded onto the VNA hard disk and then recalled to active memory as required. See also .kit files.
.cha	All Channels Setup and Calibrations File	For saving and recalling all channel setup parameters and calibration data. Upon recall, restores all configuration settings to all channels. Similar to the .sta file. The .sta file does not save calibration data.

Table A-1. File Extension Definitions (2 of 6)

Extension	Name	Definition
.chc	Active Channel Setup and Calibration File with Calibration Kit information.	For the active channel, saves the channel setup parameters, RF calibration coefficients, and information on calibration kits. Upon recall, restores the setup parameters and RF calibration coefficients to the active channel, as well as calibration kit information. Similar to the .stc file, but the .stc file does not save RF calibration coefficients. Similar to the .chx file, but the .chx file does not save calibration kit information.
.chx	Active Channel Setup and Calibration File	For the active channel, saves the channel setup parameters and RF calibration coefficients. Upon recall, restores the setup parameters and RF calibration coefficients to the active channel. The .chx and .stx file formats are very convenient for copying the setup of one channel into another channel: Save the setup from the active channel Open an additional channel Recall the saved .chx or .stx file into the new channel. Similar to the .stx files, but the .stx file does not save RF calibration coefficients. Similar to the .chc file, but the .chc file also saves the calibration kit information.
.csv	Active Channel Information CSV File	An exportable trace data file in a spreadsheet compatible comma-separated-value (CSV) format. Includes an optional descriptive heading in which the data for every trace is saved to a defined location folder. The data for each trace is saved as an X and a Y column to accommodate multiple parameters such as mixed frequency and time domain. Subsequent traces are added as additional columns. Instrument data can be saved to the .csv but the .csv file cannot be recalled into the VNA memory. Similar to the .txt file format.
.edl	Embedding/De-embedding Configuration File	Default file name is EmbedDeembed.edl.

Table A-1. File Extension Definitions (3 of 6)

Extension	Name	Definition
.fpc	Frequency Sweep Power Calibration File	On a per-channel, per-port basis, saves the active channel and port data. Upon recall, restores the saved port data to the active channel. File extension for frequency sweep calibrations using Frequency Sweep (Linear), Segmented Sweep (Frequency-based), and Segmented Sweep (Index-based). Compare with .ppc file types below for power sweeps.
.ini	AutoCal Default Setup File	The default setup file for AutoCal. The default file name is auto_cal.ini. If another file is required, another AutoCal setup file should be loaded by selecting **File | Open Setup File.**
.ini	Frequency Initialization Table file	Default name is FreqIniTable.ini
.jpg .jpeg	Joint Photographic Experts Group Image File	User-initiated capture of the data display area of the VNA.
.kit	Calibration Kit Coefficients File	From Anritsu Lightning Series VNA. ShockLine VNAs will read .kit files but not save them. The ShockLine VNA will convert a .kit file to a .ccf file format.
.lmt	Limit Line Configuration File	For the active trace on the active channel, saves all limit line data including number of segments, frequency range or CW, test result signs, limit fail signals, and limit external output. Upon recall, restores the limit line configuration to the active trace on the active channel
.log	Microsoft Windows Event Viewer Log File	These are operating system files logging events for the Application, Security, System, and Vector. The files are viewable by navigating to: **MAIN | System | SYSTEM | Event Log | EVENT VIEWER Dialog Box**
.mkr	Marker Table	List of all markers.
.ppc	Power Sweep Power Calibration File	On a per-channel basis, saved the active channel and port. Upon recall, restores the saved port data to the active channel. File extension for power sweep calibration files using Power Sweep (CW Frequency) or Power Sweep (Swept Frequency). Compare with .fpc file types above for frequency-based sweeps.
.rcvr	Receiver Calibration File	On a per-channel basis, saves all available user receiver calibration data. Upon recall, restored the user receiver calibration data to the active channel.

Table A-1. File Extension Definitions (4 of 6)

Extension	Name	Definition
.s1p .s2p .s3p .s4p	Active Channel S1P file Active Channel S2P file Active Channel S3P file Active Channel S4P file	Generically, an .sNp file is in standard microwave simulator text format and is similar to the .txt file described below. Includes a controlled header and only one or four S-parameters are saved. An .s1p file type holds the characteristics of a reflective calibration components. These files are loaded as needed during calibration if the calibration components is characterized by this file type. An .s2p file type holds the characteristics of a 2-port microwave device. If a full two-port calibration is applied, all of the S-parameters are always measured, even if they do not need to be displayed. The resultant .s2p file is complete with all S-parameter information. Upon recall, the .sNp file can be recalled and displayed as trace memory when they are loaded into the active channel.
.sgs	Segmented Sweep File	On a per-channel basis, saves the segmented sweep definition configuretion data. Use Segmented sweep definition file. Used for frequency-based sweep and index-based sweep.
.sqm	Source Quadrupler hardware calibration file	
.sta	All Channels Setup File	For saving and recalling all system and all channel setup parameters. Upon recall, restores all configuration settings to all channels. Similar to the .cha file, but the .cha file also saves RF calibration coefficients.
.stc	Active Channel Setup File with Calibration Kit Information.	For the active channel, saves the channel setup parameters and information on calibration kits. Upon recall, restores the setup parameters and calibration kit information. Similar to the .stx file, but the .stx file does not save calibration kit information. Similar to the .chc file, but the .chc file also saves RF calibration coefficients.

Table A-1. File Extension Definitions (5 of 6)

Extension	Name	Definition
.stx	Active Channel Setup File	For the active channel, saves the channel setup parameters. Upon recall, restores the setup parameters to the active channel. The .chx and .stx file formats are very convenient for copying the setup of one channel into another channel: Save the setup from the active channel Open an additional channel Recall the saved .chx or .stx file into the new channel. Similar to the .chx files, but the .chx file also saves RF calibration coefficients. Similar to the .stc file, but the .stc file also saves the calibration kit information.
.tdf	Active Trace Data Memory Formatted File – After Post Processing	The .tdf file stores trace data or trace memory data after all post processing using an XML format. This is useful for comparing a DUT against a “golden device” or seeing if the performance of a DUT has changed over time. The file can be saved and recalled. The file will recalled into the same part of the chain that it was saved from and after any post-processing steps.
.tdu	Active Trace Data Memory Unformatted File – Before Post Processing	The.tdf file stores trace data or trace memory data using an XML format. The file saves the active trace’s memory before most post processing such as time domain, smoothing, and group delay calculations. The file can save data from the current trace or from the trace memory. A previously saved file can be recalled and loaded, and then either displayed on the current trace or displayed on the trace memory. This file can be recalled into either the active trace (normally in hold or sweeping very slowly) or into the active trace’s memory. The file will recalled into the same part of the chain that it was saved from and before any post-processing steps.
.tmz	Ten (10) MHz Calibration File	Per system

Table A-1. File Extension Definitions (6 of 6)

Extension	Name	Definition
.txt	Active channel trace data text file	An exportable trace data file in a spreadsheet or word processor compatible format that uses tabs to delimit the output fields. Includes an optional descriptive heading in which the data for every trace is saved to a defined location folder. The data for each trace is saved as an X and Y column to accommodate multiple parameters such as mixed frequency and time domain. Subsequent traces are added as additional columns. Instrument data can be saved to the .txt file but the .txt file cannot be recalled into the VNA memory. Similar to the .csv file format.
.xml	VNA configuration file in XML	XML or eXtensible Markup Language file Used for the VNA configuration state when the instrument is shut down and subsequently powered back up.

A-3 Identification of Misc File Types

Table A-2 identifies specific file type names.

Table A-2. File Definitions

File	Name
EmbedDeembed.edl	Embedding/De-embedding Configuration File

Appendix B — Error Messages

B-1 Appendix Overview

This appendix lists, describes, and provides corrective action for error messages that appear on the instrument display. Messages that require action by a service representative are also listed. The tables herein describe the name of the message, the typical reason for its occurrence, and recommended error correction methods.

B-2 System Messages

System messages are displayed in the status bar or a pop-up dialog box. They indicate that the system may be malfunctioning. System messages are recorded into the event log. Contact Anritsu Customer service if problems are not resolved with instrument re-boot.

Table B-1. Status Bar Messages

Message	Description	Display Location
Lock Error "A"	Source Unlocked	Status Bar
Lock Error "B"	Local Oscillator Unlocked	Status Bar
Lock Error "O"	Synchronization Error (applies to ME7868A and ME7869A)	Status Bar
Lock Error "S"	Reference Unlocked	Status Bar
Lock Error "T"	Integration Error	Status Bar
Lock Error "U"	IF Lock Error	Status Bar
Auto IF Cal Failed	Intermediate Frequency Power Level Failed	Status Bar
Trigger IF Cal Failed		Dialog Box
Power Up Self Test Failed	Self Test Failed	Status Bar
Trigger Self Test Failed		Dialog Box
Source Pretune Cal Failed	Source Pretune Calibration Failed to Complete	Dialog Box
LO Level Cal Failed	Local Oscillator Calibration Failed to Complete	Dialog Box
ALC Cal Failed	Automatic Level Control Calibration Failed to Complete	Dialog Box
Memory Location Corrupted		Status Bar/ Dialog Box
System Out of Memory		Status Bar/dialog Box

B-3 Operational Messages

Operational messages are displayed in the status bar, a pop-up dialog box, or in a table. They indicate an operation error. A system malfunction does not typically cause operational messages. Operational messages are not recorded to the event log unless specified below.

Table B-2. Multiple Source Operational Messages

Message	Display Location	Corrective Action
Equation out of range	Table, Dialog Box	Enter values for the source equation that are within the operational range of the instrument.
Start must be less than stop	Table, Dialog Box	Enter a correct start or stop frequency for the current band.
Frequency range overlaps between bands	Table, Dialog Box	Enter a correct start or stop frequency for the current band.
Undefined divide by zero	Table, Dialog Box	Enter a correct divisor value.
Invalid data entries in band x	Table, Dialog Box	Enter an in band x value

Table B-3. LO Level Cal/ALC Cal Operational Messages

Message	Display Location	Corrective Action
Incorrect sensor detected	Dialog Box	Reconnect the sensors or change the port configuration.
Power cal in frequency sweep	Dialog Box	Change the sweep to a power sweep.
Power cal in power sweep	Dialog Box	Change the sweep to a frequency sweep
Power meter not detected	Dialog Box	Verify that the power meter is properly connected and communicating with the instrument.
Power sensor out of range	Dialog Box	Change the power range.
Wrong power meter detected	Dialog Box	Restart the calibration with the connected power meter or change the power meter.

Table B-4. AutoCal/AutoCal Characterization Operational Messages

Message	Display Location	Corrective Action
Characterization file not found	Dialog Box	Load the AutoCal module characterization file.
AutoCal module not detected	Dialog Box	Check the serial cable connection.
AutoCal module orientation not detected	Dialog Box	Select the module orientation on the next dialog.
AutoCal assurance failed	Dialog Box, Event Log	Rerun AutoCal. If the problem reoccurs, there might be a problem with the AutoCal Module.
12 term cal not applied	Dialog Box	Apply the 12-term calibration.

Table B-5. RF Calibration Operational Messages

Message	Display Location	Corrective Action
Label name already exist	Dialog Box	Enter a new label name.
Blank label name not allowed	Dialog Box	Enter a valid label name.

Table B-6. Operational Messages

Message	Display Location	Corrective Action
File read error		
File write error		
External drive has no room		Delete unneeded files from the external drive.
External drive unavailable		
Hard disk has no room		Delete unneeded files from the internal drive.
Hard disk unavailable		

Appendix C — Anritsu easyTest Tools™

C-1 Introduction

This appendix outlines using easyTest Tools with ShockLine VNAs. The easyTest Tools application is used to create easyTest .ett files having step sequences that can be run (displayed) on the instrument.

The easyTest Tools application is available for download from the Anritsu web site.

This appendix contains the following sections:

- "easyTest Tools on the PC"
- "easyTest Tools on a ShockLine VNA"
- "SCPI Commands via easyTest"

Screen images in this chapter are illustrations of typical instrument features. Because easyTest Tools supports multiple products, some images may include Anritsu instruments other than a ShockLine VNA.

C-2 Anritsu easyTest Tools and easyTest .ett Scripts

Introduction

easyTest Tools allows you to create a test sequence (.ett) file on a PC. The file can be copied to the ShockLine VNA via a USB memory stick. The ShockLine software application provides the instrument interface and is used for invoking easyTest scripts. When users select the UTILITIES menu on its Menu toolbar and then choose submenu easyTest, the application asks for the .ett file to run. After it loads the file, it then runs (displays) the test sequence steps.

Capabilities

easyTest Tools files can:

- Display custom user images on the screen showing the ShockLine application. Images may include connection diagrams or procedure steps. easyTest Tools supports a variety of image types including .jpg, .bmp, and .png.
- Set instrument parameters to a specific state including measurement type, frequency and amplitude settings, limit lines, and markers. This is accomplished by including a previously-saved instrument setup or executing SCPI commands in the easyTest Tools file.
- Prompt you with a message at the top of the display. While the message is displayed, the instrument can be unlocked for prompts that require user action. An example message is "`Press the Autoscale button to zoom in on the trace`".
- Include automatic or manual saving and naming of measurements or screen shots.

C-3 easyTest Tools on the PC

The software is available from the Anritsu web site and is compatible with Windows XP, Windows Vista, Windows 7, Windows 8, and Windows 10. To create an easyTest (.ett) file on the PC that can be opened on the ShockLine VNA, install and launch easyTest Tools, then perform the actions covered in the easyTest documentation.

Figure C-1 illustrates a test step being created on a PC ("Example of Setup in easyTest Tools on the PC"), and Figure C-2 shows the resulting material displayed on the VNA ("Resulting easyTest Tools Sequence Step Displayed on a ShockLine VNA").

Refer to the easyTest Tools HELP menu for additional information.

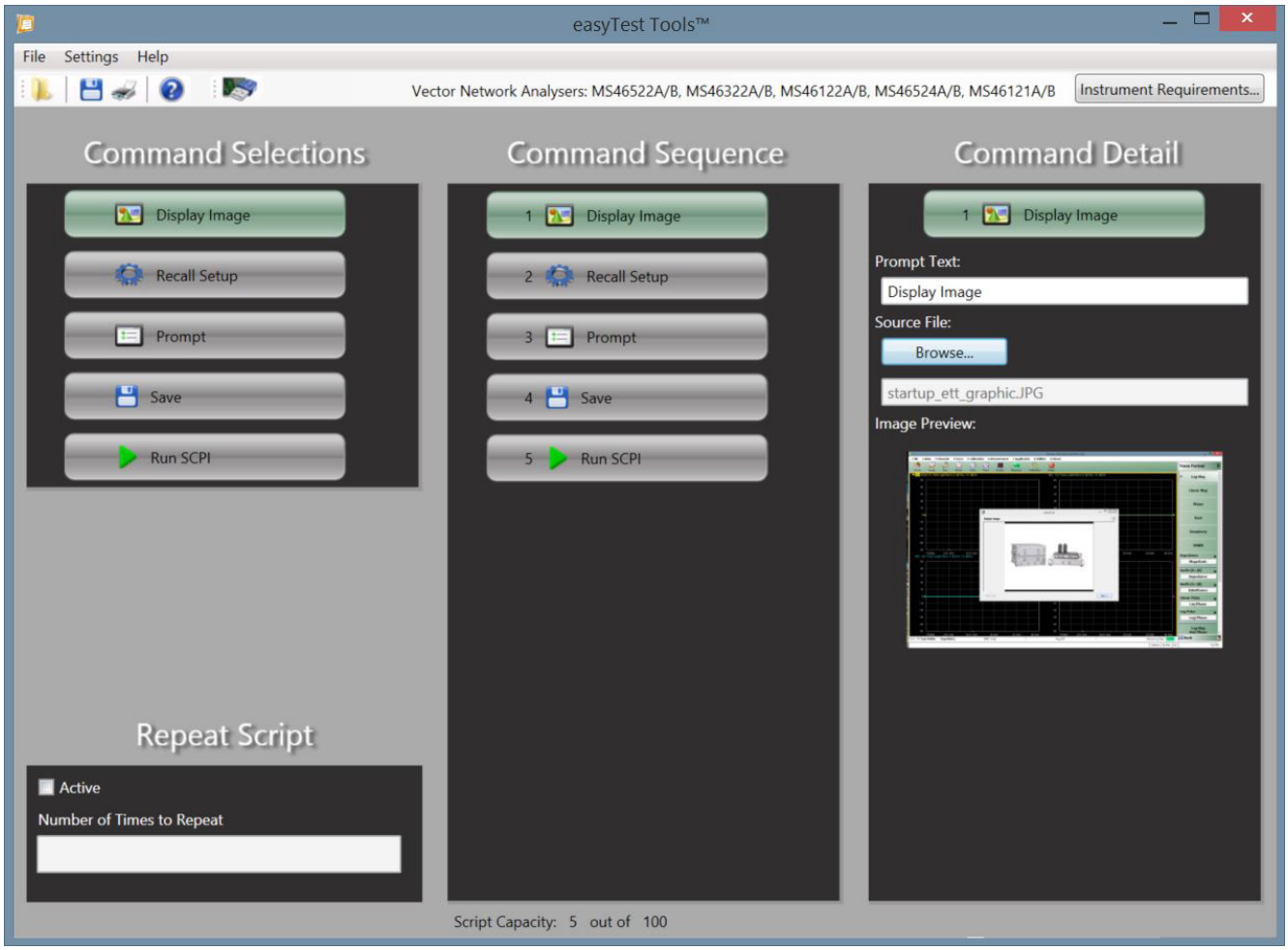


Figure C-1. Example of Setup in easyTest Tools on the PC

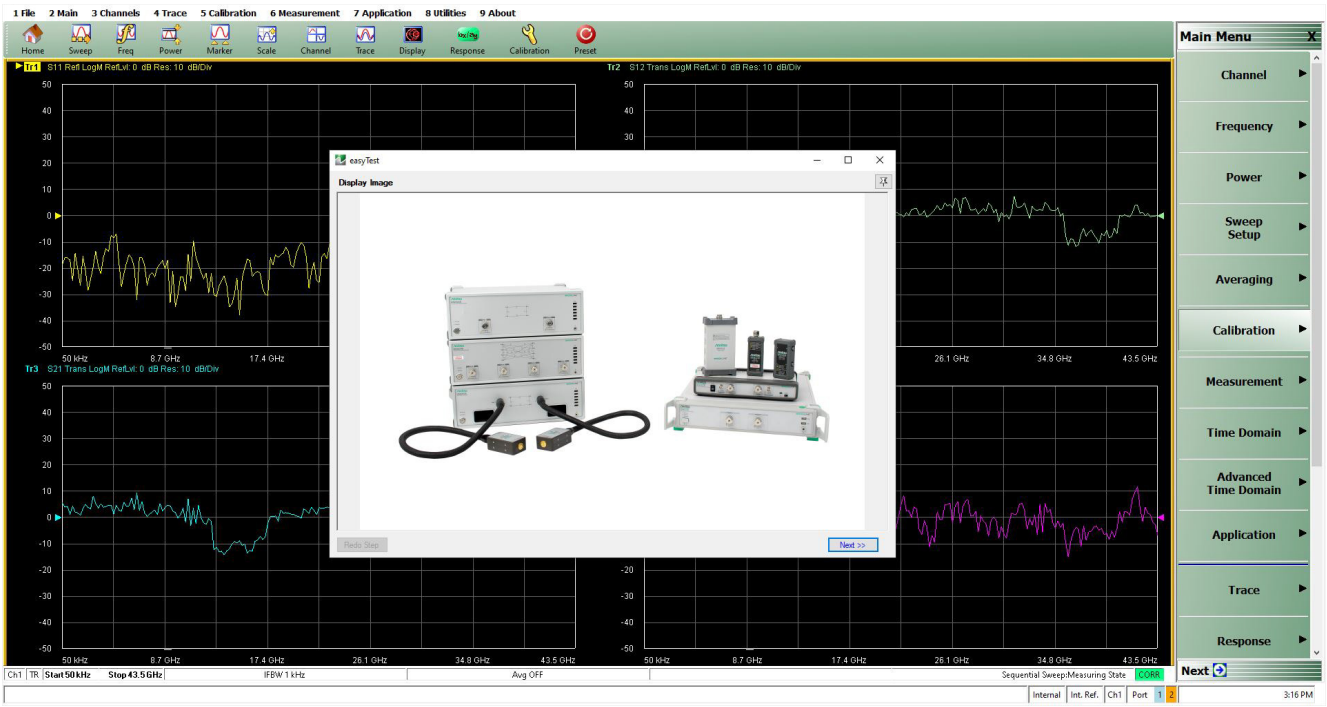


Figure C-2. Resulting easyTest Tools Sequence Step Displayed on a ShockLine VNA

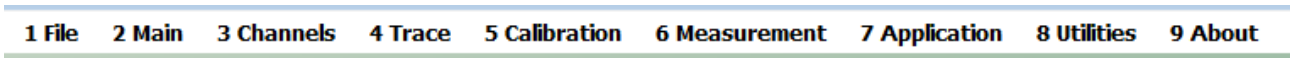
C-4 easyTest Tools on a ShockLine VNA

After an easyTest Tools test sequence has been created on a PC, you can transfer the project file to the VNA's hard drive for use. This can be done over the Ethernet port on the instrument, or through a USB port.

For Ethernet, if the VNA is visible and accessible on your network, copy the .ett file to a suitable place on the VNA's drive. After that, follow Steps 2 through 5 below to load and run the file.

For transfer from data on a USB memory device:

1. Insert the USB memory device with the easyTest (.ett) file in a ShockLine VNA USB port.
2. On the ShockLine application's Menu Bar, select the Utilities menu then sub-item easyTest



3. In the FILE OPEN dialog that appears, select an easyTest .ett file on the USB memory device then click Open.
4. The .ett file will then be loaded and run, displaying the scripted test sequence steps.
5. After the last sequence step is completed, the easyTest Tools window will show an Exit button; click the button to close the window.

C-5 SCPI Commands via easyTest

With easyTest Tools the user can run SCPI commands by using the button outlined in red in Figure C-3 to add commands to an easyTest script. The user can write one SCPI command per line, but multiple lines can be included in a single command step. The user can also write comments by starting a comment with a "#". In Figure C-3 the comment is outlined in green. The SCPI command is outlined in blue.

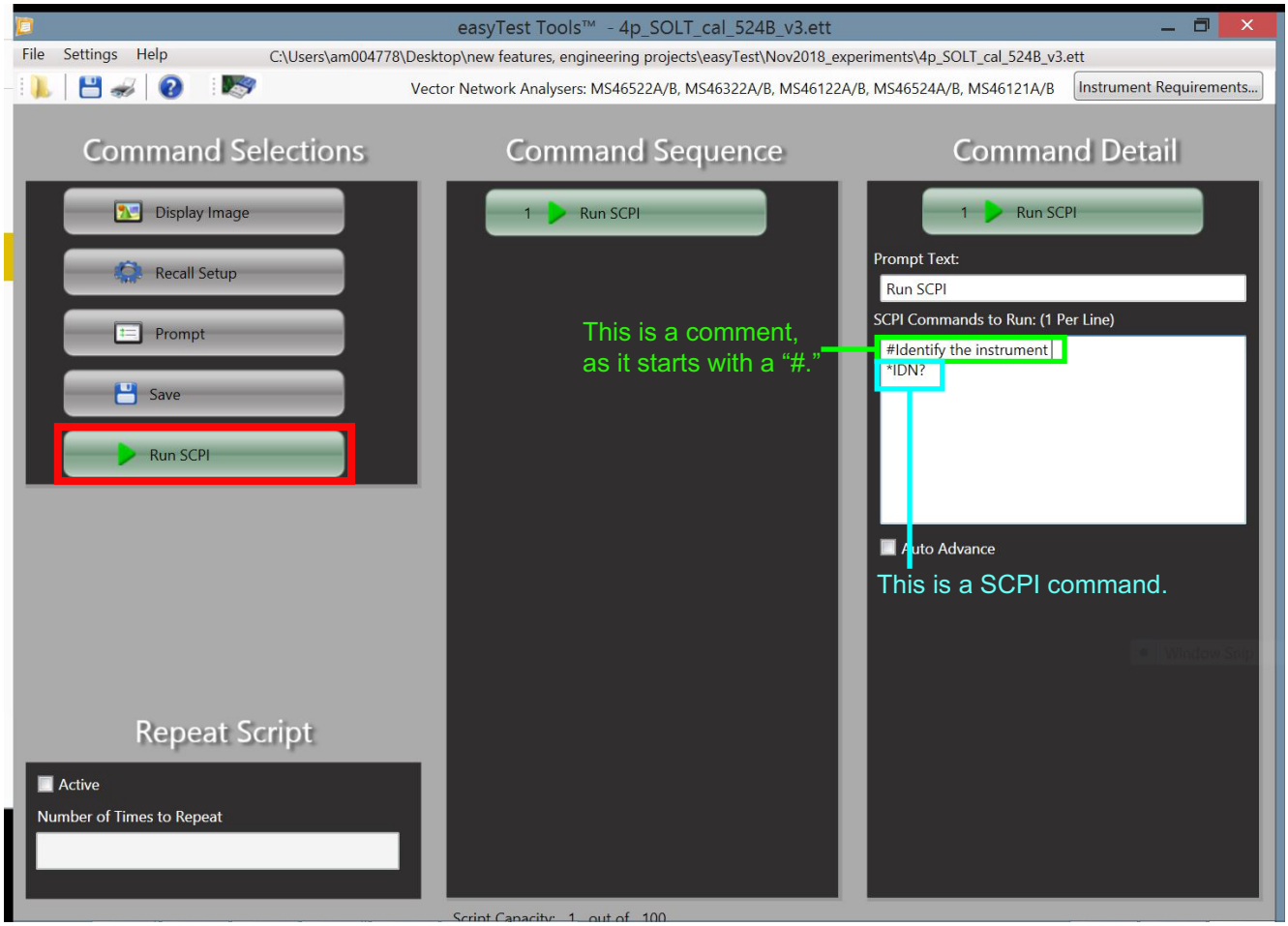


Figure C-3. Executing SCPI Commands via easyTest

After generating an .ett file using the easyTest Tools, the .ett file can be used in the ShockLine application. In Figure C-4, an ETT file is loaded which has a comment and a SCPI command. The comment is displayed in blue color. When the SCPI command is of query type then the result of that command is displayed in the following line. In Figure C-4, *IDN? is a query type command requesting the ID string from the instrument. So, the result of that command, the ID string, is displayed in the following line. If the SCPI command is just a simple write command, then the command is executed without any result being shown.

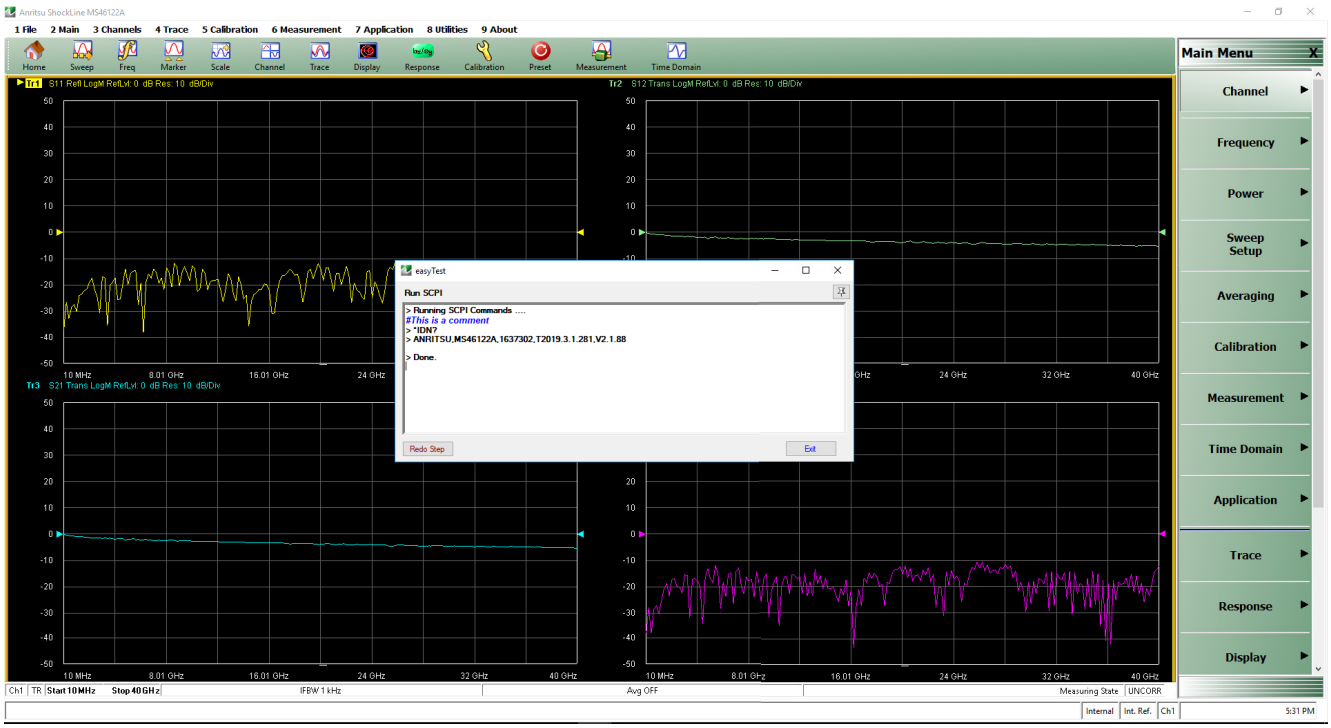


Figure C-4. Using an .ett file for Executing SCPI Commands via easyTest Tools in ShockLine

Appendix D — Glossary of Terms

D-1 Introduction

The following terms are related to this product and technology.

D-2 Glossary

3 dB rule : The 3 dB rule provides a means to estimate relative power values. A 3 dB gain indicates that power increases to twice the power (a multiple of 2). A 3 dB loss indicates that power decreases to half the power (a multiple of 1/2). A system with 40 watts of input power and a 6 dB insertion loss will have only 10†watts of output power (a multiple of 1/2 for each 3 dB loss, or 1/4 of 40 watts).

Adapter : A fitting that supplies a passage between two sets of equipment when they cannot be directly interconnected.

ADC : Analog-to-Digital Converter (ADC, A/D or A to D) is an electronic device that converts continuous signals to discrete digital numbers. The reverse operation is performed by a digital-to-analog converter (DAC). ADC can uniquely represent all analog input values within a specified total input range by a limited number of digital output codes. Refer also to DAC.

ALC : Automatic Level Control (ALC)

Analog System : An Analog system uses an analog transmission method to send voice, video and data-using analog signals, such as electricity or sound waves, that are continuously variable rather than discreet units as in digital transmissions. Mobile analog systems include AMPS, NMT and ETACS.

Analog Transmission : Analog Transmission refers to signals propagated through the medium as continuously varying electromagnetic waves.

AutoCal : The AutoCal VNA calibration method uses an external calibrator, such as the Anritsu 36585. The 36585 AutoCal module provides an automatic system for fast, repeatable high-quality calibrations of a VNA. The AutoCal module is inserted between the VNA test ports to perform the calibration. A serial to USB converter (Anritsu part number 2000-1809-R USB to Serial adapter) must be employed to enable communication between the autocal unit and the VNA.

Average power : Average power is the peak power averaged over time and is usually applied to pulsed systems where the carrier power is switched on and off.

Band : Band, in telecommunication, refers to the following definitions: 1. The range of frequencies between two defined limits which are used for a specific purpose. 2. One of the geopolitical boundaries established to define a WATS (wide-area telephone service) serving area.

Band Pass Filter : A Band Pass Filter is a radio wave filter with a specific range of frequencies in which it is designed to pass. It rejects frequencies outside the pass-band range. A resistor-inductor-capacitor circuit is an example of a Band Pass Filter.

Bandwidth : Bandwidth usually identifies the capacity of a circuit or amount of data that can be sent through a given circuit. It may be user-specified in a PVC. It is an indication of the amount of data that is passing over a medium. Also, bandwidth is the portion of the frequency spectrum required to transmit desired information. Each radio channel has a center frequency and additional frequencies above and below this carrier frequency which is used to carry the transmitted information. The range of frequencies from the lowest to the highest used is called the bandwidth.

Broadband : Broadband refers to telecommunication that provides multiple channels of data over a single communications medium, typically using some form of frequency or wave division multiplexing. It is a service or system requiring transmission channels capable of supporting rates greater than the Integrated Services Digital Network (ISDN) primary rate.

Calibration : When making measurements, the instrument must be calibrated in order to remove residual errors due to measurement setup conditions. Anritsu recommends performing the calibration under the same conditions as the measurement: temperature, frequency, number of points, source power, and IFBW. Calibrations standards with known reflection coefficients are used to calculate the correction factors. The calibration must be conducted using the appropriate standards at the open end of any test port cables and adapters that are connected to the instrument. This ensures that the match, phase length, and loss of these cables and adapters are all accounted for. For optimal performance, high quality phase-stable cables and precision adapters must be used.

Command Unit : A Command Unit is a complete command that is formatted with parameters and terminators.

Configuration Commands : Configuration Commands are commands that are issued to an instrument and that change a specific instrument configuration.

dB : Decibel or deciBel (dB) is a logarithmic ratio of the difference between two values (a logarithm ratio is equal to 10 times). dB is a unit for measuring relative power ratios in terms of gain or loss. The units of dB are expressed in terms of the logarithm to base 10 of a ratio and typically are expressed in watts. For example, a -3 dB loss indicates a 50% loss in power; a +3 dB reading is a doubling of power; 10 dB indicates an increase (or a loss) by a factor of 10; 20 dB indicates an increase (or a loss) of a factor of 100; 30 dB indicates an increase (or a loss) by a factor of 1000. Common values of dB expressed in ratios: 0 dB = 1:1, 10 dB = 10:1, 20 dB = 100:1, 30 dB = 1000:1, -30 dB = 0.001:1 [or (1/1000):1].

dBc : Decibels referenced to the carrier (dBc) is a technique for expressing a power measurement in logarithmic form using the carrier power as a reference. The units are used to describe how far down signals and noise are relative to a known signal. Typical use of this term is to describe spurious signals and noise compared to a desired transmit signal.

dBm : dBm is an absolute measurement of power relative to 1 milliwatt. In other words, dBm is a decibel value referenced to a milliWatt (dBm). This is a technique for expressing a power measurement in logarithmic form using 1 mW as a reference. dBm is a decibel ratio (log 10) of Watts (W) to one milliwatt (1mW). dBm, therefore, represents absolute power. Examples are: 0 dBm = 1.0 milliwatt, 10 dBm = 10 milliwatt, 30 dBm = 1000 milliwatt = 1 watt.

Eye diagram : An Eye diagram (or eye-pattern diagram) is a superposition of segments of a received PAM signal that is displayed on an oscilloscope or similar instrument. The eye diagram is used to assess impairments in the radio channel.

IF : Intermediate Frequency (IF) is a frequency to which a carrier frequency is shifted as an intermediate step in transmission or reception. An intermediate electromagnetic frequency is generated by a superheterodyne radio receiver.

Line Type : VNA calibration media: Coaxial, Non-dispersive, Microstrip, Waveguide

Linearity : Something may be described as linear if the characteristic is approximately but not exactly a straight line; and linearity may be valid only within a certain operating region.

LRL : VNA calibration method: Line-Reflect-Line

LRM : VNA calibration method: Line-Reflect-Match

Measurement Uncertainty : The purpose of measurement is to provide information about a quantity of interest ñ a measurand. No measurement is exact. When a quantity is measured, the outcome depends on the measuring system, the measurement procedure, the skill of the operator, the environment, and other effects. Even if the quantity were to be measured several times, in the same way and in the same circumstances, a different measured value would in general be obtained each time, assuming the measuring system has sufficient resolution to distinguish between the values.

RBW : Resolution Bandwidth (RBW) With spectrum analyzers, a narrow band filter is swept across a frequency span to create the spectrum display. The filter bandwidth (RBW) determines the frequency resolution across the frequency axis.

Return Loss : Return loss is a measure of how well devices or lines are matched. A match is good if the return loss is high. A high return loss is desirable and results in a lower insertion loss. return loss is the loss of power in the signal returned/reflected by a discontinuity in a transmission line or optical fiber.

RL : Return loss is a measure of how well devices or lines are matched. A match is good if the return loss is high. A high return loss is desirable and results in a lower insertion loss. return loss is the loss of power in the signal returned/reflected by a discontinuity in a transmission line or optical fiber.

RMS : Is the square root of the arithmetic mean of the squares of the values, or the square of the function that defines the continuous waveform. Waveforms made by summing known simple waveforms have an RMS that is the root of the sum of squares of the component RMS values. Because of their usefulness in carrying out power calculations, listed voltages for power outlets (e.g., 120 V in the USA, or 230 V in Europe) are almost always quoted in RMS values, and not peak values.

SmartCal : The SmartCal VNA calibration method uses an external calibrator, such as the Anritsu MN252x8x, MN254x8x. The SmartCal module provides an automatic system for fast, repeatable high-quality calibrations of a VNA. The SmartCal module is inserted between the VNA test ports to perform the calibration. Connect the SmartCal to the VNA or control computer with the included USB A/Micro-B latch cable.

SNP file : Generically, an .sNp file is in standard microwave simulator text format and is similar to the .txt file. The SnP files setup configuration user interface varies depending on the VNA modelís maximum number of ports as .s1p, .s2p, .s3p, .s4p

SOLR : VNA calibration method: Short-Open-Load-Return

SOLT : VNA calibration method: Short-Open-Load-Thru

SOLT : SOLT or Short Open Load Thru calibration method for coaxial line types with simple and redundant standards. It is not band-limited. It requires well-defined standards. It has lower accuracy at higher frequencies. Calibrations standards with known reflection coefficients are used to calculate the correction factors. Refer to Calibration. Compare this with SSLT or Offset Short 1, Offset Short 2, Load, Thru calibration method for waveguide line types.

Spectrum Analyzer : A spectrum analyzer measures the magnitude of an input signal versus frequency within the full frequency range of the instrument. The primary use is to measure the power of the spectrum of known and unknown signals.

SSLT : VNA calibration method: Offset Short or Short-Short-Load-Thru

SSST : VNA calibration method: Triple Offset Short or Short-Short-Short-Thru. Short-Short-Short-Thru (SSLT) uses Shorts that all have different offset lengths. It is a calibration (common in waveguide or high-frequency coax) with simple and redundant standards, but it is band-limited. It requires well-defined standards. It has better accuracy at higher frequencies than SOLT, but has high sensitivity to connector repeatability errors, and is poor with on-wafer.

TDR : Time Domain Reflection - Converted S-Parameter data into an impedance profile (TDR) with an open end.

TDT : Time Domain Transmission - Converted S-Parameter data into an impedance profile (TDT) with matched terminations.

Termination : A special device, known as a terminator, connected at the beginning and end of a wire or cable to prevent an RF signal from being reflected back from each end, causing interference, or power loss. The terminator is usually placed at the end of a transmission line or daisy chain bus (such as in SCSI), and is designed to match the AC impedance of the cable and hence minimize signal reflections, and power losses.

True RMS : The true RMS voltage is measured using the following method: P(avg) is the average power dissipated in a resistor R when a RMS voltage V(rms) is applied. The power is measured by a thermistor and the scale of the meter is calibrated as a ratio of temperature to resistance. This is true for any waveform and frequencies. Note that most meters you use are not true RMS meters. They measure only an average or a DC equivalent of a 60Hz pure sine wave.

UFX : Universal Fixture Extraction (UFX) provides more calibration choices for probe and in-fixture calibrations where a full set of calibration standards may not be available. It provides advanced de-embedding tools that improve the success of de-embedding test fixtures by including incremental calibration standard information as it becomes available. As a result, de-embedding of the test fixture improves, thereby improving DUT measurement accuracy.

VNA : Vector Network Analyzer (VNA)

:

Anritsu

10410-00337 AK

Anritsu utilizes recycled paper and environmentally conscious inks and toner.

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