User Interface Reference Manual

ShockLine™ MS46522B, MS46524B Vector Network Analyzers

MS46522B, all frequency options, 2-Port
MS46524B, all frequency options, 4-Port

Anritsu

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Chapter Descriptions

Chapter 1 — Overview

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.

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

This chapter describes the user interface screen layout, and navigation tools, including the Menu Bar, Icon Bar, and MAIN MENU.

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.

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: 2-Port VNAs

This chapter provides information on port power control in 2-port VNAs. Power conditions for sweeps are set in different places in the ShockLine application, depending on the sweep type: 1) for frequency-based sweeps and for power-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 7 — Sweep Menus for details).

Chapter 6 — Power Menus: 4-Port VNAs

This chapter provides information on port power control in 4-port VNAs. Power conditions for sweeps are set in different places in the ShockLine application, depending on the sweep type: 1) for frequency-based sweeps and for power-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 tableaus. (See Chapter 7 — Sweep Menus for details.)

Chapter 7 — Sweep Menus

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

Chapter 8 — 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 9 — Calibration Menus: 2-Port VNAs

This chapter describes the menus used when calibrating 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 because their appearance changes based on combination of instrument calibration ports, AutoCal, manual calibration, calibration methods, line types, and connectors. However, basic elements in the combinations are explained.

Chapter 10 — Calibration Menus: 4-Port VNAs

This chapter describes the menus used when calibrating 4-Port ShockLine VNAs. Chapter organization follows the flows in the progressions of menus and dialog boxes for calibration control. Representative examples of dialogs are shown. Dialog appearance changes dynamically depending on based on the combination of instrument calibration ports, AutoCal, manual calibration, calibration methods, line types, and connectors.

Chapter 11 — 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. 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..

Chapter 12 — 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 13 — Advanced Time Domain Menu

The ADVANCED TIME DOMAIN menu provides a convenient way to access Eye Diagram setup and Signal Analysis (SI) setups.

Chapter 14 — 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 15 — 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 16 — Response Menus: 2-Port VNAs

This chapter provides information on the 2-port VNA RESPONSE menus used to configure S-Parameters using standard options, or to configure user-defined parameters.

Chapter 17 — Response Menus: 4-Port VNAs

This chapter provides information about the 4-Port VNA RESPONSE menus for configuration of standard S-Parameters or user-definition of a unique parameter. The MIXED MODE dialog box variants provide mixed-mode response setup on a trace-by-trace basis with multiple response options for each trace.

Chapter 18 — 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 19 — 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 20 — 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.

Chapter 21 — 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 22 — 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. Any error messages that require action by a qualified service representative are also listed.

Appendix C — Anritsu easyTest Tools™

This appendix outlines using easyTest Tools with ShockLine MS46522B and MS46524B model 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.

The following ShockLine VNA systems are described in this manual:

- MS46522B-010, 50 kHz to 8.5 GHz, 2-Port
- MS46522B-020, 50 kHz to 20 GHz, 2-Port
- MS46522B-040, 50 kHz to 43.5 GHz, 2-Port
- MS46522B-043, 50 kHz to 43.5 GHz, 2-Port
- MS46522B-082, 55 GHz to 92 GHz, 2-port
- MS46522B-083, 55 GHz to 92 GHz, 2-port
- MS46524B-010, 50 kHz to 8.5 GHz, 4-Port
- MS46524B-020, 50 kHz to 20 GHz, 4-Port
- MS46524B-040, 50 kHz to 43.5 GHz, 4-Port
- MS46524B-043, 50 kHz to 43.5 GHz, 4-Port

The full documentation set for the ShockLine VNA is listed in "User Documentation" on page 1-2. All documentation except the maintenance manuals is available from the Anritsu website. Maintenance manuals are available by contacting Anritsu Customer Service. Refer to other MS46522B/524B Series VNA documentation for detailed explanations and procedures.

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

1-2 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 refers to any ShockLine VNA module or system.
- 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: MS46522B-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.
```

1-3 User Documentation

The following ShockLine MS46522B/524B Series VNA documentation is provided on the user documentation media, and is also available on the Anritsu website.

- ShockLine Product Information, Compliance, and Safety (PICS) – 10100-00067
- MS46522B Series VNA Technical Data Sheet – 11410-00858
- MS46524B Series VNA Technical Data Sheet – 11410-00860
- MS46522B/524B Series VNA Operation Manual – 10410-00743
- MS46522B/524B Series VNA User Interface Reference Manual – 10410-00744
- ShockLine Programming Manual – 10410-00746
- MS4652xB Series VNA Measurement Guide – 10410-00753
- MS4652xB Series VNA Maintenance Manual – 10410-00765

Updates to Manuals

For updates to any of the MS46522B/524B Series product documentation, visit the Anritsu website at:
http://www.anritsu.com

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

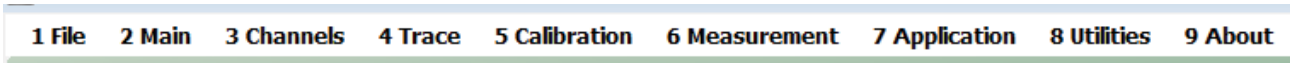
2-1 Chapter Overview

This chapter describes the user interface screen layout, and navigation tools, including the Menu Bar, Icon Bar, and MAIN MENU.

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.

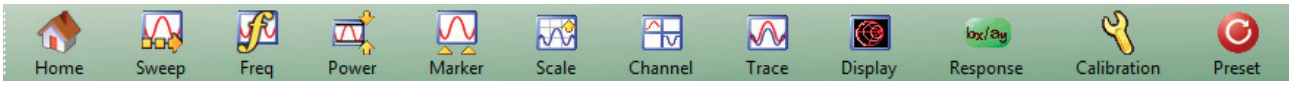
2-2 Menu Bar

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

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.

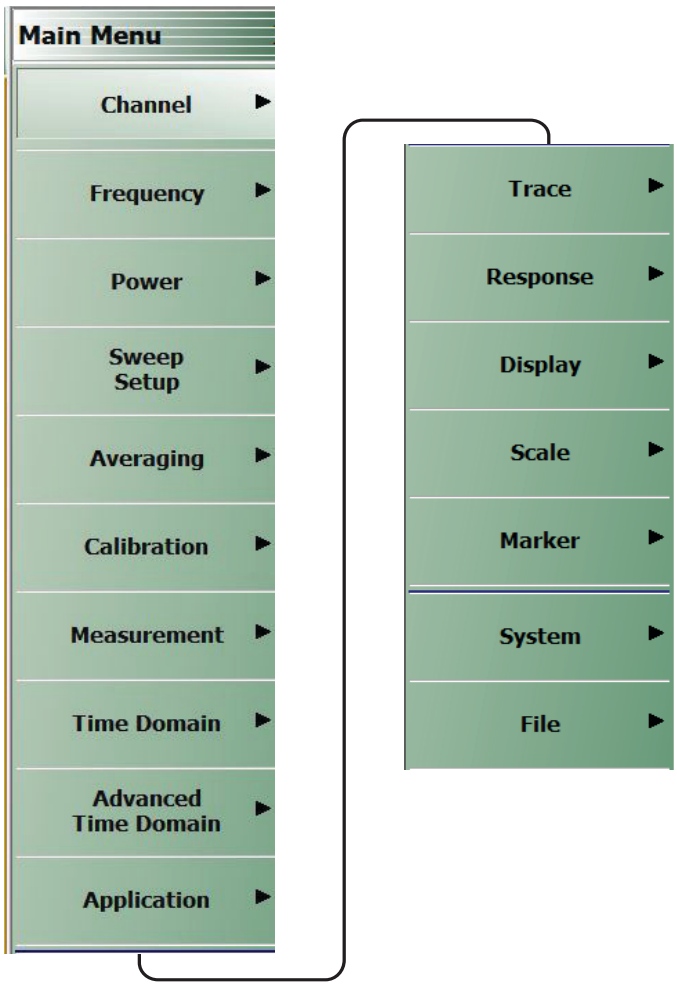


Figure 2-1. MAIN MENU

Channel

Select displays the CHANNEL menu.

- "Channel Menus" on page 3-2

Frequency

Select displays the FREQUENCY menu.

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

Power

Select displays the POWER menu.

- "Overview – Power Menus – 2-Port VNAs" on page 5-2
- "Maximum and Minimum Power Settings" on page 6-1

Sweep Setup

Select displays the SWEEP SETUP menu.

- “Sweep Menus” on page 7-1

Averaging

Select displays the AVERAGING menu.

- AVERAGING Menu on page 8-2

Calibration

Select displays the CALIBRATION menu.

- CALIBRATION [TR] Menu on page 9-6
- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Measurement

Select displays the MEASUREMENT menu.

- MEASUREMENT Menu on page 11-3

Time Domain

Selection displays the TIME DOMAIN menu.

- Time Domain Menu on page 12-2

Advanced Time Domain

Selection displays the ADVANCED TIME DOMAIN menu.

- ADVANCED TIME DOMAIN Menu on page 13-1

Application

Select displays the APPLICATION menu.

- APPLICATION Menu on page 14-1

Trace

Select displays the TRACE menu.

- TRACE Menu on page 15-2

Response

Select displays the RESPONSE menu.

- RESPONSE Menu on page 16-3
- RESPONSE Menu – 4-Port VNAs on page 17-2

Display

Select displays the DISPLAY menu.

- DISPLAY Menu on page 18-3

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 19-4

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

- TRACE FORMAT Menu on page 18-8

Marker

Select displays the MARKERS [1] menu.

- MARKERS [1] Menu on page 20-4

System

Select displays the SYSTEM menu.

- “System Menus, Buttons, and Dialog Boxes” on page 21-1

File

Select displays the FILE menu.

- FILE Menu on page 22-2

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.

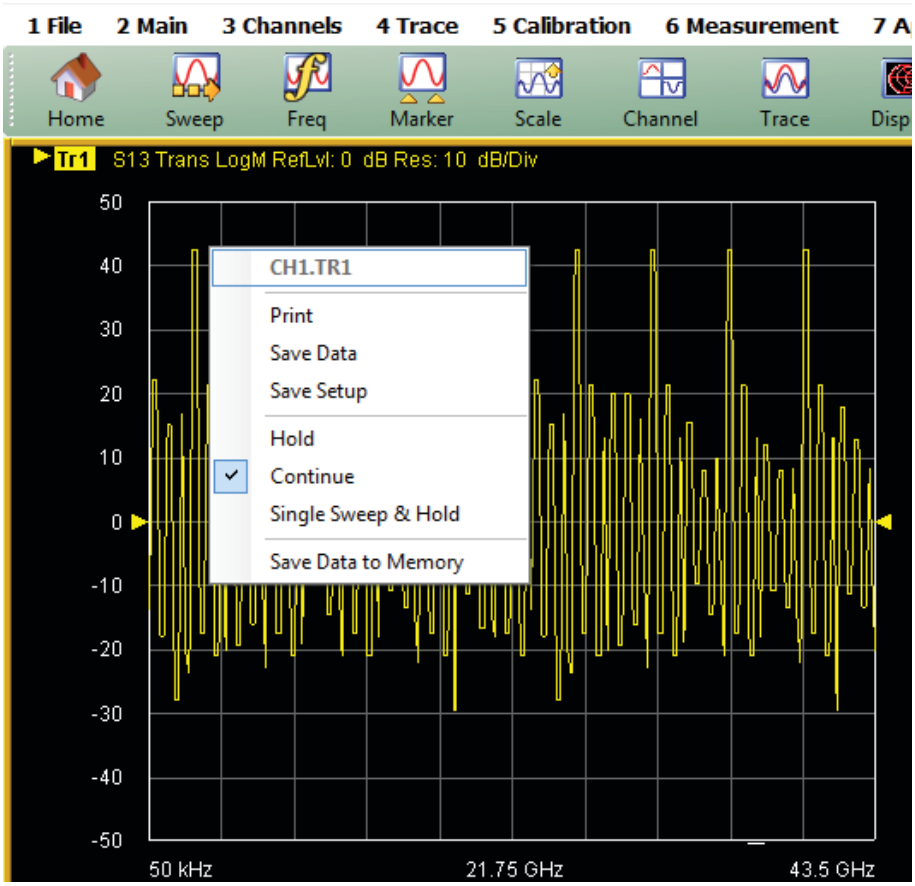


Figure 2-2. Main Display Area Context Menu

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.

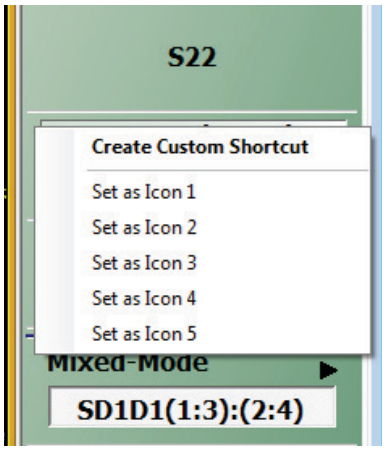


Figure 2-3. Right-side Menu Context Menu—Initial State

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

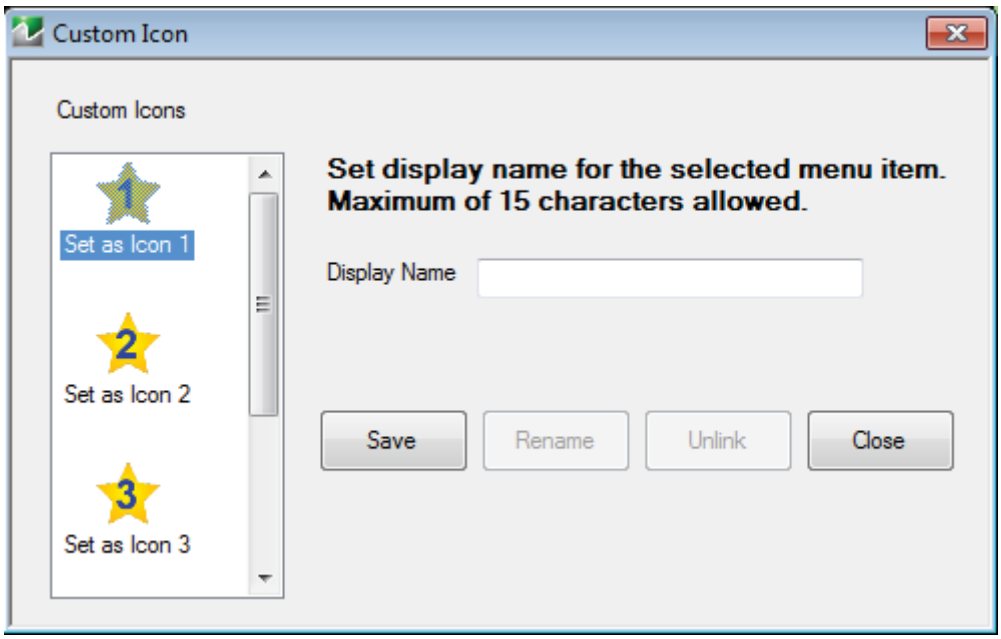


Figure 2-4. Custom Icon Dialog Box—Initial State

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 *MS4652x Operation Manual* (10410-00743).

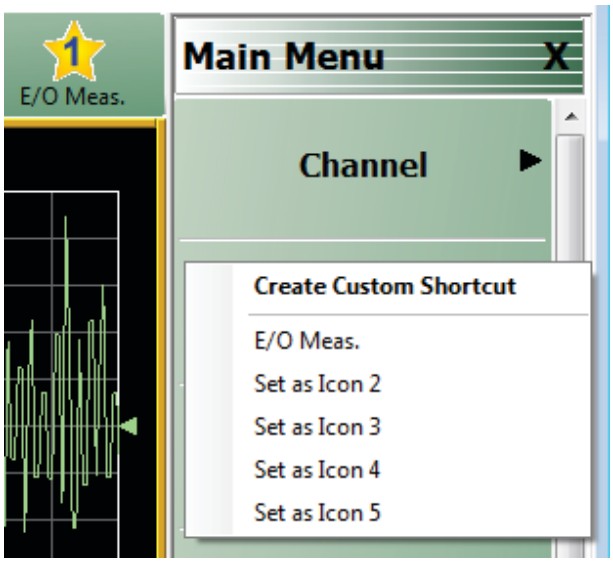


Figure 2-5. Custom Icon Dialog Box and Icon Bar—E/O Meas. Icon Added

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.

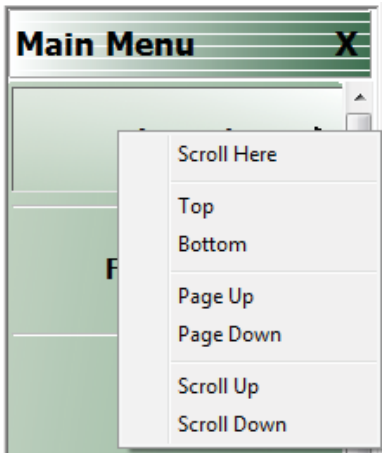


Figure 2-6. Right-Side Menu Scroll Bar Context Menu

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.

3-2 Overview of Channel Menus

There are two channel-focused 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

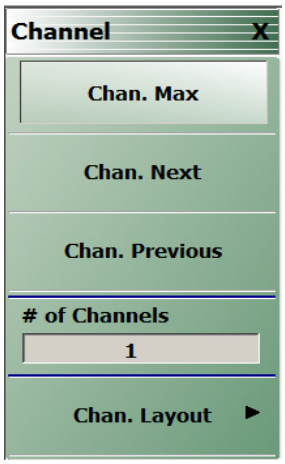
Previous

- Main Menu on page 2-2

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 (one).

Chan. Previous

When multiple channels are displayed, the Channel Previous button activates the next lower channel number. When channel 1 (one) 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, or 14), 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

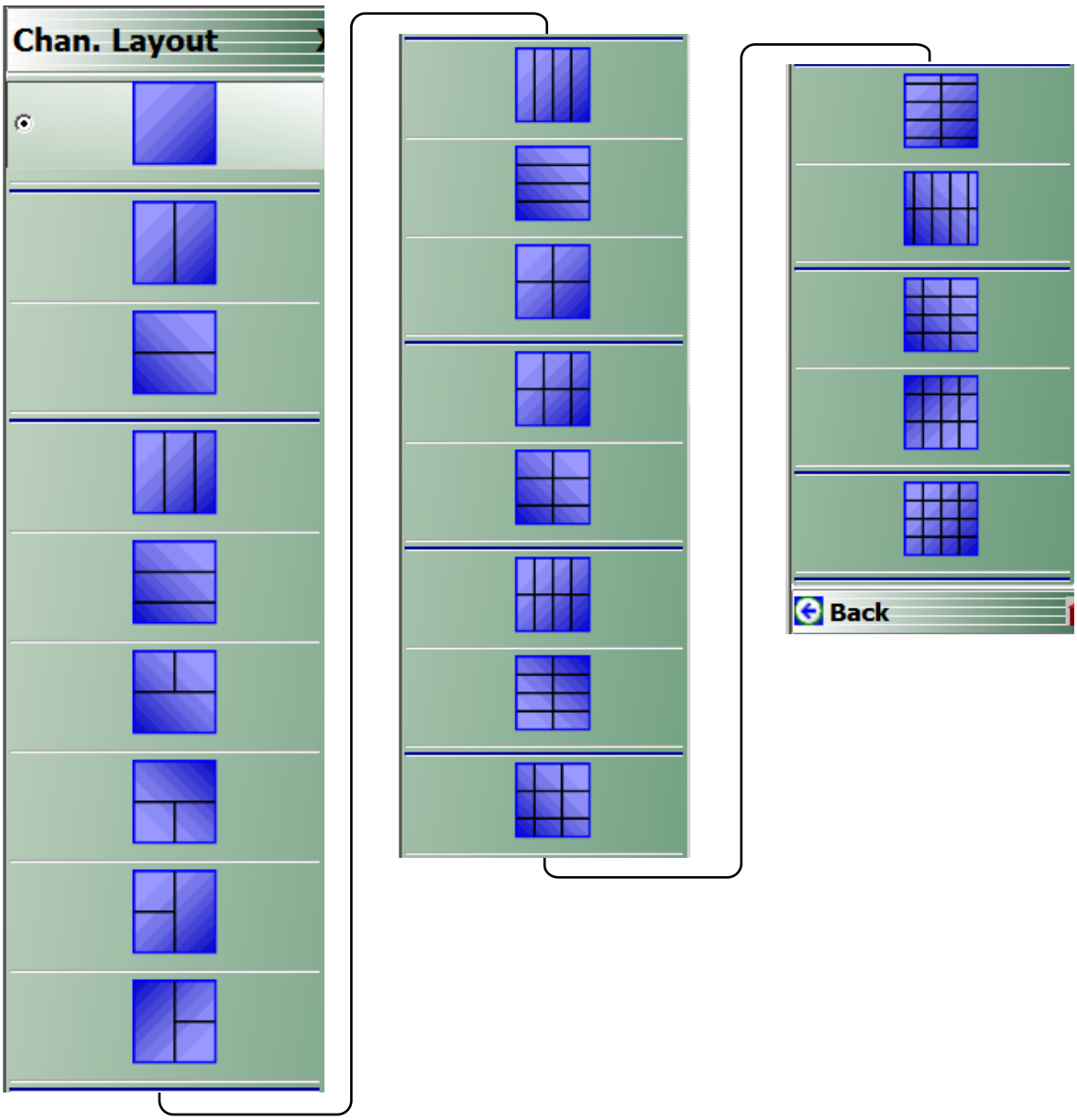
- CHANNEL Menu on page 3-2 .

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.

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.

   - 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 4-6
- FREQUENCY Power Sweep CW-Based Menu 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.

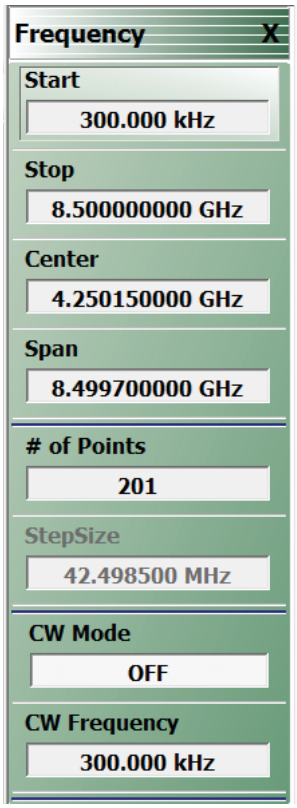
Prerequisites

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

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 and the Step Size is N/A in Log Sweep Mode.

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

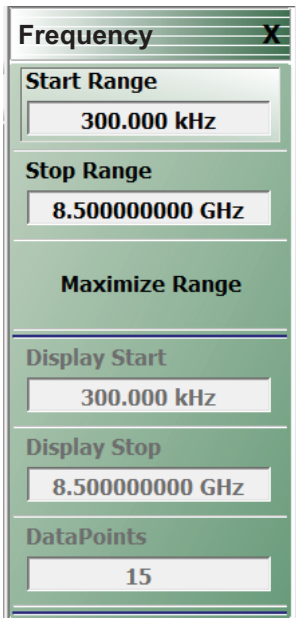
- User has selected a channel to set up.
- This menu is enabled by selection of Segmented (Freq) sweep type on the SWEEP SETUP menu's Sweep Types button.

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.

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

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

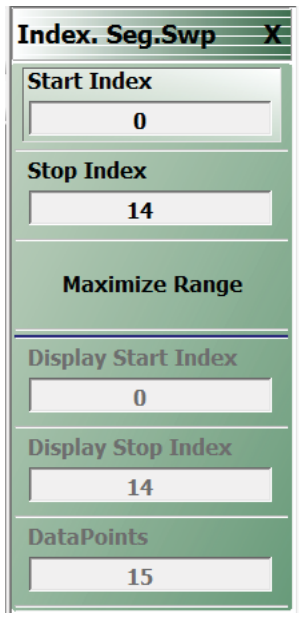
- User has selected a channel to set up.
- This menu is available when Segmented Sweep (Index-based) is selected on the SWEEP SETUP menu's Sweep Types button to produce a linear sweep.

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 value 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.

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

4-7 FREQUENCY Power Sweep CW-Based Menu

Function(s)

This menu controls (sets) the frequency at which a power-based sweep is performed. The power values for the sweep are set on the Power menu.

Displays

- Traces for the channel will show power values on the horizontal axis.

Prerequisites

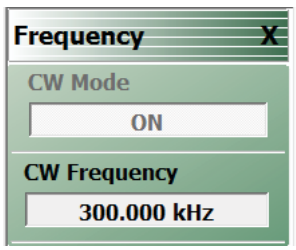
- This menu is enabled when Sweep Types is set to Power Sweep (CW Frequency) on the SWEEP SETUP menu.

Navigation

- MAIN | Frequency | FREQUENCY

Appearance

Available control buttons are: CW Frequency.



CW Mode (ON/OFF)

The CW Mode toggle button is set to a read-only value of ON for a per-channel basis.

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. Note that the CW Frequency must fall within the range set by the Start/Stop buttons above.

Figure 4-4. FREQUENCY (Power Sweep CW Freq.) Menu

Chapter 5 — Power Menus: 2-Port VNAs

5-1 Chapter Overview

This chapter provides information on port power control in 2-port VNAs. Power conditions for sweeps are set in different places in the ShockLine application, depending on the sweep type: 1) for frequency-based sweeps and for power-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 7 — Sweep Menus for details).

Maximum and Minimum Power Settings

Table 5-1 below shows the ranges on the power settings.

Table 5-1. Summary of Maximum and Minimum Power Levels for MS46522B Series 2-Port VNAs

Power Level, and Frequency Range	Power Sweep Type	Power Setting Max/Min
Maximum Power 300 kHz to 6 GHz	Any	+15 dBm
Maximum Power 6 GHz to 8 GHz	Any	+12 dBm
Maximum Power 8 GHz to 8.5 GHz	Any	+10 dBm
Minimum Power at 8.5 GHz	• Power Sweep CW • Single Power Mode	–30 dBm
Maximum Power 8.5 GHz to 40 GHz	Any	+6 dBm
Maximum Power 40 GHz to 43.5 GHz	Any	+4 dBm[a]
Maximum Power 55 GHz to 92 GHz	Any	0 dBm[a]

a.Typical

5-2 Overview – Power Menus – 2-Port VNAs

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 (2 or 4 port), and installed options.

This chapter organizes discusses of power menus by sections reflecting the sweep type, as follows:

1. POWER Settings for Frequency-Based Sweeps

POWER Menu for Frequency-Based Sweeps (Linear or Log) on page 5-3

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

POWER Menu for Segment-Based Sweeps – 2-Port VNAs on page 5-6

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 table area. To reach that area:

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 7-7

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 7-13

3. POWER Settings for Power-Based Sweeps

“POWER Menu for Power-Based Sweeps (CW)” on page 5-7

If SWEEP menu Sweep Types is set to Power-Based Sweep (CW), power settings for sweeps are set here:

Navigation to Power Settings for Power-Based Sweeps

- MAIN | Power | POWER |
- and also MAIN | Power | POWER | Other Setup | POWER SETUP
- For use see: POWER SETUP Menu – Power-Based Sweep Menu – 2-Port VNAs on page 5-10

Power Coupling State Is Shown in Power Menu Titles

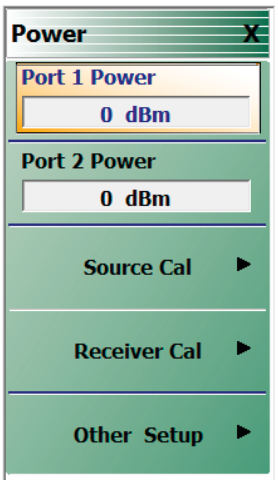
- POWER menu title text of ‘POWER [COUPLED]’ or ‘POWER [C]’ indicates that all port powers are coupled.
- POWER menu title text of ‘POWER’ indicates that the port powers are not coupled.
- To enable/disable port power coupling
  - Navigate to: MAIN | Power | POWER |
  - Click the POWER menu’s Other Setup button to open the POWER SETUP menu.
  - Toggle Port Power to select between Not Coupled and Coupled.

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

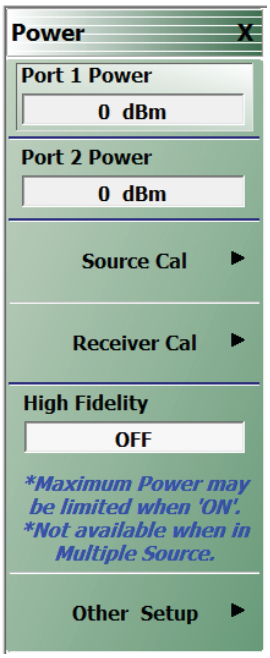
Navigation

- MAIN | Power | POWER

Without Options 20, 40, or 43



With Options 20, 40, or 43



Port 1 Power

Select displays the Port 1 Power field toolbar and allows setting the port 1 power level in dBm. If Port Power is set to coupled, changes to the Port 1 Power level affect the Port 2 Power level.

Port 2 Power

Select displays the Port 2 Power field toolbar and allows setting the port 2 power level in dBm. If Port Power is set to coupled, changes to the Port 2 Power level affect the Port 1 Power level.

Source Cal

Select opens the SOURCE SETUP menu for the source calibration-related functions.

For frequency sweeps, Linear or Log, see SOURCE CAL Menu for Frequency Based Sweeps (Linear or Log) on page 5-5

For frequency sweeps, both segmented sweep types (frequency and index-based), and power sweep, see POWER Menu for Segment-Based Sweeps – 2-Port VNAs on page 5-6

Receiver Cal

Select displays the RECEIVER SETUP menu. See Section 5-7 “Receiver Setup and Calibration Menus – 2-Port VNAs” on page 5-13.

High Fidelity (With Options 20, 40, or 43)

High Fidelity mode on the MS4652xB is a mode that reduces source harmonics in a lower microwave frequency band. For DUTs sensitive to source harmonic content, this mode may improve dynamic range measurements. This feature is available only on microwave MS4652xB units with a High Fidelity factory system calibration.

Select toggles High Fidelity mode on or off. High Fidelity mode is not available when the VNA is in multiple source mode. When High Fidelity is on, maximum power may be limited.

Other Setup

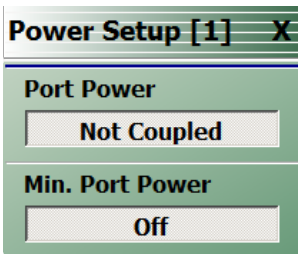
Select displays the POWER SETUP menu. The title of the POWER SETUP menu may include [1]. [2], or [C] to show reference to port 1, port 2, coupling of the port powers. This is based on the settings of the Power Selection button and the Port Power button.

Figure 5-1. POWER Menu – Frequency-Based Sweep Modes – MS46522B 2-Port VNAs

Power Setup Menu

Navigation

- MAIN | Power | POWER |Other Setup | POWER SETUP [1]



Port Power

Toggles coupling port power levels. When coupled, ports use same power level and menu title includes [C] in its text to signal this.

Min. Port Power

This has one button for OFF/ON 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 – MS46522B 2-Port VNAs

5-4 SOURCE CAL Menu for Frequency Based Sweeps (Linear or Log)

Previous

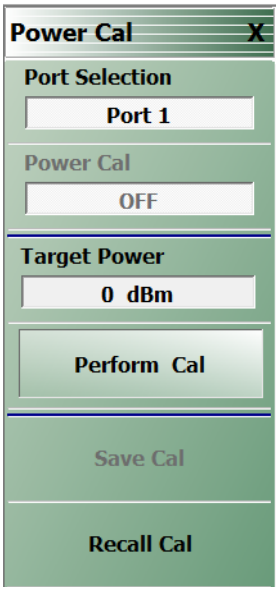
- Main Menu on page 2-2

Navigation

- MAIN | Power | POWER

Prerequisites

- SWEEP TYPES = Frequency-Based Sweeps, Linear or Log
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Frequency Sweep (Log)



Port Selection

Select either Port 1 or Port 2.

Power Cal

Power Cal is not available in this sweep type.

Target Power

Select displays the Target Power field toolbar and allows setting the target power level in dBm.

Perform Source Cal

Select performs the Source Cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

Select displays the RECALL SRC CAL dialog box.

Figure 5-3. POWER Menu – Segment-Based Sweep Mode – 2-Port VNAs

5-5 POWER Menu for Segment-Based Sweeps – 2-Port VNAs

Previous

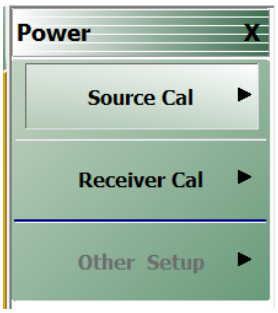
- Main Menu on page 2-2

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 on page 7-3
- SWEEP TYPES – Segmented Sweep Index-Based Setup
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Segmented Sweep (Index-Based)
  - Sweep Setup Menu on page 7-3



Source Cal

Select opens the SOURCE SETUP menu for the source calibration-related functions.

- See "Power Cal" on page 5-11

Receiver Cal

Select displays the RECEIVER SETUP menu.

Other Setup (Power)

OTHER SETUP is not applicable, under this sweep mode.
When the instrument is set for segmented sweep modes, the POWER SETUP menu's Other Setup button is grayed out. In segment sweep modes the VNA uses individual segment power values set in the Segmented Sweep Setup table area. The table area is shown at the bottom of the main display window when SWEEP SETUP menu is open and either the Freq.-based Seg. Sweep Setup, or Index-based Seg. Sweep Setup button is clicked.

Figure 5-4. POWER Menu – Segment-Based Sweep Mode – 2-Port VNAs

5-6 POWER Menu for Power-Based Sweeps (CW)

Previous

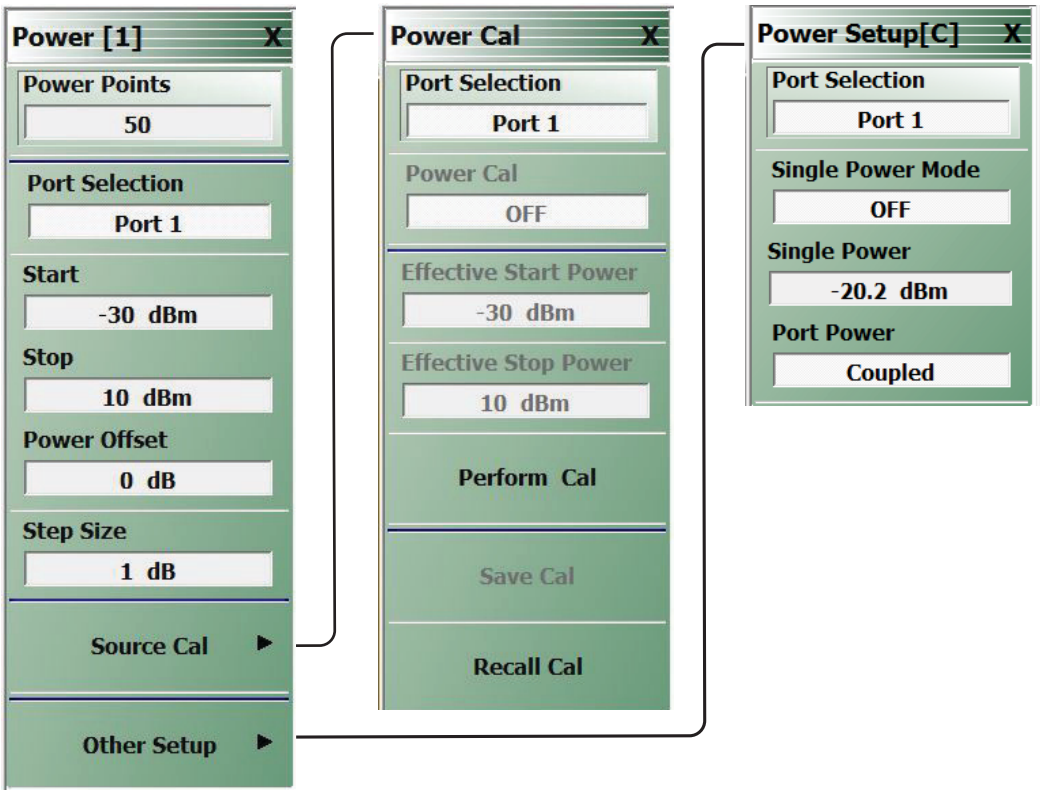
- Main Menu on page 2-2

Navigation

- MAIN | Power | POWER

Prerequisites

- SWEEP TYPES = Power-Based Sweep
- Power-Based Sweep Setup
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Power Sweep
  - Sweep Setup Menu on page 7-3



The VNA displays this menu set if SWEEP TYPES is set to Power Sweep (CW Freq).

The power settings for power sweeps are in the frequency-based or index-based segment power setting input tables: see "SEGMENTED SWEEP DEFINITION Table" on page 7-9.

1. "POWER Menu – Power-Based Sweeps – 2-Port VNAs" on page 5-8
2. "Power Cal" on page 5-11
3. "POWER SETUP Menu – Power-Based Sweep Menu – 2-Port VNAs" on page 5-10

Figure 5-5. POWER Cal Menu – Power Sweeps (CW)

POWER Menu – Power-Based Sweeps – 2-Port VNAs

The power-based sweep POWER menu provides controls for port selection and power offset, and interactive controls for adjusting the number of power points, start, stop, and step size values.

Previous

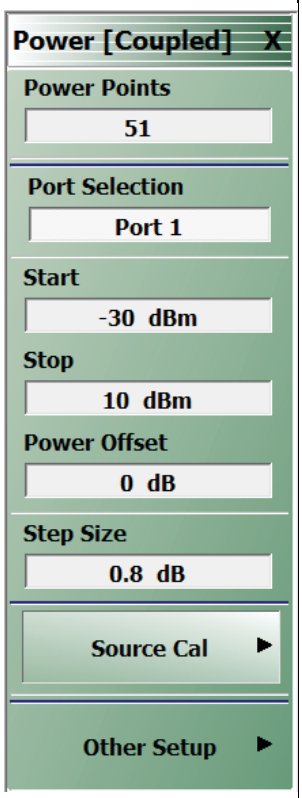
- Main Menu on page 2-2

Prerequisites

- SWEEP TYPES = Power-Based Sweep (CW Frequency)
- Power-Based Sweep (CW Frequency) Setup
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Power Sweep (CW Freq)
  - Sweep Setup Menu on page 7-3

Navigation

- MAIN | Power | Power [1]



Power Points

Select displays Power Points field toolbar for setting total number of power points in the sweep.

Port Selection

The Port Selection button displays the SELECT PORT dialog box. The selected port is shown in the button display field.

Start

Select displays the Start field toolbar with start power level set in dBm.

Stop

Select displays the Stop field toolbar with stop power level set in dBm.

Power Offset

Select displays the Power Offset field toolbar with offsets applied in dB.

Step Size

Select displays the Step Size field toolbar with step size value set in dB.

Figure 5-6. POWER Menu – Power-Based Sweep Mode- 2-Port VNAs (1 of 2)

	Source Cal Select opens the SOURCE CAL menu. • "Power Cal" on page 5-11 **Other Setup** Select displays the POWER SETUP menu which contains the controls for Port Selection, Single Power Mode, Single Power Level, and Port Power Coupling. • MAIN | Power | POWER | Other Setup | POWER SETUP • POWER SETUP Menu – Power-Based Sweep Menu – 2-Port VNAs on page 5-10

Figure 5-6. POWER Menu – Power-Based Sweep Mode- 2-Port VNAs (2 of 2)

POWER SETUP Menu – Power-Based Sweep Menu – 2-Port VNAs

Previous

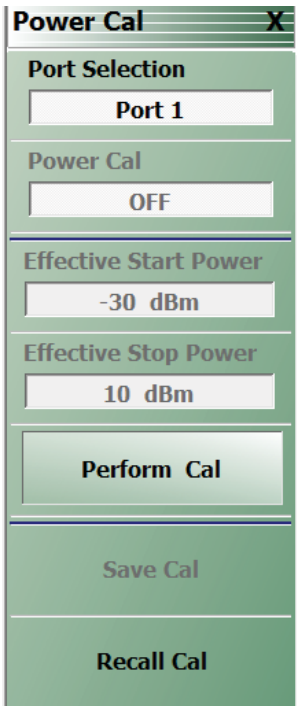
- POWER Menu – Power-Based Sweeps – 2-Port VNAs on page 5-8

Prerequisites

- Sweep = Power-Based Sweep (CW Frequency)
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Power Sweep (CW Freq)
- Sweep Setup Menu on page 7-3)

Navigation

- MAIN | Power | POWER | Source Cal | POWER CAL



Port Selection (Port 1/Port 2)

Select toggles between source Port 1 or 2.

Power Cal

This button is unavailable until a Perform Source Calibration has been completed. Once enabled, select toggles the Source Setup Port between OFF and ON.

Effective Start Power

Allows the user to set the start target power from the selected port.

Effective Stop Power

Allows the user to set the stop target power from the selected port.

Perform Source Cal

Select performs the Source Cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

Select displays the RECALL SRC CAL dialog box.

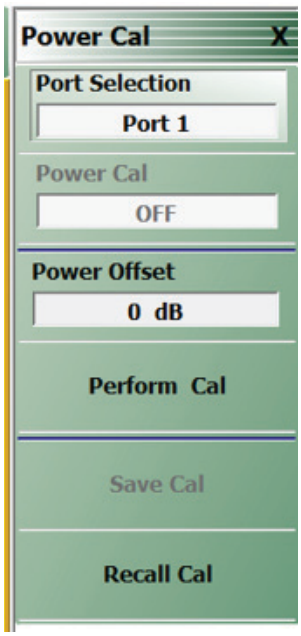
Figure 5-7. POWER [COUPLED] Menu – Power-Based Sweep Mode – 2-Port VNAs

Power Cal

The Source setup and calibration menus are available for frequency sweeps, both segmented sweep types (frequency and index-based), and power sweeps. This menu description will not apply to frequency (linear and log) or power sweeps.

Navigation

- MAIN | Power | POWER | Source Cal | POWER CAL



Port Selection

Select toggles between source Port 1 and 2.

Power Cal

This button is unavailable until a Perform Source Calibration has been completed. Once enabled, select toggles the Source Setup Port between OFF and ON.

Power Offset

Allows the user to set the offset power from the selected port.

Perform Source Cal

Select performs the Source cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

Select displays the RECALL SRC CAL dialog box.

Figure 5-8. Source Setup Menu – 2-Port VNAs

Power Cal (Power Sweeps)

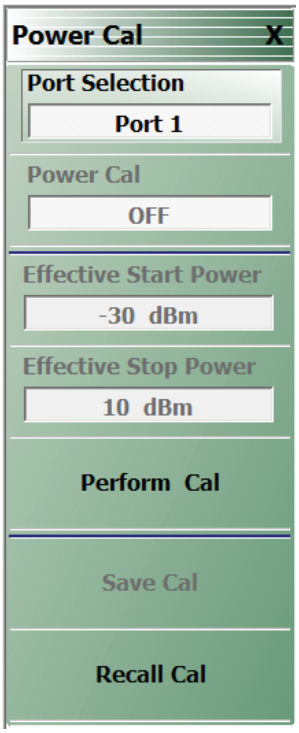
The Source setup and calibration menus are available for frequency sweeps, both segmented sweep types (frequency and index-based), and power sweep. This menu description will apply to power sweeps.

Navigation

- MAIN | Power | POWER | Source Cal | POWER CAL

Prerequisites

- Sweep = Power-Based Sweep (CW Frequency)
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Power Sweep (CW Freq)
- Sweep Setup Menu on page 7-3)



Power Cal

This button is unavailable until a Perform Source Calibration has been completed. Once enabled, select toggles the Source Setup Port between OFF and ON.

Effective Start Power

A read-only display that shows the effective start power after the application of any attenuator effects.

Effective Stop Power

A read-only display that shows the effective stop power after the application of any attenuator effects.

Perform Source Cal

Select performs the Source cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

Select displays the RECALL SRC CAL dialog box.

Figure 5-9. Receiver Setup Menu – 2-Port VNAs

5-7 Receiver Setup and Calibration Menus – 2-Port VNAs

The receiver setup and calibration menus are available for all sweep types.

RECEIVER SETUP Menu – 2-Port VNAs

Previous

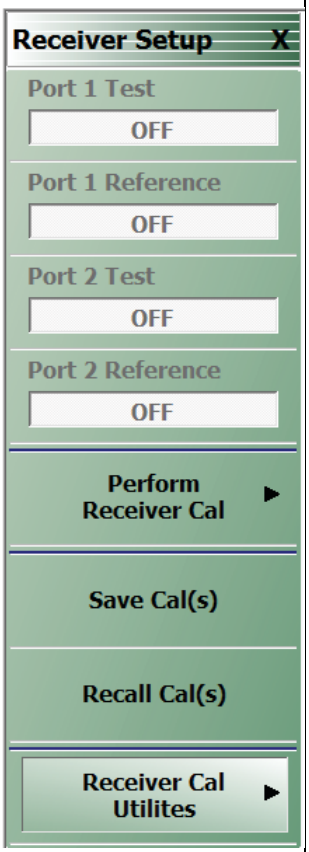
- POWER Menu – Power-Based Sweeps – 2-Port VNAs on page 5-8

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP

Menu Button Availability

- The top four (4) buttons are unavailable until a successful receiver calibration has been performed on the Receiver Cal menu. After a successful calibration, the buttons are available (shown below).



Port 1 Test (OFF/ON)

Select toggles the Port 1 Test OFF and ON.

Port 1 Reference (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Setup Port 1 Reference between OFF and ON.

Port 2 Test (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Port 2 Test between OFF and ON.

Port 2 Reference (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Setup Port 2 Reference between OFF and ON.

Perform Receiver Cal

Select displays the RECEIVER CAL menu.

- RECEIVER CAL Menu – 2-Port VNAs on page 5-14

Save Cal(s)

Select displays the SAVE RCVR CAL dialog box.

- "SAVE RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 2-Port VNAs" on page 5-15

Recall Cal(s)

Select displays the RECALL RCVR CAL dialog box.

- "RECALL RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 2-Port VNAs" on page 5-16

Receiver Cal Utilities

Select displays the RCVR UTILITIES menu.

- RCVR UTILITIES Menu – 2-Port VNAs on page 5-17

Figure 5-10. RECEIVER SETUP Menu

RECEIVER CAL Menu – 2-Port VNAs

Previous

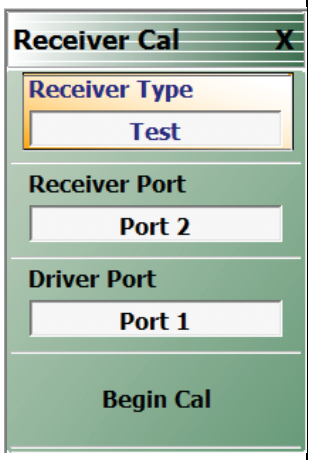
- POWER SETUP Menu – Power-Based Sweep Menu – 2-Port VNAs on page 5-10
- RECEIVER SETUP Menu – 2-Port VNAs on page 5-13

Navigation Path for Power Sweep Mode

- MAIN | Power | POWER | Power Setup | POWER SETUP | Receiver Cal | RECEIVER SETUP | Perform Receiver Cal | RECEIVER CAL

Navigation Path for Frequency Sweep Mode

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Perform Receiver Cal | RECEIVER CAL



RECEIVER CAL Menu Message

The menu displays a message: “Connect a through line between test ports.”

Receiver Type (Test/Reference)

After a successful receiver calibration, select toggles Receiver Type between Test (default) and Reference. Reference is used for additional test loop calibration.

Receiver Port (Port 1/Port 2)

The Receiver Port toggle button switches the receiver port between Port 1 and Port 2.

Driver Port (Port 1/Port 2)

The Driver Port toggle button switches the driving port between Port 1 and Port 2.

Begin Cal

The Begin Calibration button starts the receiver calibration. During the calibration process, the button dims and is unavailable. When the calibration is complete, the button returns to normal.

At the end of successful calibration, the buttons on the RECEIVER SETUP menu are enabled.

- RECEIVER SETUP Menu – 2-Port VNAs on page 5-13

Figure 5-11. RECEIVER CAL (RECEIVER CALIBRATION) Menu

SAVE RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 2-Port VNAs

Previous

- RECEIVER SETUP Menu – 2-Port VNAs on page 5-13

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Save Cal(s) | SAVE RCVR CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

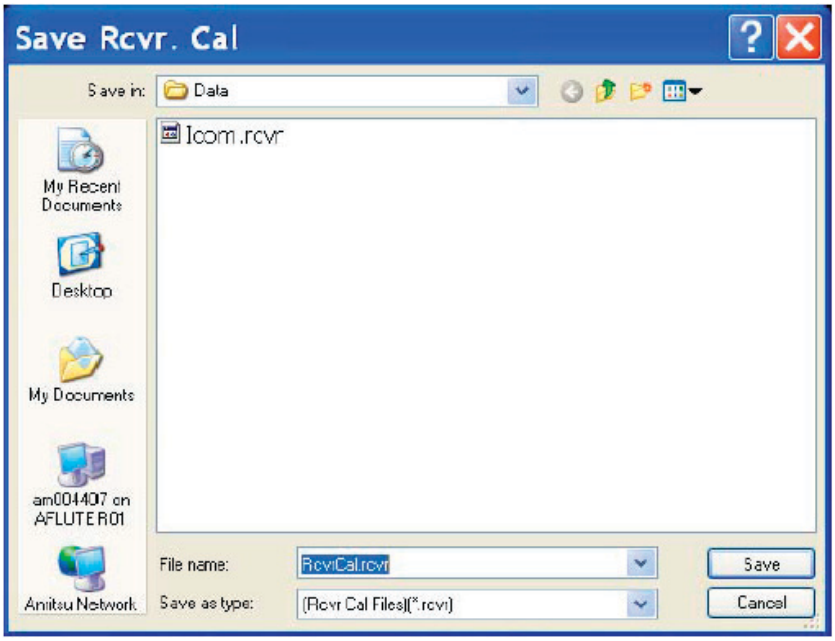


Figure 5-12. SAVE RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

Overview

Use the dialog box to navigate to the desired location, enter a unique RCVR file name, and click Save to save. Click Cancel to exit the dialog box. Allows the user to save a receiver calibration (.rcvr) file.

Instructions

1. Navigate to the required location.
2. Click Save.
3. Click Close to return or Cancel to end recall session.

RECALL RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 2-Port VNAs

Previous

- RECEIVER SETUP Menu – 2-Port VNAs on page 5-13

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Recall Cal(s) | RECALL RCVR CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

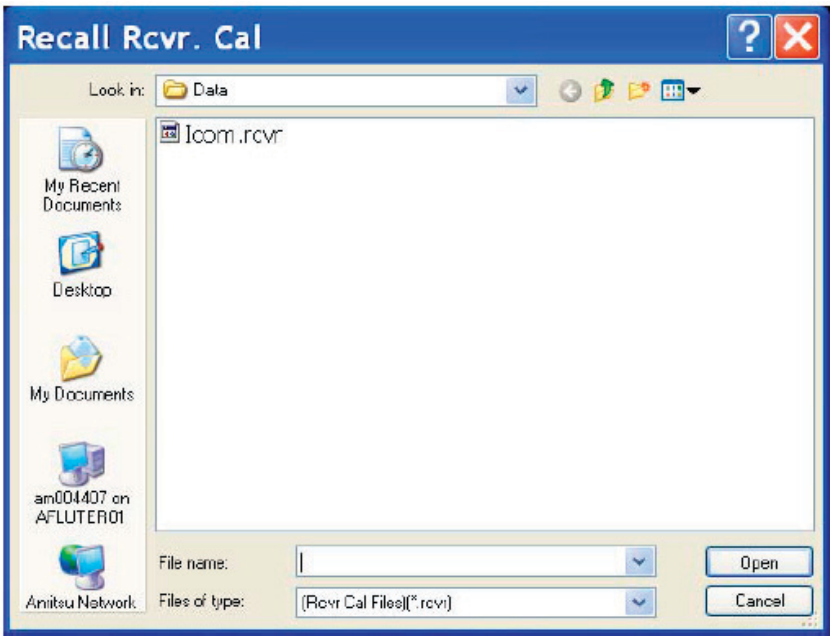


Figure 5-13. RECALL RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

Instructions

Use the RECALL RCVR CAL dialog box to navigate to required directory and select the required RCVR file. Click Open to recall the RCVR file. Click Cancel to exit the dialog box.

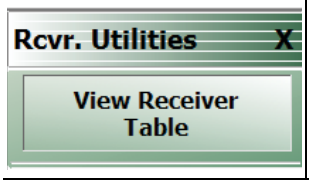
RCVR UTILITIES Menu – 2-Port VNAs

Previous

- RECEIVER CAL Menu – 2-Port VNAs on page 5-14

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Receiver Cal Utilities | RCVR UTILITIES



View Rcvr Table

The View Receiver Table button displays the VIEW RCVR CAL dialog box.

- "VIEW RECEIVER CAL Dialog Box – 2-Port VNAs" on page 5-18

Figure 5-14. RCVR UTILITIES (RECEIVER UTILITIES) Menu

VIEW RECEIVER CAL Dialog Box – 2-Port VNAs

Full Name

- View Receiver Calibration Dialog Box

Previous

- RCVR UTILITIES Menu – 2-Port VNAs on page 5-17

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Receiver Cal Utilities | RCVR UTILITIES | View Receiver Table | VIEW RECEIVER CAL Dialog Box

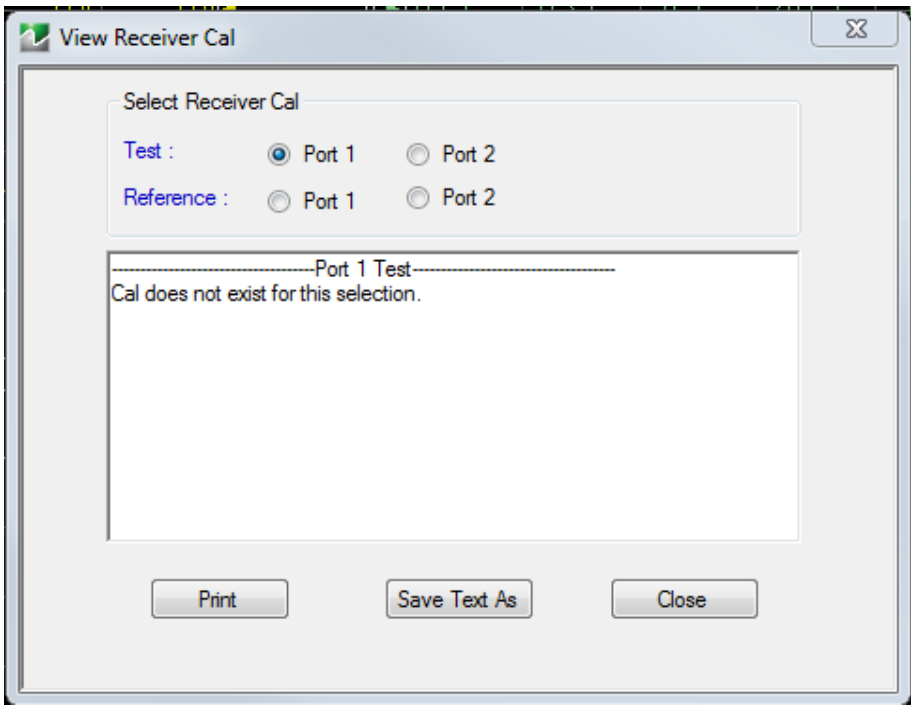


Figure 5-15. VIEW RCVR CAL (VIEW RECEIVER CALIBRATION) Dialog Box

Instructions

Use the VIEW RCVR CAL dialog box to view the applicable Receiver Calibration report. Radio buttons allow selection of following types of calibration data:

- Port 1 Test
- Port 1 Reference
- Port 2 Test
- Port 2 Reference

Click Print to print; Save Text As to save results as an ASCII TXT file to the desired directory or USB memory device; or click Close to close the dialog box.

Information Fields

The information fields provided are:

- Calibration date and time
- Port number

- Frequency
- Power in dB
- Cal.Eff.Pwr (Calculated Effective Power) in dBm

Chapter 6 — Power Menus: 4-Port VNAs

6-1 Chapter Overview

This chapter provides information on port power control in 4-port VNAs. Power conditions for sweeps are set in different places in the ShockLine application, depending on the sweep type: 1) for frequency-based sweeps and for power-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 tableaus. (See Chapter 7 — Sweep Menus for details.)

Maximum and Minimum Power Settings

For all configurations, the maximum power setting is +15 dBm.[a]

Table 6-1. Summary of Maximum and Minimum Power Levels for MS46524B Series 2-Port VNAs

Power Level and Frequency Range	Power Sweep Type	Power Setting Max/Min
Maximum Power 300 kHz to 6 GHz	Any	+15 dBm
Maximum Power 6 GHz to 8 GHz	Any	+12 dBm
Maximum Power 8 GHz to 8.5 GHz	Any	+10 dBm
Minimum Power at 8.5 GHz	• Power Sweep CW • Single Power Mode	–30 dBm
Maximum Power 8.5 GHz to 40 GHz	Any	+6 dBm[a]
Maximum Power 40 GHz to 43.5 GHz	Any	+4 dBm[a]

a.Typical.

6-2 Overview – Power Menus – 4-Port VNAs

Locations of Power Settings

VNA power control:

- 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.
- The POWER menu contents such as menu title text, buttons, and available functions, may vary depending on selected sweep type, instrument model (2 port or 4 port), and installed options.

This chapter organizes discusses of POWER menus by sections reflecting the sweep type, as follows:

1. POWER Settings for Frequency-Based Sweeps

POWER Menu for Frequency-Based Sweep (Linear and Log) on page 6-4

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

POWER Menu for Segment-Based Sweeps – 4-Port VNAs on page 6-8

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 table area. To reach that area:

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 7-7

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 7-13

3. POWER Settings for Power-Based Sweeps

POWER Menu – Power-Based Sweep Menu – 4-Port VNAs on page 6-10

POWER Menu for Power-Based Sweep (CW) on page 6-9

If SWEEP Menu Sweep Types is set to Power-Based Sweep (CW), power settings for sweeps are set here:

Navigation to Power Settings for Power-Based Sweeps

- MAIN | Power | POWER |
- and also MAIN | Power | POWER | Other Setup | POWER SETUP
- For use see: POWER SETUP Menu – Power-Based Sweep Menu – 4-Port VNAs on page 6-12

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.
- To enable/disable port power coupling
    - Navigate to: MAIN | Power | POWER |
    - Click the POWER menu's Other Setup button to open the POWER SETUP menu.
    - Toggle Port Power to select between Not Coupled and Coupled.

6-3 POWER Menu for Frequency-Based Sweep (Linear and Log)

If Port Power is set to Coupled, changes to any Port Power level are applied to all other port power levels.

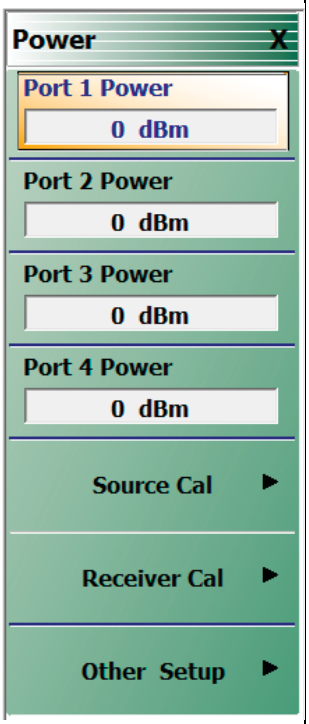
Navigation

- MAIN | Power | POWER

Prerequisites

- Sweep Type = Frequency-Based Sweep (Linear or Log)
- Frequency-Based Sweep (Linear)
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Freq Sweep (Linear)

With Option 10 only



Port 1 Power

Select displays the Port 1 Power value toolbar which allows setting the port 1 power level in dBm.

Port 2 Power

Select displays the Port 2 Power value toolbar which allows setting the port 2 power level in dBm.

Port 3 Power

Select displays the Port 3 Power value toolbar which allows setting the port 3 power level in dBm.

Port 4 Power

Select displays the Port 4 Power value toolbar which allows setting the port 4 power level in dBm.

Source Cal

Select opens the SOURCE SETUP menu for the source calibration-related functions.

For frequency sweeps, Linear or Log, see SOURCE CAL Menu for Frequency Based Sweeps, Linear or Log on page 6-6

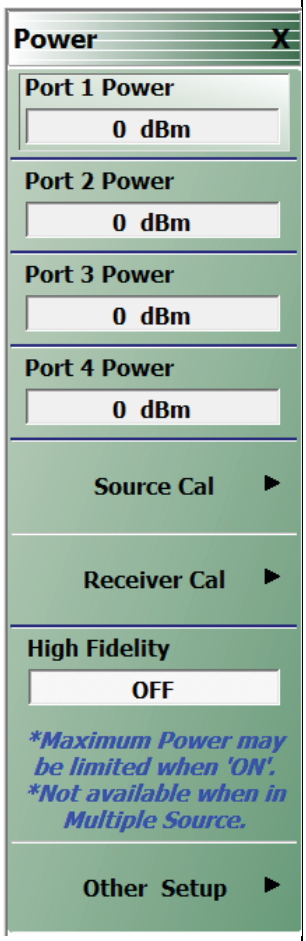
For frequency sweeps, both segmented sweep types (frequency and index-based), and power sweep, see POWER Menu for Segment-Based Sweeps – 4-Port VNAs on page 6-8

Receiver Cal

Select displays the RECEIVER SETUP menu. See Section 6-8 “Receiver Setup and Calibration Menus – 4-Port VNAs” on page 6-15.

Figure 6-1. POWER [COUPLED] Menu – Frequency-Based Sweep – 4-Port VNAs (1 of 2)

With Options 20, 40, or 43



High Fidelity (With Options 20, 40, or 43)

Select toggles High Fidelity mode on or off. High Fidelity mode is not available when the VNA is in multiple source mode. When High Fidelity is on, maximum power may be limited.

Other Setup

- Select displays the POWER SETUP menu. The title of the POWER SETUP menu may include [1], [2]], or [C] to show reference to port 1, port 2, coupling of the port powers. This is based on the settings of the Power Selection button and the Port Power button.

Figure 6-1. POWER [COUPLED] Menu – Frequency-Based Sweep – 4-Port VNAs (2 of 2)

6-4 SOURCE CAL Menu for Frequency Based Sweeps, Linear or Log

Previous

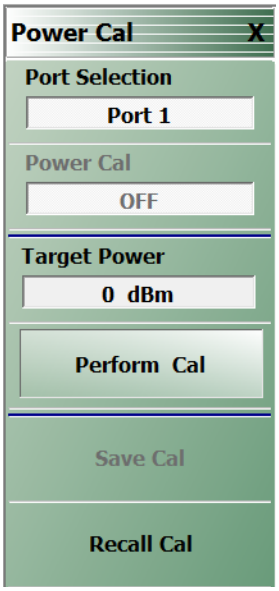
- "Main Menu" on page 2-2

Navigation

- MAIN | Power | POWER

Prerequisites

- SWEEP TYPES = Frequency-Based Sweeps, Linear or Log
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Frequency Sweep (Log)



Port Selection

Select either Port 1 or Port 2.

Power Cal

Power Cal not available in this sweep type.

Target Power

Select displays the Target Power field toolbar and allows setting the target power level in dBm.

Perform Source Cal

Select performs the Source Cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

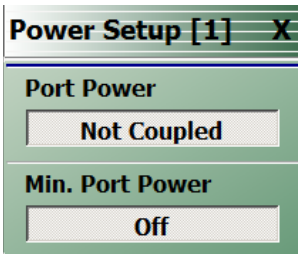
Select displays the RECALL SRC CAL dialog box.

Figure 6-2. POWER Menu – Segment-Based Sweep Mode – 2-Port VNAs

6-5 POWER SETUP Menu for Frequency-Based Sweep

Navigation

- MAIN | Power | POWER |Other Setup | POWER SETUP [1]



Port Power

Toggles coupling port power levels. When coupled, ports use same power level and menu title include [C] in its text to signal this.

Min. Port Power Dialog

This 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 6-3. POWER Setup Menu – Frequency-Based Sweep Modes – 4-Port VNAs

6-6 POWER Menu for Segment-Based Sweeps – 4-Port VNAs

Previous

- Main Menu on page 2-2

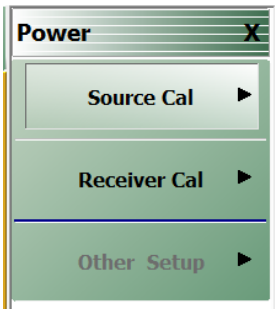
Navigation

- MAIN | Power | POWER

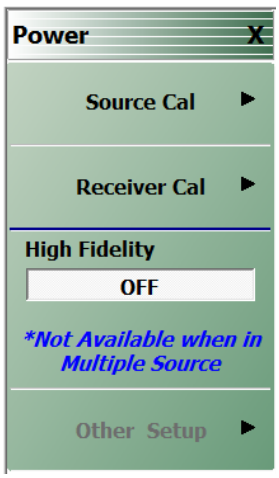
Prerequisites

- 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 on page 7-3
- SWEEP TYPES = Segmented Sweep Index-Based Setup
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Segmented Sweep (Index-Based)
  - Sweep Setup Menu on page 7-3
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Segmented Sweep

With Option 10 only



With Options 20, 40, or 43



Source Cal

Select opens the SOURCE SETUP menu for the source calibration-related functions.

- See Power Cal Menu on page 6-13

Receiver Cal

Select displays the RECEIVER SETUP menu.

- See Power Cal Menu on page 6-13

High Fidelity (With Options 20, 40, or 43)

High Fidelity mode on the MS4652xB is a mode that reduces source harmonics in a lower microwave frequency band. For DUTs sensitive to source harmonic content, this mode may improve dynamic range measurements. This feature is available only on microwave MS4652xB units with a High Fidelity factory system calibration.

Select toggles High Fidelity mode on or off. High Fidelity mode is not available when the VNA is in multiple source mode.

Other Setup (Power)

OTHER SETUP is not applicable, under this sweep mode.
When the instrument is set for segmented sweep modes, the POWER SETUP menu's Other Setup button is grayed out. In segment sweep modes the VNA uses individual segment power values set in the Segmented Sweep Setup table area. The area is shown at the bottom of the main display window when SWEEP SETUP menu is open and either the Freq.-based Seg. Sweep Setup, or Index-based Seg. Sweep Setup button is clicked.

Figure 6-4. POWER Menu – Segment-Based Sweep Mode – 2-Port VNAs

6-7 POWER Menu for Power-Based Sweep (CW)

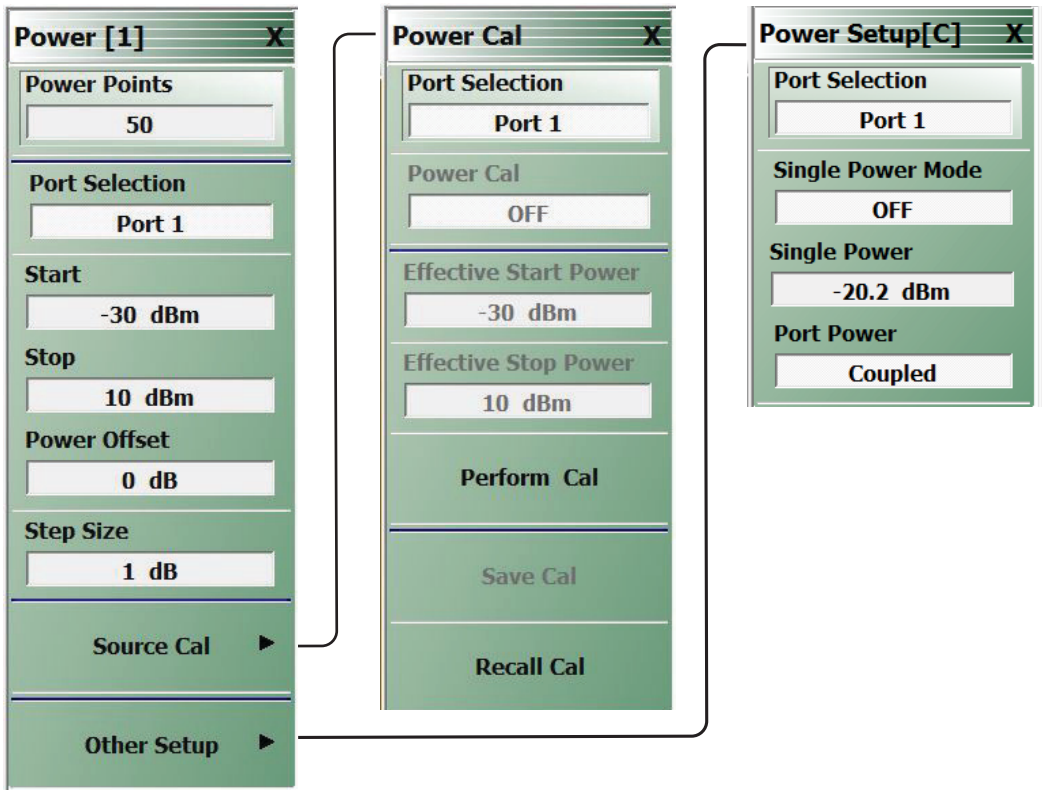
The POWER menu when instrument is set for power-based sweep is shown in the figure below.

Navigation

- MAIN | Power | POWER [1]

Prerequisites

- Sweep Type = Segmented Sweep (Freq or Index-based)
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Power Sweep (CW Freq)



This menu set is available if Sweep Type is set to Power Sweep (CW Freq). 1. "POWER Menu – Power-Based Sweep Menu – 4-Port VNAs" on page 6-10	2. "Power Cal Menu" on page 6-13 3. "POWER SETUP Menu – Power-Based Sweep Menu – 4-Port VNAs" on page 6-12

Figure 6-5. POWER Menus – Power-Based Sweep (CW)

POWER Menu – Power-Based Sweep Menu – 4-Port VNAs

The power-based sweep POWER menu provides controls for port selection and power offset, and interactive controls for adjusting the number of power points, start, stop, and step size values.

Previous

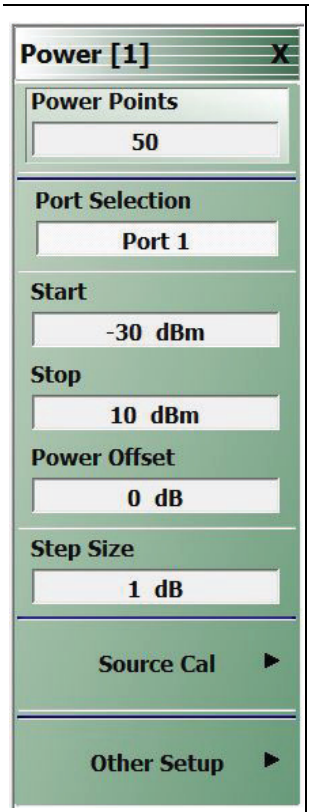
- Main Menu on page 2-2

Navigation

- MAIN | Power | POWER

Prerequisites

- Sweep Type = Power-Based Sweep (CW Frequency)
- Power-Based Sweep (CW Frequency)
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Power Sweep (CW Freq)

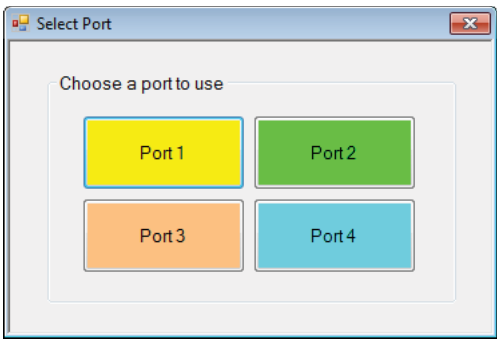


Power Points

Select displays Power Points field toolbar for setting total number of power points in the sweep.

Port Selection

The Port Selection button displays the SELECT PORT dialog box. The selected port is shown in the button display field.



Start

Select displays the Start field toolbar with start power level set in dBm.

Stop

Select displays the Stop field toolbar with stop power level set in dBm.

Figure 6-6. POWER [COUPLED] Menu – Power-Based Sweep – 4-Port VNAs (1 of 2)

Power Offset

Select displays the Power Offset field toolbar with offsets applied in dB.

Step Size (power)

Select displays the Step Size (power) field toolbar with step size value set in dB.

Other Setup

Select displays the power-based sweep POWER SETUP menu.

- MAIN | Power | POWER | Other Setup | POWER SETUP
- "POWER SETUP Menu – Power-Based Sweep Menu – 4-Port VNAs" on page 6-12

Figure 6-6. POWER [COUPLED] Menu – Power-Based Sweep – 4-Port VNAs (2 of 2)

POWER SETUP Menu – Power-Based Sweep Menu – 4-Port VNAs

Previous

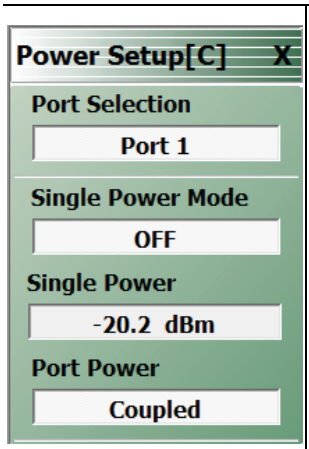
- POWER Menu – Power-Based Sweep Menu – 4-Port VNAs on page 6-10

Navigation

- MAIN | Power | POWER | Power [1] | OTHER SETUP

Prerequisites

- Sweep Type = Power Sweep (CW Frequency)
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Type | SWEEP TYPES | Power Sweep (CW Freq)



Port Selection

Select displays the SELECT PORT dialog box allowing touch screen selection of Port 1, Port 2, Port 3, or Port 4.

- "Port Selection" on page 6-10

The menu name suffix changes depending on the state of the Port Power (Coupled/Not Coupled) button, and if Not Coupled, to identify the currently selected port.

Single Power Mode

Select toggles single power mode ON and OFF.

Single Power

Select displays the Single Power field toolbar and allows the user to set the single power level in dBm.

Port Power

The Port Power button toggles whether power adjustments to Ports 1, 2, 3, and 4 are coupled or not coupled.

Coupled selected: (top figure)

- Power adjustment to one port is applied to all other ports on the POWER and POWER SETUP menus.
- The POWER SETUP menu name changes to POWER SETUP [C].
- The POWER menu name changes to POWER [COUPLED].

Not Coupled selected: (bottom figure)

- The POWER SETUP menu name changes to include the number of the port. For example, POWER SETUP [1] or POWER SETUP [2] or POWER SETUP [3] or POWER SETUP [4].

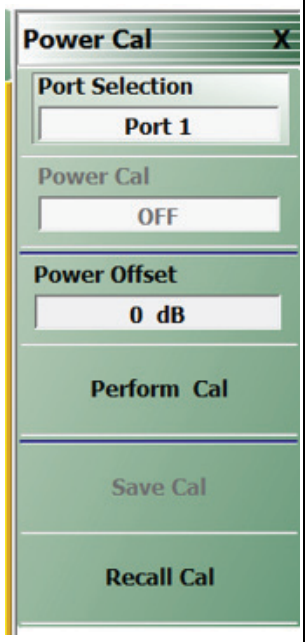
Figure 6-7. POWER SETUP Menu – Power-Based Sweep – 4-Port VNAs

Power Cal Menu

The Source setup and calibration menus are available for frequency sweeps, both segmented sweep types (frequency and index-based), and power sweeps. This menu description will not apply to frequency (linear and log) or power sweeps.

Navigation

- MAIN | Power | POWER | Source Cal | POWER CAL



Port Selection

Select toggles between source Port 1 and 2.

Power Cal

This button is unavailable until a Perform Source Calibration has been completed. Once enabled, select toggles the Source Setup Port between OFF and ON.

Power Offset

Allows the user to set the offset power from the selected port.

Perform Cal

Select performs the Source cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

Select displays the RECALL SRC CAL dialog box.

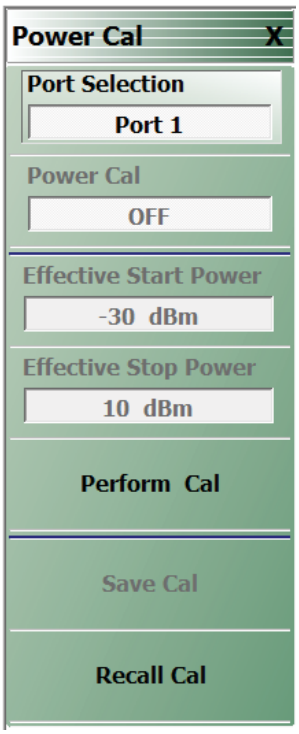
Figure 6-8. Source Setup Menu – 2-Port VNAs

Power Cal Menu (Power Sweeps)

The Source setup and calibration menus are available for frequency sweeps, both segmented sweep types (frequency and index-based), and power sweep. This menu description will apply to power sweeps.

Navigation

- MAIN | Power | POWER | Source Cal | POWER CAL



Power Cal

This button is unavailable until a Perform Source Calibration has been completed. Once enabled, select toggles the Source Setup Port between OFF and ON.

Effective Start Power

A read-only display that shows the effective start power after the application of any attenuator effects.

Effective Stop Power

A read-only display that shows the effective stop power after the application of any attenuator effects.

Perform Cal

Select performs the Source cal.

Save Cal(s)

This button is unavailable until a Perform Source Calibration has been completed. Displays the SAVE CAL dialog box.

Recall Cal(s)

Select displays the RECALL SRC CAL dialog box.

Figure 6-9. Source Setup Menu – 2-Port VNAs

6-8 Receiver Setup and Calibration Menus – 4-Port VNAs

The receiver setup and calibration menus are available for all sweep types.

RECEIVER SETUP Menu – 4-Port VNAs

Sweep Types

- The RECEIVER SETUP menu is available for all sweep types.

Previous

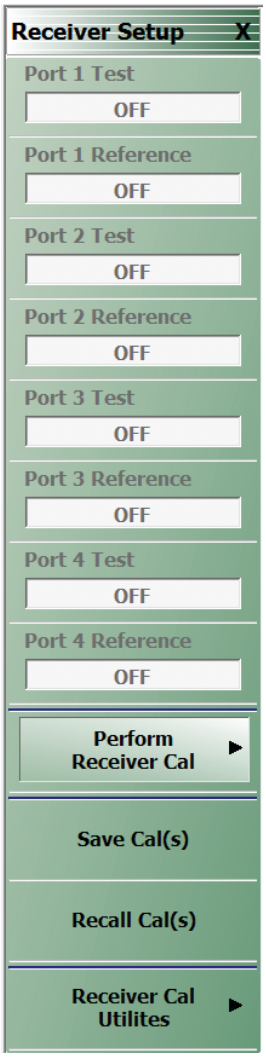
- POWER Menu – Power-Based Sweep Menu – 4-Port VNAs on page 6-10 .

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP

Menu Button Availability

- The top four (4) buttons (Port 1 Test and Reference, Port 2 Test and Reference) are unavailable until a successful receiver calibration has been performed on the RECEIVER CAL menu. After a successful calibration, the buttons are available (shown below).



Port 1 Test (OFF/ON)

Select toggles the Port 1 Test OFF and ON.

Port 1 Reference (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Setup Port 1 Reference between OFF and ON.

Port 2 Test (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Port 2 Test between OFF and ON.

Port 2 Reference (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Setup Port 2 Reference between OFF and ON.

Port 3 Test (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Port 3 Test between OFF and ON.

Port 3 Reference (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Setup Port 3 Reference between OFF and ON.

Port 4 Test (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Port 4 Test between OFF and ON.

Port 4 Reference (OFF/ON)

This button is unavailable until a Perform Receiver Calibration has been completed. Once enabled, select toggles the Receiver Setup Port 4 Reference between OFF and ON.

Perform Receiver Cal

Select displays the RECEIVER CAL menu.

- RECEIVER CAL Menu – 4-Port VNAs on page 6-18

Save Cal(s)

Select displays the SAVE RCVR CAL dialog box.

- “SAVE RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 4-Port VNAs” on page 6-19

Figure 6-10. RECEIVER SETUP Menu – 4-Port VNAs (1 of 2)

	Recall Cal(s) Select displays the RECALL RCVR CAL dialog box. • "RECALL RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 4-Port VNAs" on page 6-20 **Receiver Cal Utilities** Select displays the RCVR UTILITIES menu. • RCVR UTILITIES Menu – 2-Port VNAs on page 6-21

Figure 6-10. RECEIVER SETUP Menu – 4-Port VNAs (2 of 2)

RECEIVER CAL Menu – 4-Port VNAs

Previous

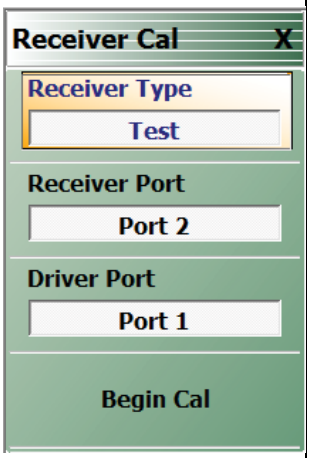
- POWER SETUP Menu – Power-Based Sweep Menu – 4-Port VNAs on page 6-12
- RECEIVER SETUP Menu – 4-Port VNAs on page 6-15

Navigation Path for Power Sweep Mode

- MAIN | Power | POWER | Power Setup | POWER SETUP | Receiver Cal | RECEIVER SETUP | Perform Receiver Cal | RECEIVER CAL

Navigation Path for Frequency Sweep Mode

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Perform Receiver Cal | RECEIVER CAL



RECEIVER CAL Menu Message

The menu displays a message: "Connect a through line between test ports."

Receiver Type (Test/Reference)

After a successful receiver calibration, select toggles Receiver Type between Test (default) and Reference. Reference is used for additional test loop calibration.

Receiver Port (Port 1/Port 2)

The Receiver Port toggle button switches the receiver port between Port 1 and Port 2.

Driver Port (Port 1/Port 2)

The Driver Port toggle button switches the driving port between Port 1 and Port 2.

Begin Cal

The Begin Calibration button starts the receiver calibration. During the calibration process, the button dims and is unavailable. When the calibration is complete, the button returns to normal.

At the end of successful calibration, the buttons on the RECEIVER SETUP menu are enabled.

- RECEIVER SETUP Menu – 4-Port VNAs on page 6-15

Figure 6-11. RECEIVER CAL (RECEIVER CALIBRATION) Menu

SAVE RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 4-Port VNAs

Previous

- RECEIVER SETUP Menu – 4-Port VNAs on page 6-15

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Save Cal(s) | SAVE RCVR CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

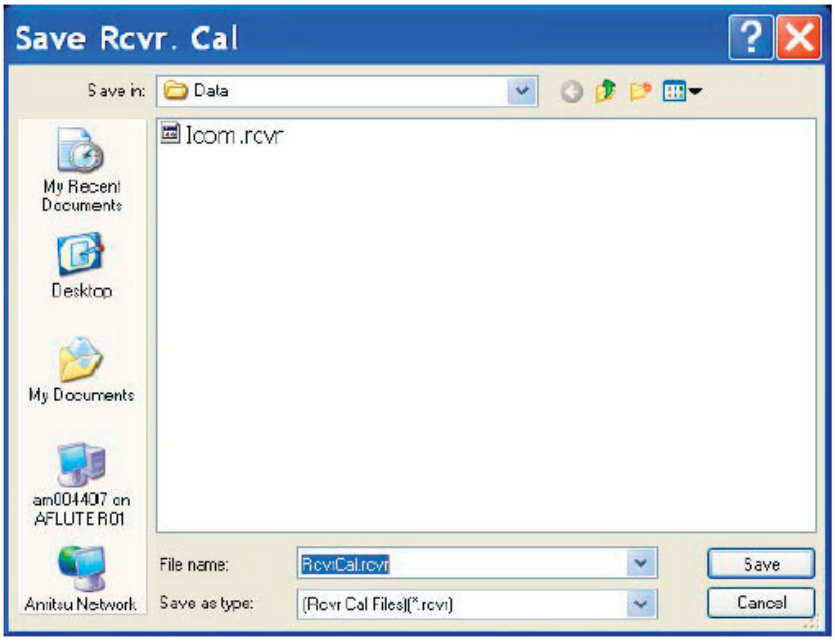


Figure 6-12. SAVE RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

Overview

Use the dialog box to navigate to the desired location, enter a unique RCVR file name, and click Save to save. Click Cancel to exit the dialog box. Allows the user to save a receiver calibration (.rcvr) file.

Instructions

1. Navigate to the required location.
2. Click Save.
3. Click Close to return or Cancel to end recall session.

RECALL RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box – 4-Port VNAs

Previous

- RECEIVER SETUP Menu – 4-Port VNAs on page 6-15

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Recall Cal(s) | RECALL RCVR CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

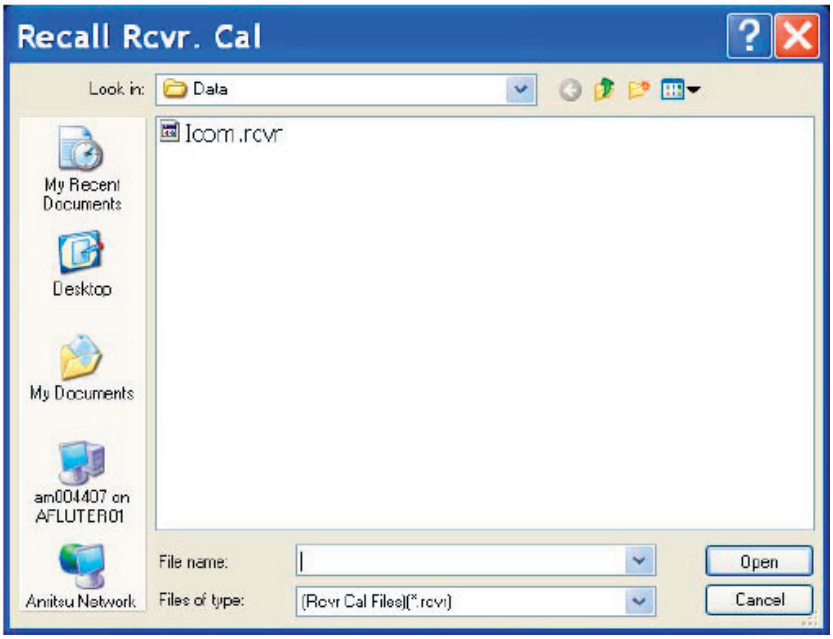


Figure 6-13. RECALL RCVR. CAL (RECEIVER CALIBRATION RCVR FILE) Dialog Box

Instructions

Use the RECALL RCVR CAL dialog box to navigate to required directory and select the required RCVR file. Click Open to recall the RCVR file. Click Cancel to exit the dialog box.

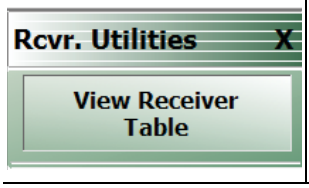
RCVR UTILITIES Menu – 2-Port VNAs

Previous

- "RECEIVER CAL Menu – 4-Port VNAs" on page 6-18

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Receiver Cal Utilities | RCVR UTILITIES



View Rcvr Table

The View Receiver Table button displays the VIEW RCVR CAL dialog box.

- "VIEW RECEIVER CAL Dialog Box – 2-Port VNAs" on page 6-22

Figure 6-14. RCVR UTILITIES (RECEIVER UTILITIES) Menu

VIEW RECEIVER CAL Dialog Box – 2-Port VNAs

Full Name

- View Receiver Calibration Dialog Box

Previous

- RCVR UTILITIES Menu – 2-Port VNAs on page 6-21

Navigation

- MAIN | Power | POWER | Receiver Cal | RECEIVER SETUP | Receiver Cal Utilities | RCVR UTILITIES | View Receiver Table | VIEW RECEIVER CAL Dialog Box

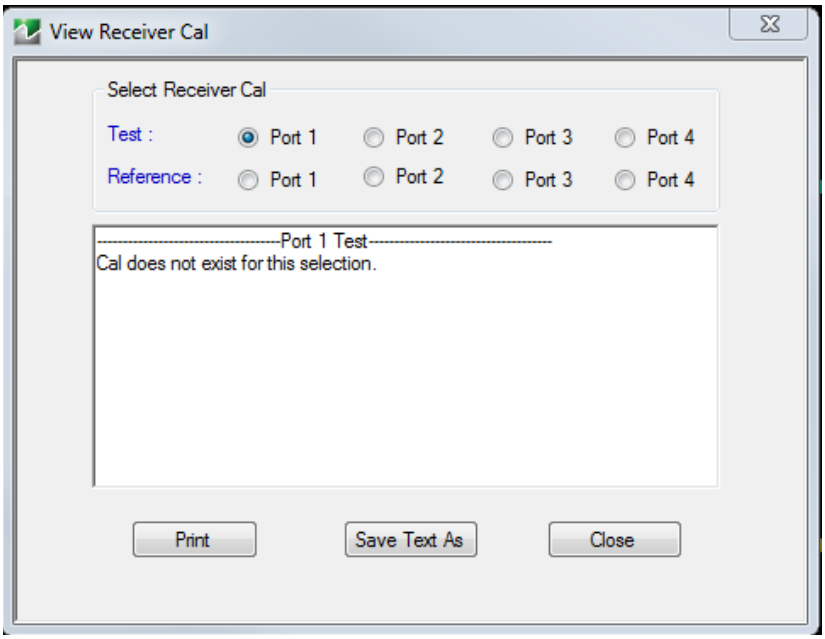


Figure 6-15. VIEW RCVR CAL (VIEW RECEIVER CALIBRATION) Dialog Box

Instructions

Use the VIEW RCVR CAL dialog box to view the applicable Receiver Calibration report. Radio buttons allow selection of following types of calibration data:

- Port 1 Test
- Port 1 Reference
- Port 2 Test
- Port 2 Reference

Click Print to print; Save Text As to save results as an ASCII TXT file to the desired directory or USB memory device; or click Close to close the dialog box.

Information Fields

The information fields provided are:

- Calibration date and time
- Port number
- Frequency

- Power in dB
- Cal.Eff.Pwr (Calculated Effective Power) in dBm

Chapter 7 — Sweep Menus

7-1 Chapter Overview

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

7-2 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 table at the bottom of the display window. You can also set parameters for segments in the FREQUENCY menu.

C. Power sweep:

- Power sweep at a CW frequency – you can set start and end power levels for a sweep at a constant frequency. Power sweep not currently supported in multiple source mode.

The power sweep mode is selected on the SWEEP menu and the port power levels are set at the POWER 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.

7-3 Overview of Sweep Menus

These are the sweep control menus and dialog boxes:

- SWEEP SETUP Menu on page 7-3
- FREQ BASE SETUP Menu on page 7-7
- "SEGMENTED SWEEP DEFINITION Table" on page 7-9
- "SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box" on page 7-11
- "RECALL SEGMENTED SWEEP TABLE SGS FILE Dialog Box" on page 7-12
- INDEX BASE SETUP Menu on page 7-13
- HOLD FUNCTIONS Menu on page 7-15
- TRIGGER Menu on page 7-17
- TRIGGER SOURCE Source Menu on page 7-18
- TRIGGER SETUP Menu on page 7-19
- TRIGGER SOURCE (EXT. TRIGGER) Menu on page 7-20
- DELAY PER POINT Menu on page 7-21
- DISPLAY SETUP Menu on page 7-21

7-4 Sweep Setup Menu

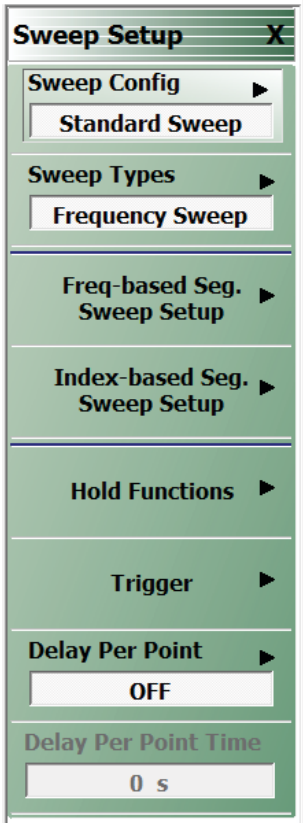
SWEEP SETUP Menu

Purposes

- Select sweep type, and set up sweep parameters.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP



Sweep Config

The MS46522B and MS465524B VNAs have independent source hardware for each port that can allow for simultaneous sweeping of the sources. At present the ShockLine software only supports standard sweeping, which sweeps one source at a time sequentially, so this menu does not allow for any choice other than standard sweep.

Sweep Types

Select 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.

- SWEEP TYPES Menu on page 7-5

Freq-based Seg. Sweep Setup

The Frequency-Based Segmented Sweep Setup button displays the FREQ BASE SETUP menu and opens the FREQ DEF for F1 & F2 table area below the main display area.

- FREQ BASE SETUP Menu on page 7-7

Index-based Seg. Sweep Setup

The Index-Based Segmented Sweep Setup button 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 7-13

Hold Functions

Select displays the HOLD FUNCTIONS menu.

- HOLD FUNCTIONS Menu on page 7-15

Trigger

Select displays the TRIGGER menu.

- TRIGGER Menu on page 7-17

Delay Per Point

Displays delay per point value. Select enables adjustment of delay per point value.

- DELAY PER POINT Menu on page 7-21

Figure 7-1. SWEEP SETUP Menu – MS4652xB Series (1 of 2)

	Delay Per Point Time Displays delay per point time. • DISPLAY SETUP Menu on page 7-21

Figure 7-1. SWEEP SETUP Menu – MS4652xB Series (2 of 2)

SWEEP TYPES Menu

Purposes

- Select sweep type.

Navigation

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

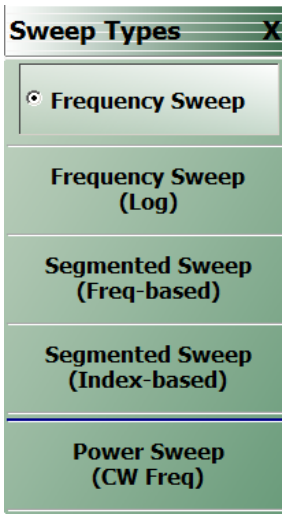
Notes

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)
- Power sweep (for CW 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.



Freq Sweep

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

Freq Sweep (Log)

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 in the FREQUENCY menu.

Segmented Sweep (Freq-Based)

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 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 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 7-2. SWEEP TYPES Menu – MS4652xB Series VNA (1 of 2)

	Power Sweep (CW Freq) The Power Sweep (CW Freq) button selects the power sweep mode and de-selects all other sweep types. In this mode, a CW Frequency for the sweep is set in the FREQUENCY menu, power parameters are set in the POWER menu, and power is swept linearly on the X-axis between start and end point, based on the number of power steps set. Not available if multiple source mode is enabled. • FREQUENCY Power Sweep CW-Based Menu on page 7-14

Figure 7-2. SWEEP TYPES Menu – MS4652xB Series VNA (2 of 2)

7-5 Frequency-Based Segmented Sweep Setup

FREQ BASE SETUP Menu

Purposes

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

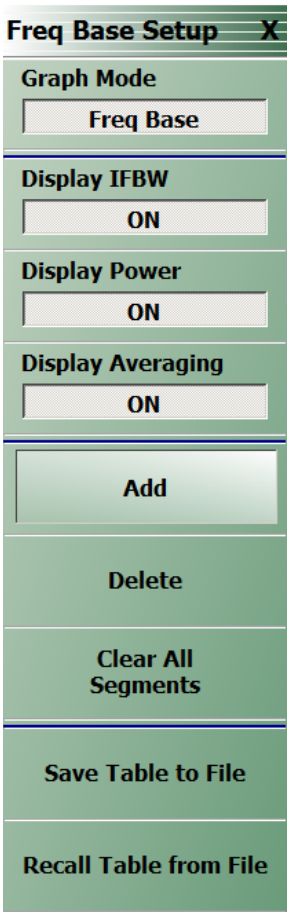
Navigation

- 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, also appears. The 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 7-9



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 7-3. 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 7-11 **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 7-12

Figure 7-3. FREQ BASE SETUP (FREQUENCY-BASED SEGMENTED SWEEP SETUP) Menu (2 of 2)

SEGMENTED SWEEP DEFINITION Table

Purposes

- Used to edit frequency-based or index-based segment sweep parameters.

Navigation

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

Overview

The Freq Def. for F1 and F2 (Segmented Sweep Definition) information appears below the display area. The number of rows and columns displayed depend on the button settings in the FREQ BASE SETUP or INDEX BASE SETUP menu. The default settings display the following column fields: P1 IFBW, P2 IFBW, (and P3 IFBW, P4 IFBW for MS46524), P1 source power, P2 source power, (and P3 source power, P4 source power for MS46524), and Averaging.

Default Appearance

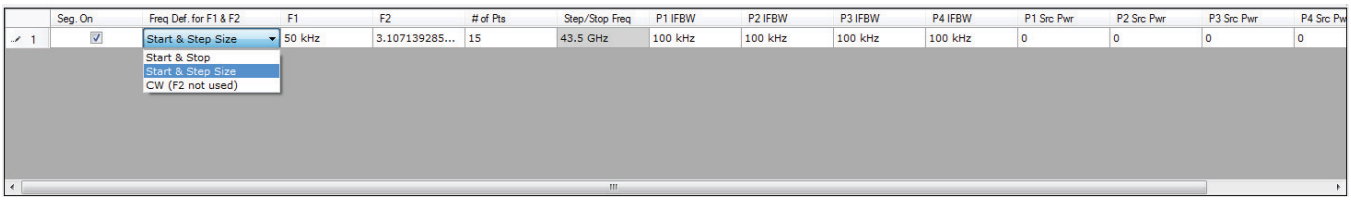
The following figure displays all fields for the MS46524 in two rows. You may need to scroll to see all the fields.

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	P1 IFBW
1	☑	Start & Stop	50 kHz	43.5 GHz	15	3.107139285...	100 kHz

P2 IFBW	P3 IFBW	P4 IFBW	P1 Src Pwr	P2 Src Pwr	P3 Src Pwr	P4 Src Pwr	Averaging
100 kHz	100 kHz	100 kHz	0	0	0	0	1

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

The Freq Def. for F1 & F2 pull-down menu allows each segment 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 columns to disappear (shown below) and appear.

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	P1 Src Pwr	P2 Src Pwr	P3 Src Pwr	P4 Src Pwr	Averaging
1	☑	CW (F2 not used)	50 kHz		1	0 kHz	0	0	0	0	1

Display Power Column, Toggle OFF/ON

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

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	P1 IFBW	P2 IFBW	P3 IFBW	P4 IFBW	Averaging
1	☑	CW (F2 not used)	50 kHz		1	0 kHz	100 kHz	100 kHz	100 kHz	100 kHz	1

Display Averaging, Toggle OFF/ON

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

	Seg. On	Freq Def. for F1 & F2	F1	F2	# of Pts	Step/Stop Freq	P1 IFBW	P2 IFBW	P3 IFBW	P4 IFBW	P1 Src Pwr	P2 Src Pwr	P3 Src Pwr	P4 Src Pwr
1	☑	CW (F2 not used)	50 kHz		1	0 kHz	100 kHz	100 kHz	100 kHz	100 kHz	0	0	0	0

Adding Rows

Selecting the Add button on the Freq Base Setup menu adds a row to the table 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

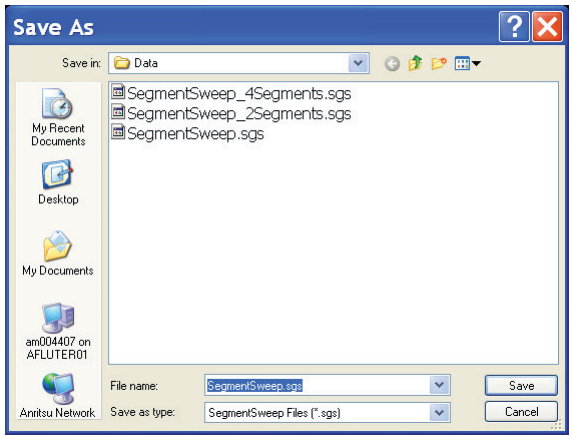


Figure 7-4. SAVE AS (SEGMENT SWEEP TABLE SGS FILE) Dialog Box

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

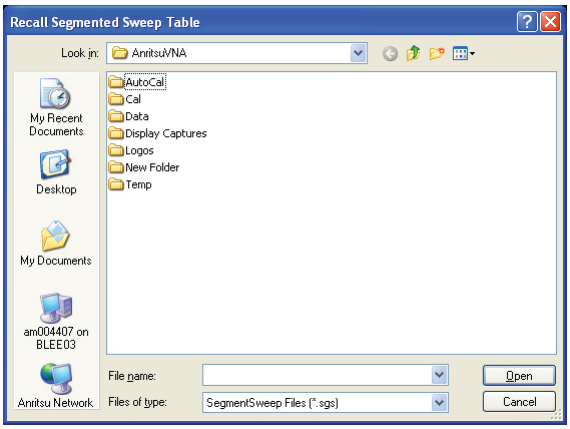


Figure 7-5. RECALL (SEGMENTED SWEEP TABLE SGS FILE) Dialog Box

Instructions

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

7-6 Index-Based Segmented Sweep Setup

INDEX BASE SETUP Menu

Purposes

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

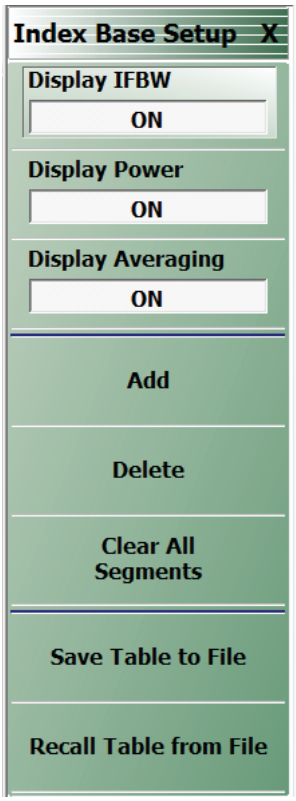
Navigation

- 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, 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 7-9



Display IFBW (OFF/ON)

Toggles the IFBW column OFF and ON in the table 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 table display

Display Averaging (OFF/ON)

Toggles the Averaging column display OFF and ON in the table 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 table area.

Delete (Index-Based Segment)

To delete a row in the table, 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 table 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 7-11

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 7-12

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

7-7 FREQUENCY Power Sweep CW-Based Menu

Full Name

- Frequency Power Sweep CW-based Menu

Menu Identification and Variants

- The FREQUENCY menu's appearance and button change when this sweep mode is selected on the SWEEP SETUP menu's Sweep Type.

Prerequisites

- When the Sweet Type is set to Power Sweep (CW Frequency), the FREQUENCY menu changes to a two (2) button menu with one active button and one read-only display.

SWEEP TYPES Menu

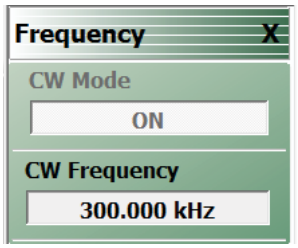
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES

Previous

- "Main Menu" on page 2-2

Navigation

- MAIN | Frequency | FREQUENCY



CW Mode (ON/OFF)

The CW Mode toggle button is set to a read-only value of ON for a per-channel basis.

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. Note that the CW Frequency must fall within the range set by the Start/Stop buttons above.

Figure 7-7. FREQUENCY Power Sweep CW Freq. Menu

7-8 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 trace.

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 All Channels button pauses the display and stops the signal processing on all channels.

Sweep All Channels

The Sweep All Channels 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.

- "HOLD CONDITIONS Menu" on page 7-16

Figure 7-8. HOLD FUNCTIONS Menu

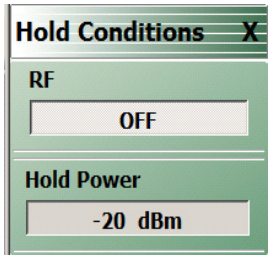
HOLD CONDITIONS Menu

Previous

- HOLD FUNCTIONS Menu on page 7-15

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 trace.

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

RF (OFF/ON)

Select toggles the Radio Frequency (RF) option OFF and ON during Hold mode.

Hold Power

On a per-system basis, sets the hold power level. Select displays the Hold Power field toolbar.

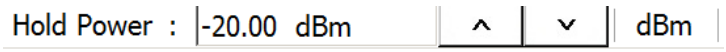


Figure 7-9. HOLD CONDITIONS Menu

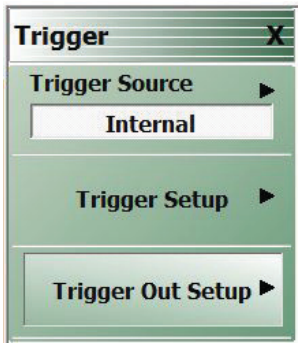
TRIGGER Menu

Purposes

Set trigger controls for the sweep in all display channels.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Trigger | 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 Source Menu on page 7-18

Trigger Setup

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

- TRIGGER SETUP Menu on page 7-19

Trigger Out Setup (MS4652xB only)

Displays the Trigger Out Setup menu enables the trigger out function on the MS4652xB VNAs.

The trigger output can be enabled on either on a per measurement (sweep) or per channel basis.

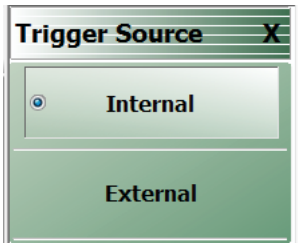
TRIGGER SOURCE Source Menu

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.

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

- TRIGGER SOURCE (EXT. TRIGGER) Menu on page 7-20

Figure 7-10. TRIGGER SOURCE Menu

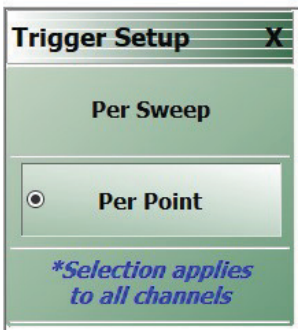
TRIGGER SETUP Menu

Purposes

- Set trigger to select receiving an external trigger Per Point or Per Sweep.

Navigation

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



TRIGGER SETUP Menu Auto-Return Button Selection Group

In the TRIGGER SETUP menu, the PER POINT and PER SWEEP buttons are members of a radio button selection group. Selection of either button de-selects the other button and automatically returns to the TRIGGER men.

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 7-11. TRIGGER SETUP Menu

TRIGGER SOURCE (EXT. TRIGGER) Menu

Full Name

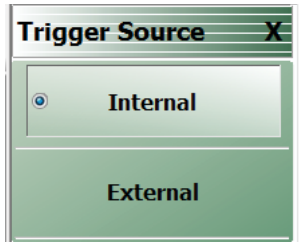
- EXTERNAL TRIGGER Menu

Purposes

- Set external trigger for Per Sweep or Per Point.

Navigation

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



TRIGGER SOURCE Menu Auto-Return Button Selection Group

In the TRIGGER SOURCE menu, the Internal and External 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 7-12. TRIGGER SOURCE Menu

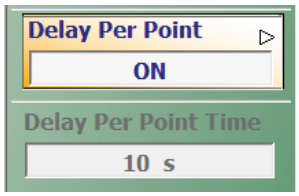
DELAY PER POINT Menu

Purposes

- Select enable sweep time configuration.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Delay Per Point | ON



Delay Per Point

Selects the enable Delay Per Point mode of ON or OFF.

Delay Per Point Time

Displays the delay per point time.

Figure 7-13. Delay Per Point Menu

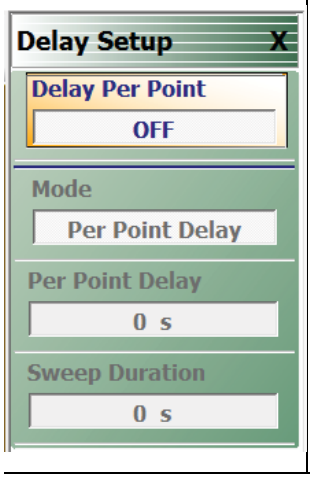
DISPLAY SETUP Menu

Purposes

- Select sweep time configuration.

Navigation

- MAIN | Sweep Setup | SWEEP SETUP | Delay per Point | ON | Delay Setup



Delay Per Point

Selects the enable Delay per Point of ON or OFF.

Mode

Sets delay to per point or per sweep.

Per Point Delay

Sets the per point delay time.

Sweep Duration

Sets the Sweep delay duration time in seconds.

Figure 7-14. Delay Setup Menu

Chapter 8 — Averaging Menu

8-1 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.

8-2 Overview of the Averaging Menu

There is one averaging menu:

- AVERAGING Menu on page 8-2

8-3 Averaging Menu Functions

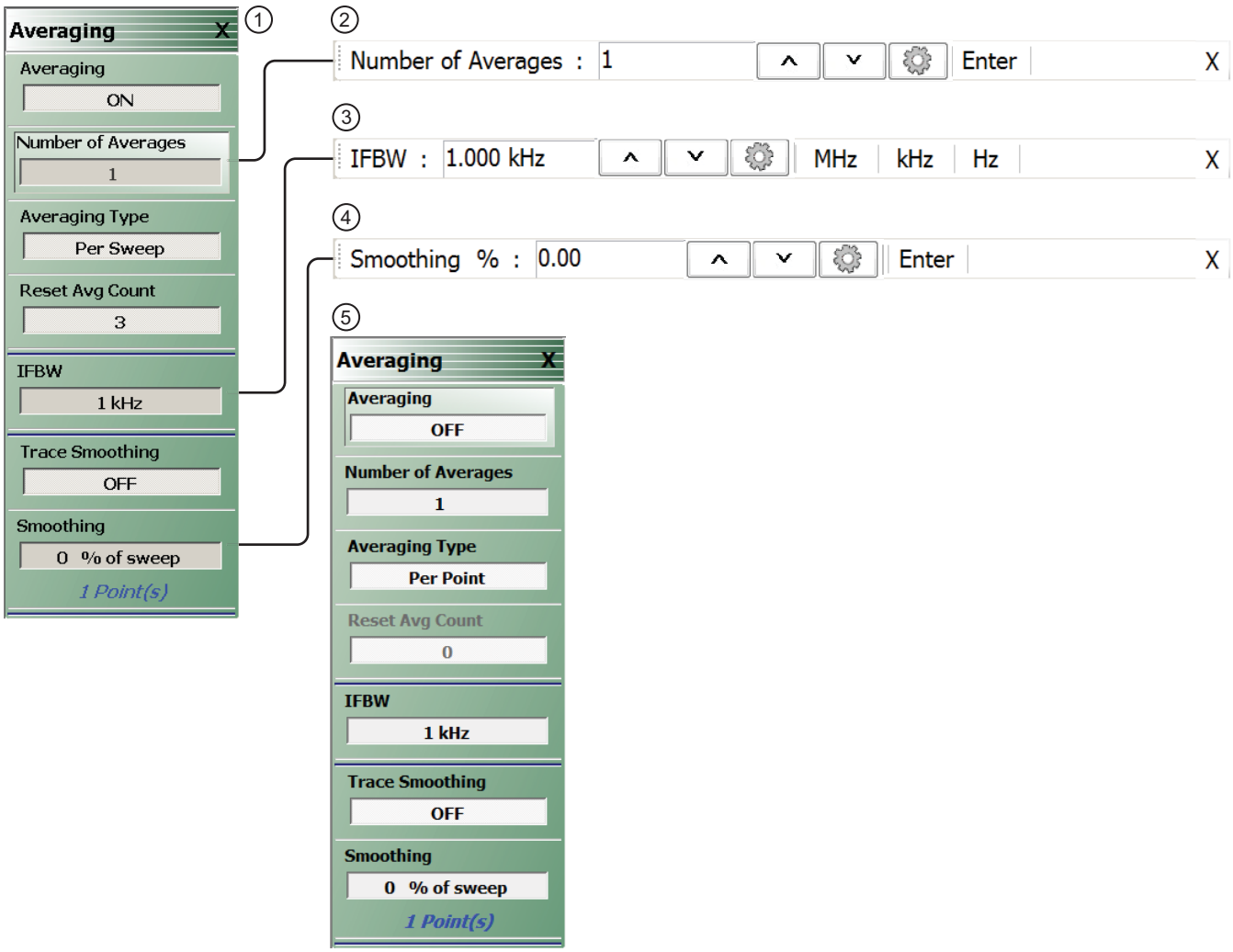
AVERAGING Menu

Previous

- Main Menu on page 2-2

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 8-1. 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 new.

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, 500 kHz

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 9 — Calibration Menus: 2-Port VNAs

9-1 Chapter Overview

This chapter describes the menus used when calibrating 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 because their appearance changes based on combination of instrument calibration ports, AutoCal, manual calibration, calibration methods, line types, and connectors. However, basic elements in the combinations are explained.

9-2 Listing of Calibration Menus

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

Primary Calibration Menus

The primary calibration menus are:

- CALIBRATION [TR] Menu on page 9-6
- CALIBRATE Menu on page 9-8
- THRU (Update) Menu – 2-Port VNAs on page 9-10

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 9-39
  - Load Kit/Charac. button -- "LOAD (Cal Kit) Dialog Box" on page 9-40
  - Save Kit/Charac. button -- "SAVE (Cal Kit) Dialog Box" on page 9-41
  - Create/Edit Kit button -- "CAL KIT INFO Dialog Box" on page 9-42
  - Restore Default Coef. button -- "RESTORE DEFAULT COEF. Dialog Box" on page 9-46
- CAL OPTIONS Menu on page 9-11
- HYBRID CAL Menu – 2-Port VNAs on page 9-36
- DEEMBED. TOOLS Menu on page 9-13
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (No Option 24)" on page 9-14
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15
  - Network Extraction — Type A–D Dialog Boxes
    - "NETWORK EXTRACTION Dialog Box – Type A" on page 9-17
    - "NETWORK EXTRACTION Dialog Box – Type B (Full Standards)" on page 9-18
    - "NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)" on page 9-19
    - "NETWORK EXTRACTION Dialog Box – Type C" on page 9-24
    - "NETWORK EXTRACTION Dialog Box – Type D (No Option 24)" on page 9-26
    - "NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards (Option 24)" on page 9-27
    - "NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)" on page 9-30

- "SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 9-32
- "MANUAL ADAPTER REMOVAL Dialog Box" on page 9-34

- CAL SETUP Menu on page 9-69
- CAL METHOD Menu on page 9-71

AutoCal/SmartCal Calibration on MS46522B Series

AutoCal/SmartCal calibration is not available with MS46522B-082 or MS46522B-083

- "AutoCal or SmartCal Port Selection Setup – 2-Port VNAs" on page 9-48
  - AUTOCAL/SMARTCAL Menu on page 9-48

Menus for Performing 2-port AutoCal/SmartCal Calibration

- "SMARTCAL SETUP Menu – 2-Port Cal" on page 9-49
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box" on page 9-51
- AUTOCAL SETUP Menu – 2-Port Cal on page 9-54
  - "MODIFY 2-PORT AUTOCAL SETUP Dialog Box" on page 9-56

Menus for Performing 1-port AutoCal/SmartCal Calibration

- SMARTCAL SETUP Menu – 1-Port Cal on page 9-59
  - "MODIFY 1-PORT SMARTCAL SETUP Dialog Box" on page 9-60
- SMARTCAL SETUP Menu – 1-Port Cal on page 9-59
  - "MODIFY 1-PORT SMARTCAL SETUP Dialog Box" on page 9-60

Manual Calibration on MS4652xB Series

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

Setup and Configuration Menus

- CAL KIT Menu on page 9-39
  - "LOAD (Cal Kit) Dialog Box" on page 9-40
  - "SAVE (Cal Kit) Dialog Box" on page 9-41
  - "CAL KIT INFO Dialog Box" on page 9-42
- CAL OPTIONS Menu on page 9-11

Once a calibration type is selected at 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 9-69
- CAL METHOD Menu on page 9-71
- LINE TYPE Menu on page 9-72

Menus and Dialogs for Performing 2-port Manual Calibration

- MANUAL CAL Menu on page 9-68
- "Manual 2-Port Cal Setup Dialog Box Summary" on page 9-92
- "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-77
- "TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 9-80

- "TWO PORT CAL SETUP (SSST, COAXIAL) Dialog Box – 2-Port VNA" on page 9-83
- "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box – 2-Port VNA" on page 9-85
- "TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box – 2-Port VNA" on page 9-89
- "THRU/RECIP Menu" on page 9-99

Menus for Performing 1-port Manual Calibration

- ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101
- "Modify One-Port Cal Setup Dialog Boxes" on page 9-103
- "ONE-PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-104
- "ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 9-107
- "ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 9-110
- "REFL. DEVICE(S) Menu" on page 9-97

Additional Menus and Dialogs

- TRANS. RESPONSE Menu on page 9-115
- "TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/R – Coaxial) Dialog Box" on page 9-118
- "Manual Cal – Trans. Freq. Resp. Cal Menus" on page 9-115
- "REFL. RESPONSE Menu" on page 9-122
- "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-125
- "Manual Cal – Refl. Freq. Resp. Cal Menus" on page 9-122

General Purpose Manual 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 9-132
- "STANDARD INFO Dialog Box" on page 9-134. Exists in different variants from the normal one, with differences in cal type and line type.
- "THRU INFO Dialog Box" on page 9-136
- "USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs" on page 9-138

9-3 Primary Menus for VNA Calibration

The menus shown in Figure 9-1 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.

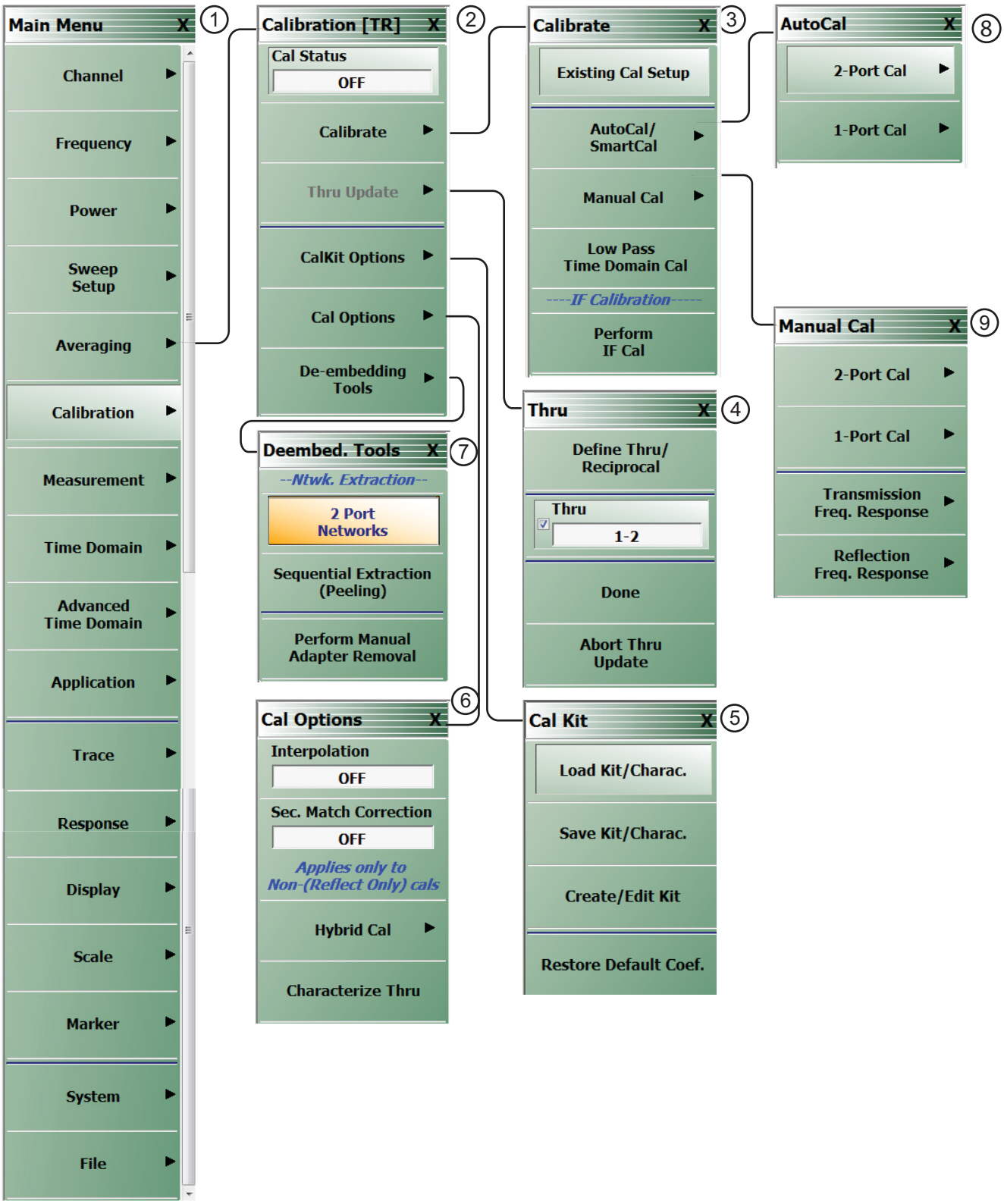


Figure 9-1. Primary Menus for VNA Calibration

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

Figure 9-1. Primary Menus for VNA Calibration

CALIBRATION [TR] Menu

Full Name

- Calibration [Transmission-Reflection] Menu

Purpose

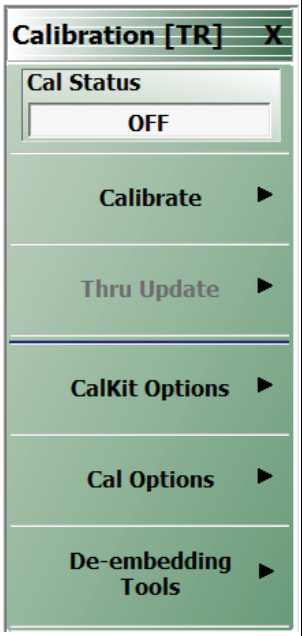
- The CALIBRATION [TR] menu provides options to configure and run calibration routines, to configure cal kit characterization files, to enable /disable interpolation, and to perform manual adapter removal.

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



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 9-8

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 9-136

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 9-39 .

Figure 9-2. CALIBRATION Menu (1 of 2)

	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 9-11 **De-embedding Tools** Select displays the DEEMBED. TOOLS menu to perform network extraction, sequential extraction, and manual adapter removal. • "AutoCal or SmartCal Port Selection Setup – 2-Port VNAs" on page 9-48

Figure 9-2. CALIBRATION Menu (2 of 2)

CALIBRATE Menu

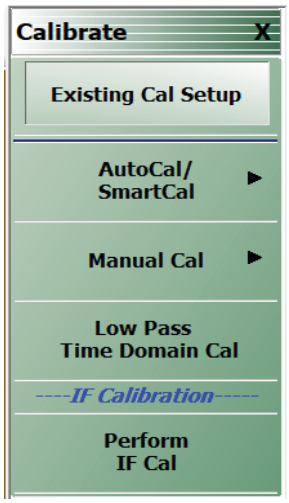
The CALIBRATE menu initiates the manual calibration process with the selection of calibration parameters, calibration types, calibration methods, line types, and test port connectors.

Previous

- CALIBRATION [TR] Menu on page 9-6

Navigation

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



Current 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 9-48.

Manual Cal

Select displays the MANUAL CALIBRATION menu.

- MANUAL CAL Menu on page 9-68 .

Low Pass Time Domain Cal

Select displays the LOW PASS TIME DOMAIN CAL dialog box.

- "LOW PASS TIME DOMAIN CAL Dialog" on page 12-3.

Perform IF Cal

Select displays the IF CALIBRATION dialog box.

- "IF CALIBRATION Dialog Box" on page 9-9.

Figure 9-3. CALIBRATE Menu

IF CALIBRATION Dialog Box

Previous

- CALIBRATE Menu on page 9-8

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Perform IF Cal | IF CALIBRATION dialog box

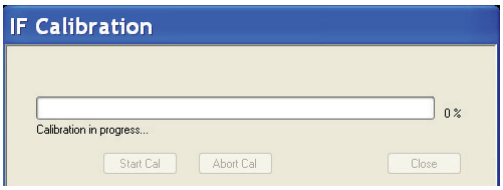


Figure 9-4. IF CALIBRATION Dialog Box

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

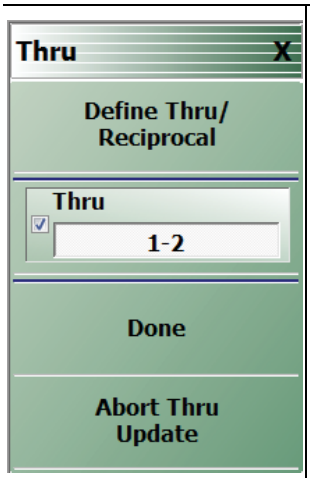
- You must be first perform a successful Full 2-Port, or a 1 Path-2 Port calibration (AutoCal or manual) before the Thru Update button on the CALIBRATION menu is available. The button will be grayed out before that.

Previous

- CALIBRATION [TR] Menu on page 9-6

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 9-136

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 9-6

Abort Thru Update

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

- CALIBRATION [TR] Menu on page 9-6

Completed THRU UPDATE calibration menu for 2-Port VNA system with completion checkmark and Done button available.

Figure 9-5. THRU (Update) Calibration Menu – 2-Port VNAs

9-4 Calibration Utility Functions

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

- CAL OPTIONS Menu on page 9-11
  - Load Kit/Charac. button -- "LOAD (Cal Kit) Dialog Box" on page 9-40
  - Save Kit/Charac. button -- "SAVE (Cal Kit) Dialog Box" on page 9-41
  - Create/Edit Kit button -- "CAL KIT INFO Dialog Box" on page 9-42
  - Restore Default Coef. button -- "RESTORE DEFAULT COEF. Dialog Box" on page 9-46
- "AutoCal or SmartCal Port Selection Setup – 2-Port VNAs" on page 9-48
  - "MANUAL ADAPTER REMOVAL Dialog Box" on page 9-34
- CAL SETUP Menu on page 9-69
- CAL METHOD Menu on page 9-71

CAL OPTIONS Menu

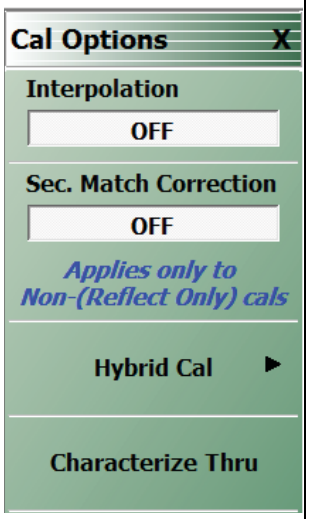
The CAL OPTIONS menu provides control for use of interpolation and procedure for manual adapter removal.

Previous

- CALIBRATION [TR] Menu on page 9-6

Navigation

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



Interpolation

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 (OFF/ON)

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), when 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

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

- HYBRID CAL Menu – 2-Port VNAs on page 9-36

Figure 9-6. CAL OPTIONS (CALIBRATION OPTIONS) Menu (1 of 2)

	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 calibration. • "THRU CHARACTERIZATION Dialog Box" on page 9-35

Figure 9-6. CAL OPTIONS (CALIBRATION OPTIONS) Menu (2 of 2)

DEEMBED. TOOLS Menu

Use the DEEMBED. TOOLS menu to for network extraction and adapter removal.

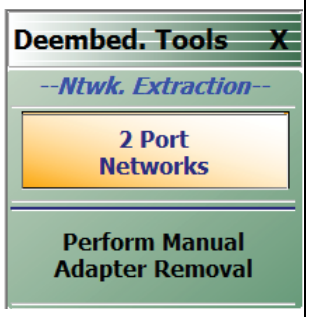
Previous

- CALIBRATION [TR] Menu on page 9-6

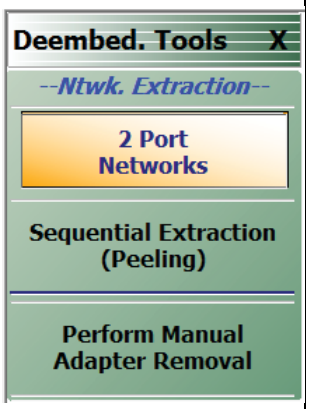
Navigation

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

Without Option 24



With Option 24



Network Extraction

2 Port Networks

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. Select displays the NETWORK EXTRACTION dialog box.

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (No Option 24)" on page 9-14.
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15.

Sequential Extraction (Peeling) — *Visible 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.

- "THRU CHARACTERIZATION Dialog Box" on page 9-35.

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 9-34.

Figure 9-7. DEEMBED TOOLS (DE-EMBEDDING TOOLS) Menu

NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (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

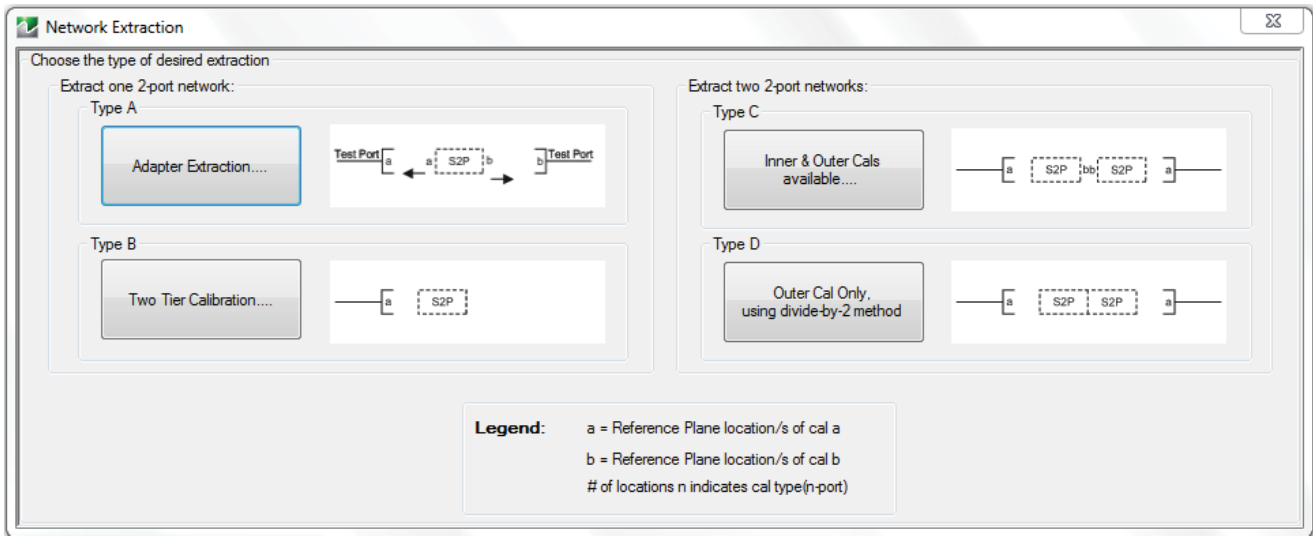
From DEEMBED. TOOLS | 2 Port Networks, open the corresponding Network Extraction dialog, which are explained with more detail in Table 9-1 on page 9-16.

Previous

- DEEMBED. TOOLS Menu on page 9-13

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 buttons below:

- Type A – Extract one 2-Port Network – Adapter Extraction: “NETWORK EXTRACTION Dialog Box – Type A” on page 9-17
- Type B – Extract one 2-Port Network – Two Tier Calibration: “NETWORK EXTRACTION Dialog Box – Type B (Full Standards)” on page 9-18
- Type C – Extract two 2-Port Networks – Inner and Outer Cals Available: “NETWORK EXTRACTION Dialog Box – Type C” on page 9-24
- Type D – Extract two 2-Port Networks – Outer Cal Only using divided-by-2 method: “NETWORK EXTRACTION Dialog Box – Type D (No Option 24)” on page 9-26

Figure 9-8. NETWORK EXTRACTION Dialog Box (Without Option 24)

NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (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 9-1 on page 9-16.

Full Name

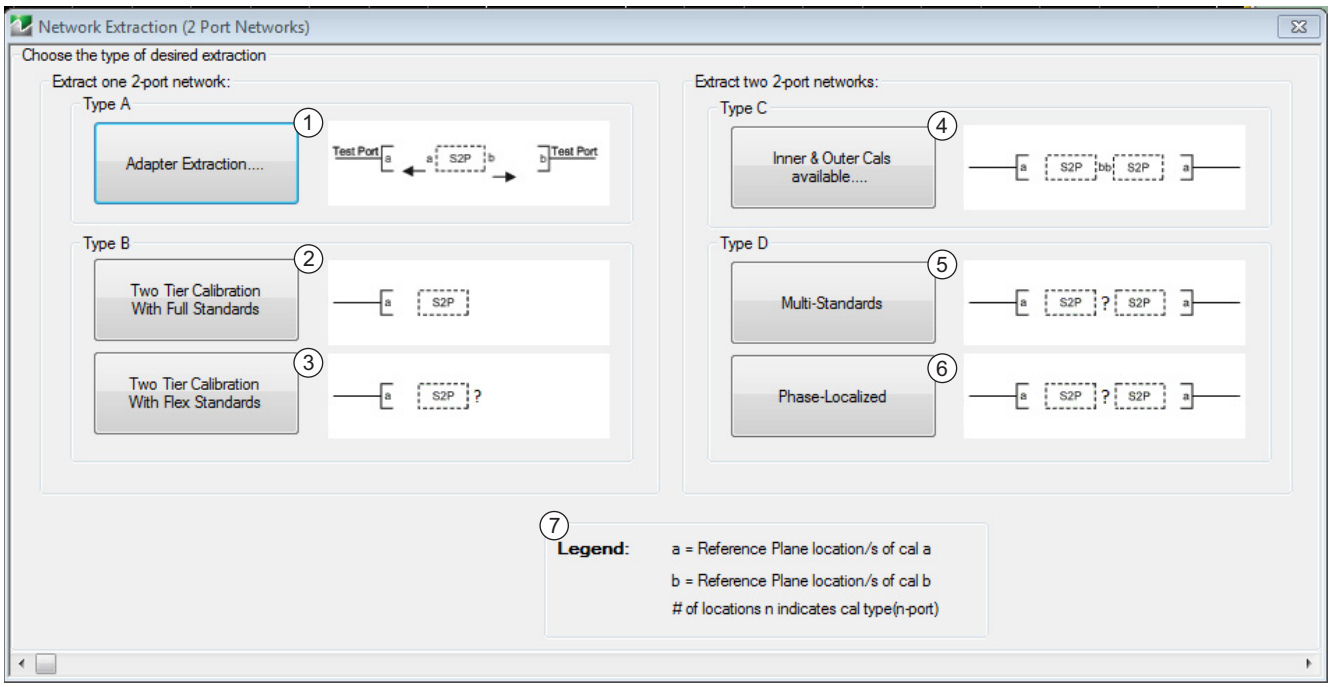
Network Extraction (2-Port Networks)

Previous

- DEEMBED. TOOLS Menu on page 9-13

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 9-9. 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 9-1. Network Extraction Type Definitions – 2-Port Networks

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 9-17
Type B	One 2-Port Network	Two Tier Calibration with Full Standards	“NETWORK EXTRACTION Dialog Box – Type B (Full Standards)” on page 9-18
		Two Tier Calibration with Flexible Standards[a] (Available only with Option 24)	“NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)” on page 9-19
Type C	Two 2-Port Networks	Inner and Outer Cals Available	“NETWORK EXTRACTION Dialog Box – Type C” on page 9-24
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 9-26
		Outer Cal only using Divide-by-Two Method (Multi-Standards)[a] (Available only with Option 24)	“NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards (Option 24)” on page 9-27
		Phase-Localized[a] (Available only with Option 24)	“NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)” on page 9-30
Sequential Extraction	–	Sequential Extraction (Peeling)[a] (Available only with Option 24)	“SEQUENTIAL EXTRACTION Dialog Box (Option 24)” on page 9-32

a. For more information on Type B, Type D, and Sequential Extraction with Option 24 installed, refer to the Measurement Guide (10410-00753).

NETWORK EXTRACTION Dialog Box – Type A

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

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (No Option 24)" on page 9-14
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15

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)]

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

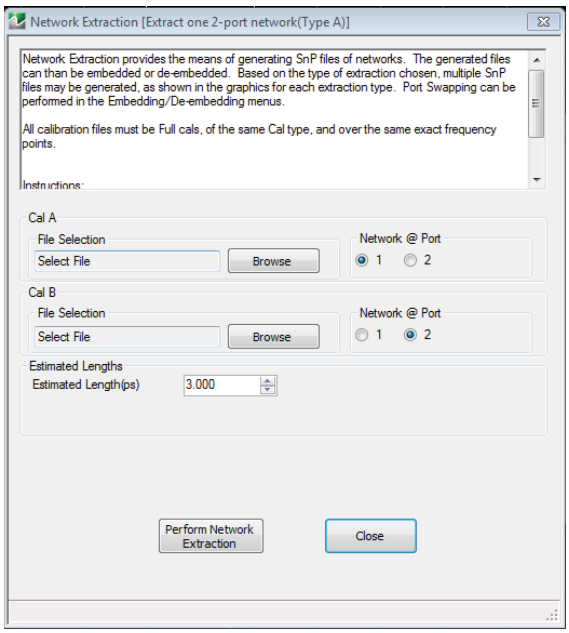


Figure 9-10. Adapter Extraction

Instructions

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

Procedure

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 on page 9-13 .
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 Networks (No Option 24)" on page 9-14
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15

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)]

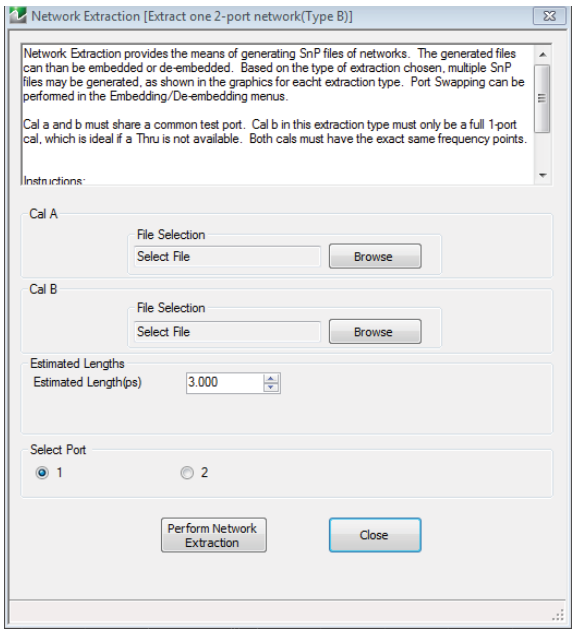


Figure 9-11. Two Tier

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.

Instructions

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.

Procedure

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 on page 9-13 .
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 Networks (Option 24)" on page 9-15

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)]

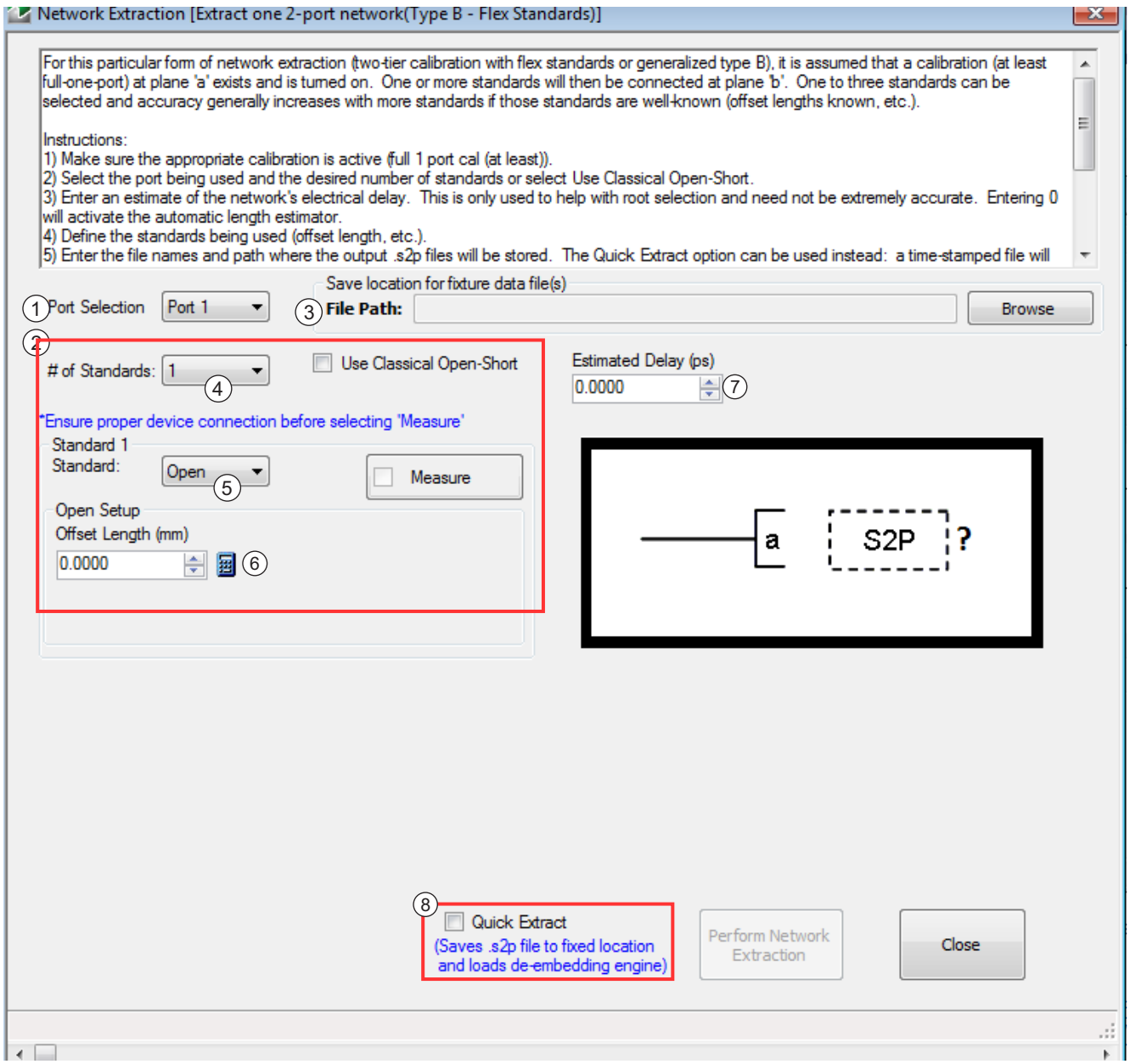
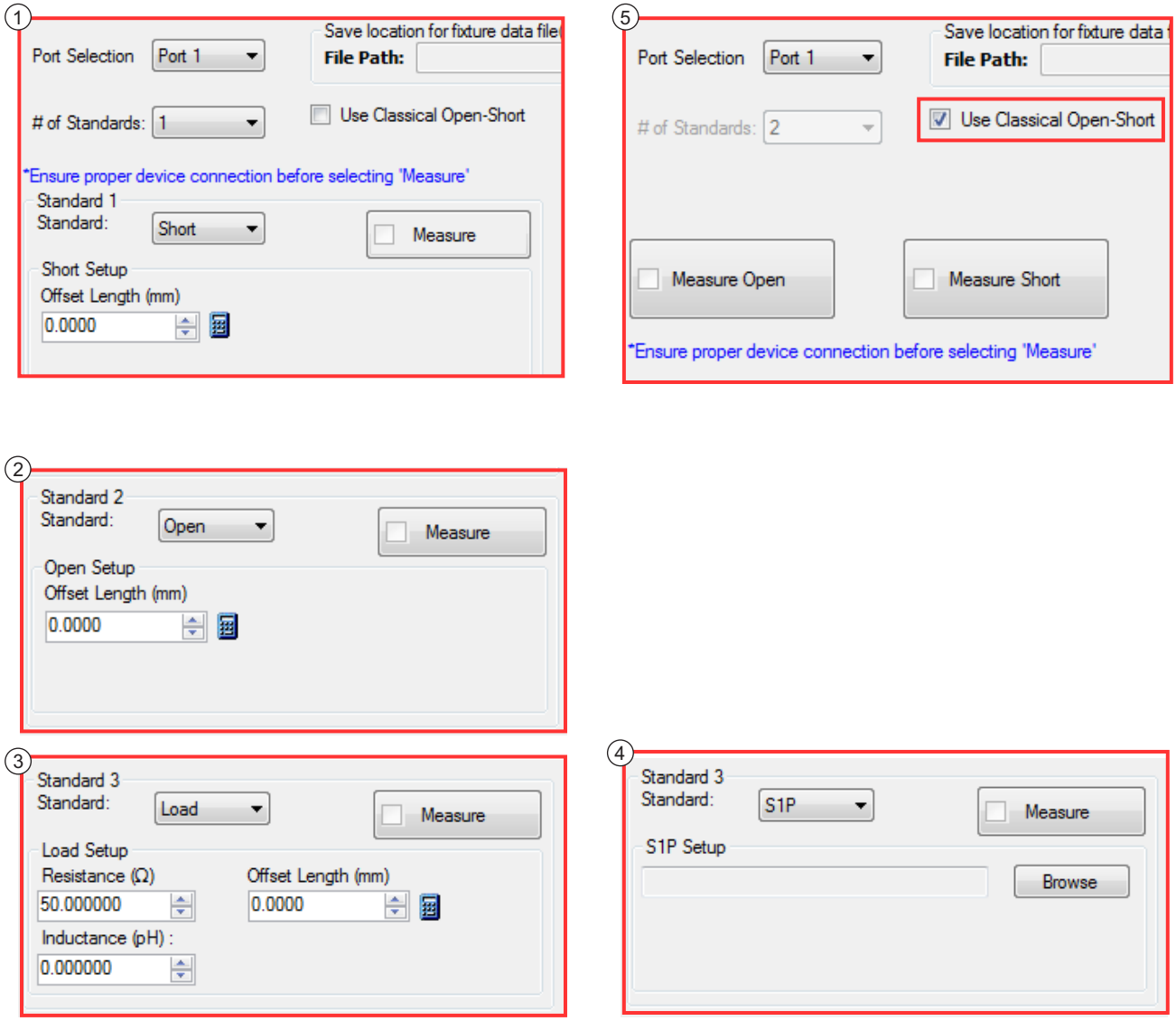


Figure 9-12. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration With Flex Standards (1 of 2)

Default view shown above.

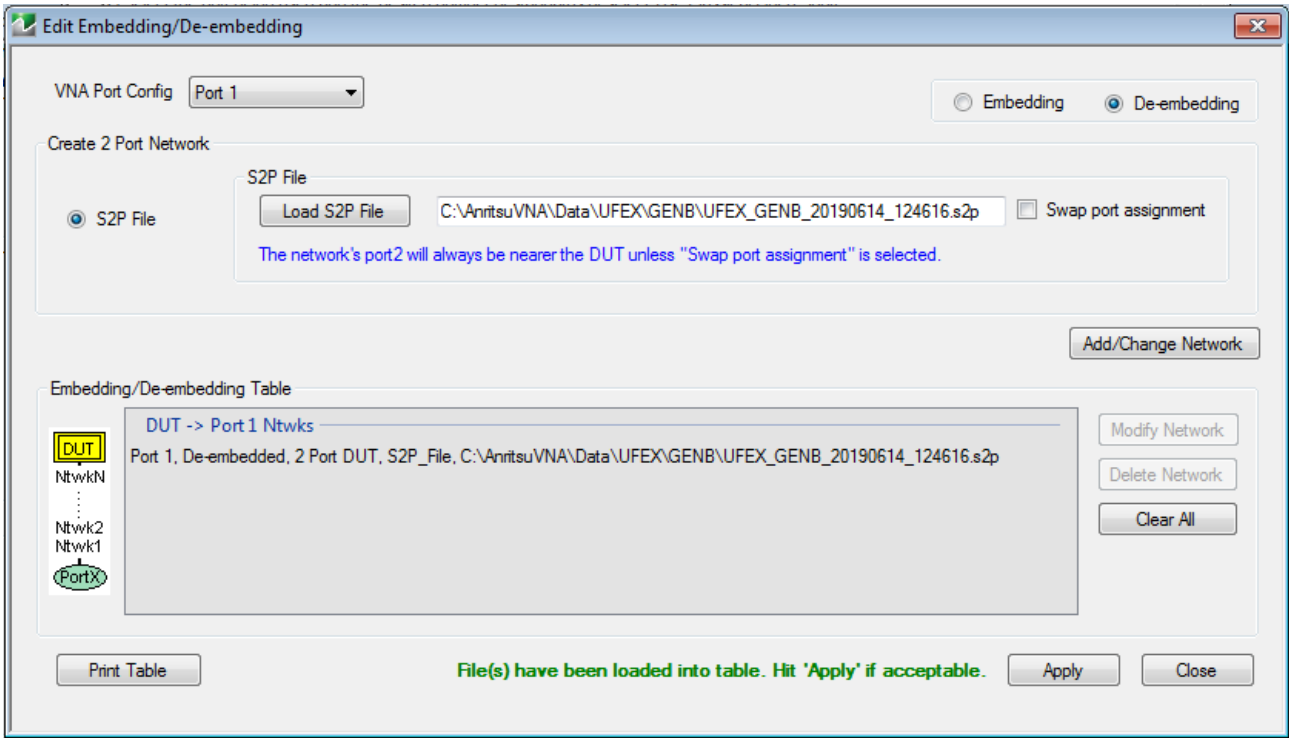
1. **Port Selection:** Two ports available (with 2-Port VNAs)
2. See Figure 9-13 for available extraction options based on the **Number of Standards** selected, or whether **Use Classical Open Short** box is checked.
3. **File Path:** Location for saving file
4. **# of Standards:** Three standards available; 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 9-14).

Figure 9-12. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration With Flex Standards (2 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 9-13. Type B – Two Tier Calibration With Flex Standards Extraction Setup Options



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 9-14. 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 on page 9-13 .

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 on page 9-13 .
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 Networks (No Option 24)" on page 9-14
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15

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

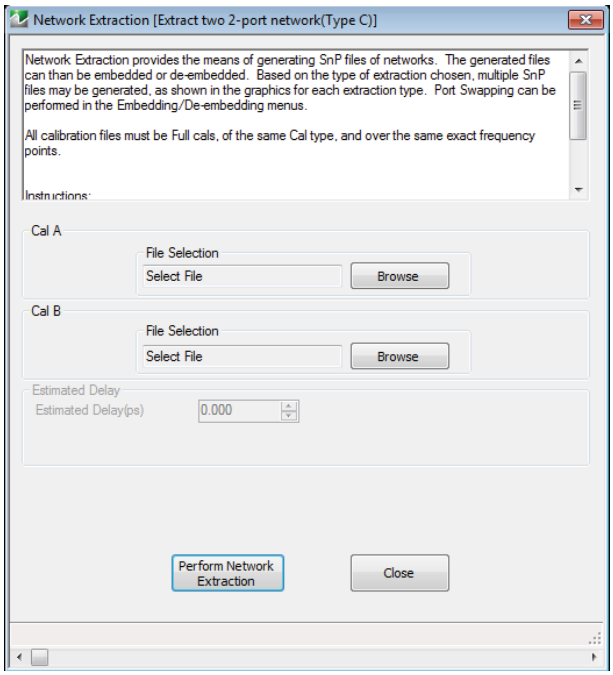


Figure 9-15. Inner Outer Cal Extraction

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

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

Procedure

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 Perform Network Extraction to perform the extraction.
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 on page 9-13 .
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 Networks (No Option 24)" on page 9-14
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15

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 – Outer Cal Only, using divide-by-2 method | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORK (TYPE D)] Dialog Box

Notes

- 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 matches instead of fully allocating them to the outer-ports.

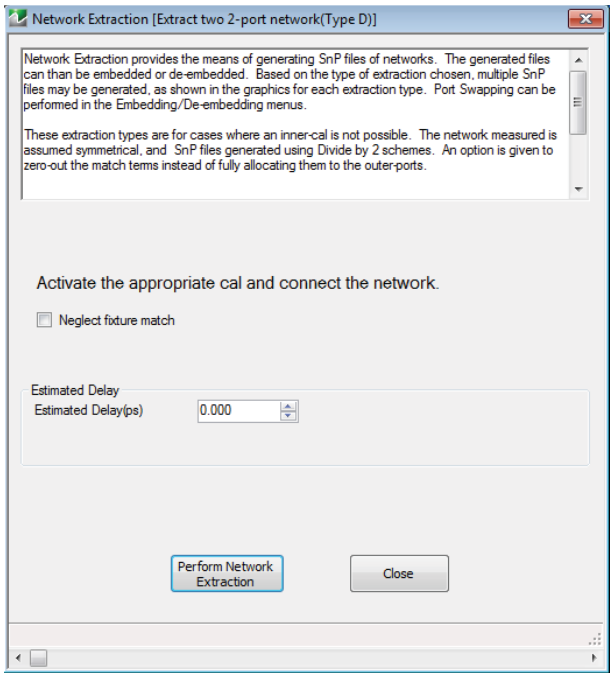


Figure 9-16. Outer Cal Only Extraction

Procedure

1. Make sure the appropriate calibration is active.
2. Select Neglect fixture match.
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 on page 9-13 .
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

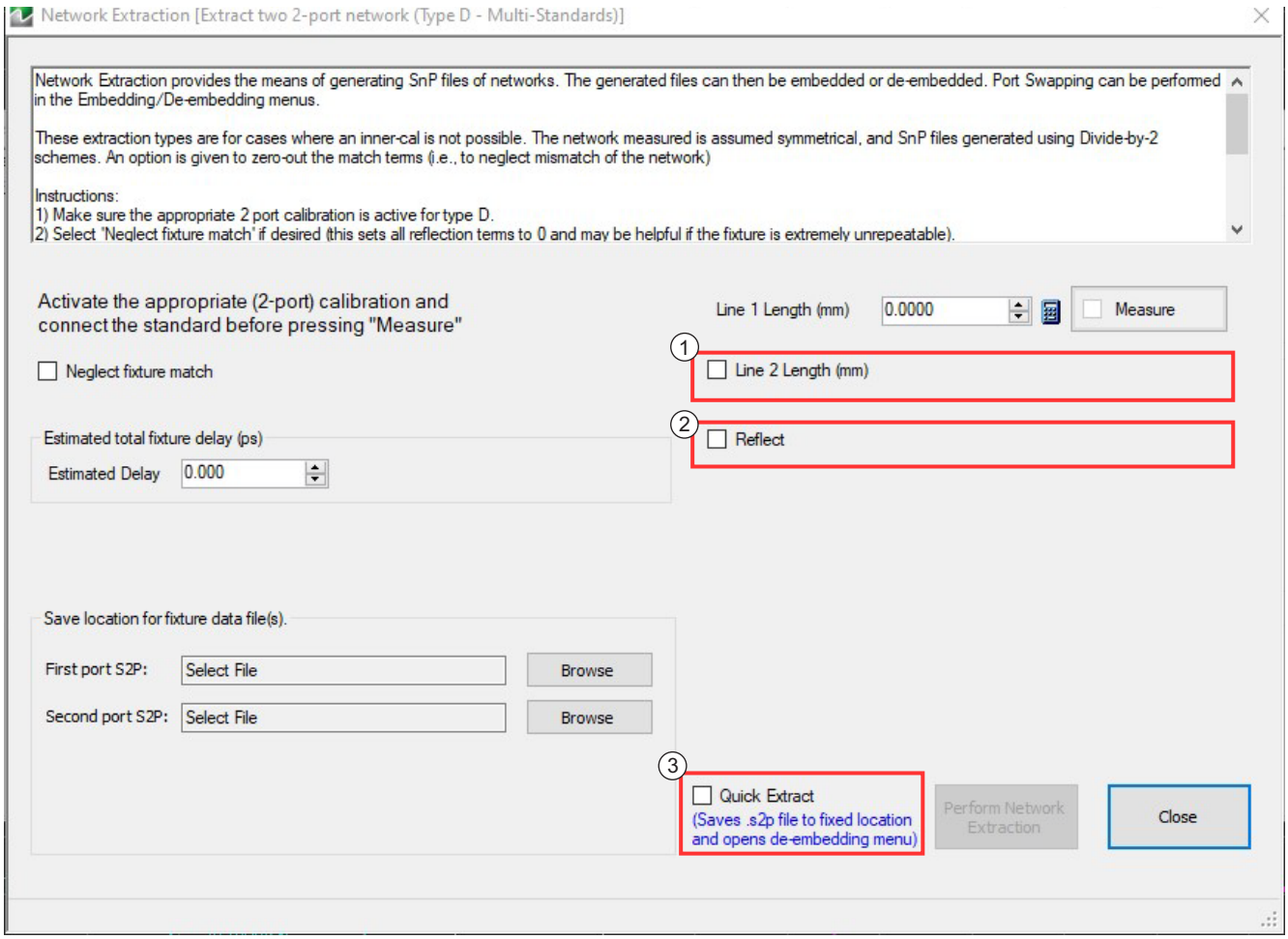
- Option 24 Universal Fixture Extraction installed
- A calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15

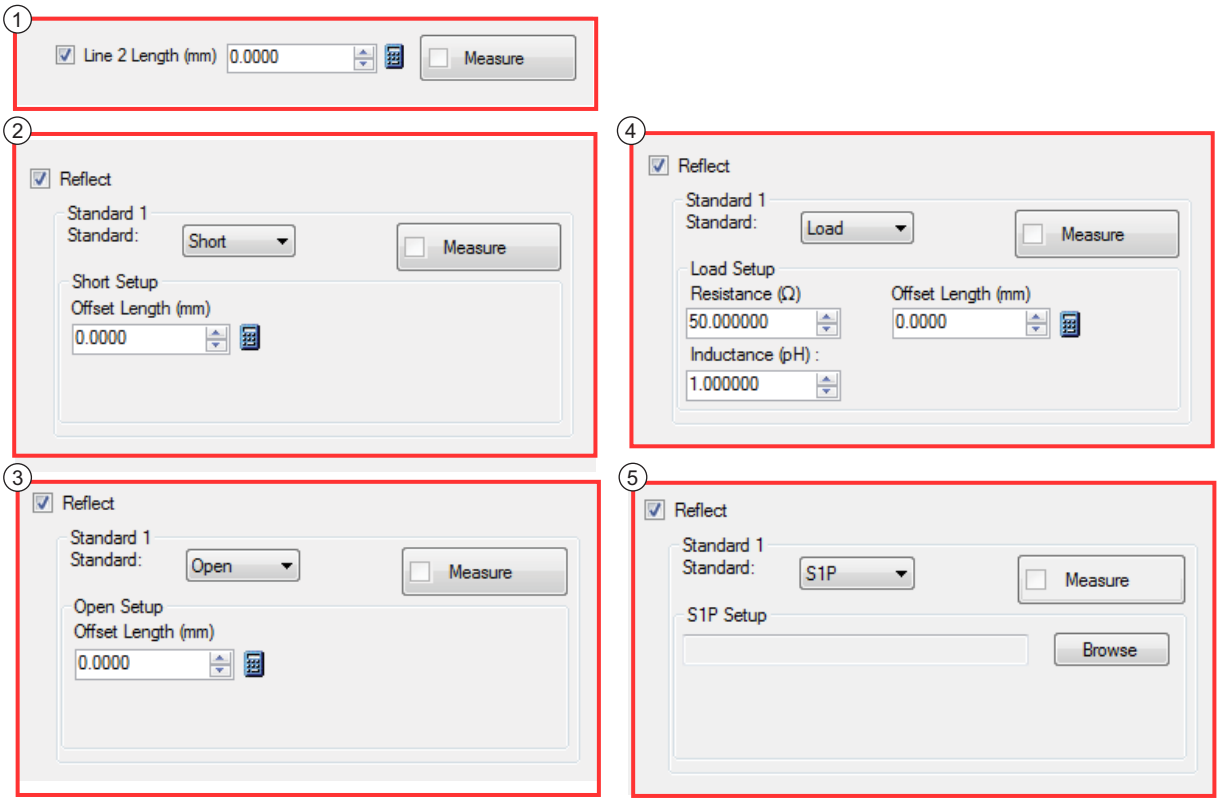
Navigation

- 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 – Outer Cal Only Using Divide-By-Two Method | 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 9-18.
2. Checking **Reflect** box opens various options related to Reflect as shown in Figure 9-18.
3. Checking **Quick Extract** saves .s2p file to a fixed location and loads deembedding dialog (Figure 9-14).

Figure 9-17. 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 9-18. 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 mismatches of the network (i.e., to neglect fixture match terms).

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 on page 9-13 .
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)

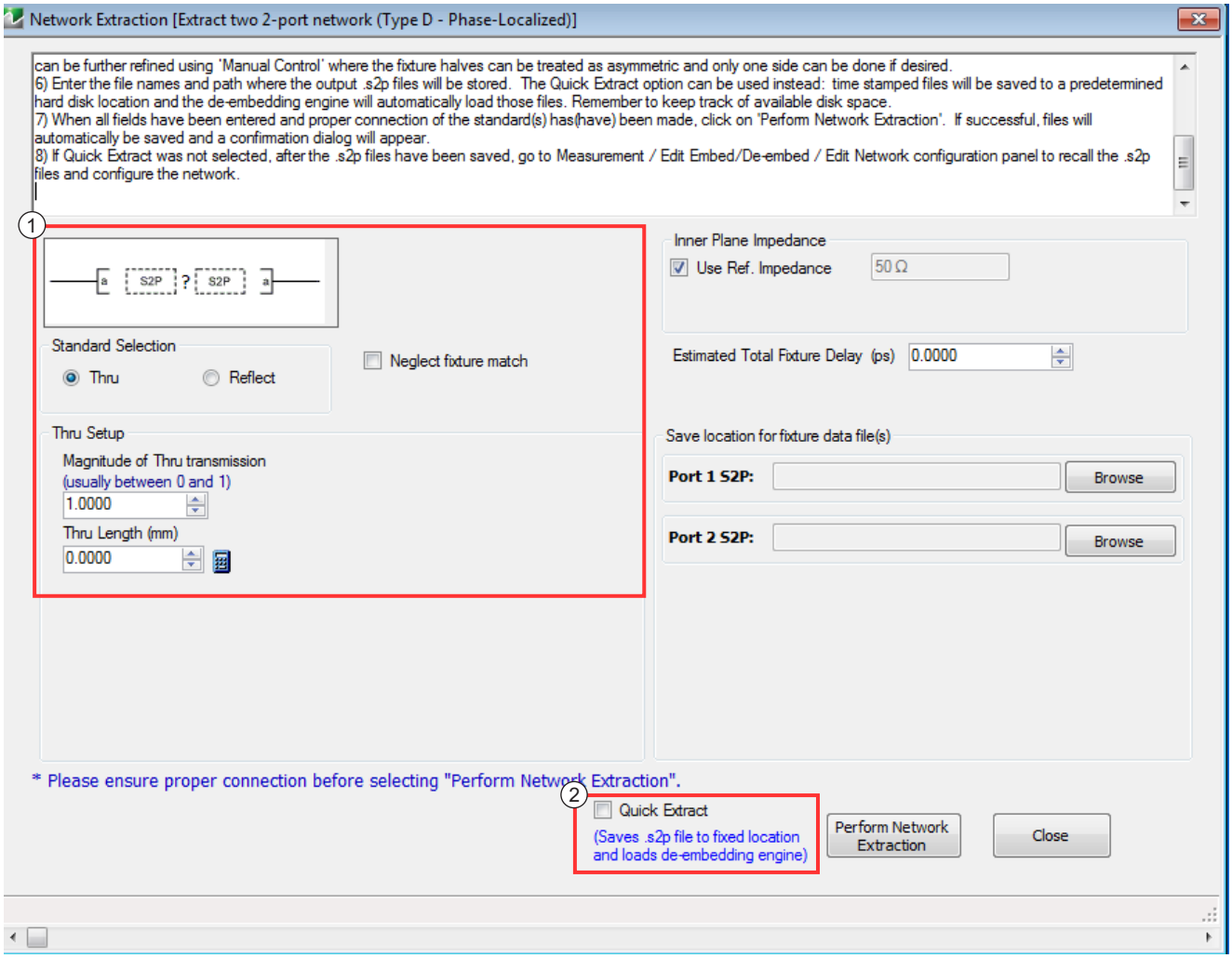
The NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized is only available with Option 24. For more information on Type D Phase-Localized network extraction, refer to the Measurement Guide (10410-00336).

Prerequisites

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

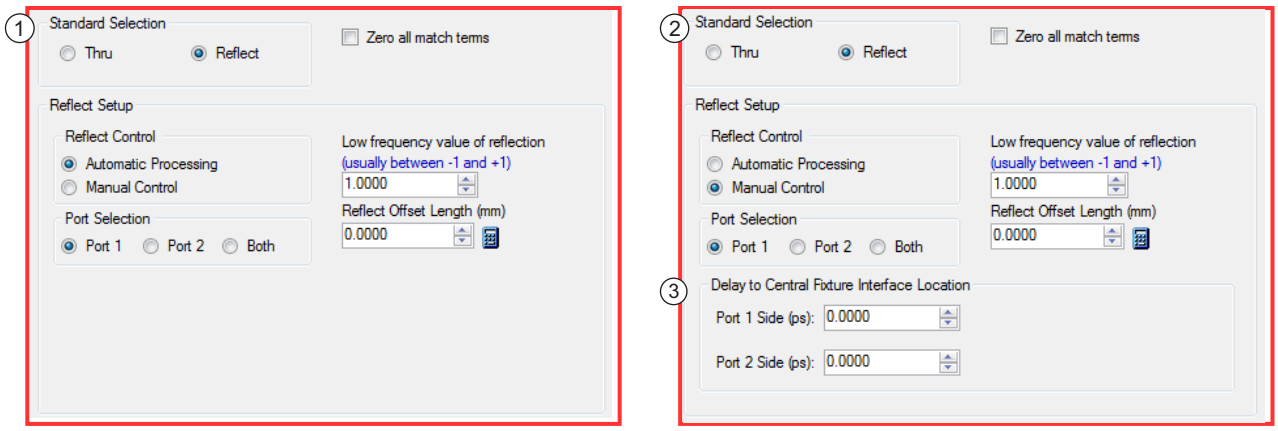
Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks (Option 24)" on page 9-15



1. Default dialog settings shown with **Thru** selected. For **Reflect** variants of this dialog, see Figure 9-20 on page 9-31.
2. Checking **Quick Extract** saves .s2p file to a fixed location and loads deembedding dialog (Figure 9-14).

Figure 9-19. 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 9-20. 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 measurement type (using thru or reflect standards). Note that for Reflection, the type of reflection must be the same on all ports.
4. Define the standards being used (offset length, transmission or reflection magnitude, include the sign of reflection)
5. Enter an estimate of the network's electrical delay (both sides of the fixture pair). Entering 0 will activate the automatic length estimator. If using a Reflect measurement, this can be further refined selecting Manual Control where the fixture halves can be treated as asymmetric and only one side can be done if desired.
6. 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.
7. When all fields have been entered and proper connection of the standard or standards have been made, click on Perform Network Extraction. If successful, files will automatically be saved and a confirmation dialog will appear.
8. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu on page 9-13 .
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.

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 (10410-00753).

Prerequisites

- Option 24 Universal Fixture Extraction installed

Previous

- DEEMBED. TOOLS Menu on page 9-13

Navigation

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

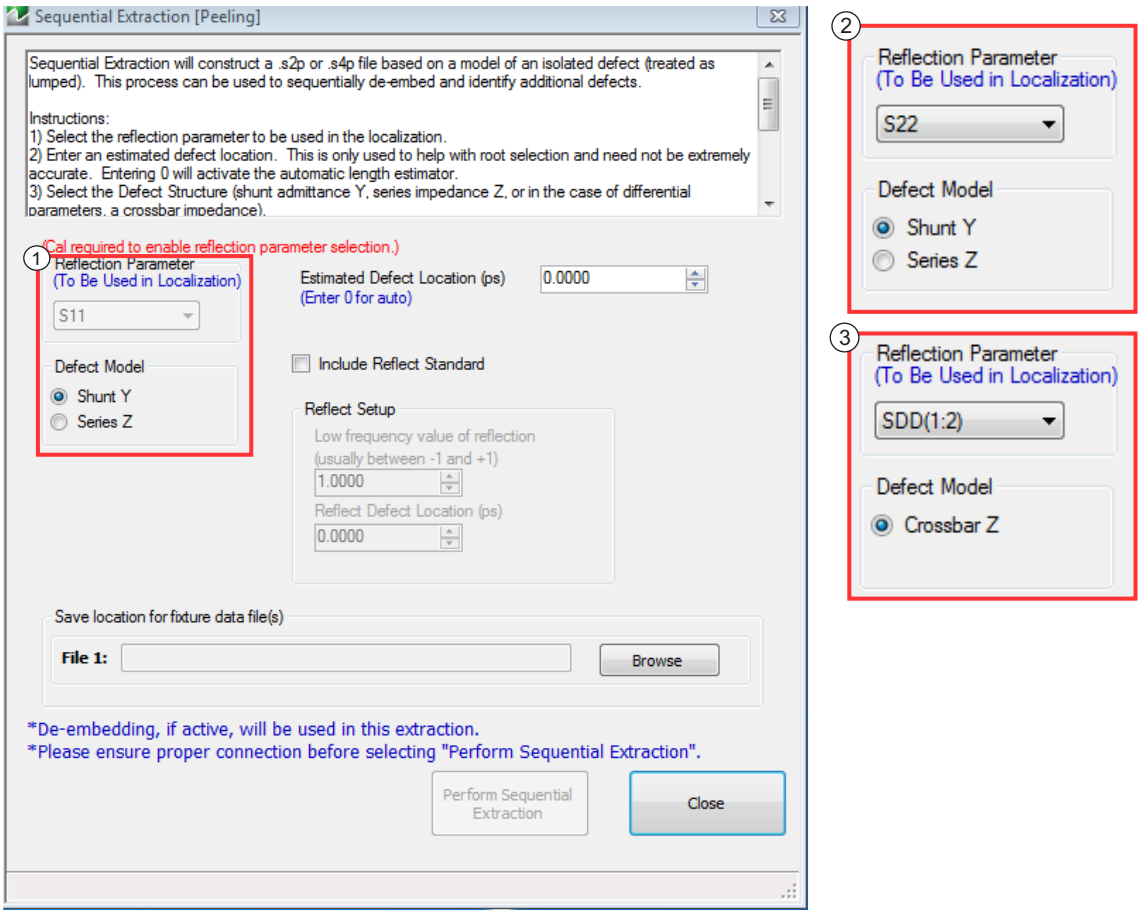


Figure 9-21. SEQUENTIAL EXTRACTION (Peeling) Dialog Box

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 9-13 .

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 9-13

Navigation

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

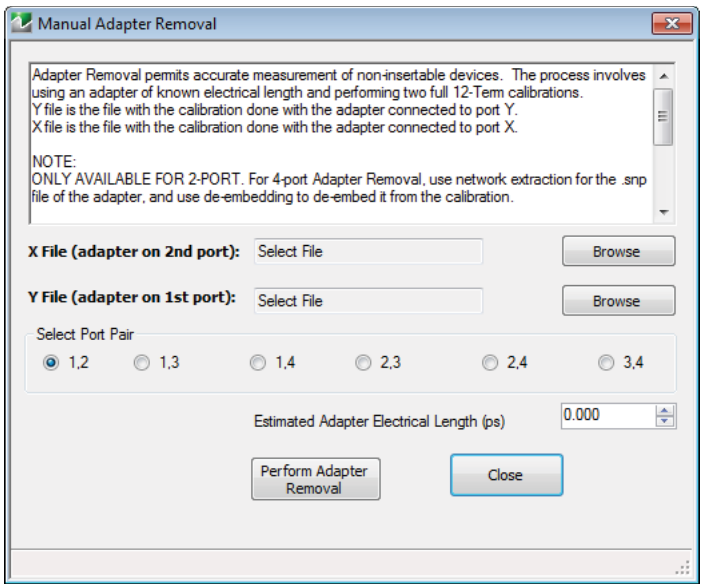


Figure 9-22. MANUAL ADAPTER REMOVAL Dialog Box

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 calibration.

Previous

- "AutoCal or SmartCal Port Selection Setup – 2-Port VNAs" on page 9-48

Navigation

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

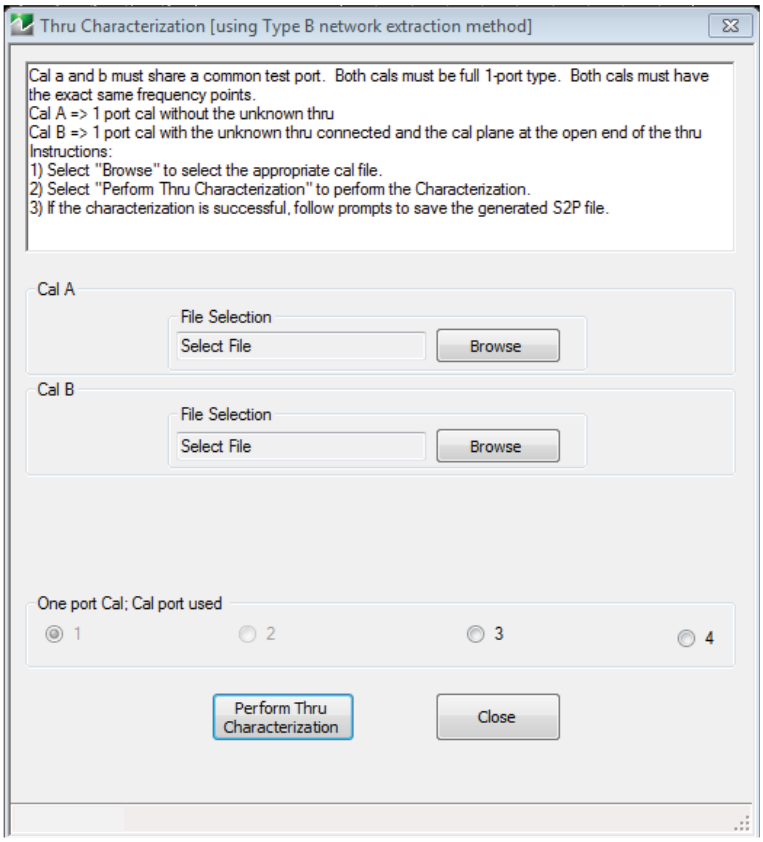


Figure 9-23. THRU CHARACTERIZATION Dialog Box

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.

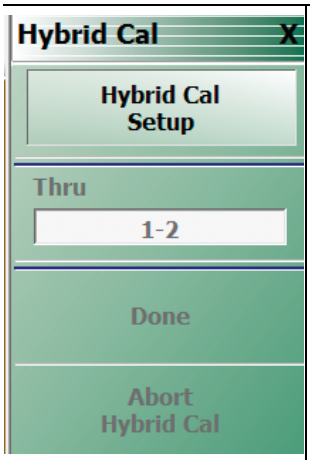
HYBRID CAL Menu – 2-Port VNAs

Previous

- "AutoCal or SmartCal Port Selection Setup – 2-Port VNAs" on page 9-48

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 9-37

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 9-6

Abort Hybrid Cal Setup

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

- CALIBRATION [TR] Menu on page 9-6

Figure 9-24. CAL OPTIONS (CALIBRATION OPTIONS) Menu

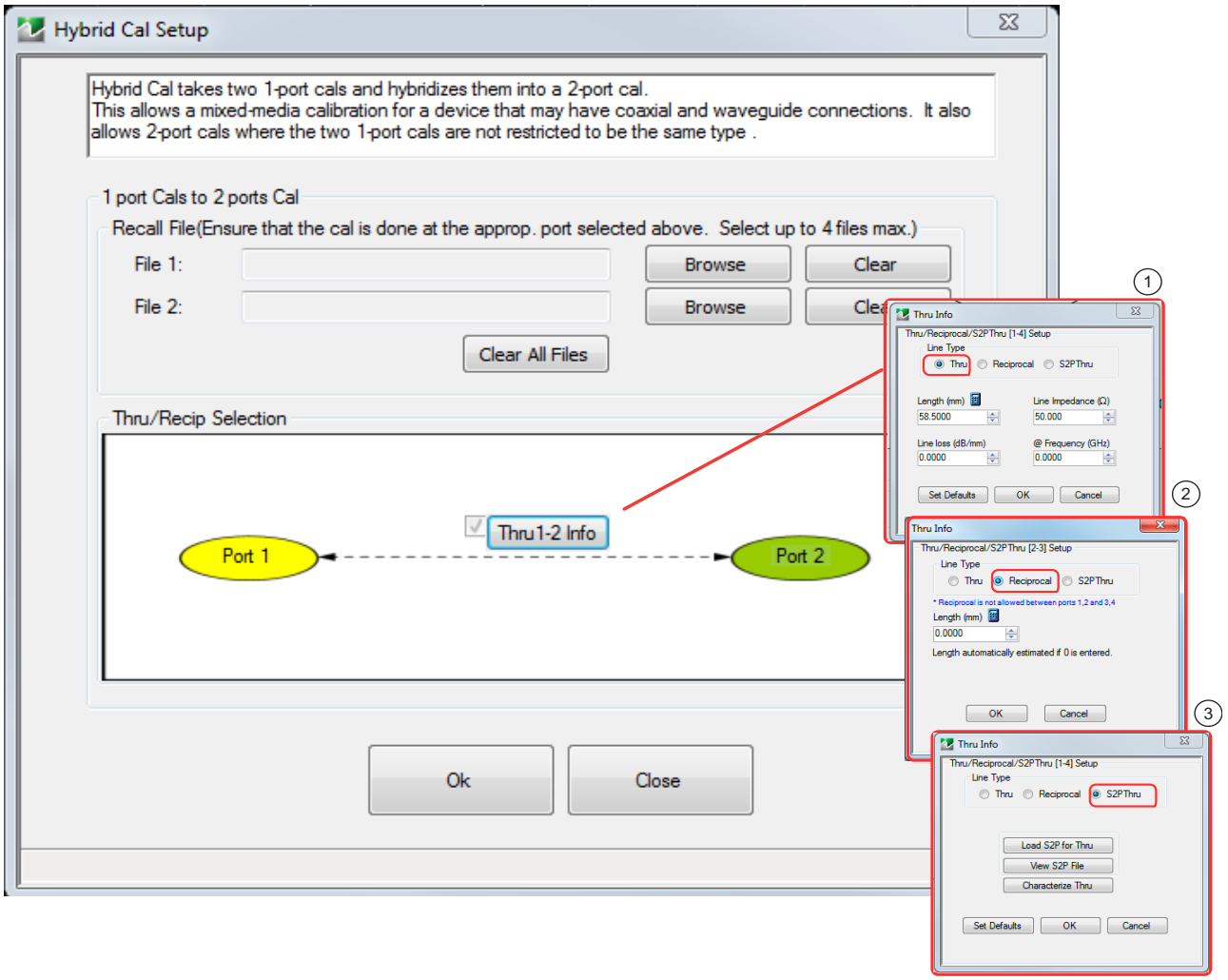
HYBRID CAL SETUP Dialog Box – 2-Port VNAs

Previous

- "HYBRID CAL Menu – 2-Port VNAs" on page 9-36

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 9-136

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

Figure 9-25. 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/Recip Selection

The figure shows the relationship between the two ports and the Thru 1-2 Info button is automatically selected.

OK

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

CAL KIT Menu

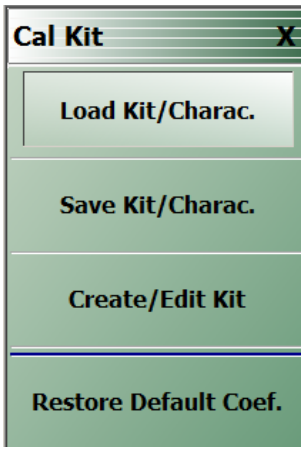
The CAL KIT menu provides tools to load, save, and create, and edit calibration kit characterization files between an external memory device, the instrument firmware, and a hard drive on the instrument or on a network.

Previous

- CALIBRATION [TR] Menu on page 9-6

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 9-40

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 (AutoCal Characterization/Cal Kit) File dialog box.

- "SAVE (Cal Kit) Dialog Box" on page 9-41

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 9-42

Restore Default Coef.

Select displays the RESTORE DEFAULT COEF dialog box.

- "RESTORE DEFAULT COEF. Dialog Box" on page 9-46

Figure 9-26. 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 OPTIONS Menu on page 9-11

Navigation

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

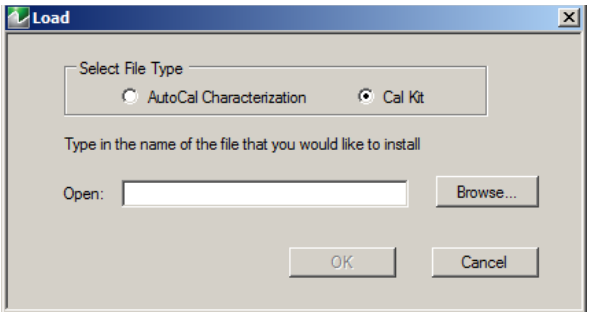


Figure 9-27. LOAD (Cal Kit) Dialog Box

Instructions

1. Cal Kit is the default selection under Select File Type.
2. Enter a file name in the Open field, or click Browse to navigate manually to the appropriate CalKit Coefficient.ccf file.
3. 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.

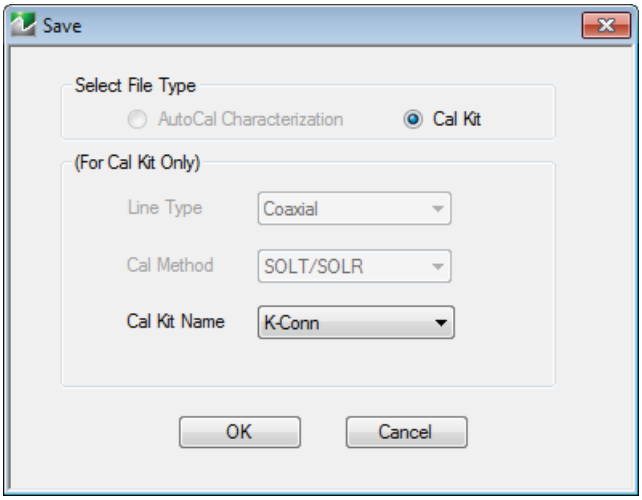
An alternate method is to a Windows® program such as File Manager to copy files from the supplied USB flash drive to the recommended internal hard drive location C:\AnritsuVNA\Data.

Previous

- CAL OPTIONS Menu on page 9-11

Navigation

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



Cal Kit radio button selected

Figure 9-28. 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:
   - 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

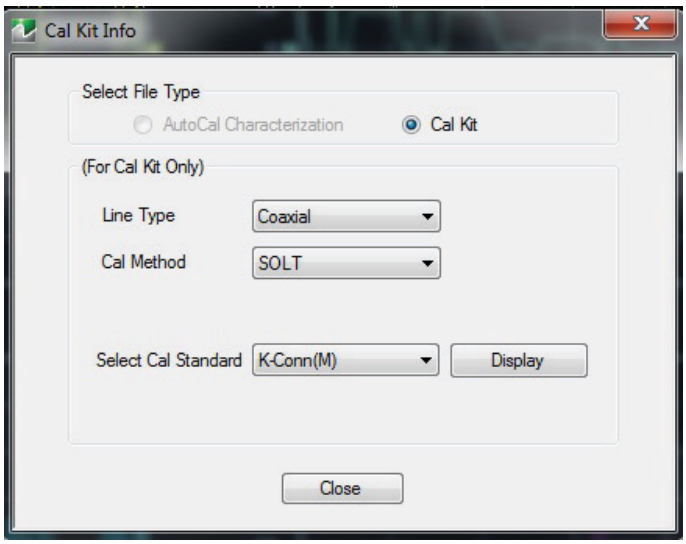
The CAL KIT INFO dialog box provides access to instrument calibration kit information that is read-only for selections from the Cal Standard drop-down menu, but editable for user-defined cal kits.

Previous

- CAL OPTIONS Menu on page 9-11

Navigation

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



Controls for Cal Kit files.

Figure 9-29. CAL KIT INFO Dialog Box

Instructions

Cal Kit is the default selection under Select Cal Standard.

1. Select the Cal Standard from a drop-down menu list with options of:

- 0.8 mm-Conn (M)
- 0.8 mm-Conn (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- GPC-3.5 (M)
- GPC-3.5 (F)
- 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)

2. Click Display.

3. The STANDARD INFO read-only dialog box opens (Figure 9-30).
   - Note that the dialog box title and content fields reflect selections made in the CAL SETUP menu (CAL SETUP Menu on page 9-69).
4. Click OK to close the STANDARD INFO dialog box
5. Click Close to close the CAL KIT INFO dialog box

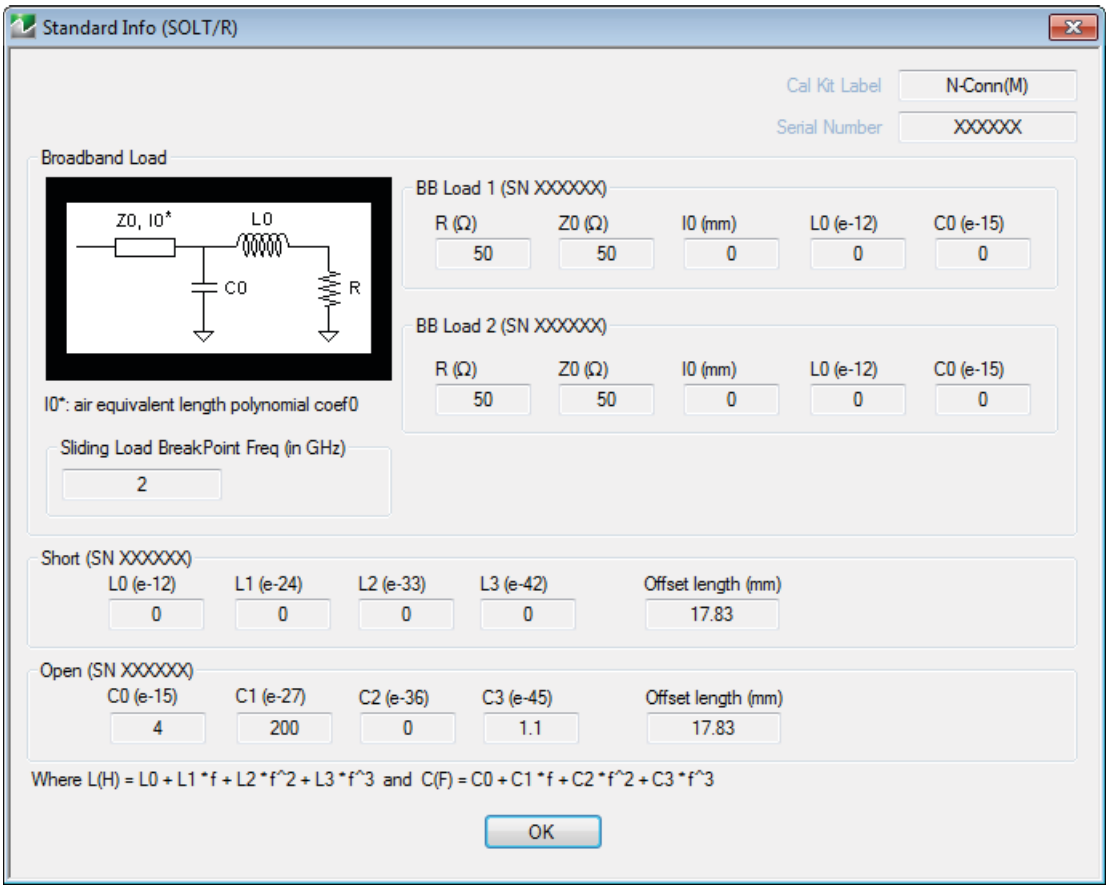


Figure 9-30. STANDARD INFO Dialog Box

When the parameters selected in the CAL KIT INFO dialog box Figure 9-29, “CAL KIT INFO Dialog Box” are defined and Display/Edit menu bar appears, Figure 9-31, “Cal Kit Info-Display/Edit”, the user must define the parameter fields in Figure 9-32, “User Define Waveguide Dialog Box”.

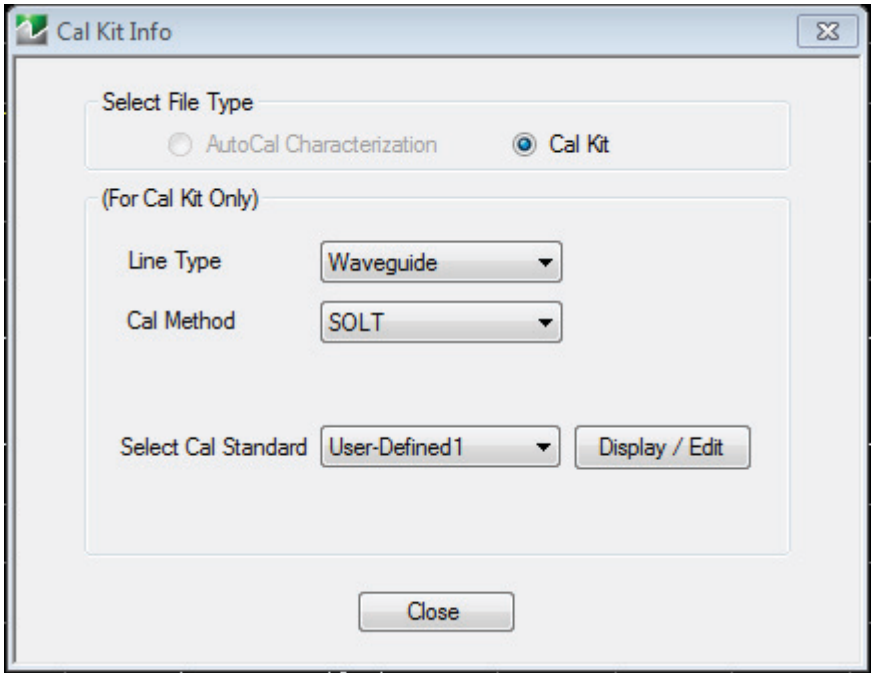


Figure 9-31. Cal Kit Info-Display/Edit

6. Click Display/Edit.

You see the USER DEFINE dialog box appear as in Figure 9-32, "User Define Waveguide Dialog Box".

7. Select the open parameter fields and edit.

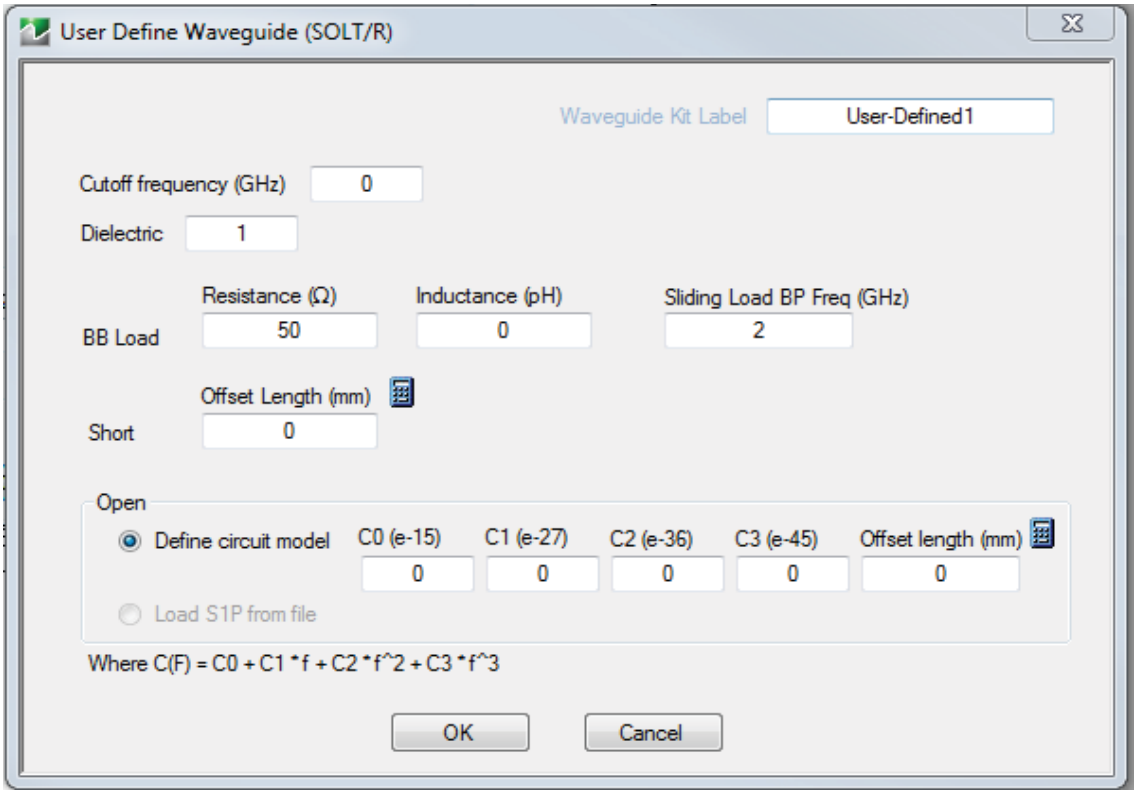


Figure 9-32. User Define Waveguide Dialog Box

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 restorable characterization data.

Previous

- CAL OPTIONS Menu on page 9-11

Navigation

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

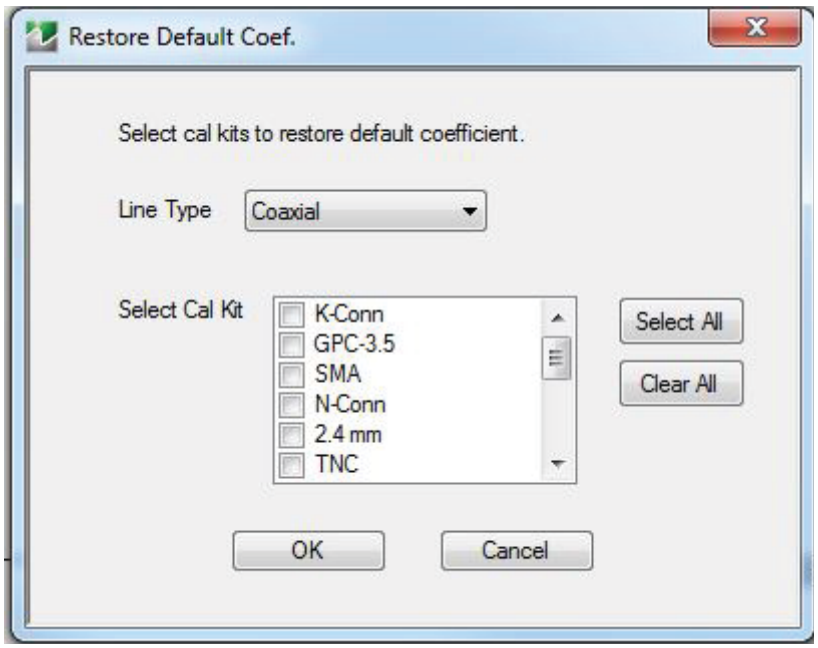


Figure 9-33. RESTORE DEFAULT COEF. (RESTORE DEFAULT COEFFICIENTS) Dialog Box

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 9-2. 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(M/F), V-Conn(M/F), K-Conn(M/F), 2.4 mm(M/F), 2.4 mm V(M/F), GPC-3.5(M/F), SMA(M/F), N-Conn(M/F), GPC-7, 7/16(M/F), TNC(M/F), TOSLK50, TOSLKF50A, TOSLN50, TOSLNF50A, GCS35(M/F)
	SSLT	W1-Conn(M), W1-Conn(F), User Defined 1-32(M/F)
	SSST	W1-Conn(M), W1-Conn(F), User Defined 1-32(M/F)
Non-Dispersive	SOLT/SOLR	W1-Conn(M/F), V-Conn(M/F), K-Conn(M/F), 2.4 mm(M/F), 2.4 mm V(M/F), GPC-3.5(M/F), SMA(M/F), N-Conn(M/F), GPC-7, 7/16(M/F), TNC(M/F), TOSLK50, TOSLKF50A, TOSLN50, TOSLNF50A, GCS35(M/F)
	SSLT	W1-Conn(M), W1-Conn(F), User Defined 1-32(M/F)
	SSST	W1-Conn(M), W1-Conn(F), User Defined 1-32(M/F)
Microstrip	SOLT/SOLR	10 Mil Kit, 15 Mil Kit, 25 Mil Kit User Defined 1-32(M/F)
	SSLT	10 Mil Kit, 15 Mil Kit, 25 Mil Kit User Defined 1-32(M/F)
	SSST	10 Mil Kit, 15 Mil Kit, 25 Mil Kit User Defined 1-32(M/F)
Waveguide	SOLT/SOLR	User Defined 1-32
	SSLT	WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, User Defined 1-32
	SSST	User Defined 1-32

9-5 AutoCal or SmartCal Port Selection Setup – 2-Port VNAs

AUTOCAL/SMARTCAL Menu

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

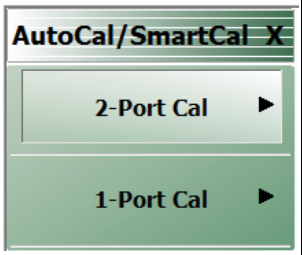
Note	AutoCal is not available with Option 82 or Option 83. To use the 36585 Series Autocal with ShockLine VNAs, a serial to USB converter (Anritsu part number 2000-1809-R USB to Serial adapter) must be employed to enable communication between the Autocal unit and the VNA. The proper comm port will need to be selected once the adapter has been installed.

Previous

- CALIBRATE Menu on page 9-8

Navigation

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



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 2-Port Cal Setup" on page 9-49
- "AutoCal 2-Port Cal Setup" on page 9-54

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 1-Port Cal Setup" on page 9-59
- "AutoCal 1-Port Cal Setup" on page 9-62

Figure 9-34. AUTOCAL (Port Selection) Menu

9-6 SmartCal 2-Port Cal Setup

SMARTCAL SETUP Menu – 2-Port Cal

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

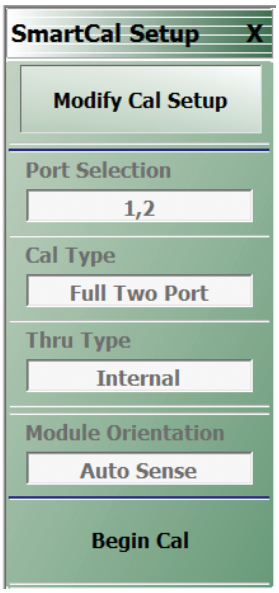
- 2-Port VNA Mode

Previous

- AUTOCAL/SMARTCAL Menu on page 9-48

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" on page 9-51

Port Selection (Read-only)

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

Cal Type (Read-only)

Displays the Cal Type selected for the SmartCal procedure. The setting is defined in the MODIFY 2-PORTSMARTCAL SETUP menu.

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 9-136.

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.

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.

Figure 9-35. SMARTCAL 2-PORT 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.

Figure 9-35. SMARTCAL 2-PORT SETUP Menu (2 of 2)

MODIFY 2-PORT SMARTCAL SETUP Dialog Box

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 left/right port sense can be automatically or manually configured.

Previous

- SMARTCAL SETUP Menu – 2-Port Cal on page 9-49

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

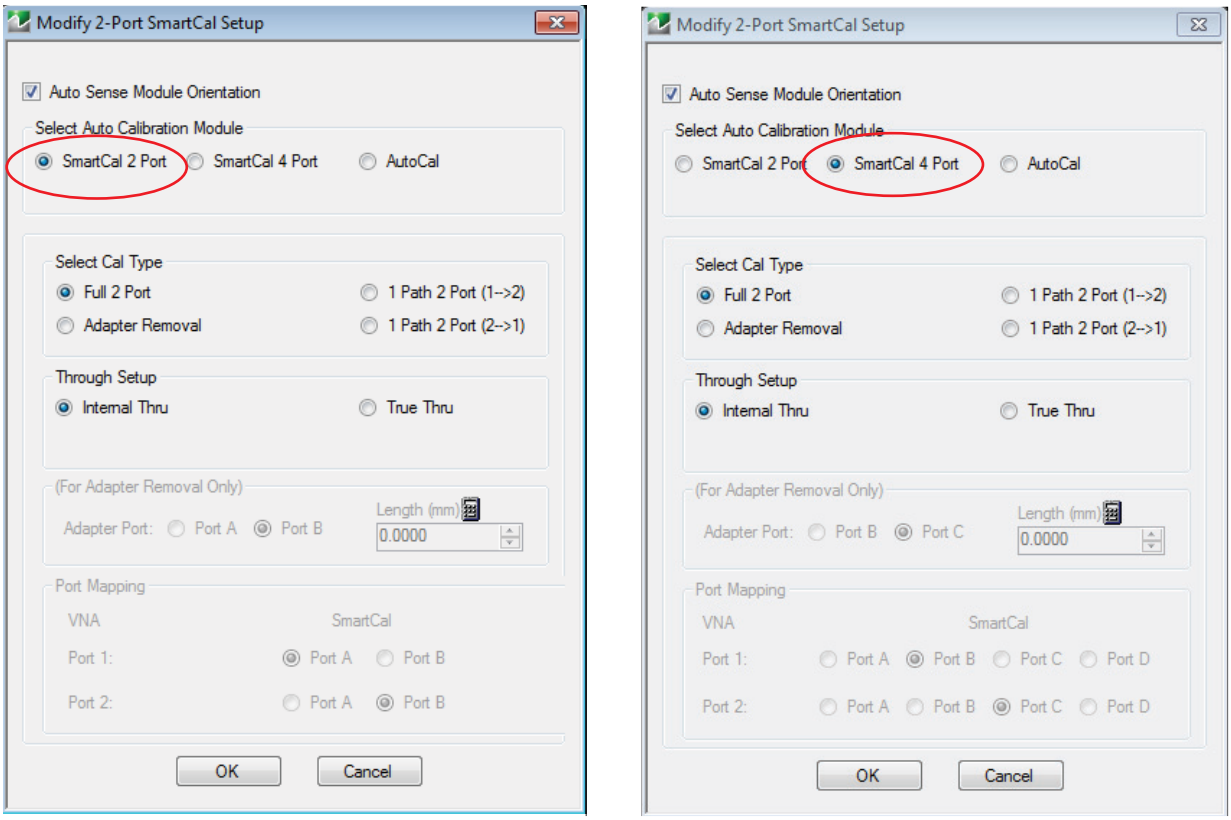


Figure 9-36. MODIFY 2-PORT AUTOCAL/SMARTCAL SETUP Dialog Box

Note	For 2-Port AutoCal dialog box descriptions, see "MODIFY 2-PORT AUTOCAL SETUP Dialog Box" on page 9-56.

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 and 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.

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.
    - 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 9-136

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
  - 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.
    - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 9-132

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 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 / Port 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". This is especially useful if the instrument is oriented differently from the work environment. Options for SmartCal 2-port calibration modules are:
  - 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.

9-7 AutoCal 2-Port Cal Setup

AUTOCAL SETUP Menu – 2-Port Cal

Note	AutoCal is not available with Option 82 or Option 83.

Note	This menu applies to the AutoCal calibration module. If you are using a SmartCal 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

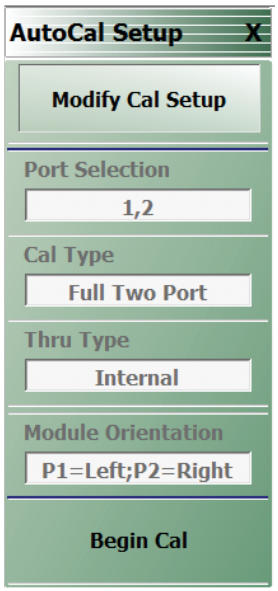
- 2-Port VNA Mode

Previous

- AUTOCAL/SMARTCAL Menu on page 9-48

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" on page 9-51

Port Selection (Read-only)

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

Cal Type (Read-only)

Displays the Cal Type selected for the AutoCal procedure. The setting is defined in the AUTOCAL PORTS menu.

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 9-37. 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 when the Cal Status button is enabled and set to ON.

Figure 9-37. AUTOCAL 2-PORT CAL SETUP Menu (2 of 2)

MODIFY 2-PORT AUTOCAL SETUP Dialog Box

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 on page 9-54

Navigation

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

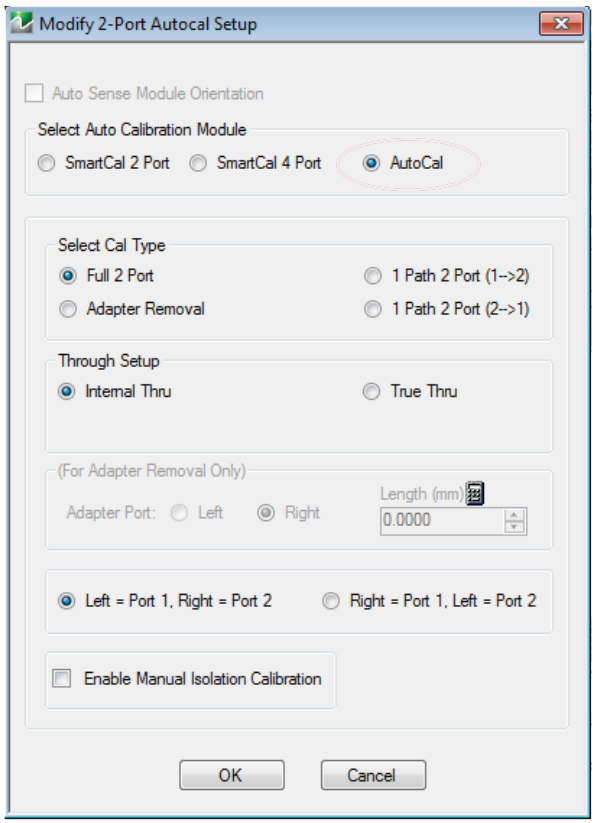


Figure 9-38. MODIFY 2-PORT AUTOCAL SETUP Dialog Box

Note	For 2-Port SmartCal dialog box descriptions, see “MODIFY 2-PORT SMARTCAL SETUP Dialog Box” on page 9-51.

Auto Sense Module Orientation Check Box

- Not available for AutoCal.

Select Auto Calibration Module Radio Buttons

Select the appropriate calibration module using the provided radio buttons.

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 9-136.)
    - 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
  - 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.

  - Click the Calculator icon to open 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.
    - "AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box" on page 9-132

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

Enable Manual Isolation Calibration

This is available for AutoCal 2-port calibrations.

Enabling this feature adds a manual isolation calibration step to the AutoCal calibration routine. The isolation calibration will require the AutoCal be disconnected and 50 ohm terminations be applied to all the ports simultaneously to complete the calibration.

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.

9-8 SmartCal 1-Port Cal Setup

SMARTCAL SETUP Menu – 1-Port Cal

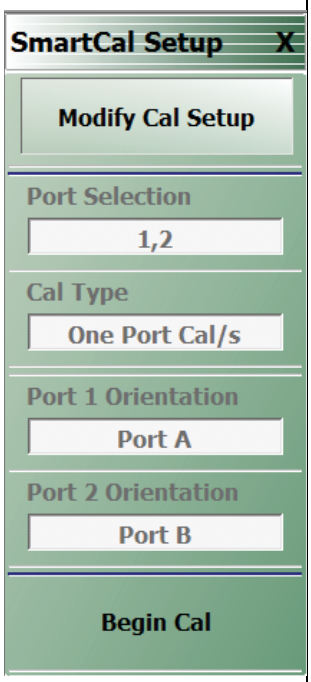
Note	This menu applies to the SmartCal 2- or 4-port calibration module. If you are using an AutoCal calibration module, select Modify Cal Setup and then select the AutoCal calibration module in the MODIFY 1-PORT SMARTCAL SETUP dialog box.

Previous

- AUTOCAL/SMARTCAL Menu on page 9-48

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" on page 9-60

Port Selection (Read-only)

Displays the Port or Ports selected for the SmartCal 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 SmartCal procedure. The setting is defined in the AUTOCAL PORTS menu.

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.

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 9-6

Figure 9-39. SMARTCAL SETUP Menu – One-Port Calibration

MODIFY 1-PORT SMARTCAL SETUP Dialog Box

Previous

- "SMARTCAL SETUP Menu – 1-Port Cal" on page 9-59

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

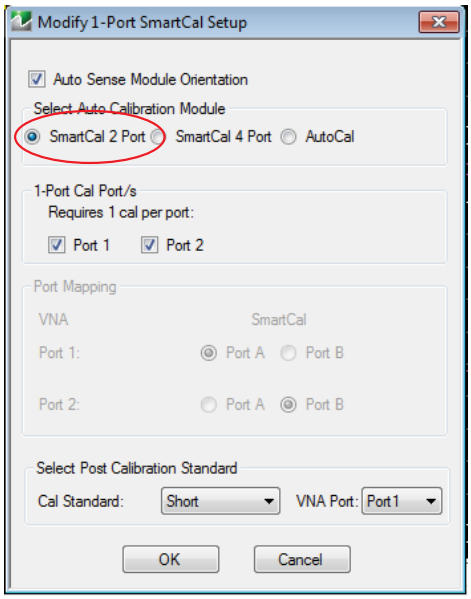


Figure 9-40. MODIFY 1-PORT SMARTCAL SETUP Dialog Box

Auto Sense Cal Port(s)

The Auto Sense selection check box is on by default in the SmartCal option.

1-Port Cal Port(s)

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

9-9 AutoCal 1-Port Cal Setup

AUTOCAL SETUP Menu – 1-Port Cal

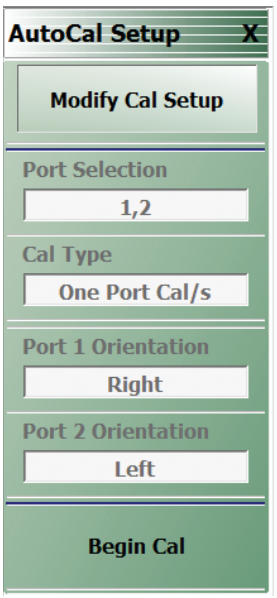
Note	This menu applies to the AutoCal calibration module. If you are using a SmartCal calibration module, select Modify Cal Setup and then select the appropriate SmartCal calibration module in the MODIFY 2-PORT AUTOCAL SETUP dialog box.

Previous

- AUTOCAL/SMARTCAL Menu on page 9-48

Navigation

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



Modify Cal Setup

Select displays the MODIFY 1-PORT AUTOCALSETUP dialog box. The dialog box provides control settings for 1-Port Calibration Ports and Port A / Port B Identification.

- "MODIFY 1-PORT AUTOCAL SETUP Dialog Box" on page 9-63

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 AUTOCAL PORTS 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 Port A/ Port B 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 AUTOCAL SETUP dialog box. If available, shows the Port A/ Port B assignment for Port 2.

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 9-6

Figure 9-41. AUTOCAL SETUP Menu – One-Port Calibration

MODIFY 1-PORT AUTOCAL SETUP Dialog Box

Previous

- SMARTCAL SETUP Menu – 1-Port Cal on page 9-59

Navigation

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

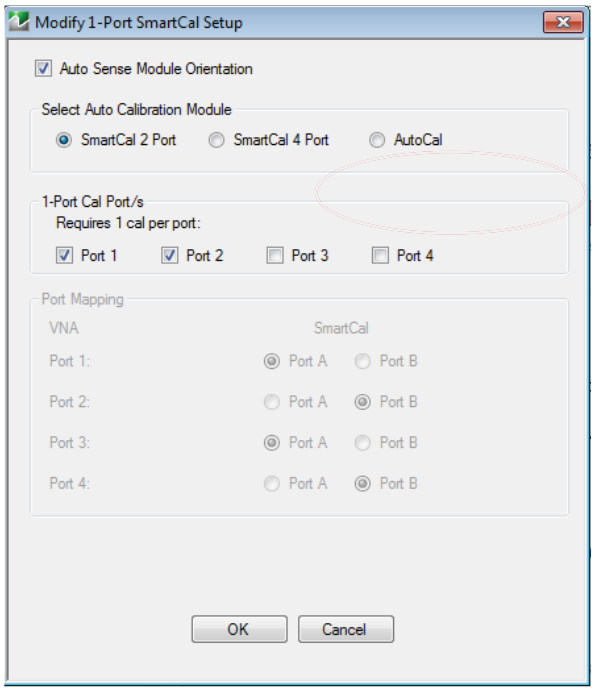


Figure 9-42. MODIFY 1-PORT AUTOCAL SETUP Dialog Box

Auto Sense Cal Port(s)

The Auto Sense selection check box is not available in AutoCal 1-Port1. 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

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.

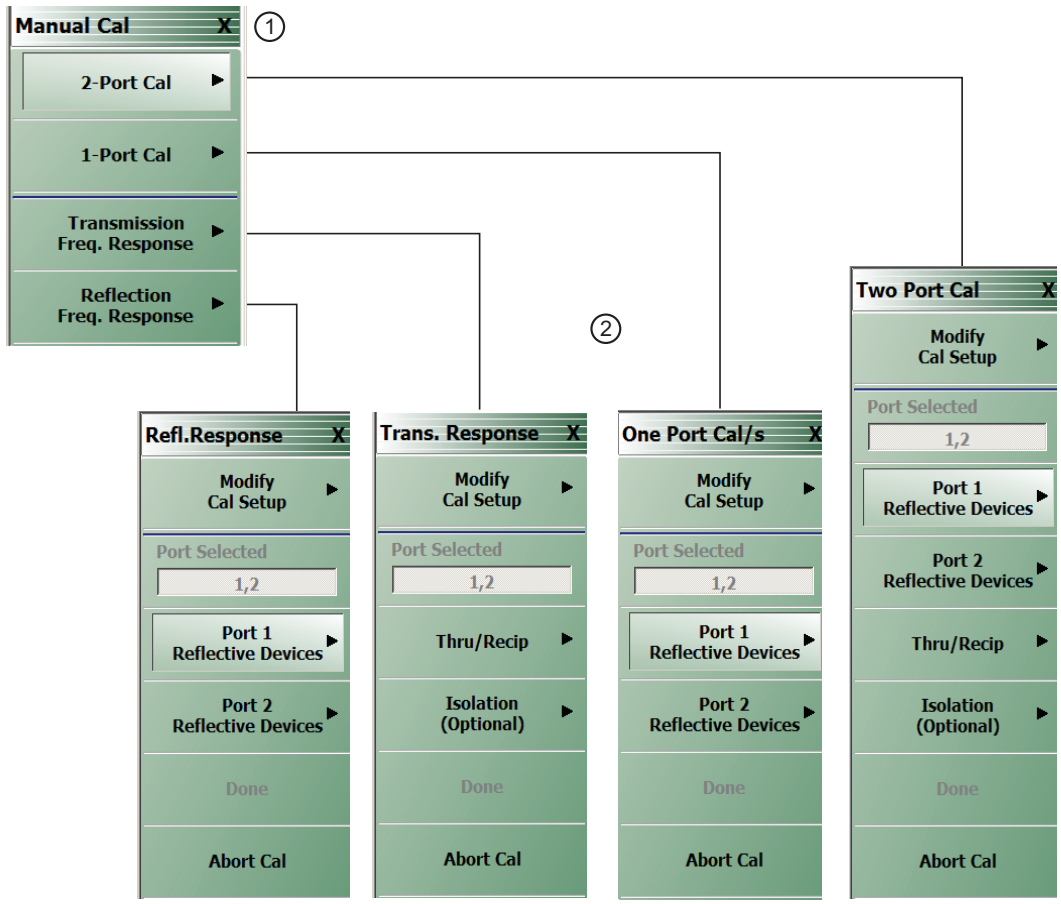
9-10 Manual Calibration Menus and Dialog Boxes

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

In 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.

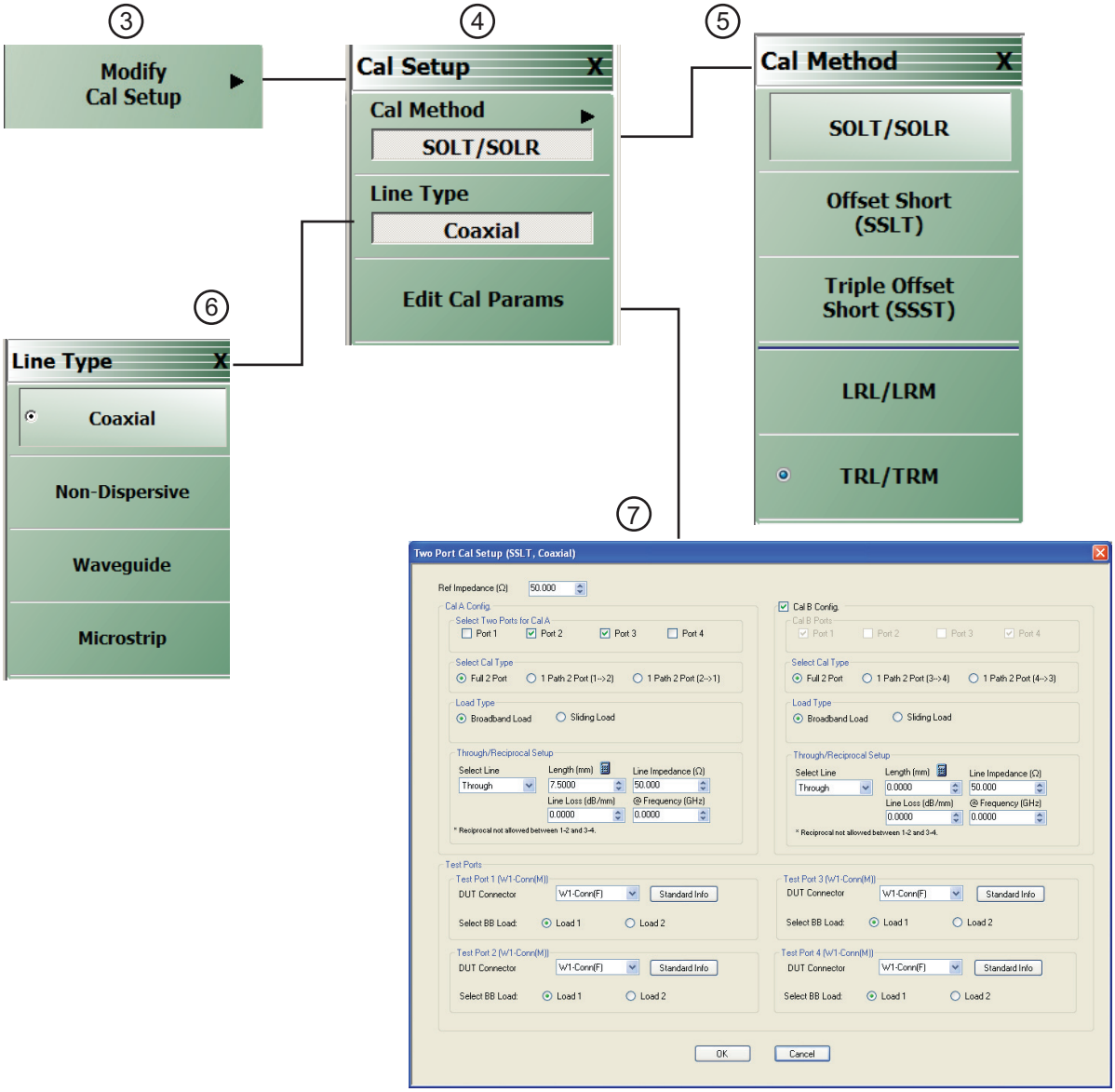
The selection of parameters shown on a menu or dialog depends on the configuration set by previous parameter selections higher in the tree.

The figure "Manual Calibration Setup Menus (1 of 2)" on page 9-65 summarizes the configuration menus and dialogs.



1. MANUAL CAL menu
2. TWO PORT CAL, ONE PORT CAL/S (select cal for a specific single port), TRANSMISSION RESPONSE, REFLECTION RESPONSE menus

Figure 9-43. 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/R, COAXIAL) dialog box

Figure 9-44. 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
- TRL/TRM – Thru-Reflect-Line/Thru-Reflect-Match

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.

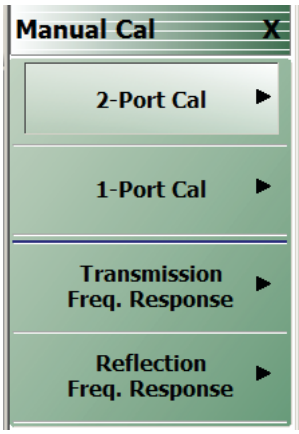
MANUAL CAL Menu

Previous

- CALIBRATE Menu on page 9-8

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL



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 9-73

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 CAL SETUP menu's Edit CAL PARAMS dialog, is fully corrected (S11 or S22). Both ports can be covered but only reflection measurements are corrected.

- ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101

Transmission Freq. Response

Selecting the Transmission Frequency Response button displays the TRANS. FREQ menu. During the calibration configuration in the CAL SETUP menu's EDIT CAL PARAMS dialog, select forward or reverse or both directions.

- TRANS. RESPONSE Menu on page 9-115

Reflection Freq. Response

Select displays the REFL. RESPONSE menu.

- REFL. RESPONSE Menu on page 9-122

Figure 9-45. MANUAL CAL (MANUAL CALIBRATION) Menu

CAL SETUP Menu

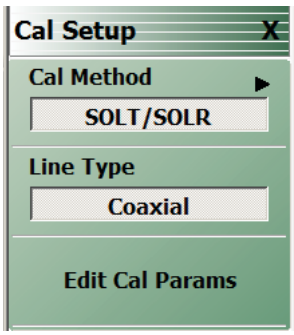
Use the CAL SETUP menu to set the calibration method (for example SOLT/R), the calibration line type (such as coaxial or microwave), and additional parameters for ports and connectors shown via the Edit Cal Parameters button and the linked CAL SETUP dialogs.

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 9-73
  - ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101
  - TRANS. RESPONSE Menu on page 9-115
  - REFL. RESPONSE Menu on page 9-122

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, LRL/LRM, SSLT, SSST, SOL, SSL, SSS). 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 9-71

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 9-72

Figure 9-46. CAL SETUP (CALIBRATION SETUP) Menu – 2-Port VNAs (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/R, Coaxial)
- Examples of CAL SETUP dialog boxes using Coaxial line type are available in the links below:
  - "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-77
  - "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box – 2-Port VNA" on page 9-85
- A summary table lists dialog box contents for all other combinations of method and line type:

Table 9-3, "Manual 2-Port Cal Setup Dialog Box Summary" on page 9-92

Figure 9-46. CAL SETUP (CALIBRATION SETUP) Menu – 2-Port VNAs (2 of 2)

CAL METHOD Menu

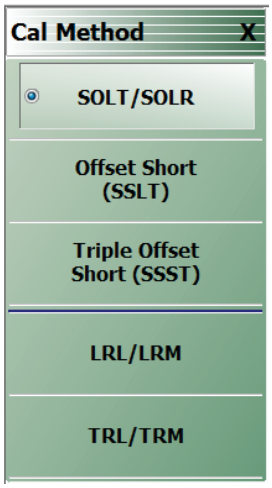
Use the CAL METHOD menu to select whether the method of SOLT/SOLR, SSLT, SSST, LRL/LRM, or TRL/TRM will be used during the calibration.

Previous

- CAL SETUP Menu on page 9-69

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.



Selecting any button marks the selection with the select icon, de-selects the other button, and auto-returns to the CAL SETUP menu.

- CAL SETUP Menu on page 9-69

SOLT/SOLR

Selecting the SOLT/SOLR button sets the calibration method to Short-Open-Load-Thru (or Short-Open-Load-Return) and then auto-returns to the CAL SETUP menu.

Offset Short (SSLT)

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)

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

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

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.

Figure 9-47. CAL METHOD Menu – 2-Port VNAs

LINE TYPE Menu

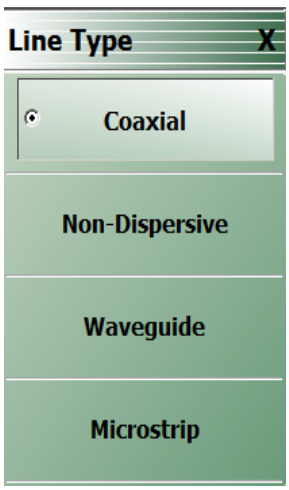
Use the LINE TYPE menu to select from coaxial, non-dispersive, waveguide, or microstrip line types. Non-dispersive is for line types such as coplanar waveguide, stripline, or twin-lead and is treated the same as coaxial line.

Previous

- CAL SETUP Menu on page 9-69 .

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 9-69

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 9-69

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 9-69

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 9-69

Figure 9-48. LINE TYPE Menu

9-11 Manual 2-Port Cal Setup

TWO PORT CAL Menu

Button Availability

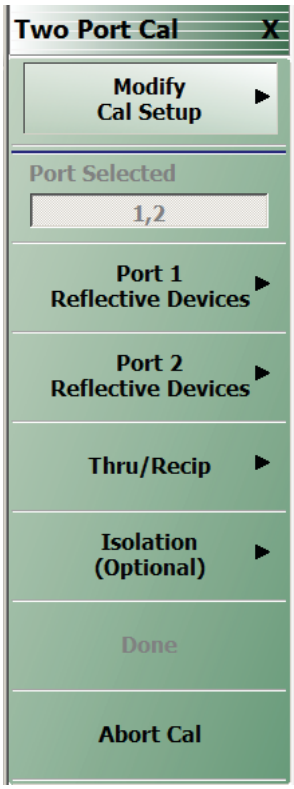
- The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant 2-PORT CAL SETUP dialog box.
- A representative menu is shown below.
- The example procedures at the end of this chapter show examples of various TWO PORT CAL menus.

Previous

- MANUAL CAL Menu on page 9-68

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 9-69

Here, changes to the calibration method, line type, and associated parameters are made on the CAL METHOD, LINE TYPE, and EDIT CAL PARAMS submenus.

- Calibration method options are: SOLT/SOLR or LRL/LRM.
- Line Type is Coaxial.

A composite view of the CAL SETUP menu set is available in the figure below:

- Figure 9-43, “Manual Calibration Setup Menus (1 of 2)” on page 9-65

Descriptions of the calibration configuration menus are available at:

- CAL SETUP Menu on page 9-69
- CAL METHOD Menu on page 9-71

A summary of 2-PORT CALIBRATION SETUP dialog box controls and functions is available in the table below:

- Table 9-3, “Manual 2-Port Cal Setup Dialog Box Summary” on page 9-92

Ports Selected (Read-only)

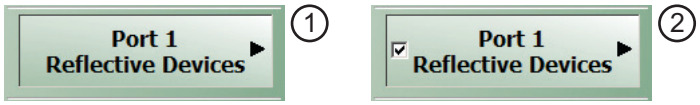
A display button showing the port numbers that are in the calibration.

Figure 9-49. TWO 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 TWO 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 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.

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 9-6

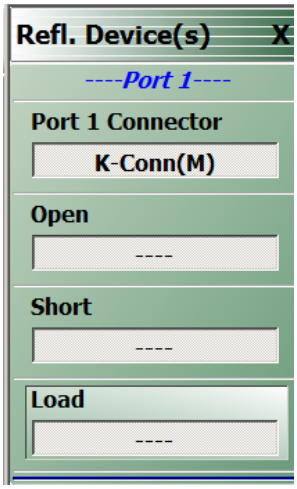
Abort Cal

Select aborts the current calibration and returns to the CALIBRATION menu.

- CALIBRATION [TR] Menu on page 9-6

Figure 9-49. TWO PORT CAL MENU – Typical Example (2 of 2)

REFLECTIVE DEVICES Menu



Port 1 Connector

Double-clicking it opens the ONE-PORT CAL SETUP dialog for setup of parameters relevant for the calibration.

Open

Clicking this performs the calibration. When the action is complete, a checkmark appears.

Short

Clicking this performs the calibration. When the action is complete, a checkmark appears.

Load

Clicking this performs the calibration. When the action is complete, a checkmark appears.

Figure 9-50. 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/R, COAXIAL) Dialog Box" on page 9-77
- "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box – 2-Port VNA" on page 9-85

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 9-92.

TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Prerequisites

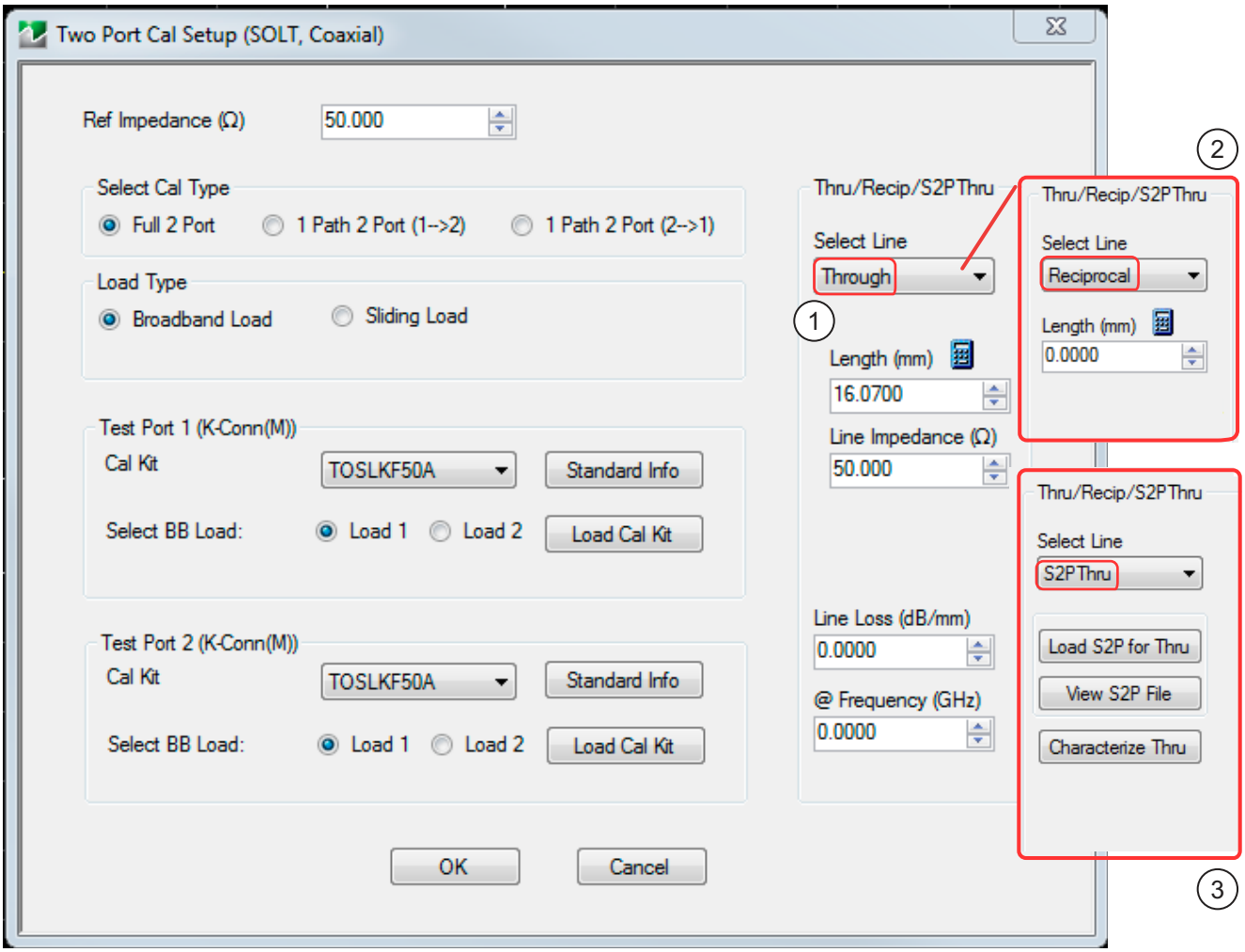
- Cal Method = SOLT/SOLR
- Line Type = Coaxial

Previous

- CAL SETUP Menu on page 9-69

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/R, COAXIAL Dialog Box



"THRU INFO Dialog Box" on page 9-136

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

Figure 9-51. Edit Cal Params – TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

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:

- 0.8 mm (M)
- 0.8 mm (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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)

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 button 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

Thru/Reciprocal/S2P Thru Area

Located on the right side of the dialog box, these controls allow characterization of the Thru/Reciprocal/S2P Thru line settings. These are the same controls as "THRU INFO Dialog Box" on page 9-136.

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

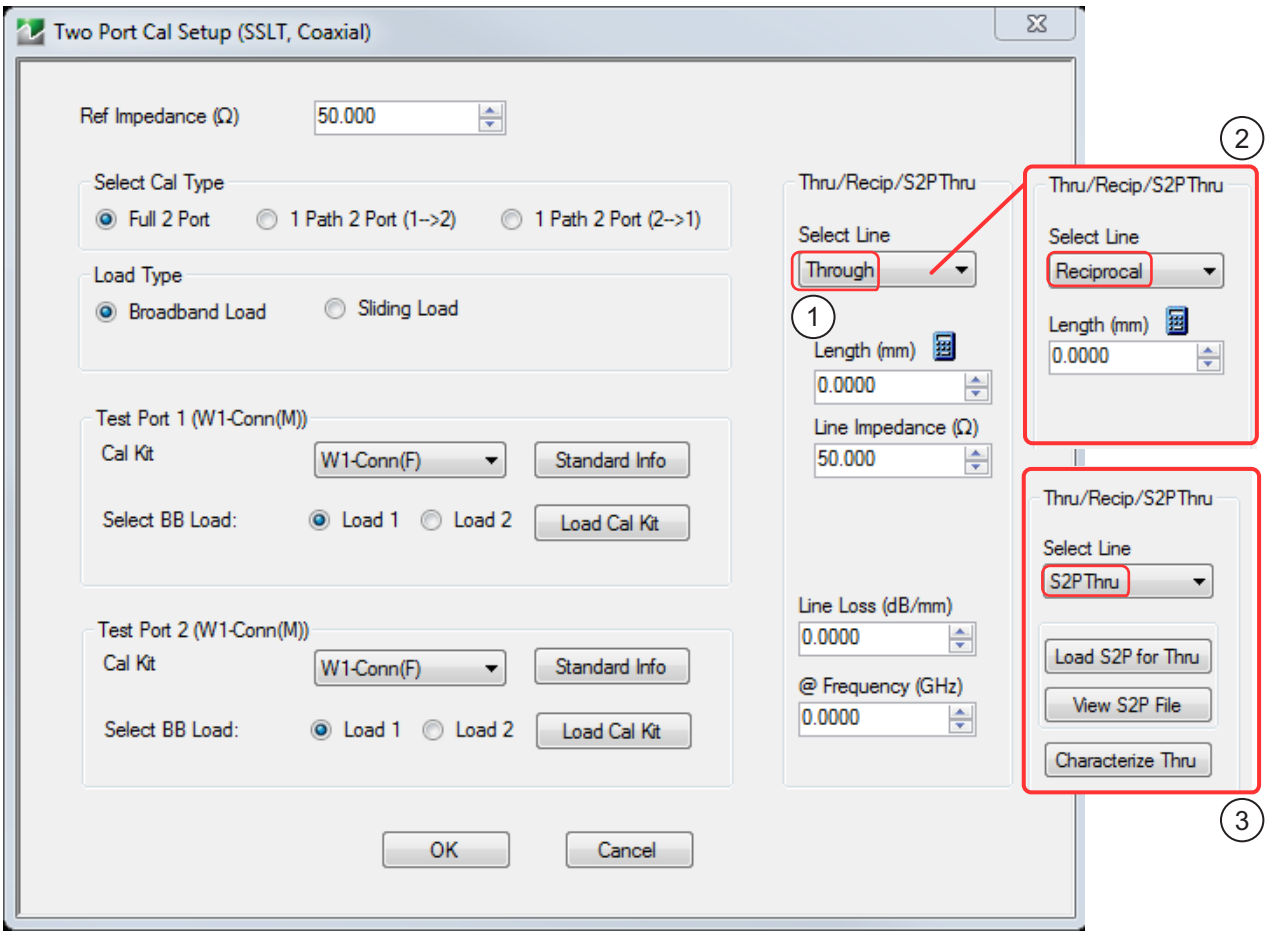
- Cal Method = SSLT
- Line Type = Coaxial

Previous

- CAL SETUP Menu on page 9-69

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



"THRU INFO Dialog Box" on page 9-136

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

Figure 9-52. TWO PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

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:

- 0.8 mm (M)
- 0.8 mm (F)
- 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

Thru/Reciprocal/S2P Thru Area

Located on the right side of the dialog box, these controls allow characterization of the Thru/Reciprocal/S2P Thru line settings. These are the same controls as "THRU INFO Dialog Box" on page 9-136.

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.

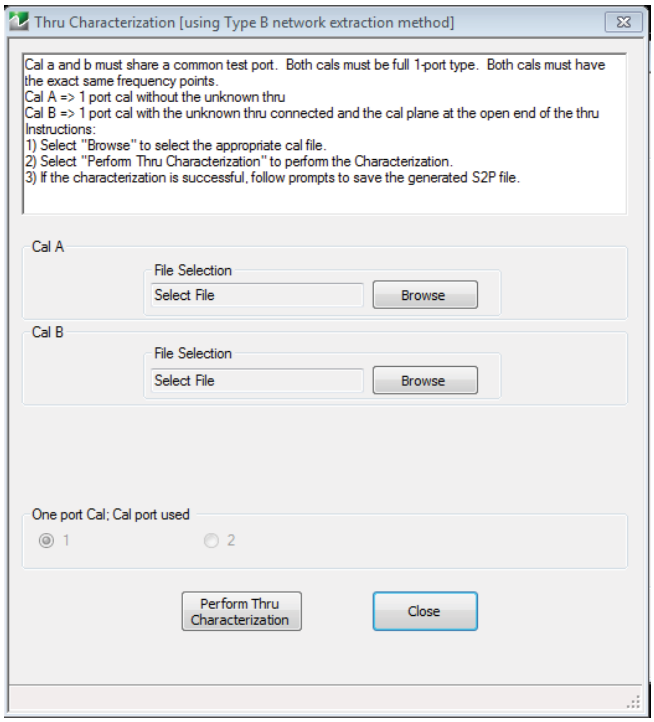


Figure 9-53. Characterize Thru

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 (SSST, COAXIAL) Dialog Box – 2-Port VNA

Prerequisites

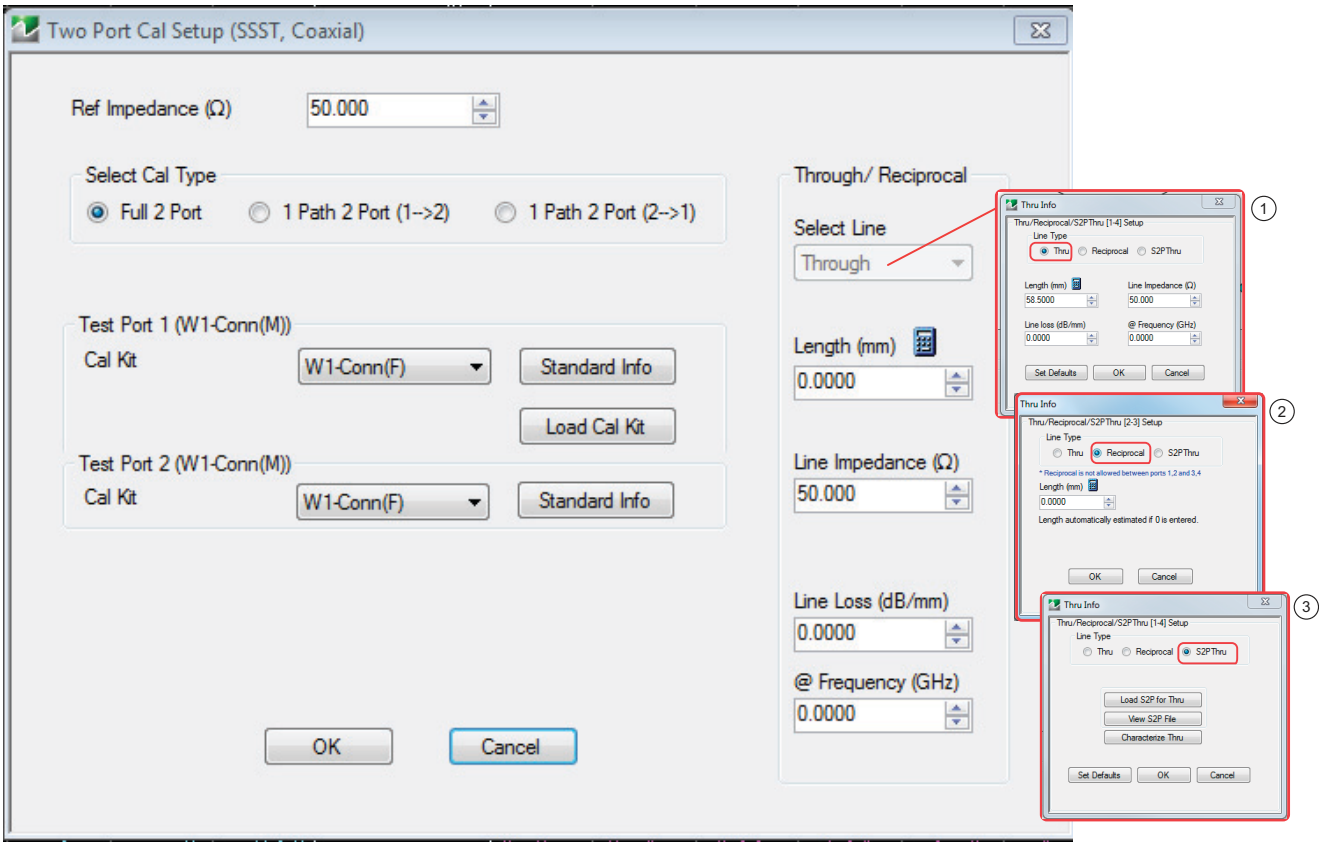
- Cal Method = SSST
- Line Type = Coaxial

Previous

- CAL SETUP Menu on page 9-69

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



"THRU INFO Dialog Box" on page 9-136

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

Figure 9-54. Edit Cal Params – TWO 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.

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 Area

Located on the right side of the dialog box, these controls allow characterization of the through/reciprocal line settings. These are the same controls as "THRU INFO Dialog Box" on page 9-136.

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 (LRL/LRM, COAXIAL) Dialog Box – 2-Port VNA

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 9-69

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 (LRL/LRM, COAXIAL Dialog Box

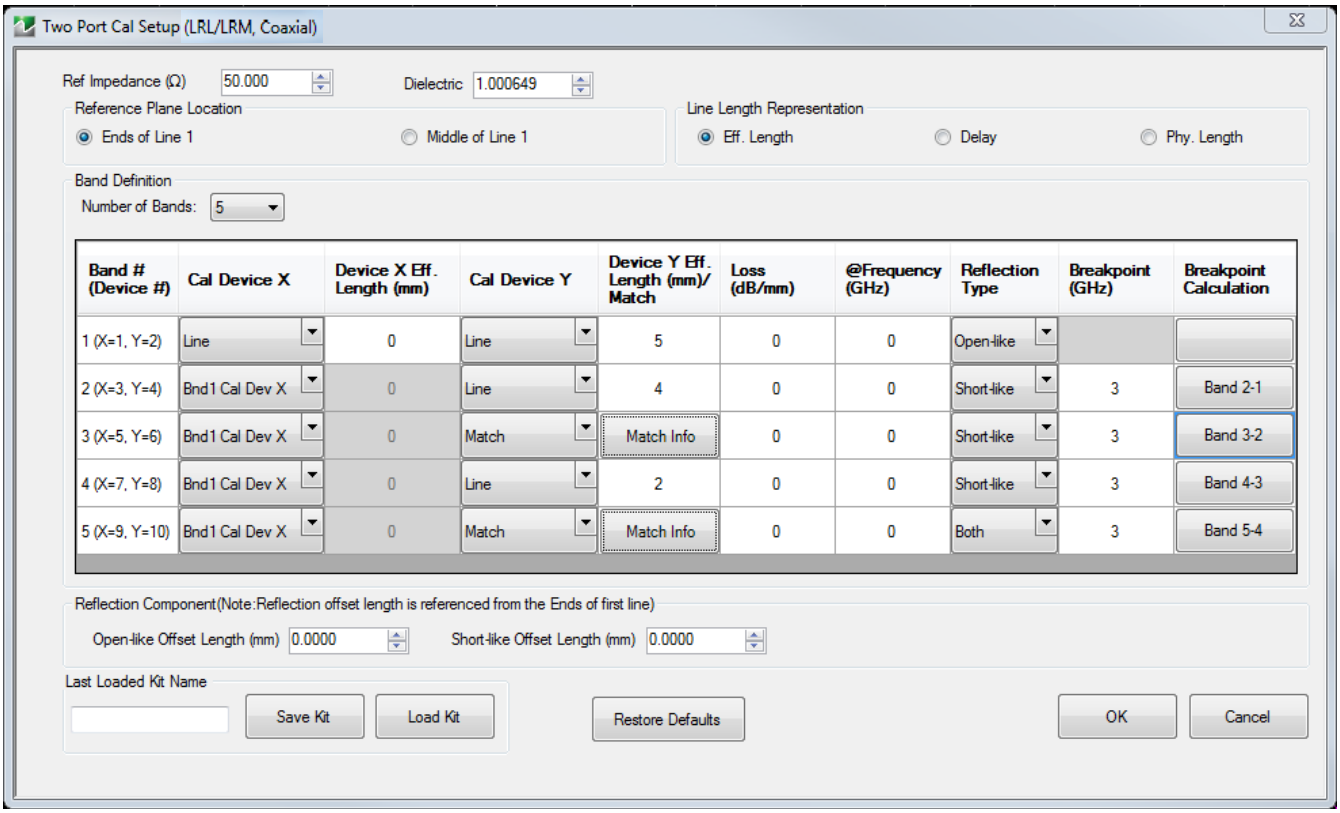


Figure 9-55. Edit Cal Params – TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

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.

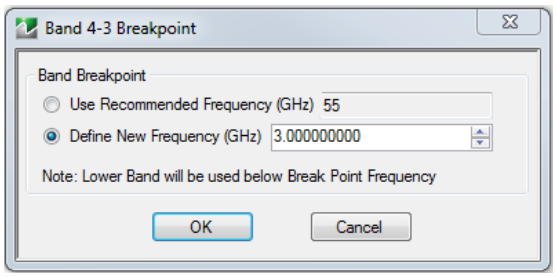
- Number of Bands = 1. Only the Band 1 Definition and editable parameters appear.
- Number of Bands = 2. The Band 2 Definition and editable parameters appear.
- Number of Bands = 3. The Band 3 Definition and editable parameters appear.
- Number of Bands = 4. The Band 4 Definition and editable parameters 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
    - Band1 Cal Dev Y
  - Band 3 choices are
    - New Line
    - Bnd1 Cal Dev X
    - Band1 Cal Dev Y
    - Bnd2 Cal Dev X
    - Band2 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 MATCH DEVICES Dialog Box – 2-Port VNAs" on page 9-138
- **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

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 – 2-Port VNA

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 9-69

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

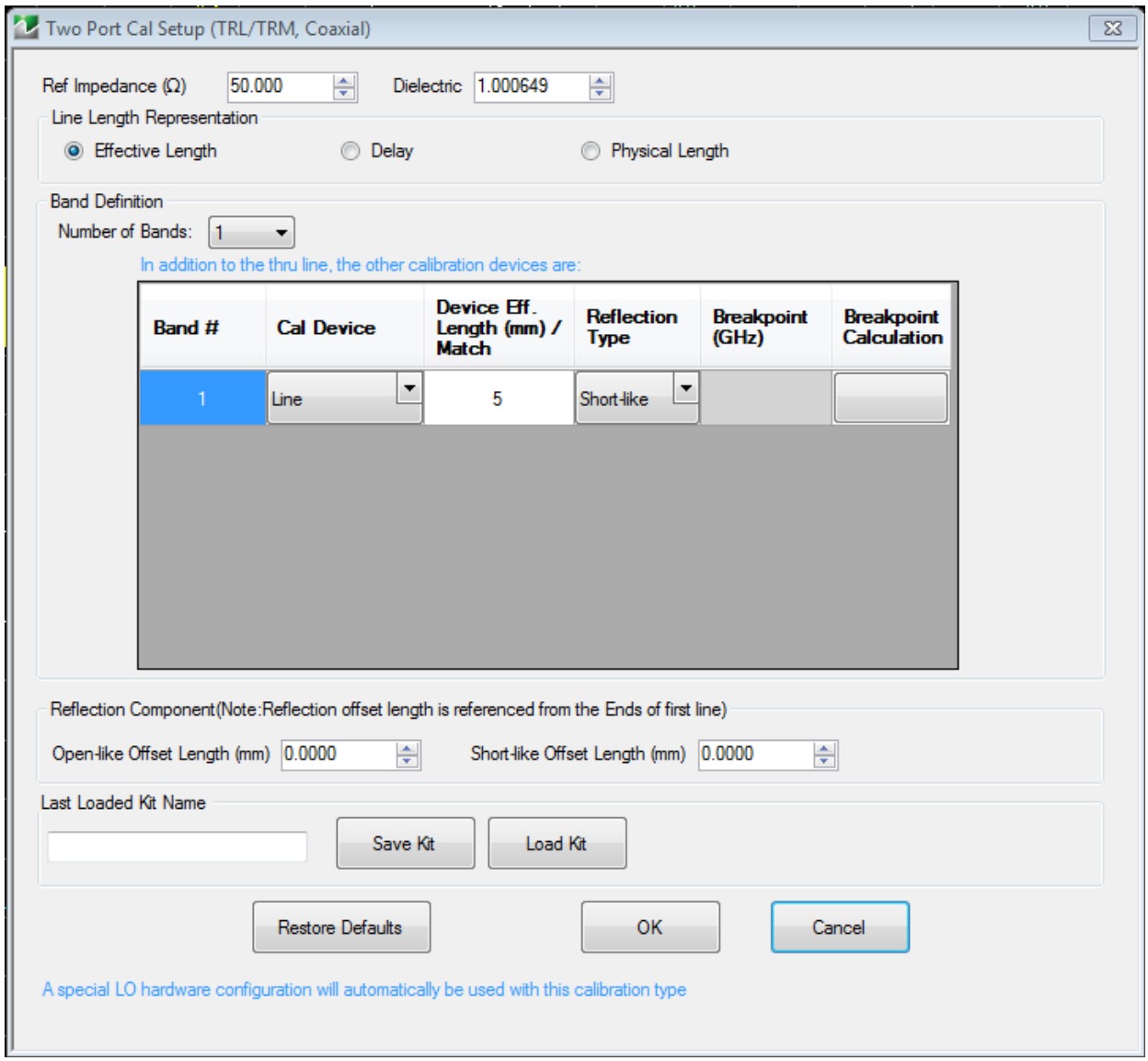


Figure 9-56. Edit Cal Params – TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

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

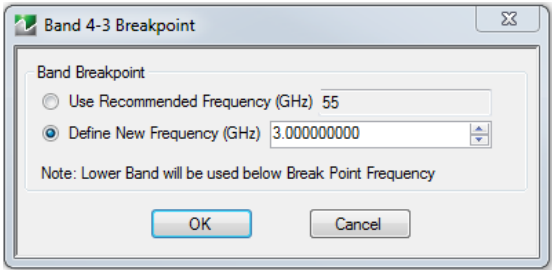
Select one to five bands from the pull-down menu.

- 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:



Reflection Component

- Enter Open-like and/or Short-like offset length

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.

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 9-3. Manual 2-Port Cal Setup Dialog Box Summary (1 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
SOLT/R Coaxial	See full description above at "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-77 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 9-134 Test Port Select BB Load: Load 1, Load 2 Thru/Reciprocal/S2P Thru Select Line: Through, Reciprocal, S2P Thru area Thru selected allows user entries for length, line impedance, line loss and frequency. Reciprocal selected allows user entry for length. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files).

Table 9-3. 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 9-80 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 9-134 Test Port Select BB Load: Load 1, Load 2 Thru/Reciprocal/S2P Thru Select Line: Thru, Reciprocal, S2P Thru area Thru selected allows user entries for length, line impedance, line loss and frequency. Reciprocal selected allows user entry for length. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files).
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, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, User-Defined1 to User-Defined32. Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box. • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 9-140
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 9-134 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 9-3. 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 – 2-Port VNA" on page 9-83. 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 9-134 Thru/Reciprocal/S2P Thru Select Line: Thru, Reciprocal, S2P Thru area Thru selected allows user entries for length, line impedance, line loss and frequency. Reciprocal selected allows user entry for length. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files)
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 9-140
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 9-134 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 9-3. Manual 2-Port Cal Setup Dialog Box Summary (4 of 5)

Cal Method Line Type	Dialog Box Controls and Functions
LRL/LRM Coaxial	See full description above display logic and controls at "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box – 2-Port VNA" on page 9-85. 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 9-138 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 9-138 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) Last Loaded Kit Name: Provides the name of the LRL/LRM Cal Kit file that was last loaded. Save Kit: Provides the ability to save calibration kit data. Click opens a Save Cal Kit window 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 9-3. 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-Defined1 to User-Defined32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical “STANDARD INFO Dialog Box” on page 9-134
TRL/TRM Coaxial	See full description above display logic and controls at “TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box – 2-Port VNA” on page 9-89. 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. 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-Defined1 to User-Defined32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical “STANDARD INFO Dialog Box” on page 9-134

9-12 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
- A coaxial line type
- Connector

Using a different configuration set can change the appearance of the REFL. DEVICE(S) menu.

Full Name

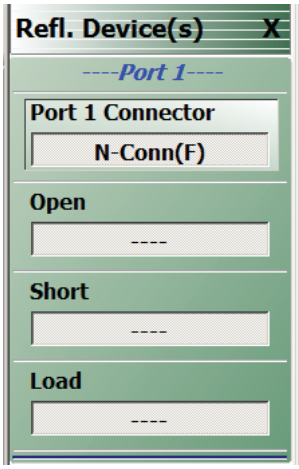
- Reflective Device(s) Menu

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 9-73
  - ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101
  - TRANS. RESPONSE Menu on page 9-115
  - REFL. RESPONSE Menu on page 9-122
- The REFL. DEVICE(s) menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu on page 9-69
  - CAL METHOD Menu on page 9-71
  - LINE TYPE Menu on page 9-72

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 9-57. 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
- 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 9-73
  - ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101
  - TRANS. RESPONSE Menu on page 9-115
  - REFL. RESPONSE Menu on page 9-122
- The THRU/RECIP menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu on page 9-69
  - CAL METHOD Menu on page 9-71

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 9-97

Figure 9-58. THRU/RECIP Menu – Typical Example

ISOLATION(S) Menu – 2-Port VNA

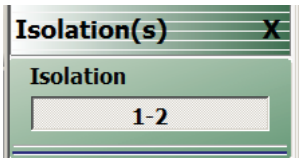
This menu example is a representative menu based on the following configuration:

- VNA is in 2-port mode
- A 2-port calibration
- A SOLT/SOLR calibration method
- 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 9-73
  - ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101
  - TRANS. RESPONSE Menu on page 9-115
  - REFL. RESPONSE Menu on page 9-122
- The THRU/RECIP menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu on page 9-69
  - CAL METHOD Menu on page 9-71



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 9-97

Figure 9-59. ISOLATION(S) Menu – Typical Example

9-13 Manual 1-Port Cal Setup

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.

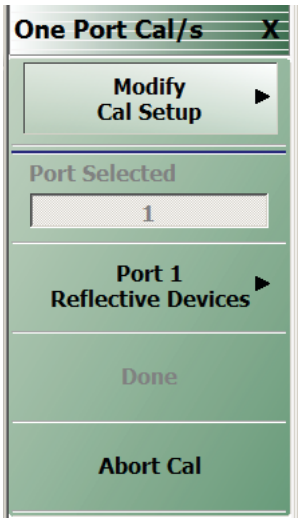
ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs

Previous

- MANUAL CAL Menu on page 9-68

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 9-69 .
- CAL METHOD Menu on page 9-71 .
  - Calibration method option: SOLT/SOLR or LRL/LRM.
  - Line Type option is Coaxial.
- LINE TYPE Menu on page 9-72
  - Line Type options are Coaxial, Non-Dispersive, Waveguide, or Microstrip.

A composite view of the CAL SETUP menu set and is available in:

- Figure 9-43 on page 9-65

Ports Selected (Read-only)

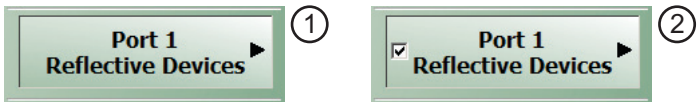
A display-only button showing the port numbers that are in the calibration.

Figure 9-60. 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 9-6

Abort Cal

Select aborts the current calibration and returns to the CALIBRATION menu.

- CALIBRATION [TR] Menu on page 9-6

Figure 9-60. 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/R, COAXIAL) Dialog Box" on page 9-104

For all other combinations of calibration methods and line types, see the summary in Table 9-4 on page 9-112 for a listing of dialog box controls and functions.

Note	Note that the LRL/LRM calibration method is not available for One-Port Calibrations.

ONE-PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Prerequisites

- Calibration Method = SOLT/SOLR
- Line Type = Coaxial

Previous

- ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101

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/R, COAXIAL) Dialog Box

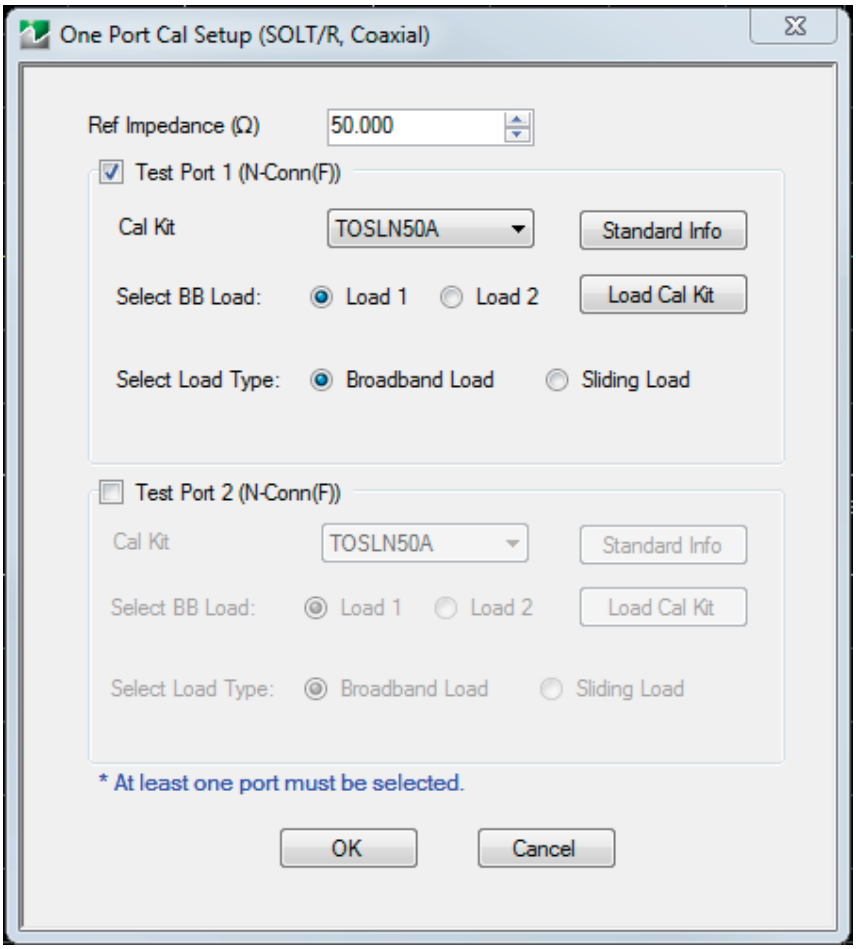


Figure 9-61. ONE-PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

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:

Test Port 1 Cal Kit (Connector)

Select the DUT Connector Type from a drop-down menu list with options of:

- 0.8 mm-Conn (M)
- 0.8 mm-Conn (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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 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

Prerequisites

- Calibration Method = SSLT
- Line Type = Coaxial

Previous

- ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101

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

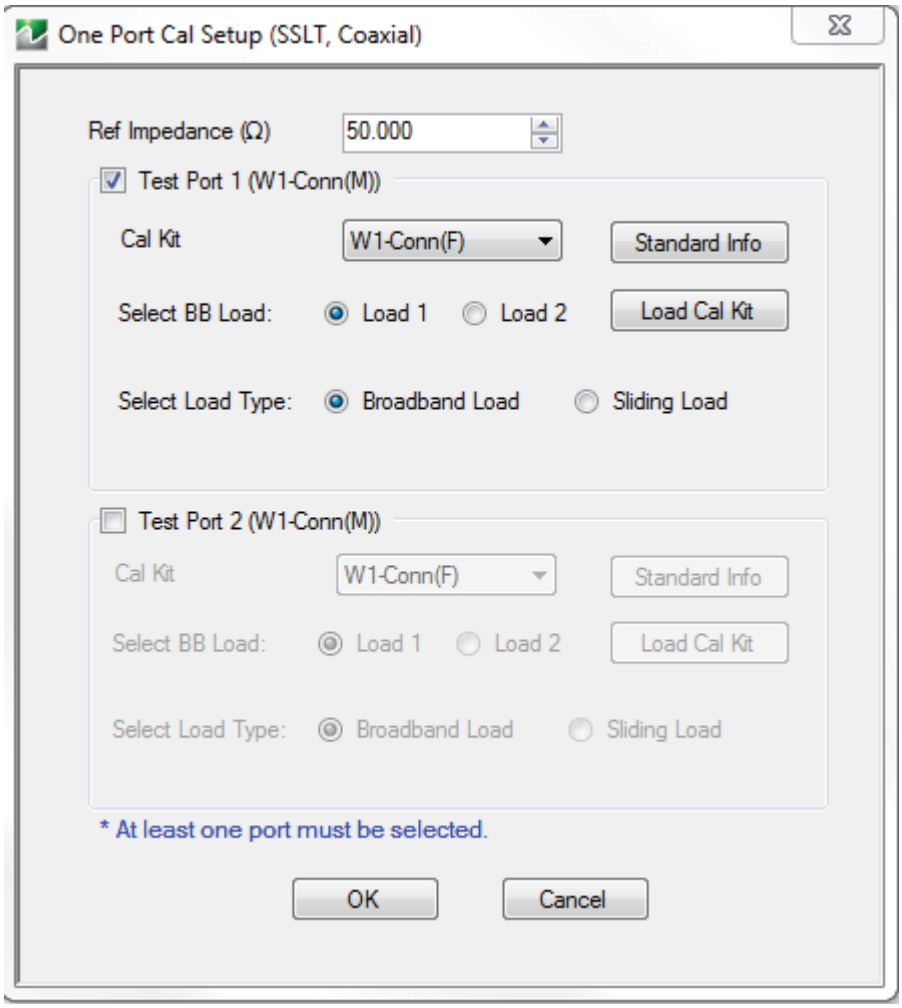


Figure 9-62. ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

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 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 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

Prerequisites

- Calibration Method = SSST
- Line Type = Coaxial

Previous

- ONE PORT CAL Menu (SOLT/R – Coaxial) 2-Port VNAs on page 9-101

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

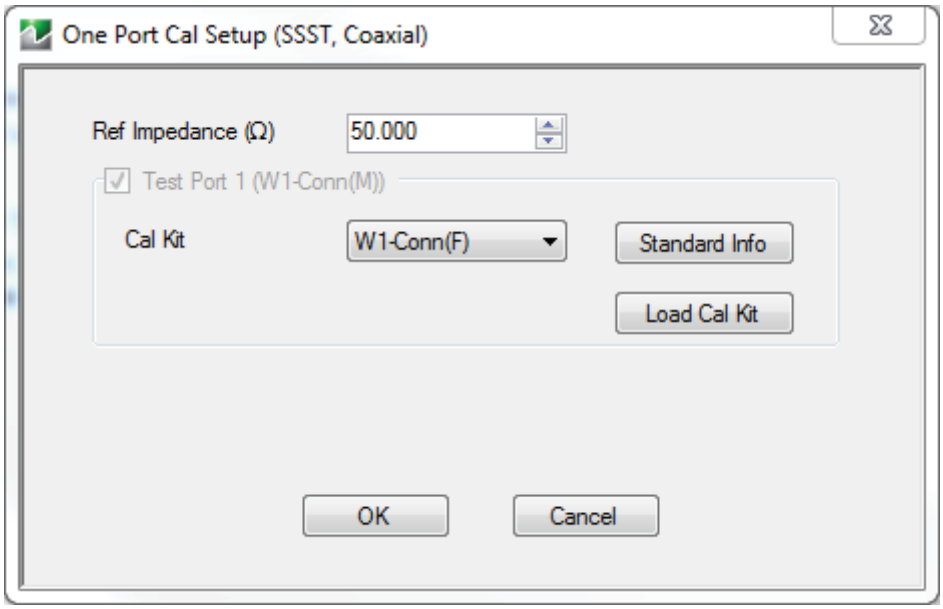


Figure 9-63. ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box

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

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 9-4. Manual Calibration – 1-Port Calibration Setup Dialog Box Contents (1 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/R Coaxial	See full description above at "ONE-PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-104. 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 9-134 Test Port BB Load: Load 1, Load 2 Test Port Load Type: Broadband Load, Sliding Load
SOLT/R Non-Dispersive	Same controls and functions as SOLT/R Coaxial above.
SOLT/R Waveguide	SOLT/R is not recommended for Waveguide calibrations. Same controls and functions as SOLT/R 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 9-140
SOLT/R Microstrip	Same controls and functions as SOLT/R 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 dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 9-134 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 9-134

Table 9-4. Manual Calibration – 1-Port Calibration Setup Dialog Box Contents (2 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSLT Coaxial	See full description above at "ONE-PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 9-107. 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 connectors 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 9-134 Test Port BB Load: Load 1, Load 2 Test Port Load Type: Broadband Load, Sliding Load
SSLT Non-Dispersive	Same controls and functions as SSLT Coax.
SSLT Waveguide	Same controls and functions as SSLT Coax with the following changes: Waveguide Kit: WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, 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 9-134 • Typical "USER DEFINED WAVEGUIDE Dialog Box" on page 9-140
SSLT 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 9-134 Test Port Standard Info button: Displays USER DEFINED STANDARD dialog box for selected calibration method and kit. • Typical "USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs" on page 9-138
SSST Coaxial	See the full description above at "ONE-PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 9-110. 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 9-134
SSST Non-Dispersive	Same controls and functions as SSST Coaxial.

Table 9-4. Manual Calibration – 1-Port Calibration Setup Dialog Box Contents (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: Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • Typical "USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs" on page 9-138
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 MICROSTRIP INFO dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box" on page 9-134
LRL/LRM Coaxial	The LRL/LRM calibration method is not available for one-port calibrations.
LRL/LRM Non-Dispersive	
LRL/LRM Waveguide	
LRL/LRM Microstrip	
TRL/TRM Coaxial	The TRL/TRM calibration method is not available for one-port calibrations.
TRL/TRM Non-Dispersive	
TRL/TRM Waveguide	
TRL/TRM Microstrip	

9-14 Manual Cal – Trans. Freq. Resp. Cal Menus

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

Menu Name

- TRANS. RESPONSE

Button Name

- Transmission Freq. Response

TRANS. RESPONSE Menu

Full Name

- Transmission Frequency Response Calibration Setup Menu

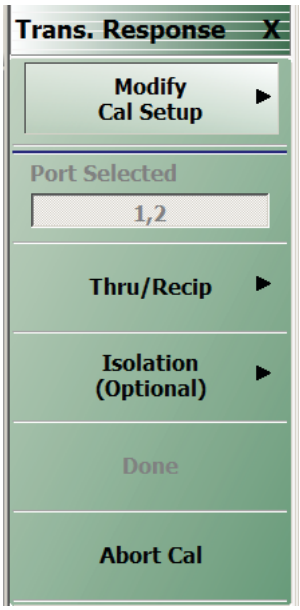
The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant TRANSMISSION FREQUENCY REPONSE CAL SETUP dialog box. A representative menu is shown below. There is one example procedure of a Trans. Response calibration in this chapter.

Previous

- MANUAL CAL Menu on page 9-68

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 9-69

Example transmission frequency response calibration dialog boxes are available below:

- "TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/R – Coaxial) Dialog Box" on page 9-118

A summary table of all transmission frequency response calibration configuration dialog boxes is available here:

- Table 9-5, "Manual Calibration – Trans. Freq. Resp. Cal. Setup Dialog Box Contents" on page 9-120

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.

Isolation (Optional)

When selected, displays the ISOLATION menu. When all tasks are completed, return to the TRANS. RESPONSE 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 9-6

Figure 9-64. 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 9-6

Figure 9-64. TRANS. RESPONSE Menu – Trans. Freq. Resp. Cal. – Typical Example (2 of 2)

TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/R – Coaxial) Dialog Box

Full Name

- Transmission Frequency Response Calibration Setup Dialog Box

Prerequisites

- Cal Method = SOLT/SOLR
- Line Type = Coaxial

Previous

- TRANS. RESPONSE Menu on page 9-115
- CAL SETUP Menu on page 9-69

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/R, COAXIAL) Dialog Box

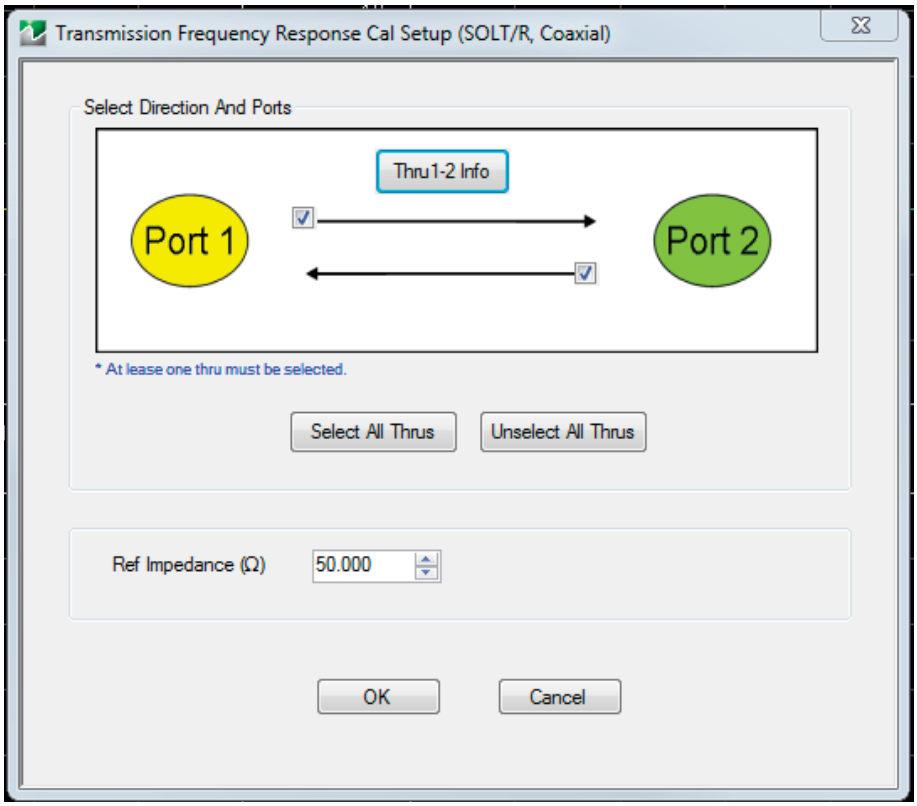


Figure 9-65. TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Select Direction And Ports

Select any combination of the two available throughs. 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.

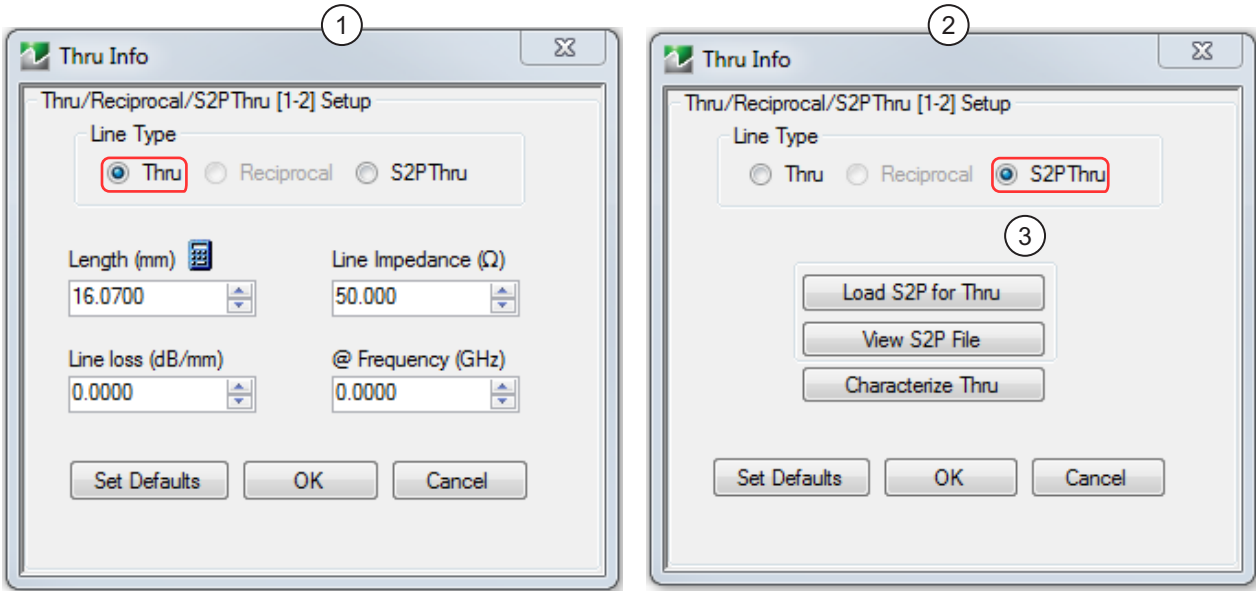


Figure 9-66. Thru Info

- The THRU INFO dialog box is described above in "THRU INFO Dialog Box" on page 9-136

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 9-132.

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 9-5. Manual Calibration – Trans. Freq. Resp. Cal. Setup Dialog Box Contents (1 of 2)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/R Coaxial	See full description above at "TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/R – Coaxial) Dialog Box" on page 9-118. Select Direction and Ports: Port 1, Port 2, Port 1 and Port 2 Reference Impedance (Ohms)
SOLT/R Non-Dispersive	Same controls and functions as SOLT/R Coaxial.
SOLT/R Waveguide	Same controls and functions as SOLT/R Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box.
SOLT/R Microstrip	Same controls and functions as SOLT/R 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 9-134
SSLT Coaxial	Same controls and functions as SOLT/R Coaxial above.
SSLT Non-Dispersive	Same controls and functions as SOLT/R Coaxial above.
SSLT Waveguide	Same controls and functions as SOLT/R 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 9-134
SSLT Microstrip	Same controls and functions as SOLT/R 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 9-134
SSST Coaxial	Same controls and functions as SOLT/R Coaxial above.
SSST Non-Dispersive	Same controls and functions as SOLT/R Coaxial above.
SSST Waveguide	Same controls and functions as SOLT/R Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box.

Table 9-5. Manual Calibration – Trans. Freq. Resp. Cal. Setup Dialog Box Contents (2 of 2)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSST Microstrip	Same controls and functions as SOLT/R 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 9-134
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	

9-15 Manual Cal – Refl. Freq. Resp. Cal Menus

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, and LINE TYPE menus, and in the associated dialog boxes that appear from the Edit Cal Params button.

Full Name

- Reflection Frequency Response Calibration Menu

Menu Name

- REFL. RESPONSE

Button Name

- Reflection Freq. Response

REFL. RESPONSE Menu

Full Name

- Reflection Response Menu

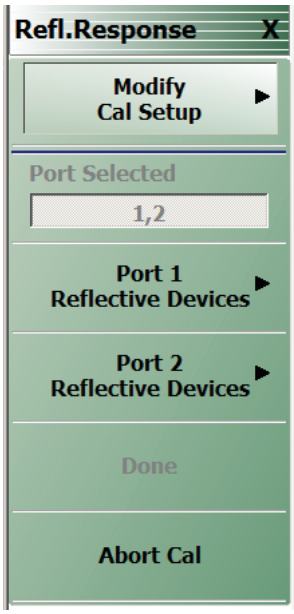
  The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant REFLECTION FREQUENCY REPONSE CAL SETUP dialog box. A representative menu is shown below. There is one example procedure of a Refl. Response calibration in this chapter.

Previous

- MANUAL CAL Menu on page 9-68

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 9-69

A typical reflection frequency response calibration dialog box is available at:

- "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-125

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 9-128

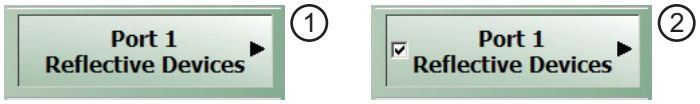
Port Selected

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 9-67. 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 9-6 **Abort Cal** Select aborts the current calibration and returns to the CALIBRATION menu. • CALIBRATION [TR] Menu on page 9-6

Figure 9-67. REFL. RESPONSE Menu – Refl. Freq. Resp. Cal. – Typical Example (2 of 2)

REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Prerequisites

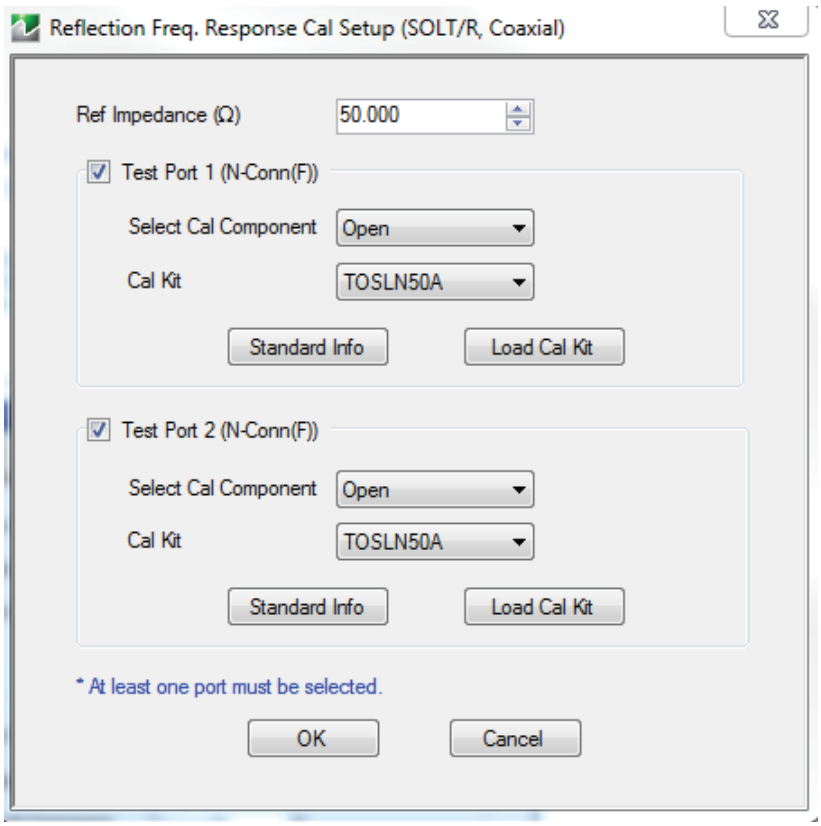
- Cal Method = SOLT/SOLR
- Line Type = Coaxial

Previous

- REFL. RESPONSE Menu on page 9-122
- CAL SETUP Menu on page 9-69

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/R, COAXIAL) Dialog Box



REFLECTION FREQUENCY RESPONSE CALIBRATION SETUP Dialog Box

Figure 9-68. REFL. FREQ. RESP. CAL SETUP (SOLT/R, COAXIAL) 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 **DUT Connector Type** from a drop-down menu list with options of:

- 0.8 mm-Conn (M)
- 0.8 mm-Conn (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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 1 Connector Standard Info Button

Select displays the STANDARD INFO (SOLT/R) 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/R) 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 9-6. Manual Calibration – Reflection Frequency Response Cal Setup (1 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/R **Coaxial**	See the full description above "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-125 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 9-134\
SOLT/R **Non-Dispersive**	Same controls and functions as SOLT/R Coaxial above.
SOLT/R **Waveguide**	Same controls and functions as SOLT/R Coaxial 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 9-140
SOLT/R **Microstrip**	Same controls and functions as SOLT/R 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 selected microstrip kit. • Typical "STANDARD INFO Dialog Box" on page 9-134
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 9-134
SSLT **Non-Dispersive**	Same controls and functions as SSLT Coaxial above.

Table 9-6. Manual Calibration – Reflection Frequency Response Cal Setup (2 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSLT Waveguide	See the full description above Same controls and functions as SSLT Coaxial above with the following changes: Waveguide Kit: WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, 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 9-142
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 9-134
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 9-134
SSST Non-Dispersive	Same controls and functions as SSST Coaxial above.
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 9-134

Table 9-6. Manual Calibration – Reflection Frequency Response Cal Setup (3 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
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	

9-16 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 9-132
- "STANDARD INFO Dialog Box" on page 9-134
- "THRU INFO Dialog Box" on page 9-136
- "USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs" on page 9-138

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/R, COAXIAL) Dialog Box" on page 9-77
  - "TWO PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box – 2-Port VNA" on page 9-85
  - "ONE-PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-104
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box" on page 9-51.
  - "MODIFY 2-PORT AUTOCAL SETUP Dialog Box" on page 9-56

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 Conversion Dialog Box

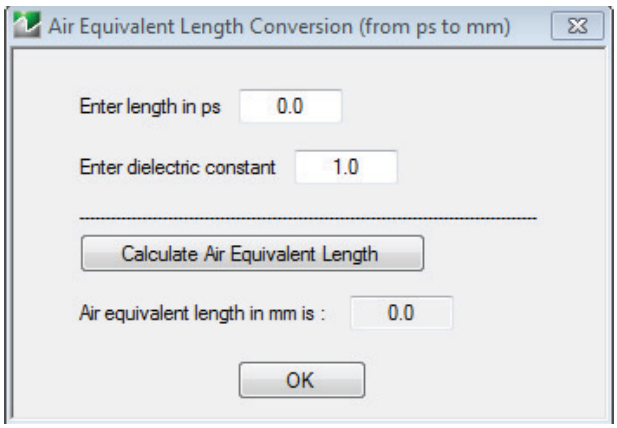


Figure 9-69. AIR EQUIVALENT LENGTH CONVERSION (FROM PS TO MM) Dialog Box

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 9-136
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/R, COAXIAL) Dialog Box" on page 9-104
  - "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 9-77

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/R, COAXIAL) | DUT Connector = N-Conn(M) | Standard Info button | STANDARD INFO (SOLT/R) Dialog Box

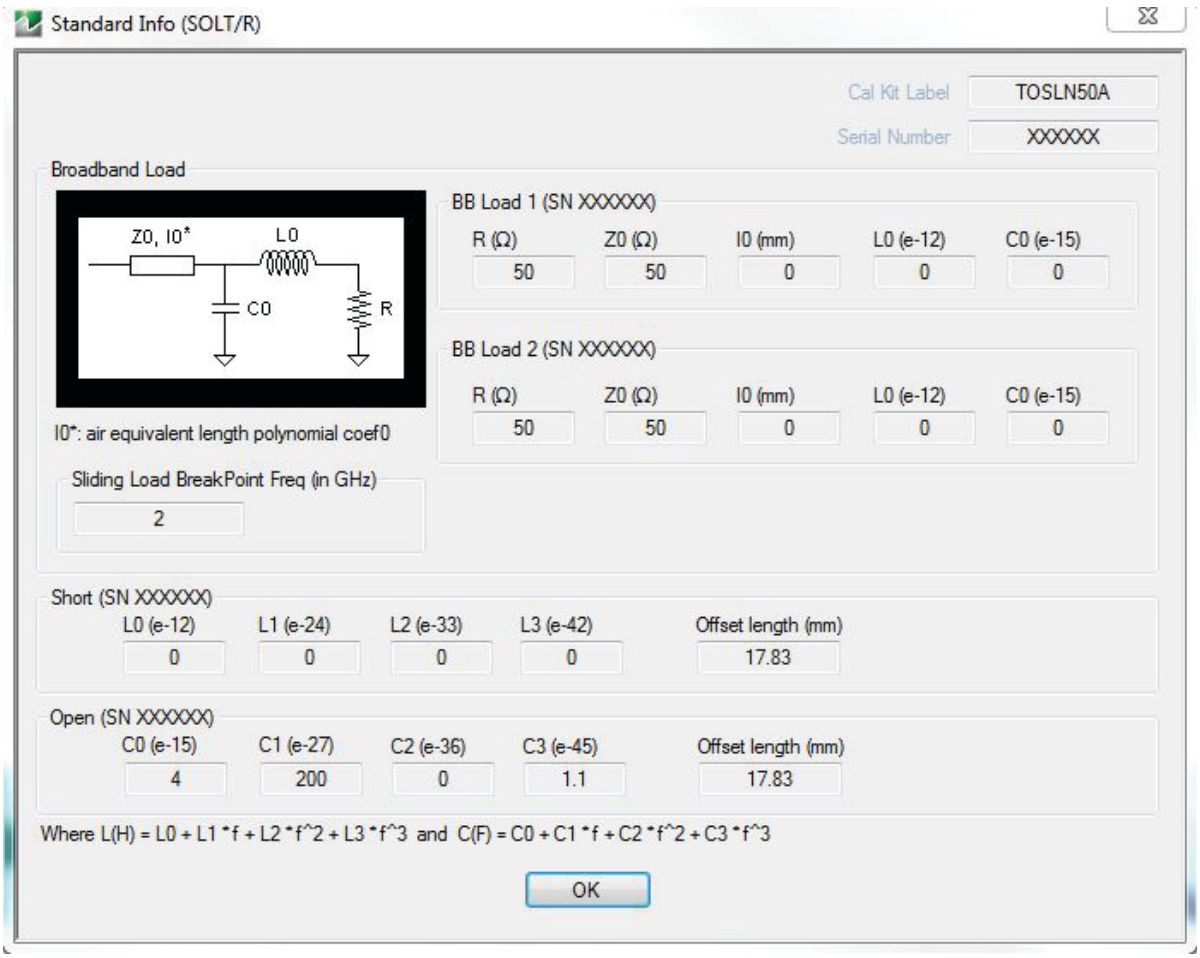


Figure 9-70. STANDARD INFO (SOLT/R) Dialog Box

The read-only dialog box provides the calibration parameters for the selected connector and calibration method.

THRU INFO Dialog Box

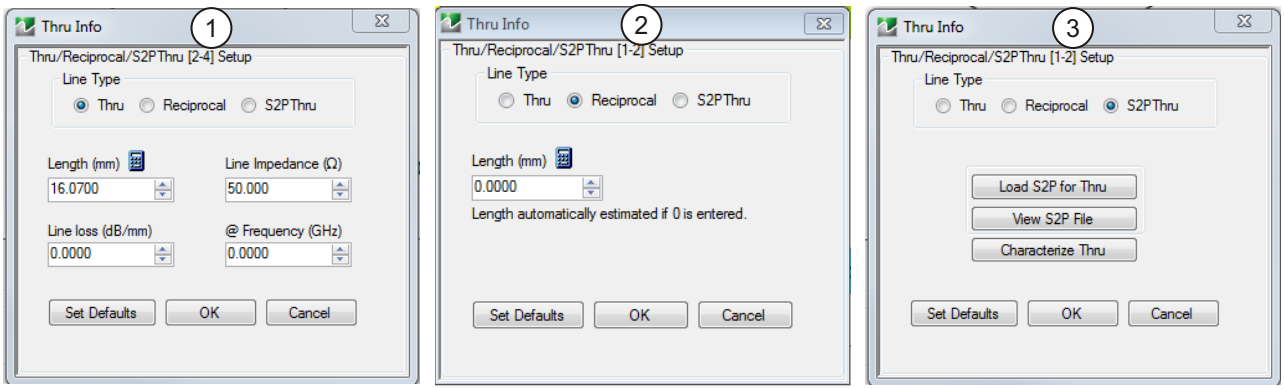
Use the THRU INFO dialog to update the thru information for most calibration types. The dialog includes access to the AIR EQUIVALENT LENGTH CONVERSION dialog box to speed configuration.

Previous

- The THRU INFO dialog box can be accessed from multiple locations.
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box" on page 9-51.
  - "MODIFY 2-PORT AUTOCAL SETUP Dialog Box" on page 9-56

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Thru Update | THRU | Define Thru/Reciprocal | Thru Info Dialog Box



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

Figure 9-71. THRU INFO Dialog Box – AutoCal Two Port Calibration

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 9-132
  - 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 9-132
- **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.

USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs

Prerequisites

- Calibration Method = LRL/LRM
- 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 – 2-Port VNA" on page 9-85

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 MATCH DEVICES Dialog Box

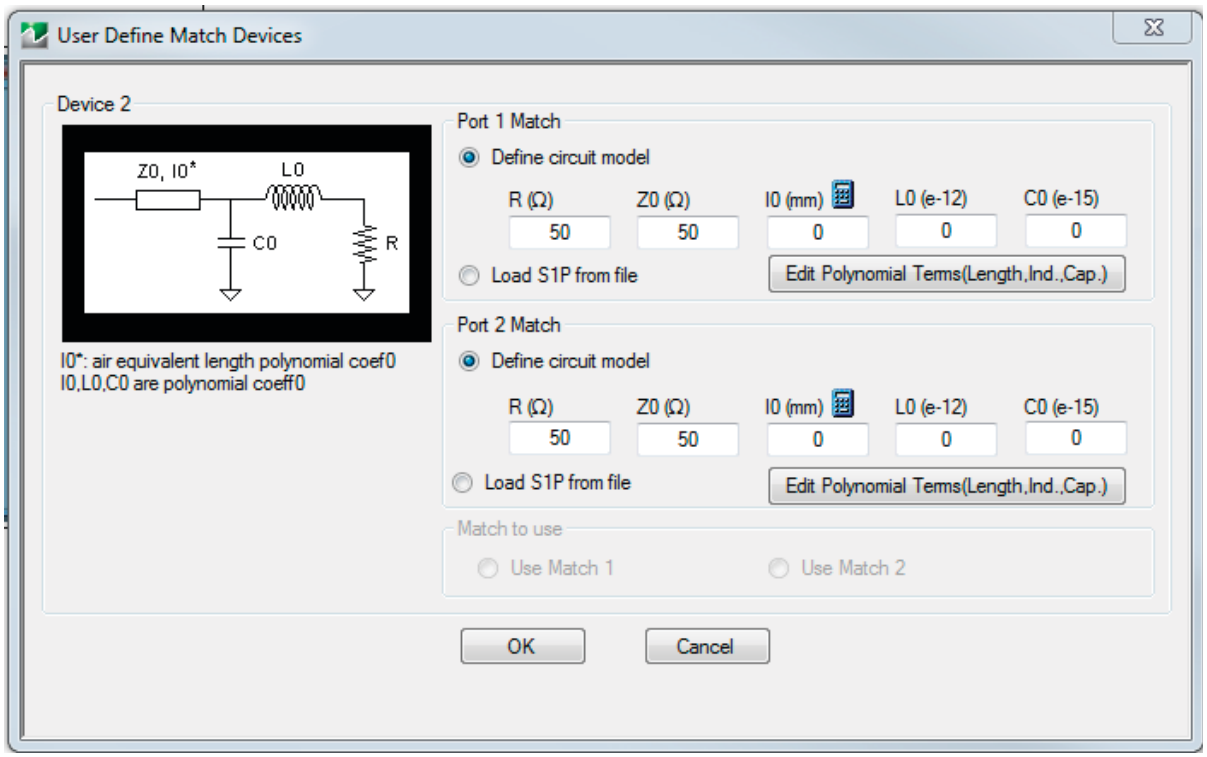


Figure 9-72. USER DEFINED MATCH DEVICES Dialog Box – 2-Port VNAs

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 9-132
- 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 9-142.

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

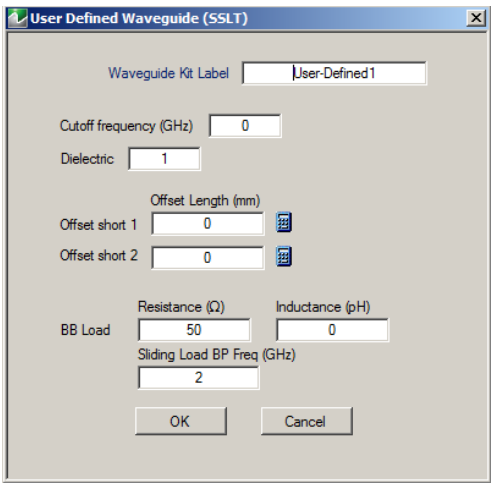


Figure 9-73. USER DEFINED WAVEGUIDE Dialog Box

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 9-132

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 9-132

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 9-140.

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, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229 | Waveguide Info button | WAVEGUIDE Dialog Box

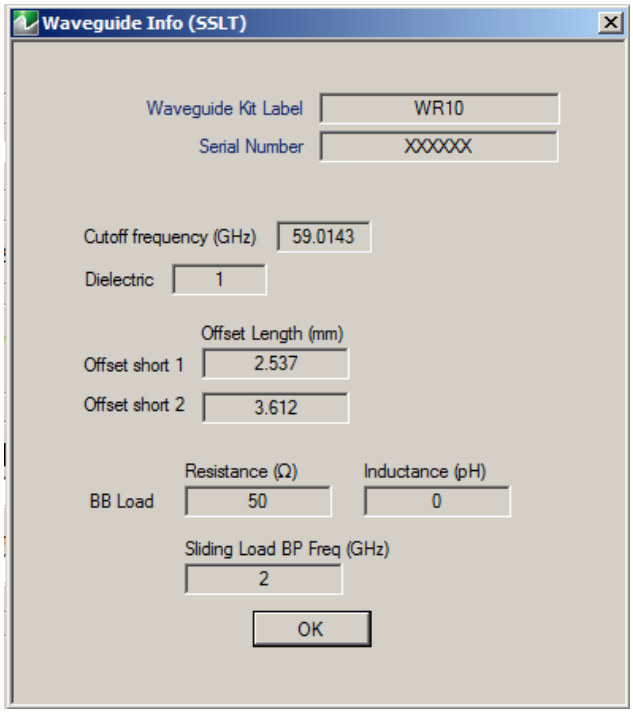


Figure 9-74. WAVEGUIDE INFO Dialog Box

Description

The read-only WAVEGUIDE INFO dialog box provides the calibration parameters for the WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229 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 10 — Calibration Menus: 4-Port VNAs

10-1 Chapter Overview

This chapter describes the menus used when calibrating 4-Port ShockLine VNAs. Chapter organization follows the flows in the progressions of menus and dialog boxes for calibration control. Representative examples of dialogs are shown. Dialog appearance changes dynamically depending on based on the combination of instrument calibration ports, AutoCal, manual calibration, calibration methods, line types, and connectors.

10-2 Listing of Calibration Menus (4-Port VNA)

This section covers all calibration menu types for a 4-port VNA, including:

- 1-port, 2-port, 3-port, and 4-port calibration
- AutoCal and Manual cal
- Calibration utilities and support menus

These links connect to the calibration menus organized by function and type of calibration:

Primary Calibration Menus

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7
- CALIBRATE Menu – 4-Port VNAs on page 10-9
- THRU UPDATE Menu – 4-Port VNAs on page 10-11

Calibration Utility Functions

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

- CAL OPTIONS Menu – 4-Port VNAs on page 10-14
  - "MANUAL ADAPTER REMOVAL Dialog Box – 4-Port VNAs" on page 10-62
- CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68
  - "SAVE (Cal Kit) Dialog Box – 4-Port VNAs" on page 10-70
  - "CAL KIT INFO Dialog Box – 4-Port VNAs" on page 10-72
  - "RESTORE DEFAULT COEF. Dialog Box – 4-Port VNAs" on page 10-74
- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x VNAs (No Option 24)" on page 10-16
  - "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17
  - "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (No Option 24)" on page 10-19
  - "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20
  - Network Extraction — Type A–G Dialog Boxes
    - "NETWORK EXTRACTION Dialog Box – Type A" on page 10-22
    - "NETWORK EXTRACTION Dialog Box – Type B – Full Standards" on page 10-24
    - "NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)" on page 10-26

- "NETWORK EXTRACTION Dialog Box – Type C" on page 10-31
- "NETWORK EXTRACTION Dialog Box – Type D (No Option 24)" on page 10-33
- "NETWORK EXTRACTION Dialog Box – Type D – Multi-Standards (Option 24)" on page 10-35
- "NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)" on page 10-38
- "NETWORK EXTRACTION Dialog Box – Type E" on page 10-40
- "NETWORK EXTRACTION Dialog Box – Type F (No Option 24)" on page 10-42
- "NETWORK EXTRACTION Dialog Box – Type F – Multi-Standards (Option 24)" on page 10-44
- "NETWORK EXTRACTION Dialog Box – Type F – Phase-Localized (Option 24)" on page 10-47
- "NETWORK EXTRACTION Dialog Box – Type G (No Option 24)" on page 10-50
- "NETWORK EXTRACTION Dialog Box – Type G – Multi-Standards (Option 24)" on page 10-52
- "NETWORK EXTRACTION Dialog Box – Type G – Phase-Localized (Option 24)" on page 10-55
- "NETWORK EXTRACTION Dialog Box – Type G – Phase-Localized (Option 24)" on page 10-55
- "NETWORK EXTRACTION Dialog Box – Type G – Phase-Localized High Crosstalk (Option 24)" on page 10-58

- "SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 10-60

AutoCal/SmartCal Setup Menu

The main AutoCal/SmartCal setup menu is:

- AUTOCAL/SMARTCAL Menu – 4-Port VNAs on page 10-76

AutoCal 4-Port Calibration on 4-Port VNA

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76
  - "MODIFY 4-PORT SMARTCAL SETUP Dialog Box" on page 10-79

AutoCal 2-Port Calibration on 4-Port VNA

- "SMARTCAL SETUP Menu – 2-Port Cal – 4-Port VNAs" on page 10-87
  - "MODIFY 2-PORT SMARTCAL SETUP Dialog Box" on page 10-89

AutoCal 1-Port Calibration on 4-Port VNA

- "SMARTCAL SETUP Menu – 1-Port Cal – 4-Port VNAs" on page 10-97
  - "MODIFY 1-PORT SMARTCAL SETUP Dialog Box – 4-Port VNAs" on page 10-98

Manual Calibration Configuration on 4-Port VNA

Basic method: Once a calibration type is selected in the MANUAL CALIBRATION menus, the following menus are used to set up the calibration method and line type. The settings in these menus define which dialog boxes will be available and the procedural menus that will appear for the specified calibration parameters:

- MANUAL CAL Menu – 4-Port VNAs on page 10-106
- CAL SETUP Menu – 4-Port VNAs on page 10-108
- CAL METHOD Menu – 4-Port VNA on page 10-110
- LINE TYPE Menu – 4-Port VNA on page 10-111

Manual 4-Port Calibration on 4-Port VNA

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
  - "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117
  - "FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-120
  - "FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-123
  - "FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box" on page 10-125
  - "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127
  - "FULL FOUR PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 10-132
  - THRU Menu – 4-Port VNAs on page 10-146
  - Summary Table:
    - Table 10-4, "Manual 4-Port Cal Setup Dialog Box Summary" on page 10-136

Manual 3-Port Calibration on 4-Port VNA

- THREE PORT CAL Menu – 4-Port VNAs on page 10-150
  - "THREE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-159
  - "THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box" on page 10-153
  - "THREE PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-156
  - "THREE PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-162
  - "THREE PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 10-166
  - Summary Table:
    - Table 10-5, "Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs" on page 10-171

Manual 2-Port Calibration on 4-Port VNA

- TWO PORT CAL Menu – 4-Port VNAs on page 10-177
  - "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-179
  - "TWO PORT CAL SETUP (SOLT/SOLR, MICROSTRIP) Dialog Box" on page 10-182
  - "TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 10-187
  - Summary Table:
    - Table 10-6, "Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs" on page 10-190

Manual 1-Port Calibration on 4-Port VNA

- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195
  - "ONE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-196
  - "ONE PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-200
  - "ONE PORT CAL SETUP (SSLT, WAVEGUIDE) Dialog Box" on page 10-202
  - Summary Table:
    - Table 10-7, "Manual Calibration – 1-PORT CALIBRATION SETUP Dialog Box Contents – 4-Port VNAs" on page 10-204

Manual Transmission Frequency Response on 4-Port VNA

- TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207
  - "TRANSMISSION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 10-209
  - "TRANS. FREQ. RESP. CAL SETUP (SSLT, WAVEGUIDE) Dialog Box" on page 10-211
  - "TRANS. FREQ. RESP. CAL SETUP (SSST, MICROSTRIP) Dialog Box" on page 10-213
  - Summary Table:
    - "Trans. Freq. Resp. Manual Cal Setup Dialog Box Contents – 4-Port VNAs" on page 10-215

Manual Reflection Frequency Response Calibration on 4-Port VNA

- REFL. RESPONSE Menu – 4-Port VNAs on page 10-216
  - "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-218
  - "REFL. FREQ. RESP. CAL SETUP (SSLT, MICROSTRIP) Dialog Box" on page 10-220
  - "REFL. FREQ. RESP. CAL SETUP (SSST, WAVEGUIDE) Dialog Box" on page 10-222
  - Summary Table:
    - Table 10-9, "Refl. Freq. Resp. Manual Cal. Setup Dialog Box Contents – 4-Port VNAs" on page 10-224

Manual Calibration General Dialog Boxes on 4-Port VNA

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 Dialog Box" on page 10-226
- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
- "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229
- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237
- "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

10-3 Primary Menus for 4-Port VNA Calibration

The menus shown below provide access to all 4-Port VNA calibration functions. From the AUTOCAL menu (below at #6), additional menus and dialog boxes provide configuration and setup for the 4-Port, 2-Port, and 1-Port AutoCal calibration procedures. From the MANUAL CAL menu (below at #7), additional menus and dialog boxes provide configuration and setup for the manual calibration 4-Port, 3-Port, 2-Port, 1-Port, Transmission Frequency Response, and Reflection Frequency Response procedures.

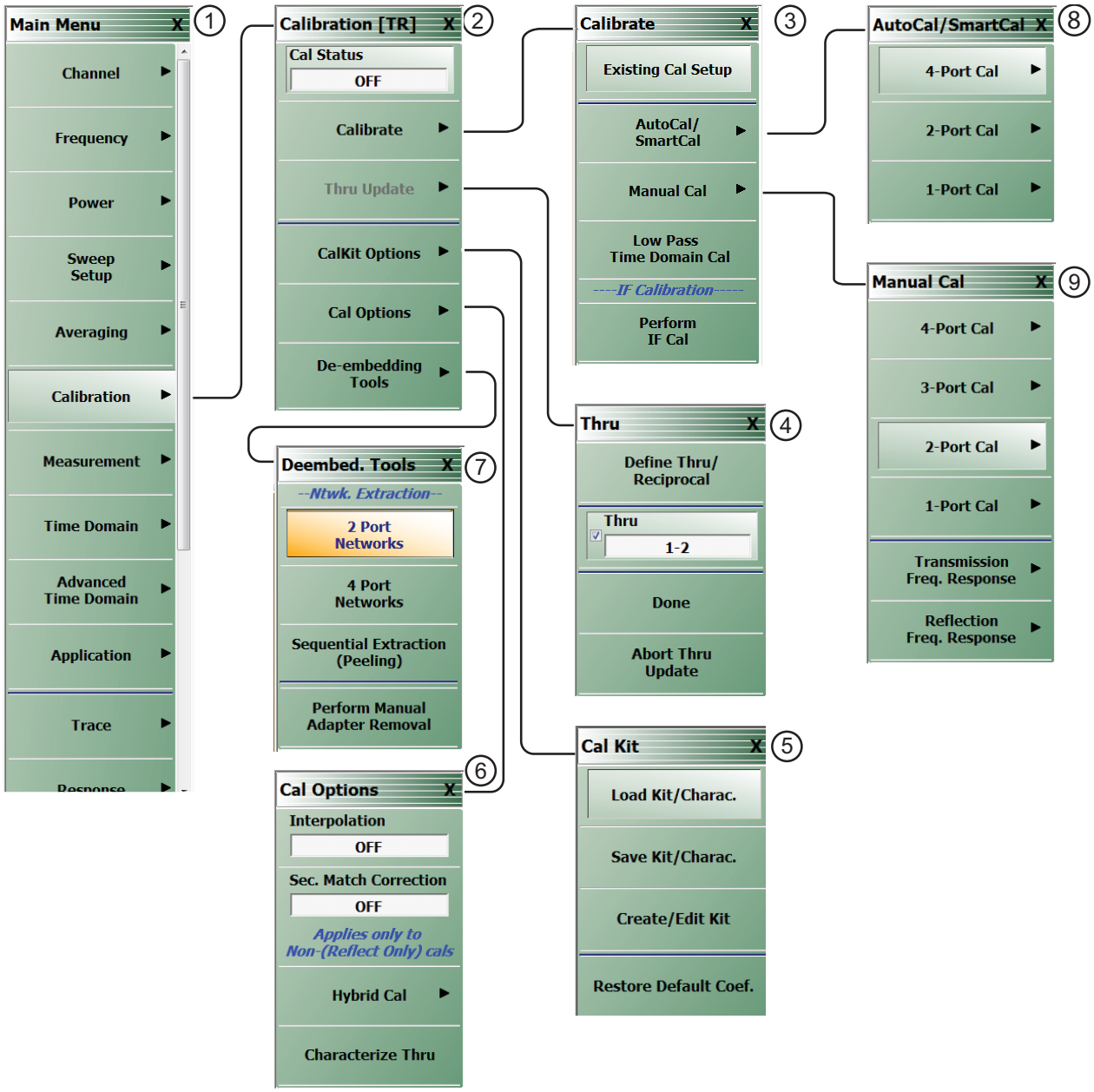


Figure 10-1. Primary Menus for 4-Port VNA Calibration (1 of 2)

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

Figure 10-1. Primary Menus for 4-Port VNA Calibration (2 of 2)

CALIBRATION [TR] Menu – 4-Port VNAs

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

Full Name

- Calibration [Transmission-Response] Menu

The name of the CALIBRATION menu is appended with [TR] for transmission/reflection operational mode.

Prerequisites

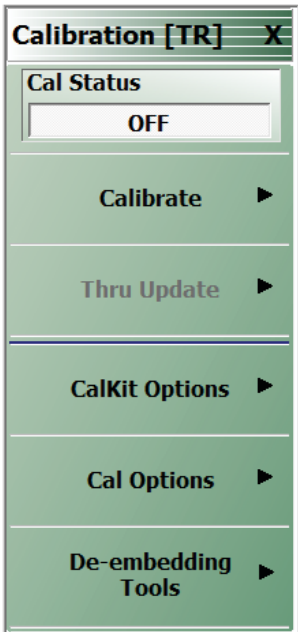
- The VNA is in 4-Port mode.
- The VNA is equipped with a Multiport Test Set.
- Availability of the Thru Update button on the CALIBRATION [TR] menu requires successful completion of a full 4-Port, 3-Port, 2-Port, or 1 Path-2 Port calibration.

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Calibration | CALIBRATION



Cal Status

Select 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.

Availability of the Cal Status button results from selecting the Done button following completion of Thru calibrations on the THRU UPDATE menu. If the calibrations have not been performed, the Cal Status button is unavailable.

Calibrate

Select displays the CALIBRATE menu to begin 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.

- CALIBRATE Menu – 4-Port VNAs on page 10-9

Thru Update

Select displays the THRU UPDATE menu to perform Thru calibrations.

- THRU UPDATE Menu – 4-Port VNAs on page 10-11

Cal Kit Options

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

- CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68

Figure 10-2. CALIBRATION Menu – 4-Port VNAs (1 of 2)

	Cal Options Select displays the CAL OPTIONS menu to add interpolated measurement points and perform manual adapter removal after calibration completion. • CAL OPTIONS Menu – 4-Port VNAs on page 10-14 **De-embedding Tools** Select displays the DEEMBED. TOOLS menu to perform network extraction, sequential extraction, and manual adapter removal. • DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

Figure 10-2. CALIBRATION Menu – 4-Port VNAs (2 of 2)

CALIBRATE Menu – 4-Port VNAs

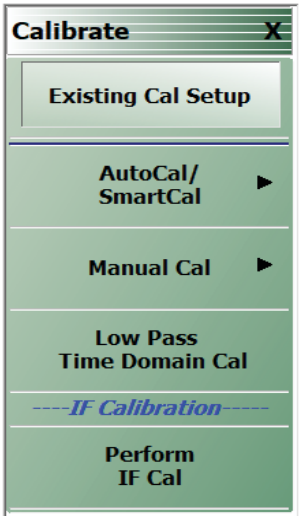
The CALIBRATE menu initiates the manual calibration process with the selection of calibration parameters, calibration types, calibration methods, line types, and test port connectors.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

Navigation

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



Existing Cal Setup

Displays the setups that were used during the current calibrations, whether an AutoCal, SmartCal, or manual calibration.

AutoCal/SmartCal

Select displays the AutoCal/SmartCal menu.

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

Manual Cal

Select displays the Manual Cal menu.

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

----IF Calibration----

Perform IF Cal

Select displays the IF CALIBRATION dialog box.

Figure 10-3. CALIBRATE Menu – 4-Port VNAs

IF CALIBRATION Dialog Box

Previous

- CALIBRATE Menu – 4-Port VNAs on page 10-9

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Perform IF Cal | IF CALIBRATION dialog box

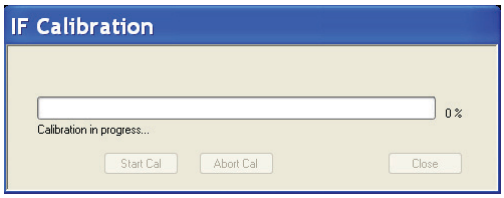


Figure 10-4. IF CALIBRATION Dialog Box

Instructions

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

THRU UPDATE Menu – 4-Port VNAs

The THRU UPDATE menu provides completion buttons for Thru calibrations. When a Thru calibration is complete, the button displays a completion checkmark.

Prerequisites

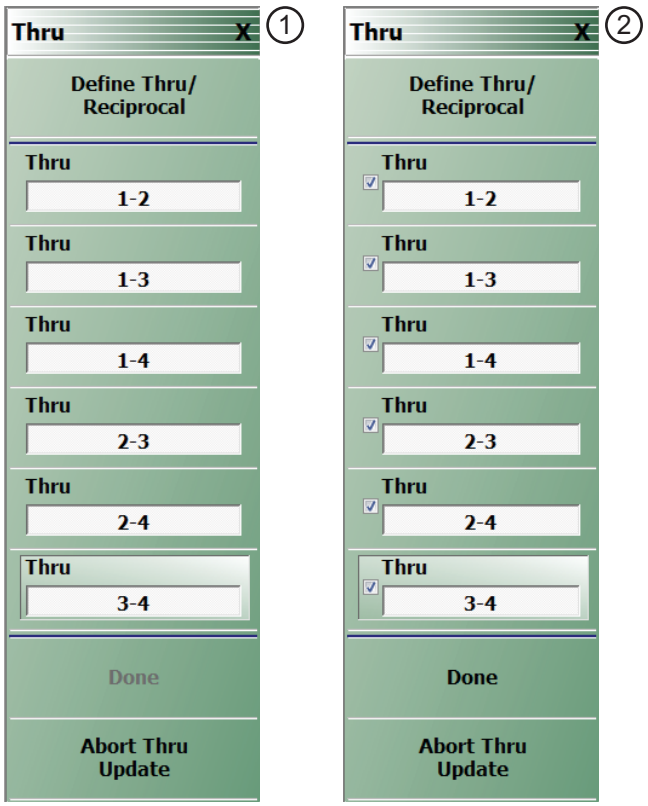
- To enable the Thru Update button on the MANUAL CALIBRATION menu, a Full 4-Port, Full 3-Port, Full 2-Port, or a 1 Path-2 Port calibration must first be successfully completed.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Thru Update | THRU UPDATE



1. Initial display of THRU UPDATE calibration menu with Done button unavailable.	2. All THRU calibrations completed with Done button available.

Figure 10-5. THRU UPDATE Calibration Menu – 4-Port VNAs

Define Thru/Reciprocal

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

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Thru

Select to calibrate Thru connection. The number of Thru connection buttons displayed on the menu corresponds to the number of ports selected during setup. A 4-Port calibration requires calibrating all possible thru connections (1-2, 1-3, 1-4, 2-3, 2-4, and 3-4) as illustrated in Figure 10-5.

Done

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

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Abort Thru Update

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

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

10-4 Calibration Utility Functions

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

- CAL OPTIONS Menu – 4-Port VNAs on page 10-14
  - "MANUAL ADAPTER REMOVAL Dialog Box – 4-Port VNAs" on page 10-62
- CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68
  - "LOAD (Cal Kit) Dialog Box – 4-Port VNAs" on page 10-69
  - "SAVE (Cal Kit) Dialog Box – 4-Port VNAs" on page 10-70
  - CREATE/EDIT KIT: "CAL KIT INFO Dialog Box – 4-Port VNAs" on page 10-72
  - "RESTORE DEFAULT COEF. Dialog Box – 4-Port VNAs" on page 10-74

CAL OPTIONS Menu – 4-Port VNAs

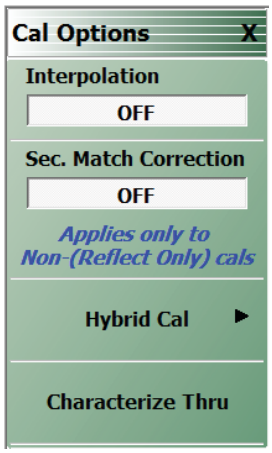
The CAL OPTIONS menu provides control for use of interpolation and procedure for manual adapter removal.

Previous

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Navigation

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



Interpolation (OFF/ON)

Select toggles interpolation OFF and ON with a default OFF state.

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 (OFF/ON)

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

Hybrid calibration takes either up to four 1-port cals and hybridizes them into a 2-port, 3-port, or 4-port cal, or takes two 2-port cals and hybridizes them into one 4-port cal.

- HYBRID CAL Menu – 4-Port VNAs on page 10-65 .

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 calibration.

- “THRU CHARACTERIZATION Dialog Box” on page 10-64

Figure 10-6. CAL OPTIONS (CALIBRATION OPTIONS) Menu

DEEMBED. TOOLS Menu – 4-Port VNAs

The DEEMBED. TOOLS (De-embedding Tools) menu provides control for use of interpolation and procedure for manual adapter removal.

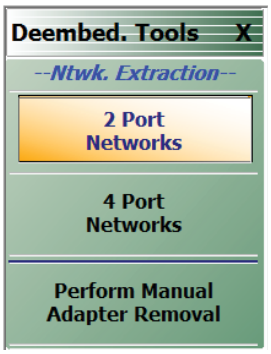
Previous

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

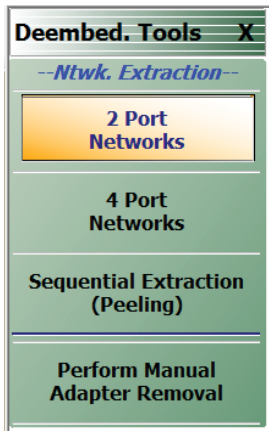
Navigation

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

Without Option 24



With Option 24



Network Extraction

2 Port Networks

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. Select displays the NETWORK EXTRACTION dialog box.

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x VNAs (No Option 24)" on page 10-16
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17

4 Port Networks

Network Extraction provides the means of generating SnP files of networks. The generated files can than 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 menus.

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (No Option 24)" on page 10-19
- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

Sequential Extraction (Peeling) — *Visible 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 10-60

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 – 4-Port VNAs" on page 10-62

Figure 10-7. DEEMBED TOOLS (De-embedding Tools) Menu

NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x 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

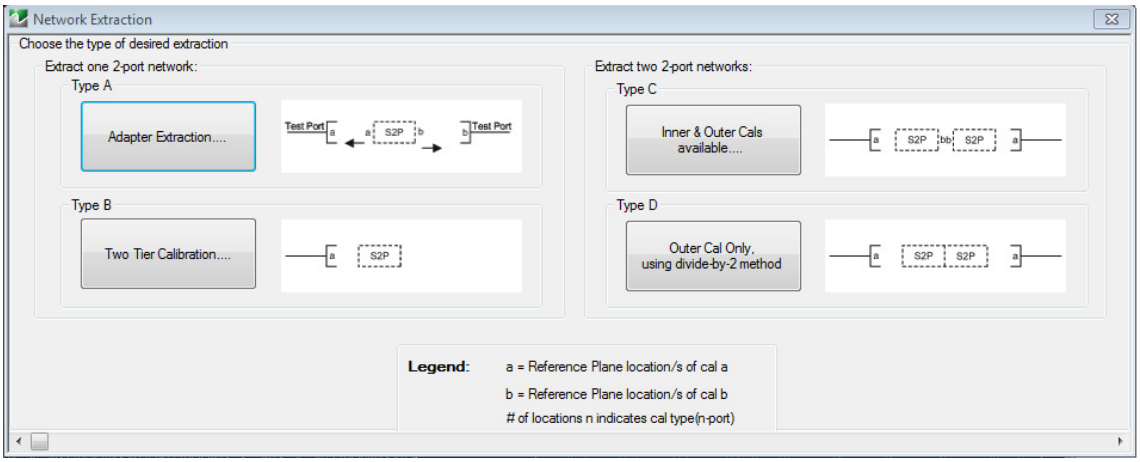
From DEEMBED. TOOLS | 2 Port Networks, open the corresponding Network Extraction dialog, which are explained with more detail in Table 10-1 on page 10-18.

Previous

- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

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 buttons below:

- Type A – Extract one 2-Port Network – Adapter Extraction: "NETWORK EXTRACTION Dialog Box – Type A" on page 10-22
- Type B – Extract one 2-Port Network – Two Tier Calibration: "NETWORK EXTRACTION Dialog Box – Type B – Full Standards" on page 10-24
- Type C – Extract two 2-Port Networks – Inner and Outer Cals Available: "NETWORK EXTRACTION Dialog Box – Type C" on page 10-31
- Type D – Extract two 2-Port Networks – Outer Cal Only using divided-by-2 method: "NETWORK EXTRACTION Dialog Box – Type D (No Option 24)" on page 10-33

Figure 10-8. NETWORK EXTRACTION Dialog Box (Without Option 24)

NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (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 10-1 on page 10-18.

Full Name

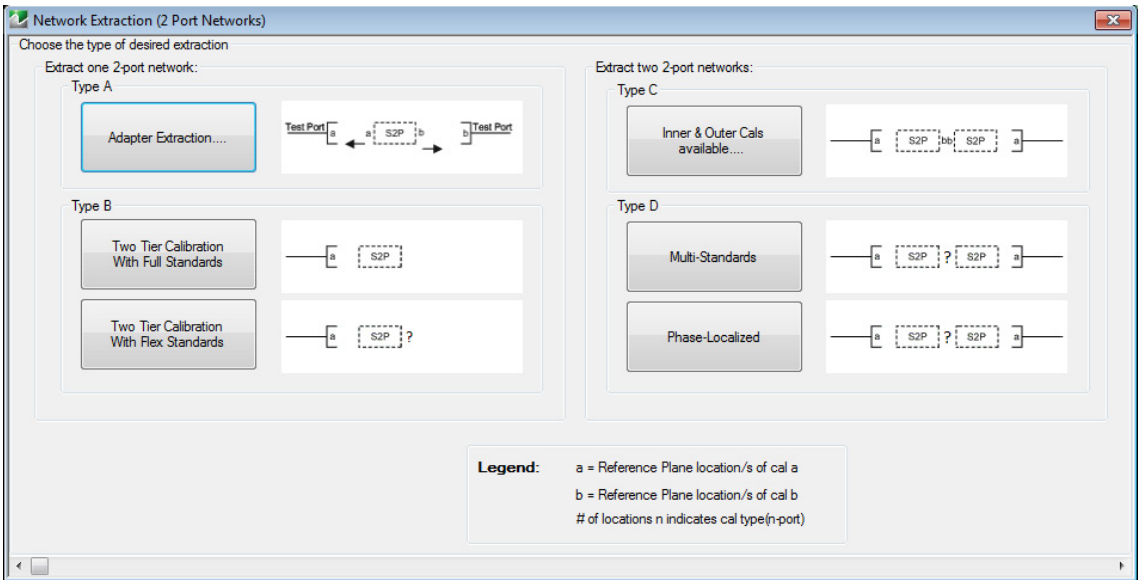
Network Extraction (2-Port Networks)

Previous

- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

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 10-9. 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 10-1. Network Extraction Type Definitions - 2-Port Networks

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 10-22
Type B	One 2-Port Network	Two Tier Calibration with Full Standards	"NETWORK EXTRACTION Dialog Box – Type B – Full Standards" on page 10-24
		Two Tier Calibration with Flexible Standards (Available only with Option 24)[a]	"NETWORK EXTRACTION Dialog Box – Type B – Flex Standards (Option 24)" on page 10-26
Type C	Two 2-Port Networks	Inner and Outer Cals Available	"NETWORK EXTRACTION Dialog Box – Type C" on page 10-31
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 10-33
		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 10-35
		Phase-Localized (Available only with Option 24)[a]	"NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized (Option 24)" on page 10-38
Sequential Extraction	–	Sequential Extraction (Peeling) (Available only with Option 24)[a]	"SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 10-60

a. For more information on Type B, Type D, and Sequential Extraction with Option 24 installed, refer to the Measurement Guide (10410-00753).

NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 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. Seven extractable network configurations are provided:

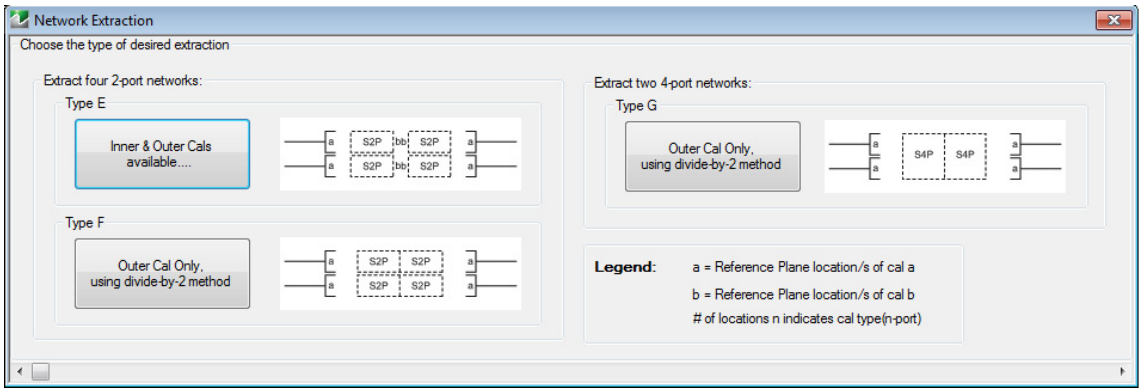
- Type E – Extract four (4) 2-Port Networks – Inner and Outer Cals Available
- Type F – Extract four (4) 2-Port Networks – Outer Cal Only using divided-by-2 method
- Type G – Extract two (2) 4-Port Networks – Outer Cal Only using divided-by-2 method

Previous

- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

Navigation

- MAIN | Calibration | CALIBRATION [TR] | De-embedding Tools | Deembed. Tools | *Ntwk. Extraction* – 4 Port Networks | NETWORK EXTRACTION Dialog Box



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

- Type E – Extract four (4) 2-Port Networks – Inner and Outer Cals Available – "NETWORK EXTRACTION Dialog Box – Type E" on page 10-40
- Type F – Extract four (4) 2-Port Networks – Outer Cal Only using divided-by-2 method – "NETWORK EXTRACTION Dialog Box – Type F (No Option 24)" on page 10-42
- Type G – Extract two (2) 4-Port Networks – Outer Cal Only using divided-by-2 method – "NETWORK EXTRACTION Dialog Box – Type G (No Option 24)" on page 10-50

Figure 10-10. NETWORK EXTRACTION Dialog Box

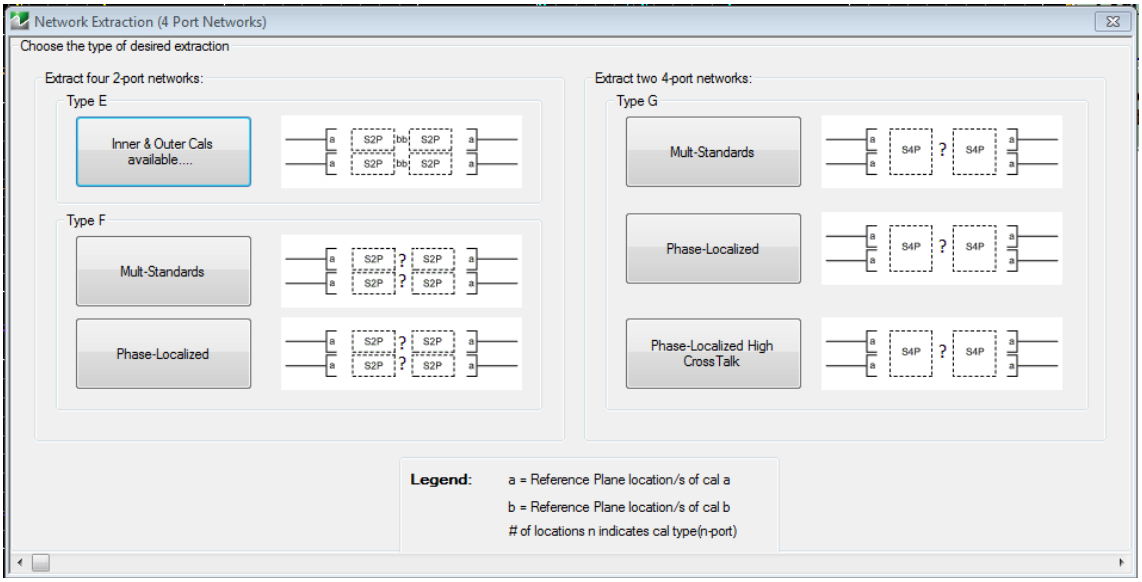
NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)

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. Previous

- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

Navigation

- MAIN | Calibration | CALIBRATION [TR] | De-embedding Tools | Deembed. Tools | *Ntwk. Extraction* – 4 Port Networks | NETWORK EXTRACTION Dialog Box



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

- Type E – Extract four (4) 2-Port Networks – Inner and Outer Cals Available
- Type F – Extract four (4) 2-Port Networks – Multi-Standards
- Type F – Extract four (4) 2-Port Networks – Phase-Localized
- Type G – Extract two (2) 4-Port Networks – Multi-Standards
- Type G – Extract two (2) 4-Port Networks – Phase-Localized
- Type G – Extract two (2) 4-Port Networks – Phase-Localized High Crosstalk

Figure 10-11. NETWORK EXTRACTION Dialog Box

Table 10-2. Network Extraction Type Definitions – 4-Port Networks – Option 24

Network Extraction Type	Extract These Networks	Extraction Method	Cross Reference to Dialog Box Description
Type E	Four 2-Port Networks	Inner and Outer Cals	"NETWORK EXTRACTION Dialog Box – Type E" on page 10-40
Type F	Four 2-Port Networks	Outer Cal only using Divide-by-Two Method	"NETWORK EXTRACTION Dialog Box – Type F (No Option 24)" on page 10-42
		Outer Cal only using Divide-by-Two Method (Multi-Standards)[a] (Available only with Option 24)	"NETWORK EXTRACTION Dialog Box – Type F – Multi-Standards (Option 24)" on page 10-44
		Phase-Localized[a] (Available only with Option 24)	"NETWORK EXTRACTION Dialog Box – Type F – Phase-Localized (Option 24)" on page 10-47
Type G	Two 4-Port Networks	Outer Cal only using Divide-by-Two Method	"NETWORK EXTRACTION Dialog Box – Type G (No Option 24)" on page 10-50
		Outer Cal only using Divide-by-Two Method (Multi-Standards)[a] (Available only with Option 24)	"NETWORK EXTRACTION Dialog Box – Type G – Multi-Standards (Option 24)" on page 10-52
		Phase-Localized[a] (Available only with Option 24)	"NETWORK EXTRACTION Dialog Box – Type G – Phase-Localized (Option 24)" on page 10-55
		Phase-Localized High Crosstalk[a] (Available only with Option 24)	"NETWORK EXTRACTION Dialog Box – Type G – Phase-Localized High Crosstalk (Option 24)" on page 10-58
Sequential Extraction	–	Sequential Extraction (Peeling)[a] (Available only with Option 24)	"SEQUENTIAL EXTRACTION Dialog Box (Option 24)" on page 10-60

a. For more information on Type F, Type G, and Sequential Extraction with Option 24 installed, refer to the MS4652xB Measurement Guide (10410-00753).

NETWORK EXTRACTION Dialog Box – Type A

Full Name

- Network Extraction [Extract One 2-Port Network (Type A)] Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x VNAs (No Option 24)" on page 10-16
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17

Navigation

- MAIN | Calibration | CALIBRATION [TR] | De-embedding Tools | Deembed. Tools | *Ntwk. Extraction* – 4 Port Networks | NETWORK EXTRACTION Dialog Box | Extract One 2-Port Network Extract One 2-Port Network | Type A – Adapter Extraction | NETWORK EXTRACTION [EXTRACT ONE 2-PORT NETWORK (TYPE A)] Dialog Box

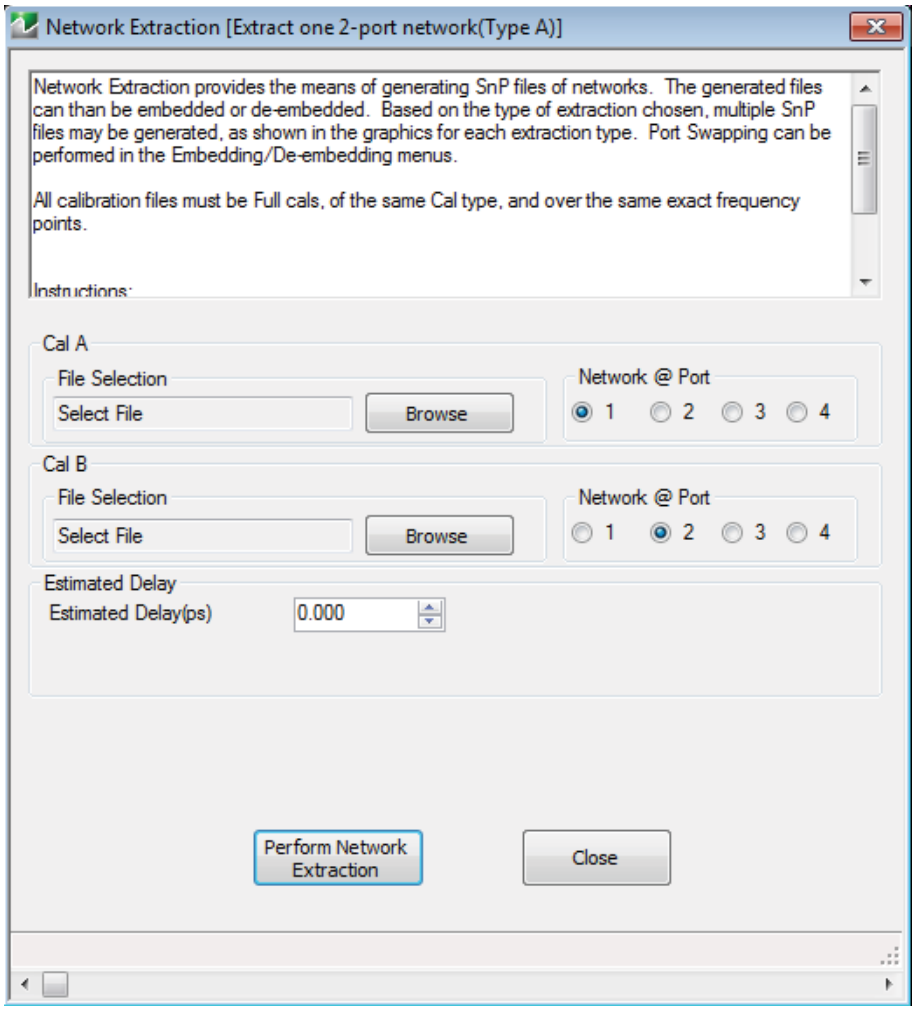


Figure 10-12. NETWORK EXTRACTION – EXTRACT ONE 2-PORT NETWORK – TYPE A

Description

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

Instructions

1. Use the Browse buttons 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 or files.
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 B – Full Standards

Full Name

- Network Extraction [Extract One 2-Port Network (Type B)] Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x VNAs (No Option 24)" on page 10-16
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17

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)] Dialog Box

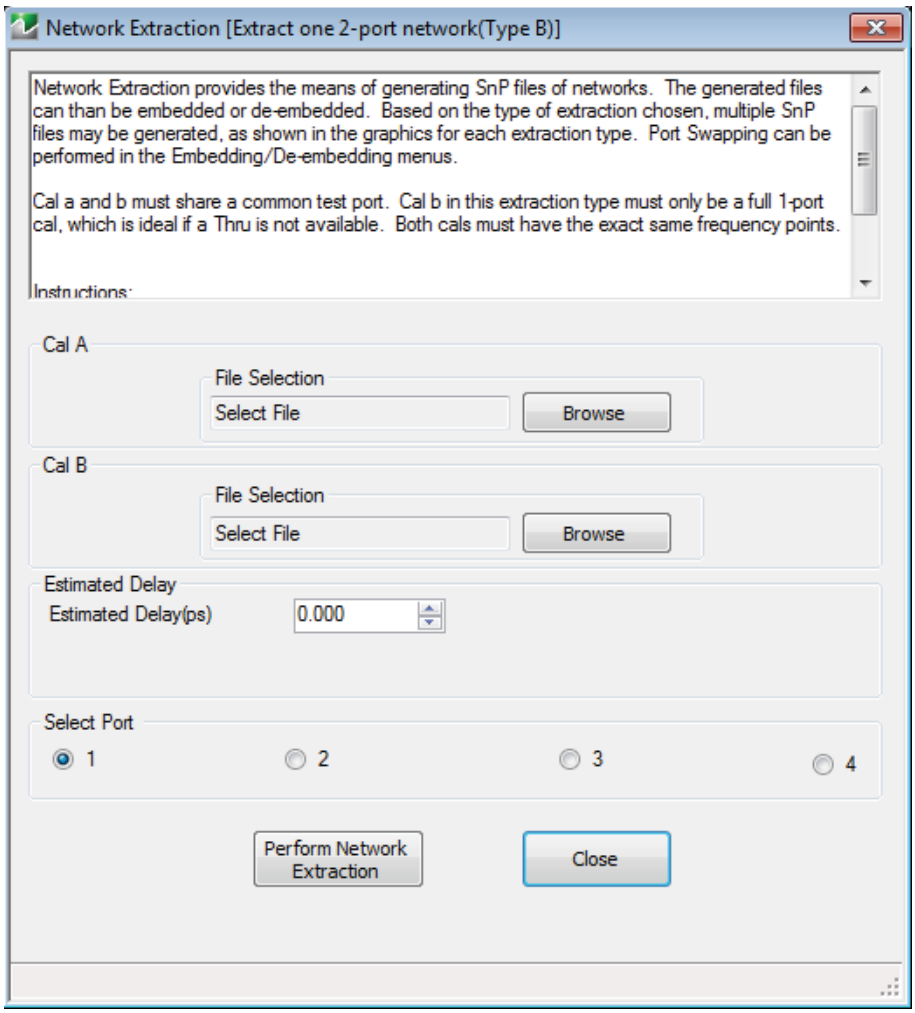


Figure 10-13. NETWORK EXTRACTION – EXTRACT ONE 2-PORT NETWORK – TYPE B

Instructions

Cal A and Cal B must share a common test port. Cal A 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.

Procedure

1. Use the Browse button to select the appropriate cal file(s).
2. If necessary, enter 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 .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 Networks – MS4652x (Option 24)" on page 10-17

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)]

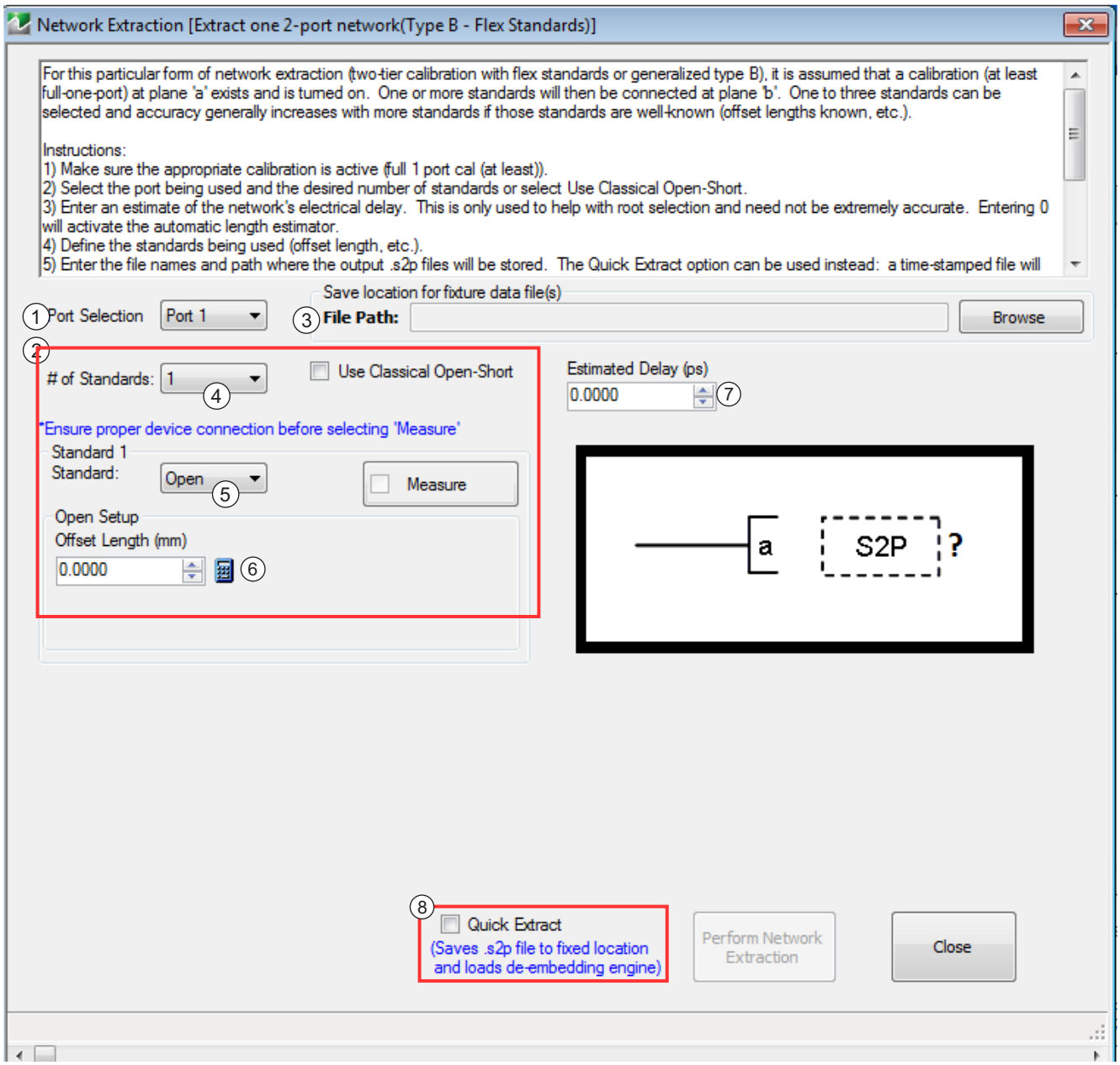
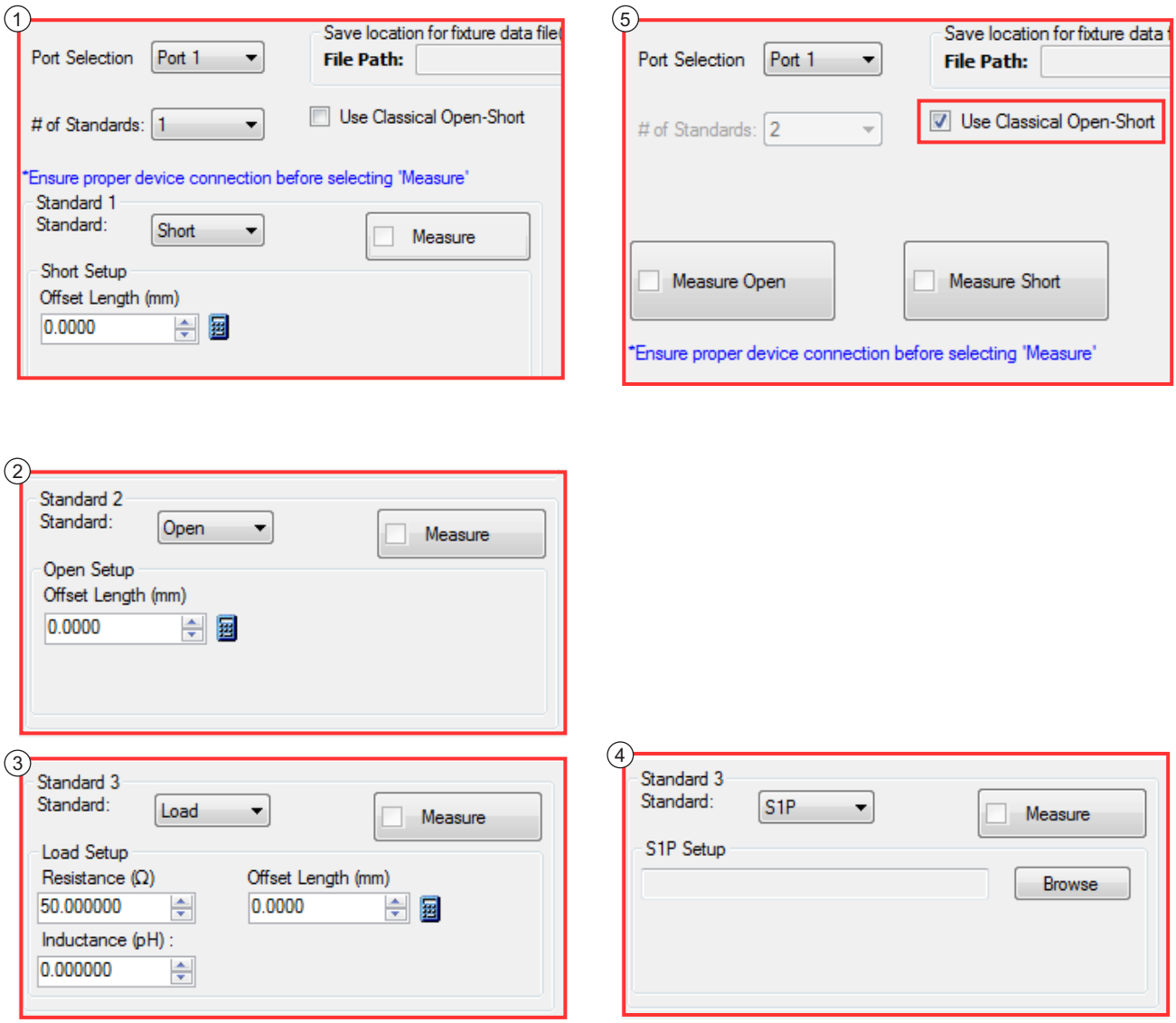


Figure 10-14. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration With Flex Standards (1 of 2)

Default view shown above.

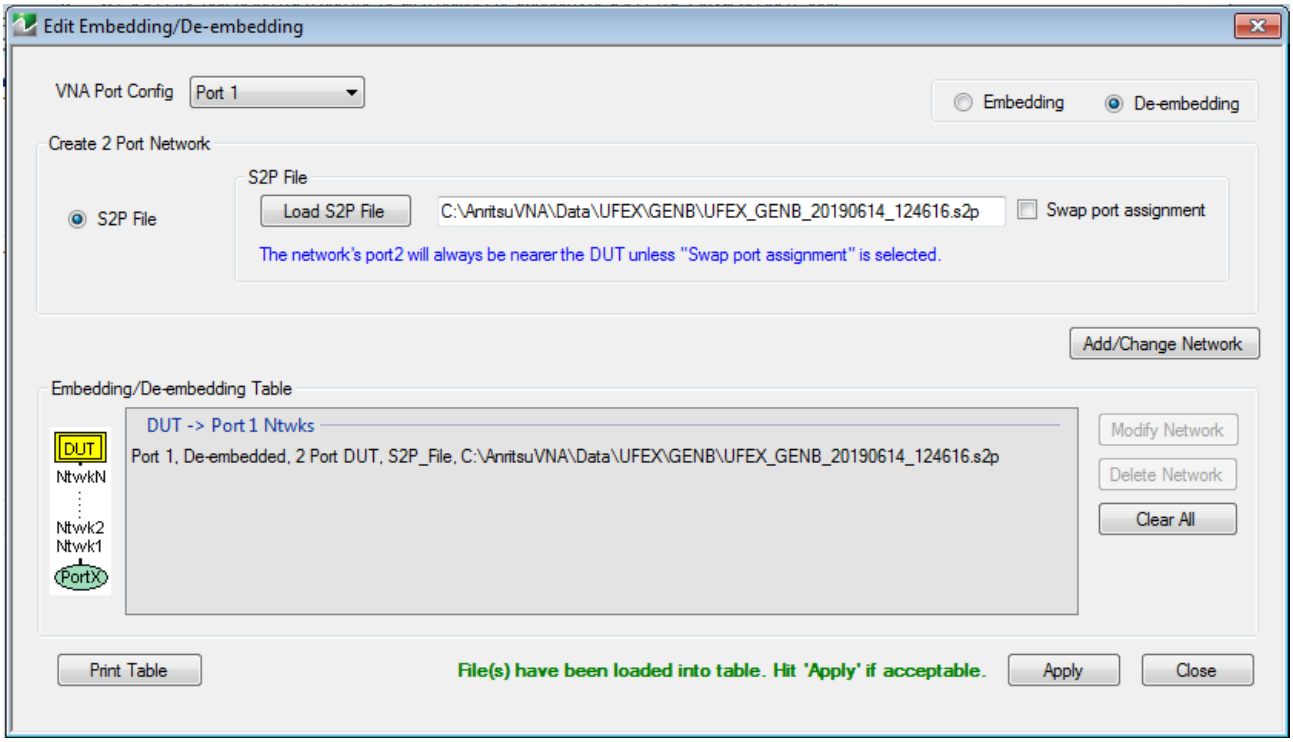
1. **Port Selection:** Four ports available (with 4-Port VNA)
2. See Figure 10-15 for available extraction options based on the **Number of Standards** selected, or whether **Use Classical Open Short** box is checked.
3. **File Path:** Location for saving file
4. **# of Standards:** Three standards available; 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 10-16).

Figure 10-14. NETWORK EXTRACTION Dialog Box – Type B – Two Tier Calibration With Flex Standards (2 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 10-15. Type B – Two Tier Calibration With Flex Standards Extraction Setup Options



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 10-16. 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 – 4-Port VNAs on page 10-15 .

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 – 4-Port VNAs on page 10-15 .
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

Full Name

- Network Extraction – Type C – Extract Two 2-Port Networks – Inner and Outer Cals Available – 4-Port VNAs Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x VNAs (No Option 24)" on page 10-16
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17

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 C – Inner and Outer Cals Available | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORKS (TYPE C)] Dialog Box

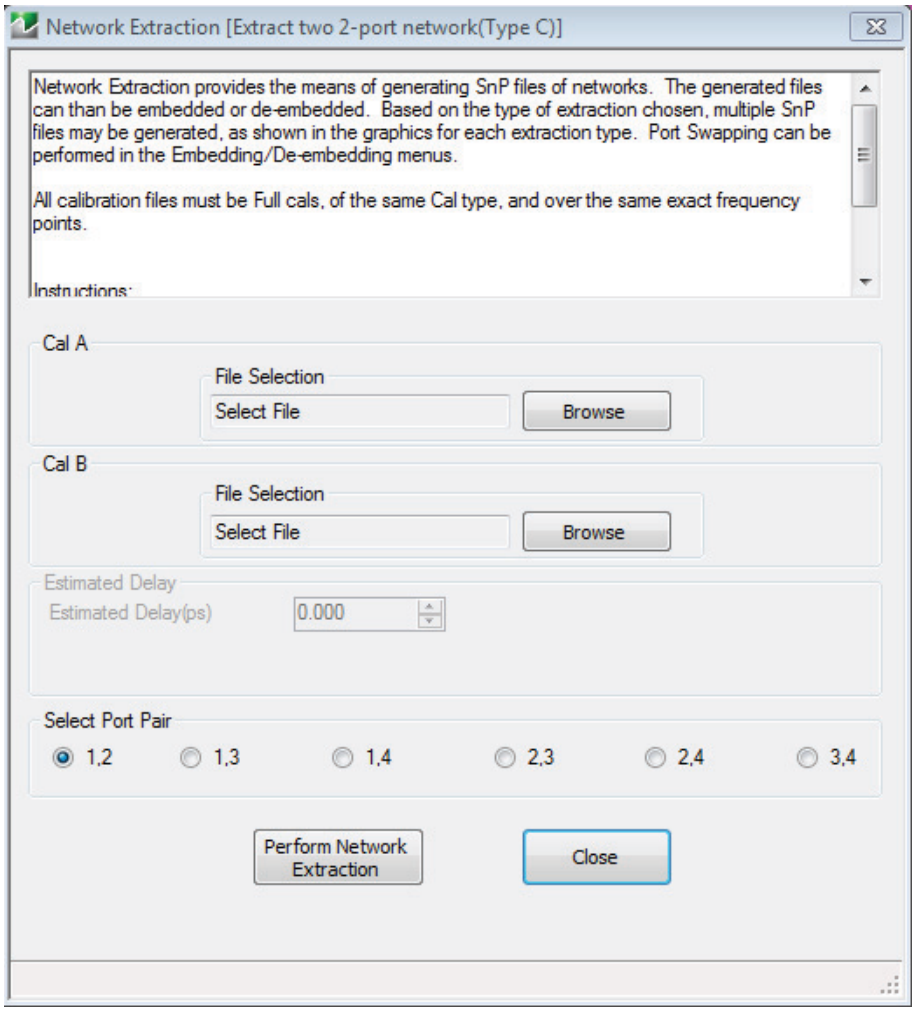


Figure 10-17. NETWORK EXTRACTION – EXTRACT TWO 2-PORT NETWORKS – TYPE C – 4-Port

Description

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 Perform Network Extraction to perform the extraction.
3. If the extraction is successful, follow the prompt to save the generated SnP files(s).
4. 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)

Full Name

- Network Extraction [Extract two 2-port networks (Type D)] Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x VNAs (No Option 24)" on page 10-16
- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 2 Port Networks | NETWORK EXTRACTION (2 Port Networks) Dialog Box | Type D – Outer Cal Only Using Divide-By-Two Method | NETWORK EXTRACTION [EXTRACT TWO 2-PORT NETWORKS (TYPE D)] Dialog Box

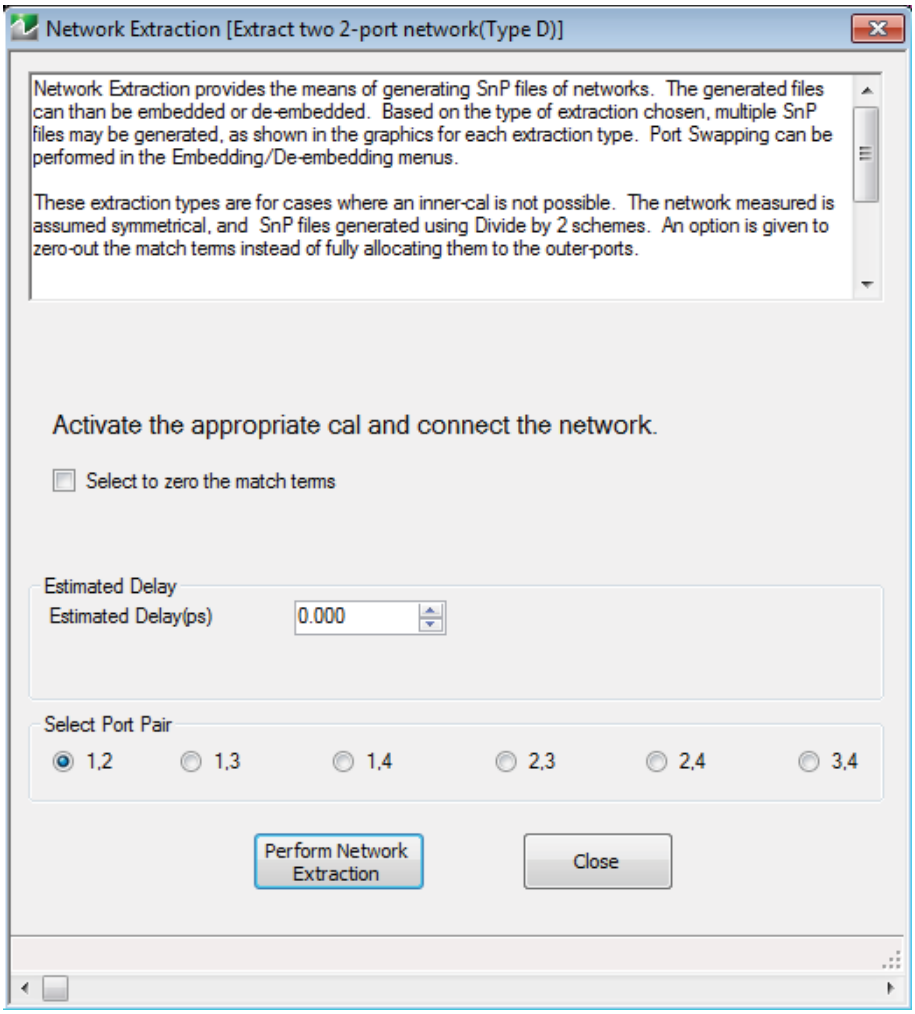


Figure 10-18. NETWORK EXTRACTION – EXTRACT TWO 2-PORT NETWORKS – TYPE D – 4-Port

Description

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 needed.
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 .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

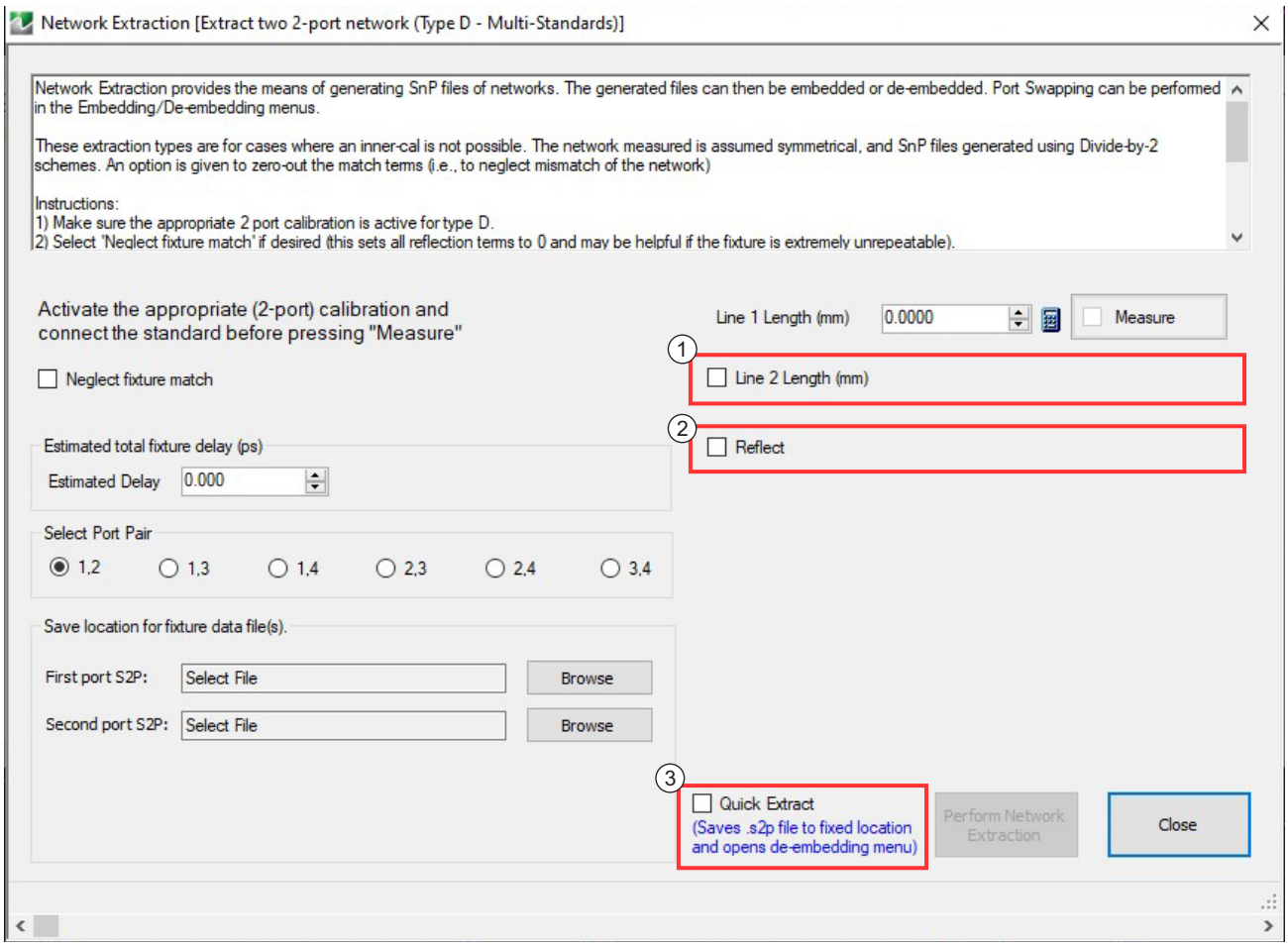
- Option 24 Universal Fixture Extraction installed
- A calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17

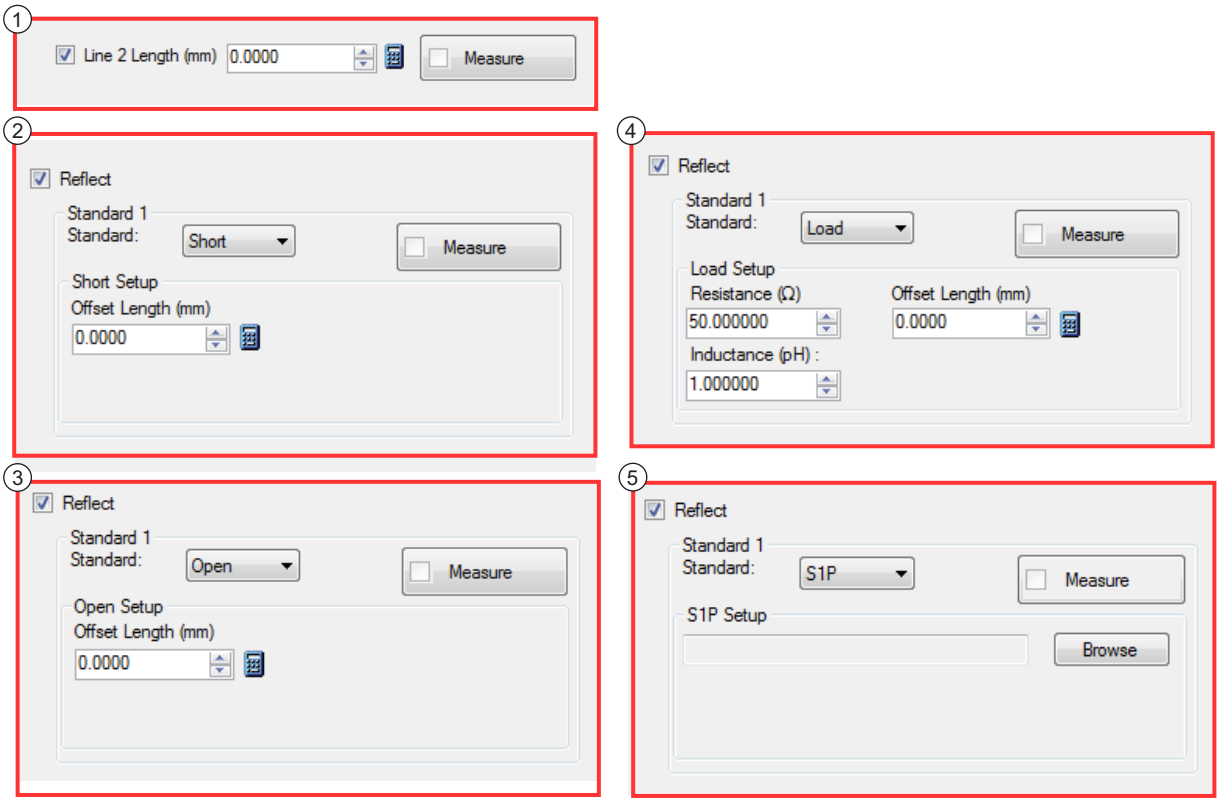
Navigation

- 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 – Outer Cal Only Using Divide-By-Two Method | 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 10-20.
2. Checking **Reflect** box opens various options related to Reflect as shown in Figure 10-20.
3. Checking **Quick Extract** saves .s2p file to a fixed location and loads deembedding dialog (Figure 10-16).

Figure 10-19. 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 10-20. 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 – 4-Port VNAs on page 10-15 .
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)

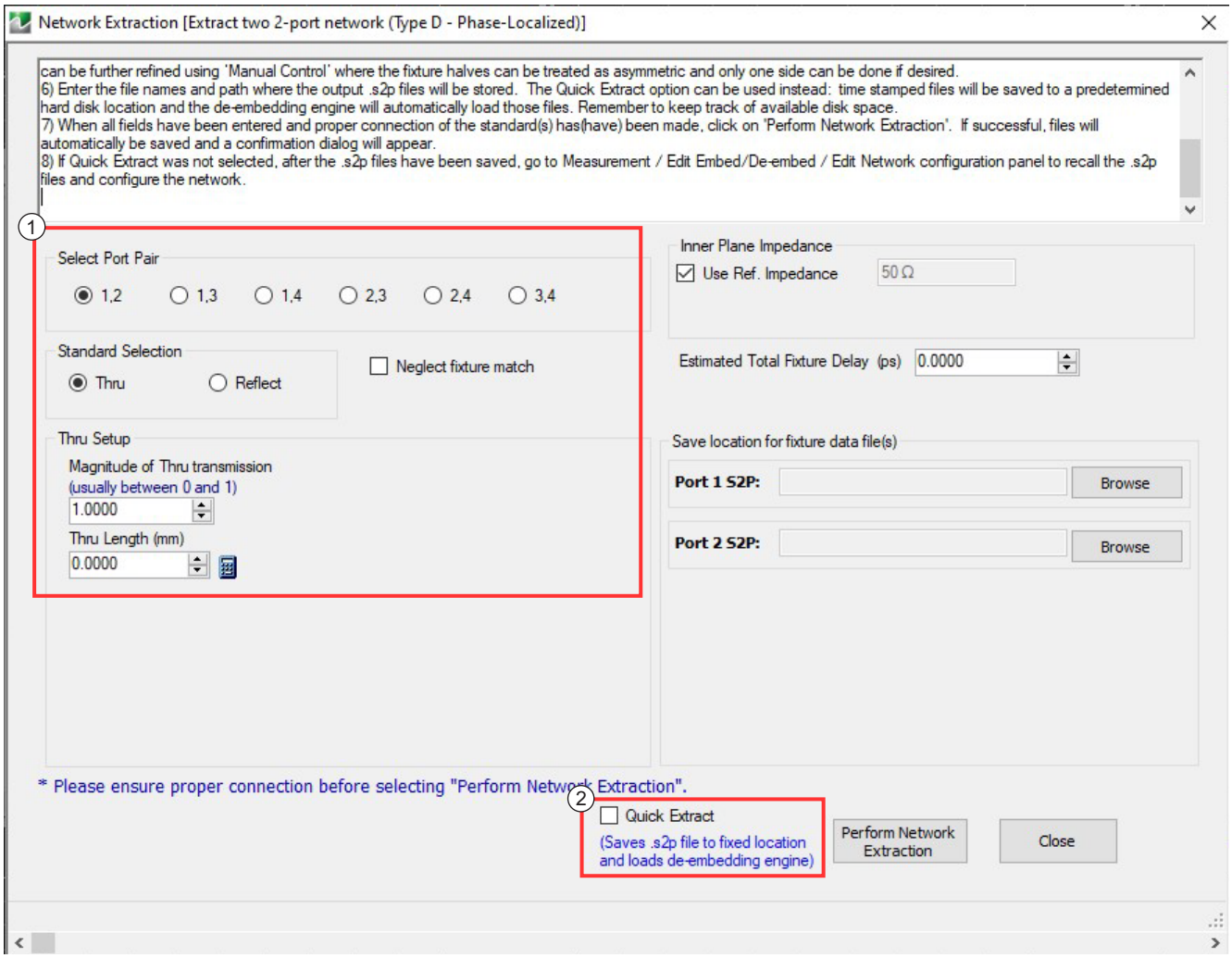
The NETWORK EXTRACTION Dialog Box – Type D – Phase-Localized is only available with Option 24. For more information on Type D Phase-Localized network extraction, refer to the Measurement Guide (10410-00336).

Prerequisites

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

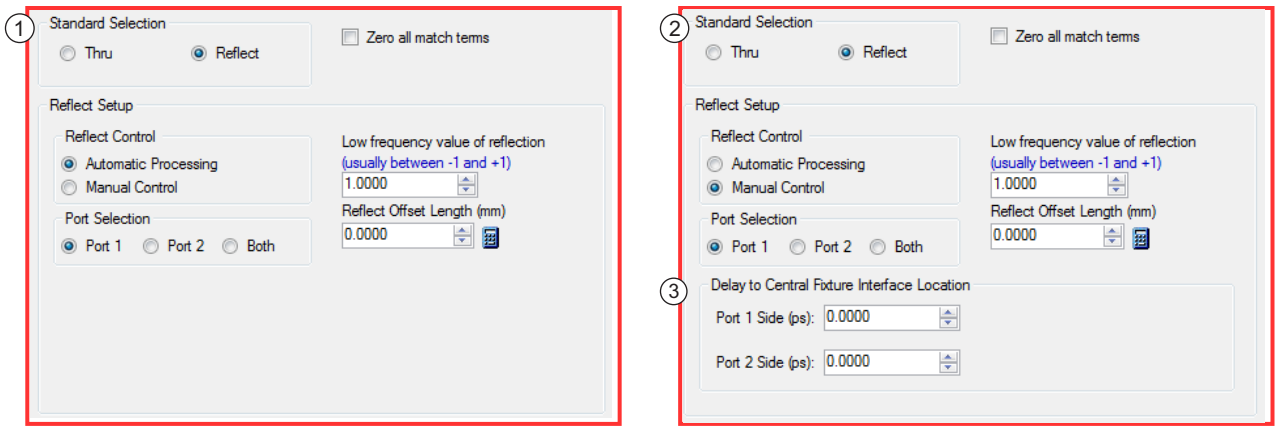
Previous

- "NETWORK EXTRACTION Main Dialog Box – 2-Port Networks – MS4652x (Option 24)" on page 10-17



1. Default dialog settings shown with **Thru** selected. For **Reflect** variants of this dialog, see Figure 10-22 on page 10-39.
2. Checking **Quick Extract** saves .s2p file to a fixed location and loads deembedding dialog (Figure 10-16).

Figure 10-21. 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 10-22. 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 measurement type (using thru or reflect standards). Note that for Reflection, the type of reflection must be the same on all ports.
4. Define the standards being used (offset length, transmission or reflection magnitude, include the sign of reflection)
5. Enter an estimate of the network's electrical delay (both sides of the fixture pair). Entering 0 will activate the automatic length estimator. If using a Reflect measurement, this can be further refined selecting Manual Control where the fixture halves can be treated as asymmetric and only one side can be done if desired.
6. 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.
7. When all fields have been entered and proper connection of the standard or standards have been made, click on Perform Network Extraction. If successful, files will automatically be saved and a confirmation dialog will appear.
8. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15 .
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.

NETWORK EXTRACTION Dialog Box – Type E

Full Name

- Network Extraction – Type E – Extract Four 2-Port Networks – Inner and Outer Cals Available – 4-Port VNAs Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (No Option 24)" on page 10-19
- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Four 2-Port Networks | Type E – Inner and Outer Cals Available | NETWORK EXTRACTION [EXTRACT FOUR 2-PORT NETWORKS (TYPE E)] Dialog Box

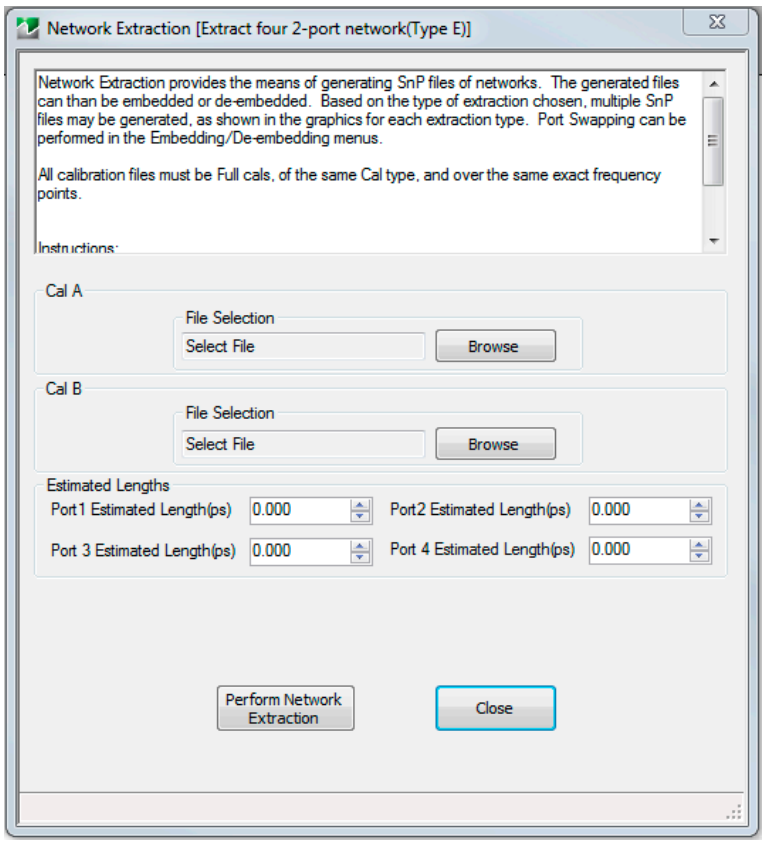


Figure 10-23. NETWORK EXTRACTION – EXTRACT FOUR 2-PORT NETWORKS – TYPE E – 4-Port

Instructions

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

Procedure

1. Select Browse to select the appropriate cal file(s).
2. Select Perform Network Extraction.

3. If the extraction is successful, follow the prompt to save the generated SnP file(s).
4. 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 F (No Option 24)

Full Name

- Network Extraction – Type F – Extract Four 2-Port Networks – Inner and Outer Cals Available – 4-Port VNAs Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (No Option 24)" on page 10-19

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Four 2-Port Networks | Type F – Outer Cal Only Using Divide-By-Two Method | NETWORK EXTRACTION [EXTRACT FOUR 2-PORT NETWORKS (TYPE F)] Dialog Box

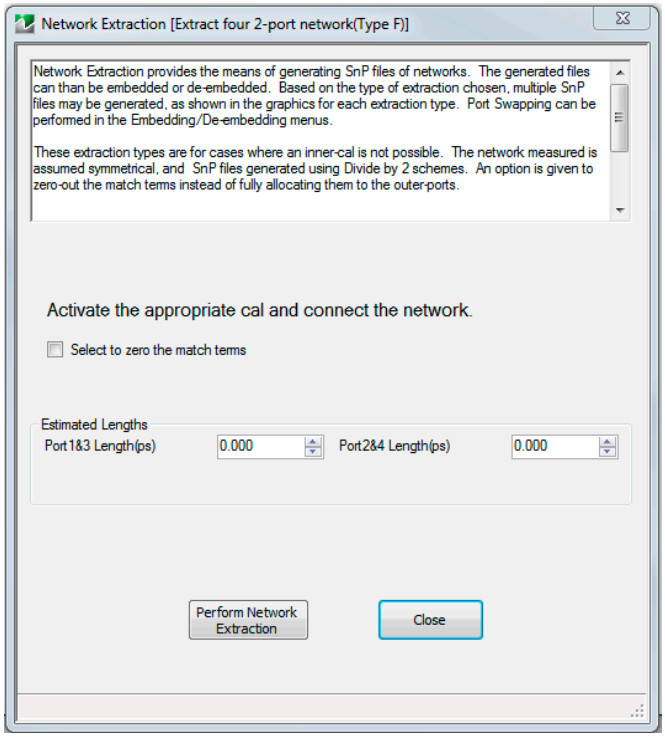


Figure 10-24. NETWORK EXTRACTION – EXTRACT FOUR 2-PORT NETWORKS – TYPE F – 4-Port, No Option 24)

Instructions

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 needed.
3. Select the dominant paths of the network (i.e., the ports between which thrus are connected within the network assembly for the extraction).

4. Connect the network and select Perform Network Extraction.
5. If the extraction is successful, follow the prompt to save the generated SnP file(s).
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 F – Multi-Standards (Option 24)

Full Name

- Network Extraction [Extract Four 2-port Networks (Type F-Multi-Standards)]

Prerequisites

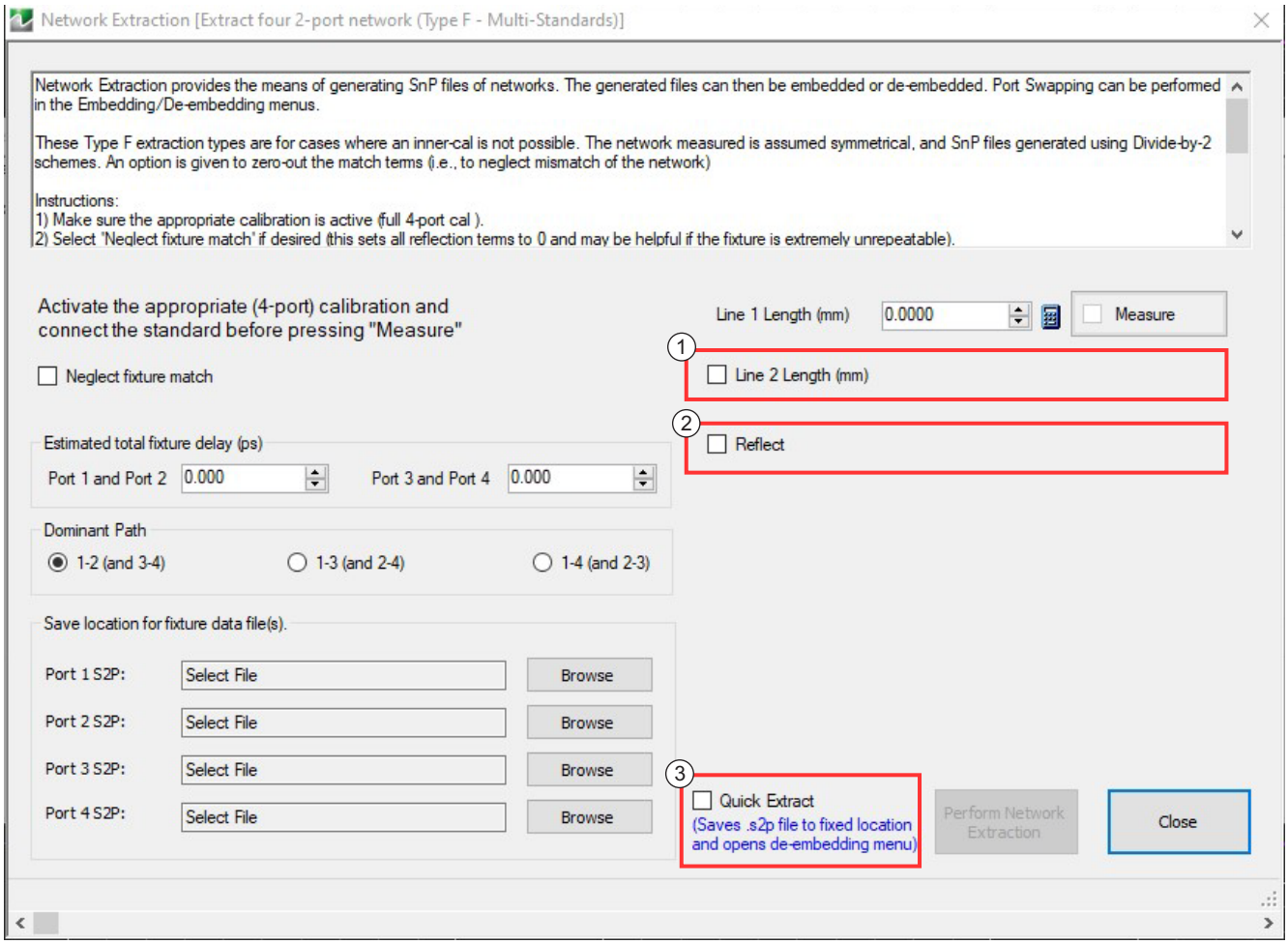
- Option 24 – Universal Fixture Extraction installed.
- A full-term calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

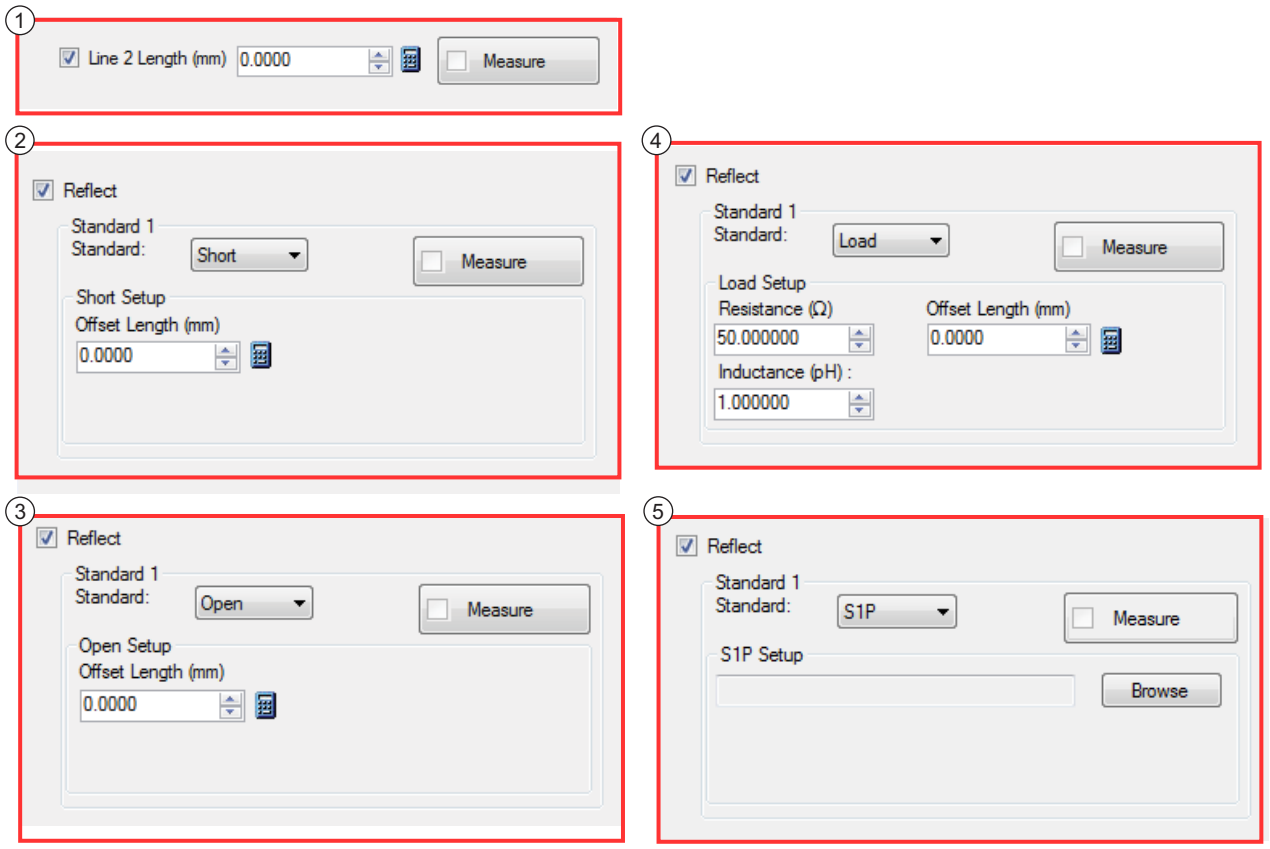
Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Four 2-Port Networks | Type F - Outer Cal Only Using Divide-By-Two Method | NETWORK EXTRACTION [EXTRACT FOUR 2-PORT NETWORKS (TYPE F-MULTI-STANDARDS)] Dialog Box



1. Checking **Line 2 Length** box opens entry window as shown in Figure 10-26.
2. Checking **Reflect** box opens various options related to Reflect as shown in Figure 10-26.
3. Checking **Quick Extract** box saves .s2p file to fixed location and opens the deembedding dialog (Figure 10-16).

Figure 10-25. NETWORK EXTRACTION - EXTRACT FOUR 2-PORT NETWORKS - TYPE F – Multi-Standards – 4-Port



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

Figure 10-26. TYPE F – Multi-Standards – Extraction Setup Variations

Instructions

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

These Type F 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).

Procedure

1. Make sure the appropriate calibration is active (a full 4-port cal for Type F).
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 path of interest or indicate how the dominant transmission paths are aligned (e.g., if the network is a differential pair with port 1 connected to port 2 with high transmission and port 3 is connected to port 4 with high transmission, and the other paths like 1-3 and 2-3 are high loss, then select 1-2 (and 3-4).
4. Select the number of standards to be used and their definitions. Line 1 is always required.

5. Connect each standard (or standards in the case of Reflect; all ports must have the Reflect connected simultaneously) before pressing Measure.
6. Enter the file names where the output .s4p 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.
7. When all fields have been entered and all standards measurements have been completed (all of the check boxes marked and button fields turn green), press Perform Network Extraction. If successful, a confirmation dialog will appear.
8. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15 .
9. If Quick Extract was not selected, after the .s4p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s4p files and configure the network.

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

Full Name

- Network Extraction [Extract Four 2-port Networks (Type F-Phase-Localized)]

Prerequisites

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

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Four 2-Port Networks | Type F - Phase Localized | NETWORK EXTRACTION [EXTRACT FOUR 2-PORT NETWORKS (TYPE F-PHASE-LOCALIZED)] Dialog Box

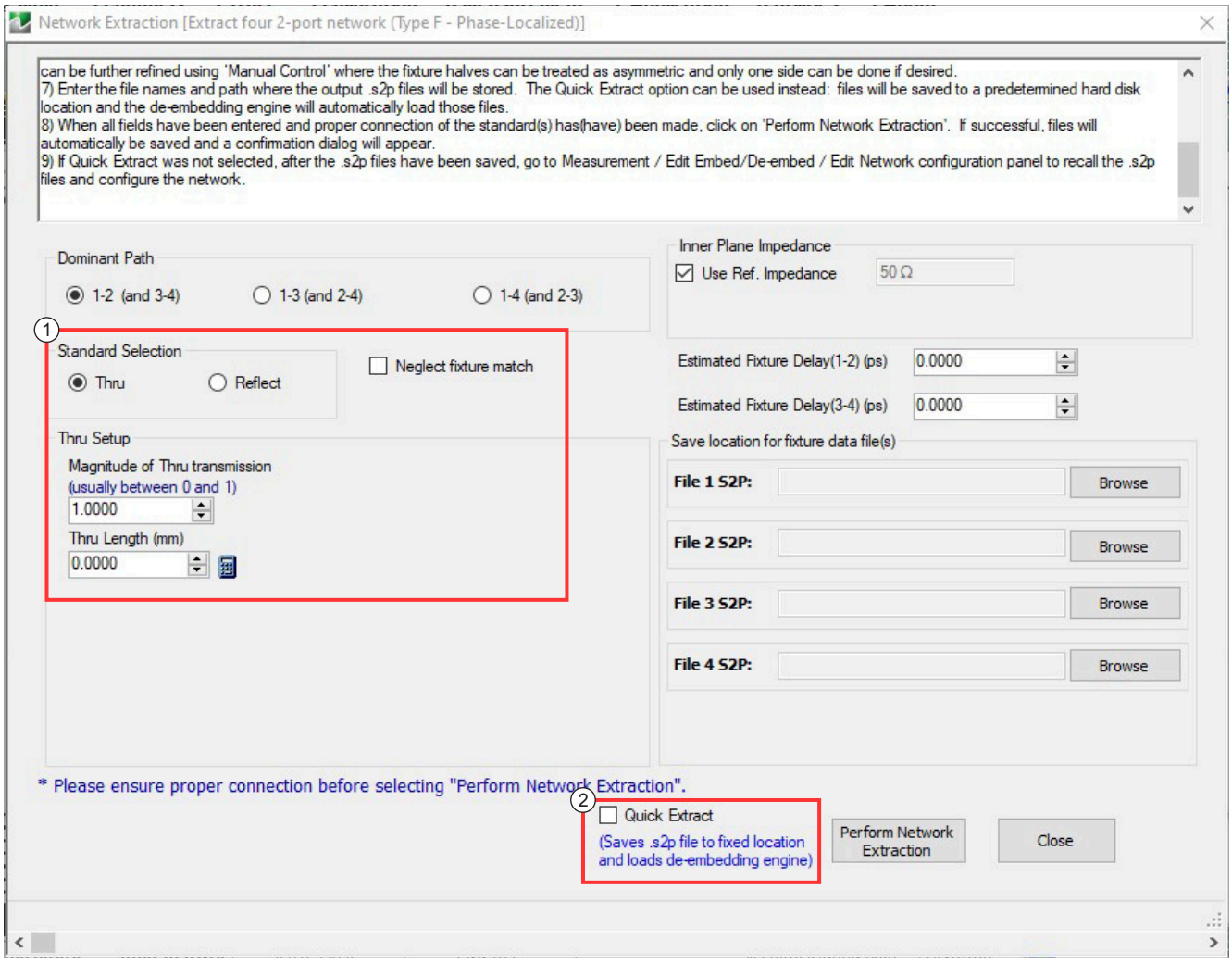
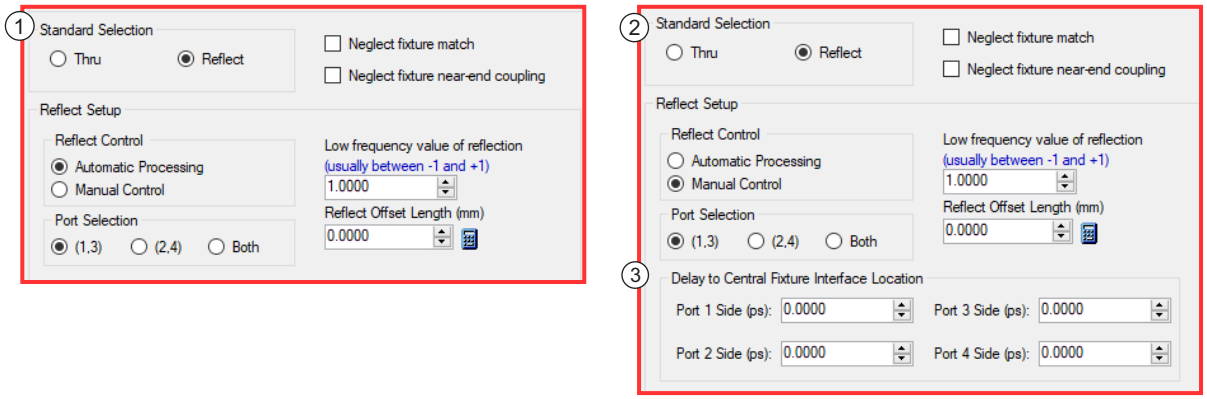


Figure 10-27. NETWORK EXTRACTION - EXTRACT TWO 2-PORT NETWORKS – TYPE F – Phase-Localized – 4-Port (1 of 2)

1. Default dialog settings are shown with Thru selected. For Reflect variants of this dialog, see Figure 10-28 on page 10-48.
2. Checking Quick Extract saves .s2p file to fixed location and opens the deembedding dialog (Figure 10-16).

Figure 10-27. NETWORK EXTRACTION - EXTRACT TWO 2-PORT NETWORKS – TYPE F – Phase-Localized – 4-Port (2 of 2)



1. Checking **Reflect** and selecting **Automatic Processing** opens the dialog shown.
2. Checking **Reflect** and selecting **Manual Control** opens the dialog shown.
3. With Manual Control selected, Delay to Central Fixture Interface Location is enabled.

Figure 10-28. TYPE F – Phase-Localized – Extraction Setup Variations

Instructions

This will construct .s2p files based on a thru or reflect measurement using a 2-port/4-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)).

1. Make sure the appropriate calibration is active (a full 4-port cal for Type F).
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 path of interest or indicate how the dominant transmission paths are aligned (e.g., if the network is a differential pair with port 1 connected to port 2 with high transmission and port 3 is connected to port 4 with high transmission (and paths like 1-3 are coupled only) then select 1-2 (and 3-4)).
4. Select the measurement type (using thru or reflect standards). Note that for reflection, the type of reflection must be the same on all ports.
5. Define the standards being used (offset length, transmission or reflection magnitude, include the sign of reflection)
6. Enter an estimate of the network's electrical delay (both sides of the fixture pair). Entering 0 will activate the automatic length estimator. If using a reflect measurement, this can be further refined using 'Manual Control' where the fixture halves can be treated as asymmetric and only one side can be done if desired.
7. Enter the file names and path where the output .s2p files will be stored. The Quick Extract option can be used instead; files will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files.

8. When all fields have been entered and proper connection of the standard(s) has(have) been made, click Perform Network Extraction. If successful, files will automatically be saved and a confirmation dialog will appear.
9. If Quick Extract was not selected, after the .s2p files have been saved, go to the MEASUREMENT | Edit Embed/De-embed | Edit Network configuration panel to recall the .s2p files and configure the network.

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

Full Name

- Network Extraction [Extract Two 4-port Networks (Type G)] Dialog Box

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (No Option 24)" on page 10-19

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Two 4-Port Networks | Type G – Outer Cal Only Using Divide-By-Two Method | NETWORK EXTRACTION [EXTRACT FOUR 2-PORT NETWORKS (TYPE G)] Dialog Box

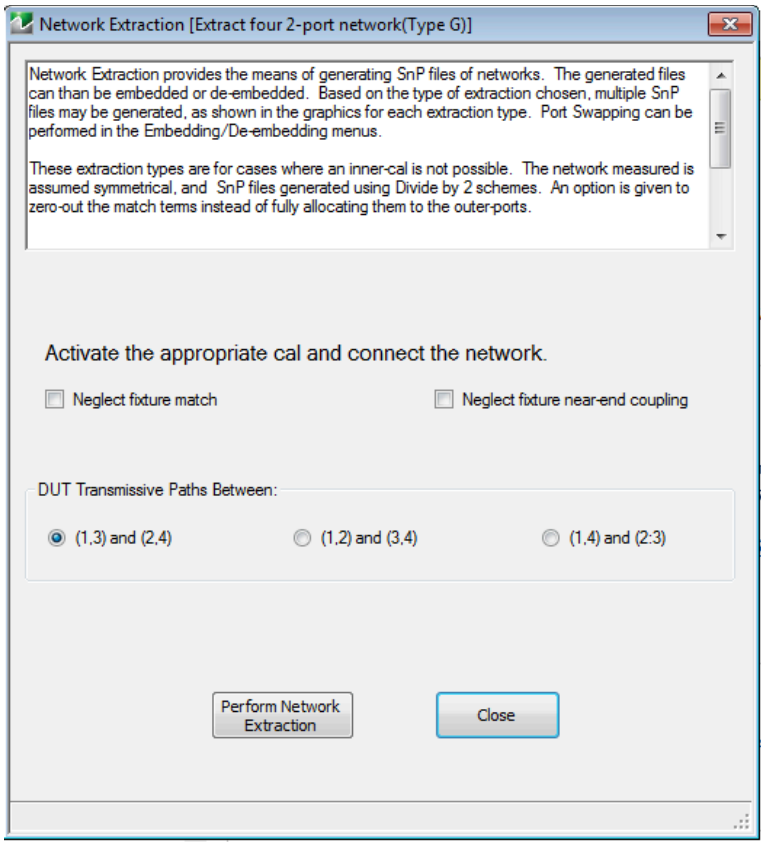


Figure 10-29. NETWORK EXTRACTION – EXTRACT TWO 4-PORT NETWORKS – TYPE G – 4-Port

Instructions

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 needed.

3. Connect the network and select Perform Network Extraction.
4. If the extraction is successful, follow the prompt to save the generated SnP file(s).
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 G – Multi-Standards (Option 24)

Full Name

- Network Extraction [Extract Two 4-port Networks (Type G – Multi-Standards)]

Prerequisites

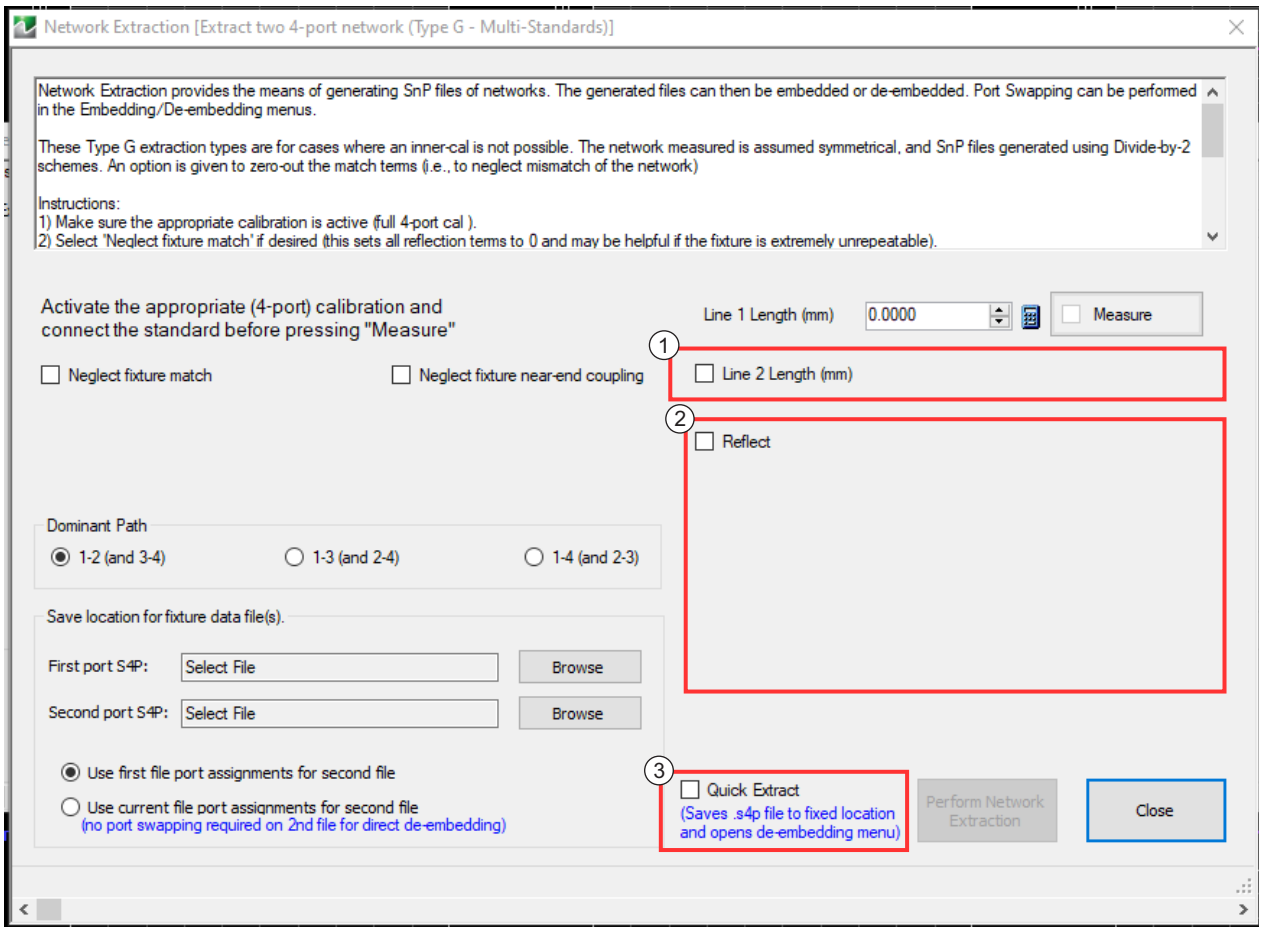
- Option 24 – Universal Fixture Extraction installed.
- A full-term calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

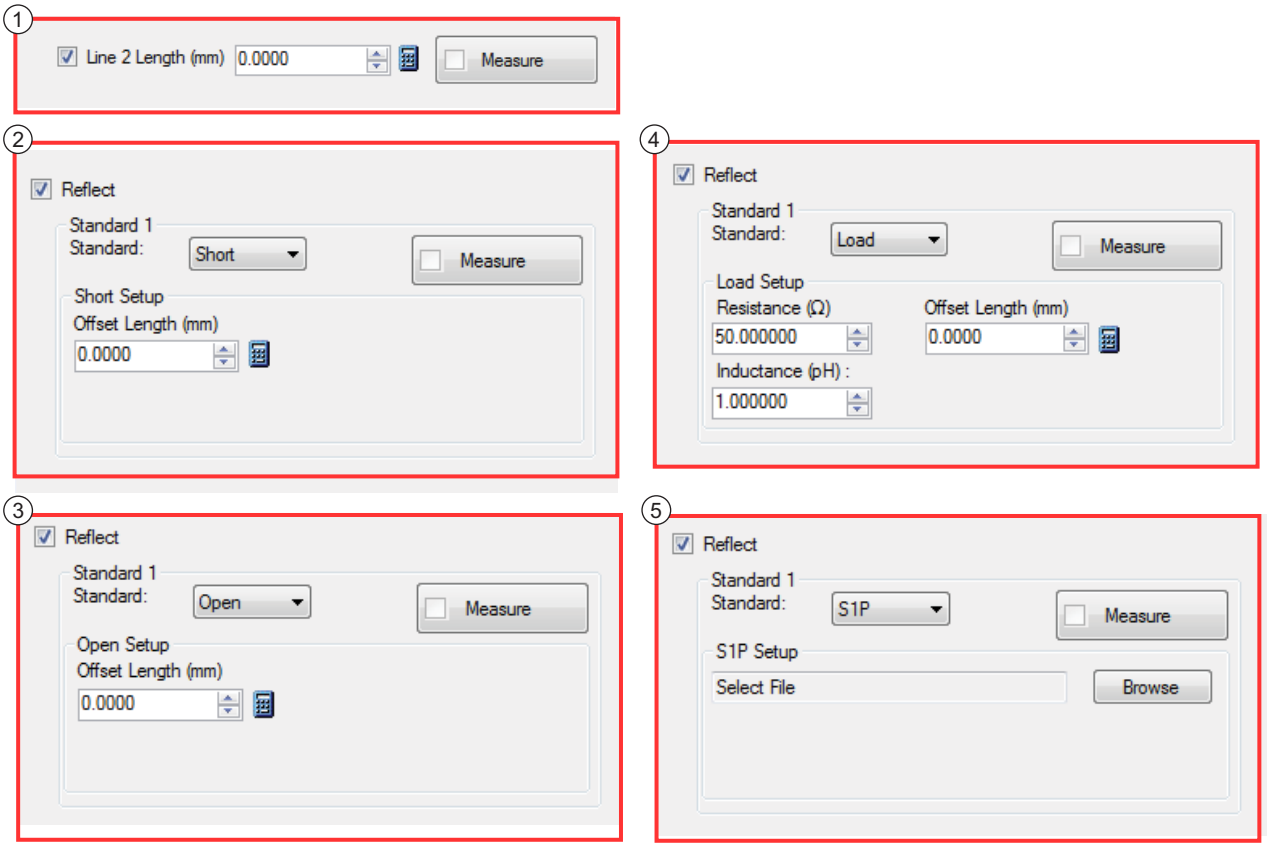
Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Two 4-Port Networks | Type G – Outer Cal Only Using Divide-By-Two Method | NETWORK EXTRACTION [EXTRACT TWO 4-PORT NETWORKS (TYPE G – MULTI-STANDARDS)] Dialog Box



1. Checking **Line 2 Length** box opens entry window as shown in Figure 10-26.
2. Checking **Reflect** box opens various options related to Reflect as shown in Figure 10-26.
3. Checking **Quick Extract** box saves .s4p file to fixed location and opens the deembedding dialog (Figure 10-16).

Figure 10-30. NETWORK EXTRACTION – EXTRACT TWO 4-PORT NETWORKS – TYPE G – Multi-Standards – 4-Port



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

Figure 10-31. TYPE G– Multi-Standards – Extraction Setup Variations

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.

These Type G 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).

1. Make sure the appropriate calibration is active (full 4-port cal for Type G).
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 path of interest or indicate how the dominant transmission paths are aligned (e.g., if the network is a differential pair with port 1 connected to port 2 with high transmission and port 3 is connected to port 4 with high transmission, and the other paths like 1-3 and 2-3 are high loss, then select 1-2 (and 3-4)).
4. Select the number of standards to be used and their definitions. Line 1 is always required.
5. Connect each standard (or standards in the case of Reflect; all ports must have the Reflect connected simultaneously) before pressing Measure.

6. Enter the file names where the output (.s4p for Type G) files will be stored. The Quick Extract option can be used instead: files will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files.
7. When all fields have been entered and all standards measurements have been completed (all of the check boxes marked and the button fields have turned green), press Perform Network Extraction. If successful, a confirmation dialog will appear.
8. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15 .
9. If Quick Extract was not selected, after the .s4p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s4p files and configure the network.

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

Full Name

- Network Extraction [Extract Two 4-port Networks (Type G – Phase-Localized)]

Prerequisites

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

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Two 4-Port Networks | Type G – Phase Localized | NETWORK EXTRACTION [EXTRACT TWO 4-PORT NETWORKS (TYPE G – PHASE-LOCALIZED)] Dialog Box

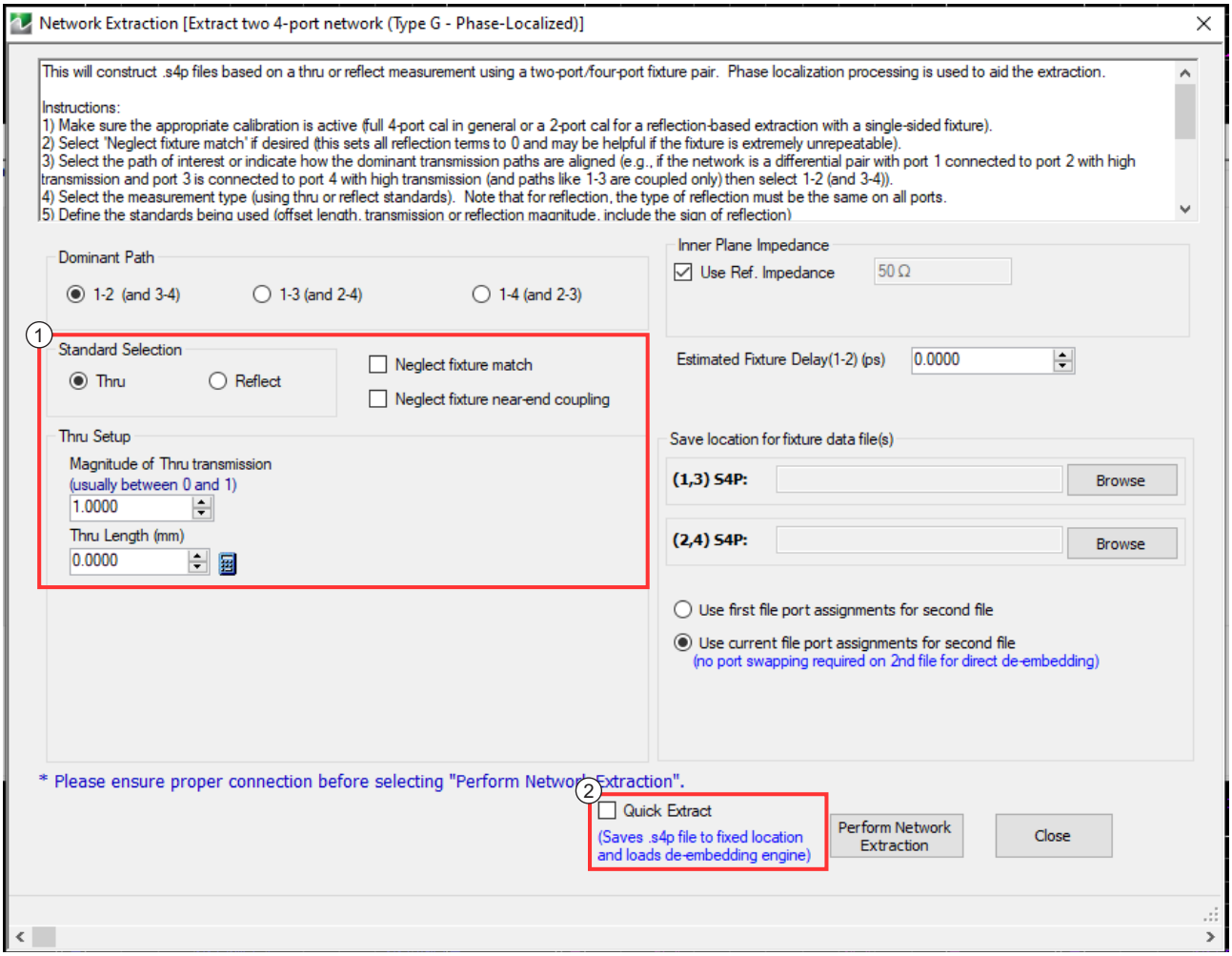
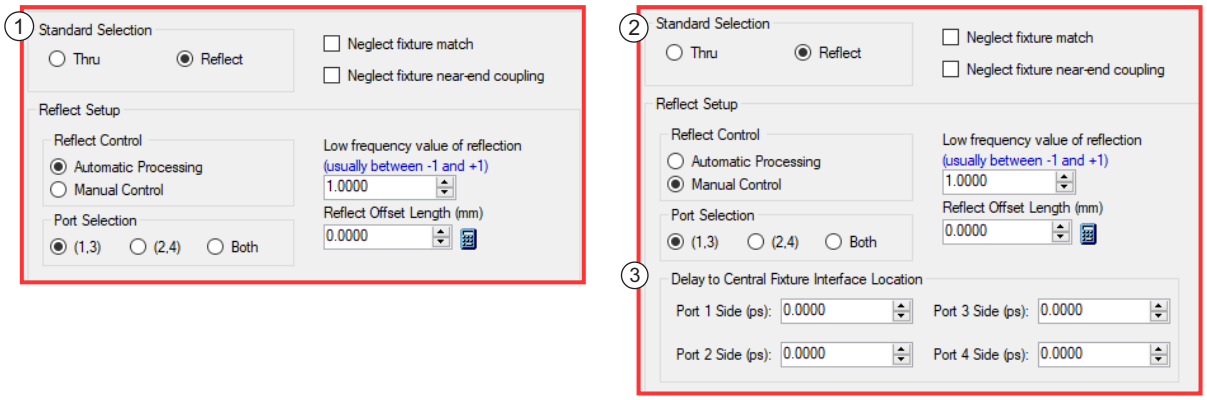


Figure 10-32. NETWORK EXTRACTION – EXTRACT TWO 4-PORT NETWORKS – TYPE G – Phase-Localized – 4-Port

1. Default dialog settings are shown with Thru selected. For Reflect variants of this dialog, see Figure 10-33 on page 10-56.
2. Checking Quick Extract saves .s4p file to fixed location and opens the deembedding dialog (Figure 10-16).

Figure 10-32. NETWORK EXTRACTION – EXTRACT TWO 4-PORT NETWORKS – TYPE G – Phase-Localized – 4-Port



1. Checking **Reflect** and selecting **Automatic Processing** opens the dialog shown.
2. Checking **Reflect** and selecting **Manual Control** opens the dialog shown.
3. With Manual Control selected, Delay to Central Fixture Interface Location is enabled.

Figure 10-33. TYPE G – Phase-Localized – Extraction Setup Variations

Description

This will construct .s4p files based on a thru or reflect measurement using a two-port/four-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 calibration is active (full 4-port cal in general or a 2-port cal for a reflection-based extraction with 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 path of interest or indicate how the dominant transmission paths are aligned (e.g., if the network is a differential pair with port 1 connected to port 2 with high transmission and port 3 is connected to port 4 with high transmission (and paths like 1-3 are coupled only) then select 1-2 (and 3-4).
4. Select the measurement type (using Thru or Reflect standards). Note that for reflection, the type of reflection must be the same on all ports.
5. Define the standards being used (offset length, transmission or reflection magnitude, include the sign of reflection).
6. Enter an estimate of the network's electrical delay (both sides of the fixture pair). Entering 0 will activate the automatic length estimator. If using a reflect measurement, this can be further refined by selecting Manual Control where the fixture halves can be treated as asymmetric and only one side can be done if desired.

7. Enter the file names where the output (.s4p for Type G) files will be stored. The Quick Extract option can be used instead: date stamped files will be saved to a predetermined hard disk location and the de-embedding engine will automatically load those files.
8. When all fields have been entered and proper connection of the standard or standards have been made, click on Perform Network Extraction. If successful, files will automatically be saved and a confirmation dialog will appear.
9. After the extraction, the focus auto-returns to the DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15 .
10. If Quick Extract was not selected, after the .s4p files have been saved, go to Measurement | Edit Embed/De-embed | Edit Network configuration panel to recall the .s4p files and configure the network.

NETWORK EXTRACTION Dialog Box – Type G – Phase-Localized High Crosstalk (Option 24)

Full Name

- Network Extraction [Extract Two 4-port Networks (Type G – Phase-Localized High Crosstalk)]

Prerequisites

- Option 24 – Universal Fixture Extraction installed.
- A full-term 4-port calibration needs to exist and be active.

Previous

- "NETWORK EXTRACTION Main Dialog Box – 4-Port Networks – MS46524 VNAs (Option 24)" on page 10-20

Navigation

- MAIN | Calibration | CALIBRATION | De-embedding Tools | DEEMBED. TOOLS | *Ntwk. Extraction* | 4 Port Networks | NETWORK EXTRACTION (4-PORT NETWORKS) Dialog Box | Extract Two 4-Port Networks | Type G – Phase Localized | NETWORK EXTRACTION [EXTRACT TWO 4-PORT NETWORKS (TYPE G – PHASE-LOCALIZED High CROSS TALK)] Dialog Box

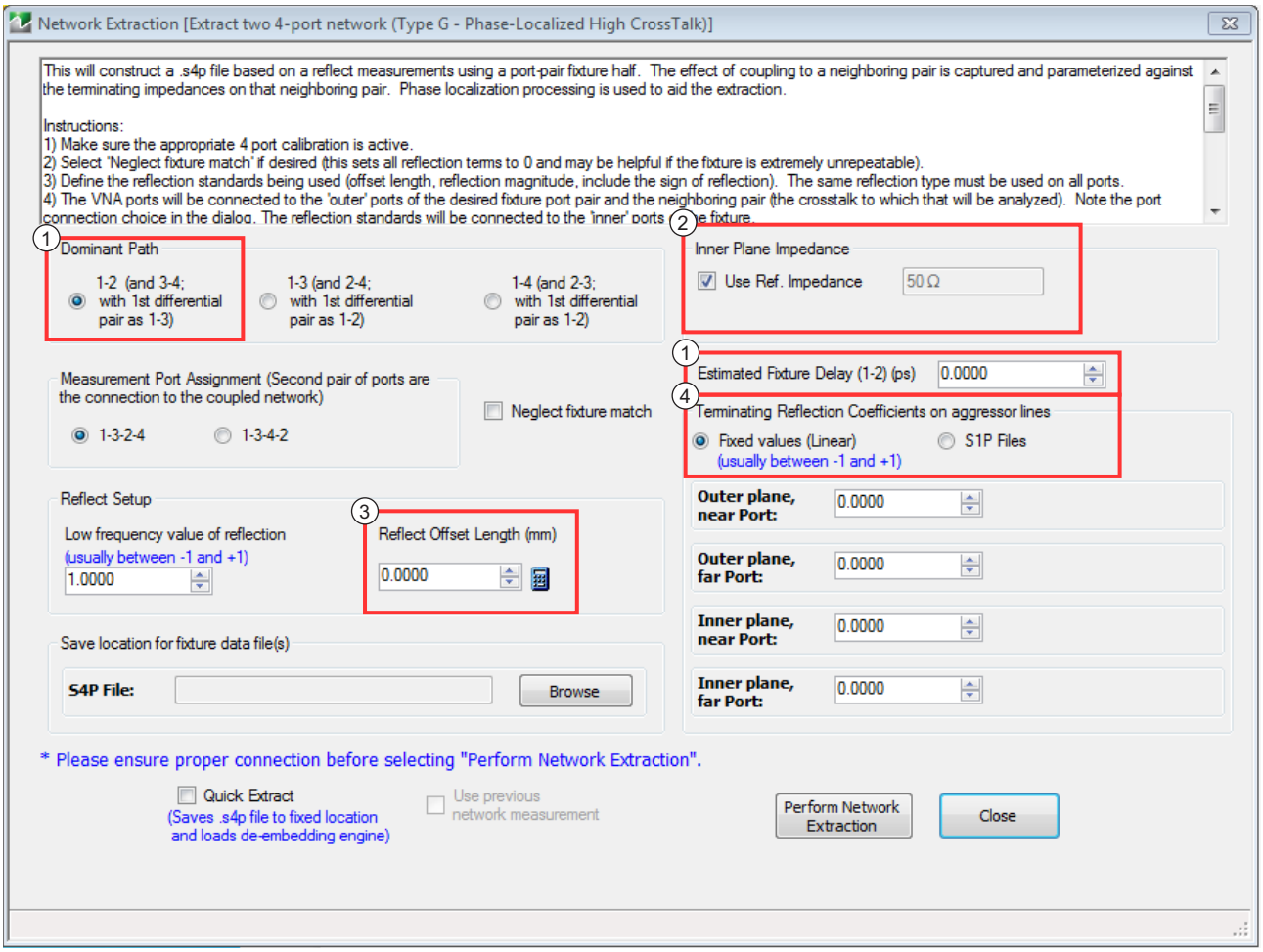


Figure 10-34. NETWORK EXTRACTION – EXTRACT TWO 4-PORT NETWORKS – TYPE G – Phase- Localized High Crosstalk – 4-Port (1 of 2)

1. Changing the Dominant Path also changes the Estimated Fixture Delay Pair
2. Unchecking the Use Ref. Impedance checkbox displays the New Impedance field.
3. Clicking the calculator next to the Reflect Offset Length field will display the "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226.
4. The Terminating Reflection Coefficient can be set to Fixed Values (Linear) or S1P Files. On selecting S1P Files, four Browse buttons will be shown to allow file selection.

Figure 10-34. NETWORK EXTRACTION – EXTRACT TWO 4-PORT NETWORKS – TYPE G – Phase- Localized High Crosstalk – 4-Port (2 of 2)

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 (10410-00753).

Prerequisites

- Option 24 Universal Fixture Extraction installed

Previous

- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

Navigation

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

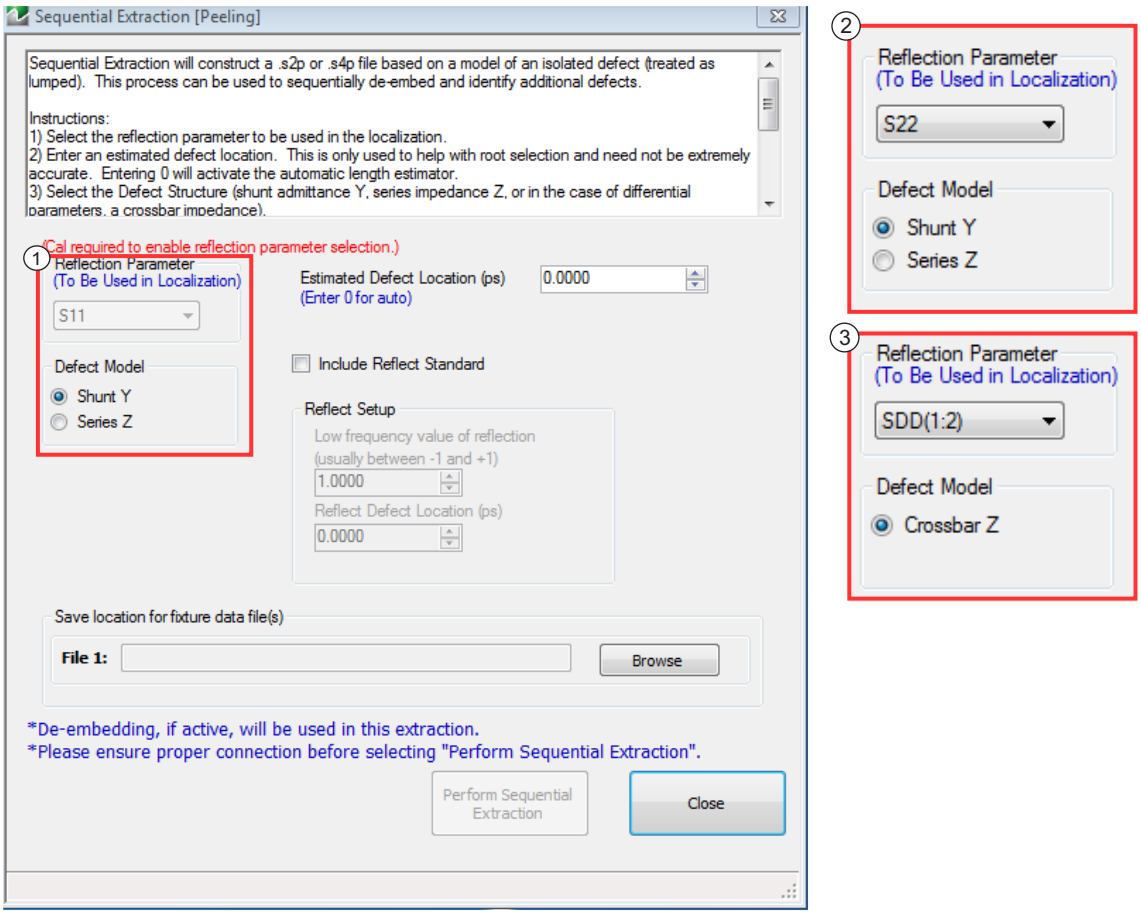


Figure 10-35. SEQUENTIAL EXTRACTION (Peeling) Dialog Box

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 – 4-Port VNAs on page 10-15 .

MANUAL ADAPTER REMOVAL Dialog Box – 4-Port VNAs

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.

Note	Manual Adapter Removal is only available for 2-port. For 4-port adapter removal, use network extraction for the .sNp file of the adapter, and use de-embedding to de-embed it from the calibration.

Previous

- DEEMBED. TOOLS Menu – 4-Port VNAs on page 10-15

Navigation

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

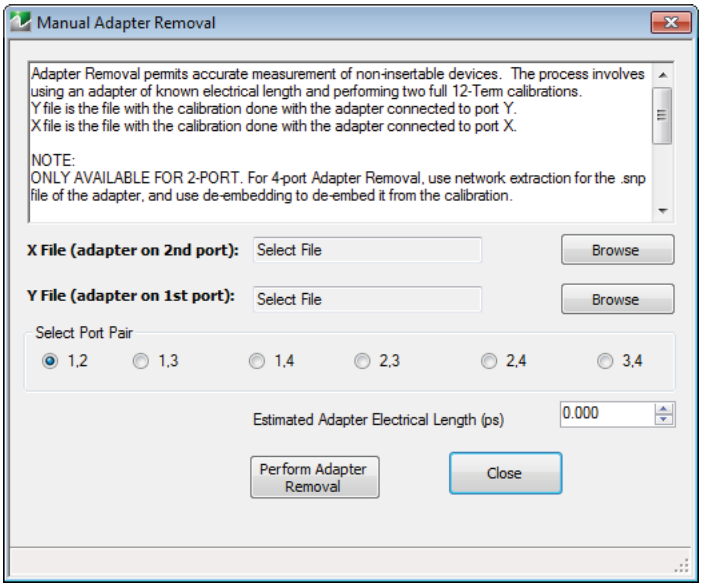


Figure 10-36. MANUAL ADAPTER REMOVAL Dialog Box

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.

Note	ONLY AVAILABLE FOR 2-PORT. For 4-port Adapter Removal, use network extraction for the SNP file of the adapter, and use de-embedding to de-embed it from the calibration.

Procedure

Select the port pair to be used from the following port combinations: 1,2; 1,3; 1,4; 2,3; 2,4; or 3,4.

1. Connect the adapter to Port X where X signifies any port. Perform a full 12-term calibration using Y' and Y as the test ports and store 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 in picoseconds (ps).

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 calibration.

Previous

- CAL OPTIONS Menu – 4-Port VNAs on page 10-14

Navigation

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

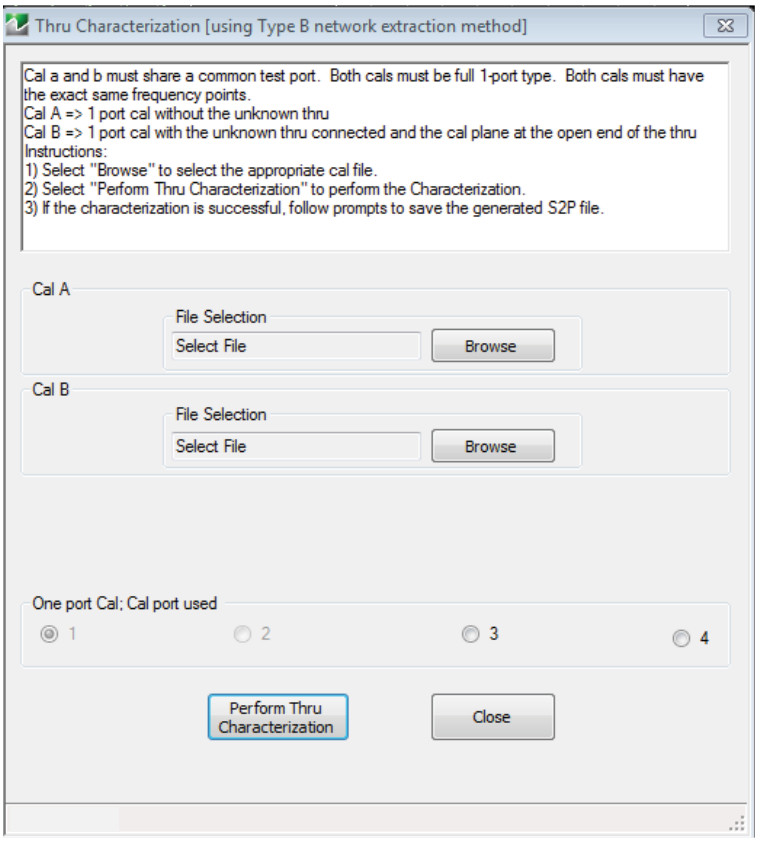


Figure 10-37. THRU CHARACTERIZATION Dialog Box

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.

HYBRID CAL Menu – 4-Port VNAs

Prerequisites

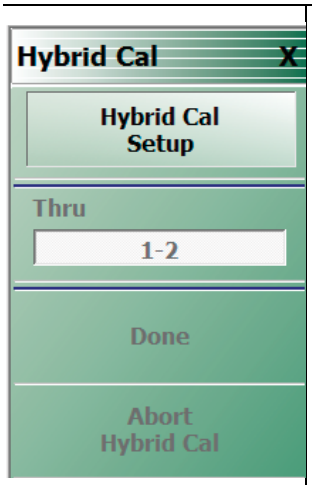
- 4-Port Mode

Previous

- CAL OPTIONS Menu – 4-Port VNAs on page 10-14

Navigation

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



Hybrid Cal Setup

Use Hybrid Cal Setup to change the hybrid calibration parameters. Select displays the HYBRID CAL SETUP dialog box.

- "HYBRID CAL SETUP Dialog Box – 4-Port VNAs" on page 10-66

Thru

Read-only display. Shows the thru port pair configured in the HYBRID CAL SETUP dialog box.

Done

The Done button is unavailable until a successful hybrid calibration has been completed. When available, select returns to the CAL OPTIONS menu.

- CAL OPTIONS Menu – 4-Port VNAs on page 10-14

Abort Hybrid Cal

The Abort button is unavailable until a hybrid calibration is started. Selection cancels the hybrid calibration, and returns to the CAL OPTIONS menu.

- CAL OPTIONS Menu – 4-Port VNAs on page 10-14

Figure 10-38. CAL OPTIONS (CALIBRATION OPTIONS) Menu

HYBRID CAL SETUP Dialog Box – 4-Port VNAs

Prerequisites

- 4-Port Mode

Previous

- HYBRID CAL Menu – 4-Port VNAs on page 10-65

Navigation

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

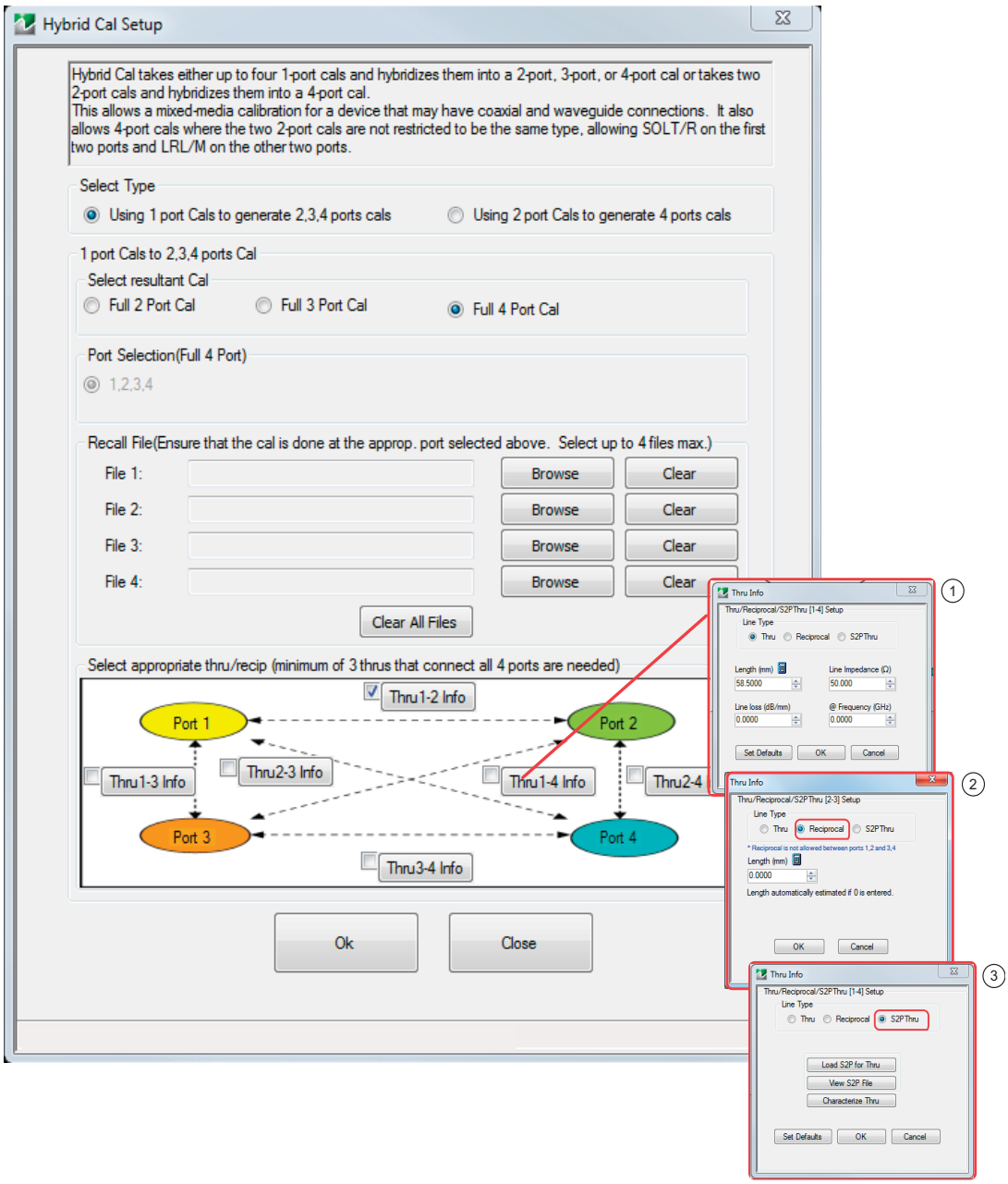


Figure 10-39. HYBRID CAL (CALIBRATION) Dialog Box – 4-Port VNAs (1 of 2)

"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-39. HYBRID CAL (CALIBRATION) Dialog Box – 4-Port VNAs (2 of 2)

CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs

Use the CAL KIT menu to install, save, and restore calibration kit characterization files between an external memory device, the instrument firmware, and a hard drive on the instrument or on a network This menu is also used for working with AutoCal kit characterization files.

Full Name

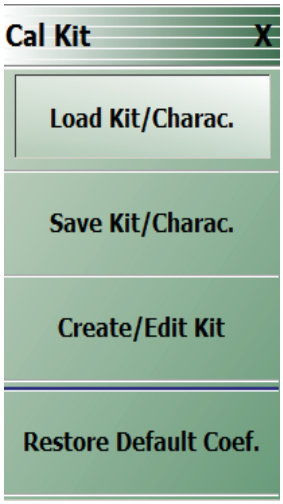
- Full Manual Calibration Kit / Automatic Calibrator (AutoCal) Menu

Previous

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Cal Kit 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 INSTALL (AutoCal Characterization/Cal Kit File) dialog box.

- "LOAD (Cal Kit) Dialog Box – 4-Port VNAs" on page 10-69

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 (AutoCal Characterization/Cal Kit) File dialog box.

- "SAVE (Cal Kit) Dialog Box – 4-Port VNAs" on page 10-70

Create/Edit Info

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 – 4-Port VNAs" on page 10-72

Restore Default Coef.

Select displays the RESTORE DEFAULT COEF dialog box.

Figure 10-40. CAL KIT/AUTOCAL Menu – 4-Port VNAs

LOAD (Cal Kit) Dialog Box – 4-Port VNAs

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

Full Name

- Load (Cal Kit Parameters Files) Dialog Box

Previous

- CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68

Navigation

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

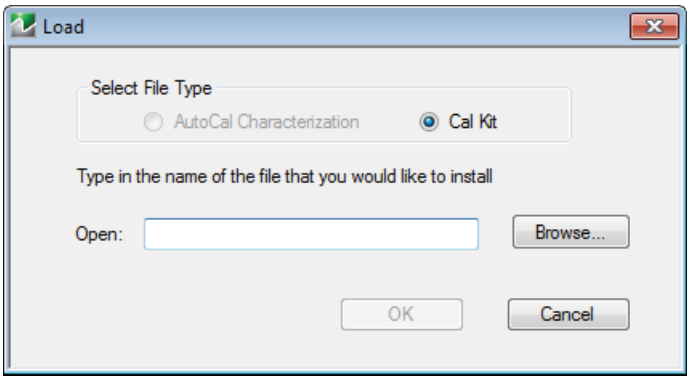


Figure 10-41. LOAD (Cal Kit) Dialog Box

Instructions

1. Cal Kit is the default selection under Select File Type.
2. Enter a file name in the Open field, or click Browse to navigate manually to the appropriate CalKit Coefficient.ccf file.
3. Click Open to load the file or Cancel to return to the menu.

SAVE (Cal Kit) Dialog Box – 4-Port VNAs

The SAVE (Cal Kit) dialog is used to save CalKitReflectionCoefficient 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 (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68

Navigation

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

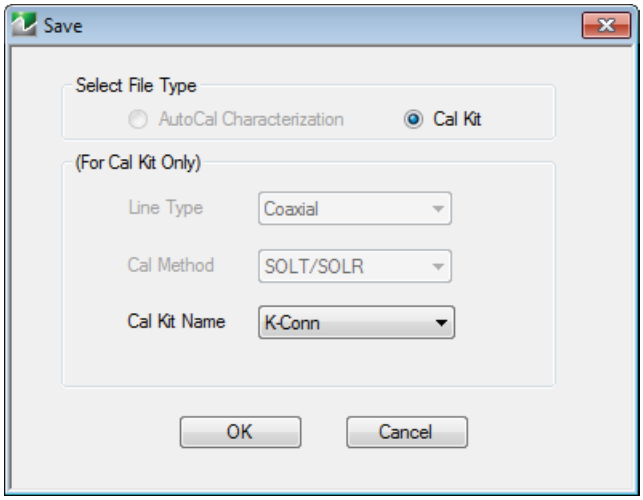


Figure 10-42. SAVE (Cal Kit) Dialog Box

Instructions for Cal Kit File Types

1. Under Select File Type, Cal Kit is the default selection. If Cal Kit is selected, the fields of Line Type, Cal Method, and Cal Kit Name are available (shown at right in Figure 10-42 on page 10-70 above) with the values in drop-down menus. For AutoCal these are no active.
2. For a Cal Kit but not with AutoCal, select a line type.
3. For a Cal Kit but not with AutoCal, select a calibration method.

   Select a calibration kit characterization file type from the Cal Kit Name drop-down menu.

- 0.8 mm (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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)

- 2.4 mm (M)
- 2.4 mm (F)
- GPC-3.5 (M)
- GPC-3.5 (F)
- TNC (M)
- TNC (F)
- User-Defined1 (M) through User-Defined32 (M)
- User-Defined1 (F) through User-Defined32 (F)

4. A SAVE AS dialog box appears with a default ReflectionCoefficient 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 – 4-Port VNAs

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, but editable for user-defined cal kits.

Previous

- CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68

Navigation

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

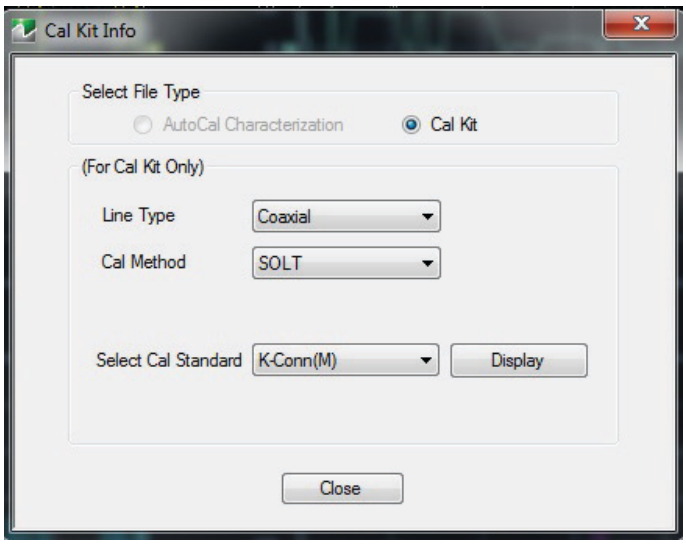


Figure 10-43. CAL KIT INFO Dialog Box

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:
3. Click Display.
4. The STANDARD INFO read-only dialog box opens (Figure 10-44).
   - Dialog box title and content fields reflect selections made in the CAL SETUP menu (CAL SETUP Menu – 4-Port VNAs on page 10-108).
5. Click OK to close the STANDARD INFO dialog box.
6. Click Close to close the CAL KIT INFO dialog box.

STANDARD INFO Dialog Box – 4-Port VNAs

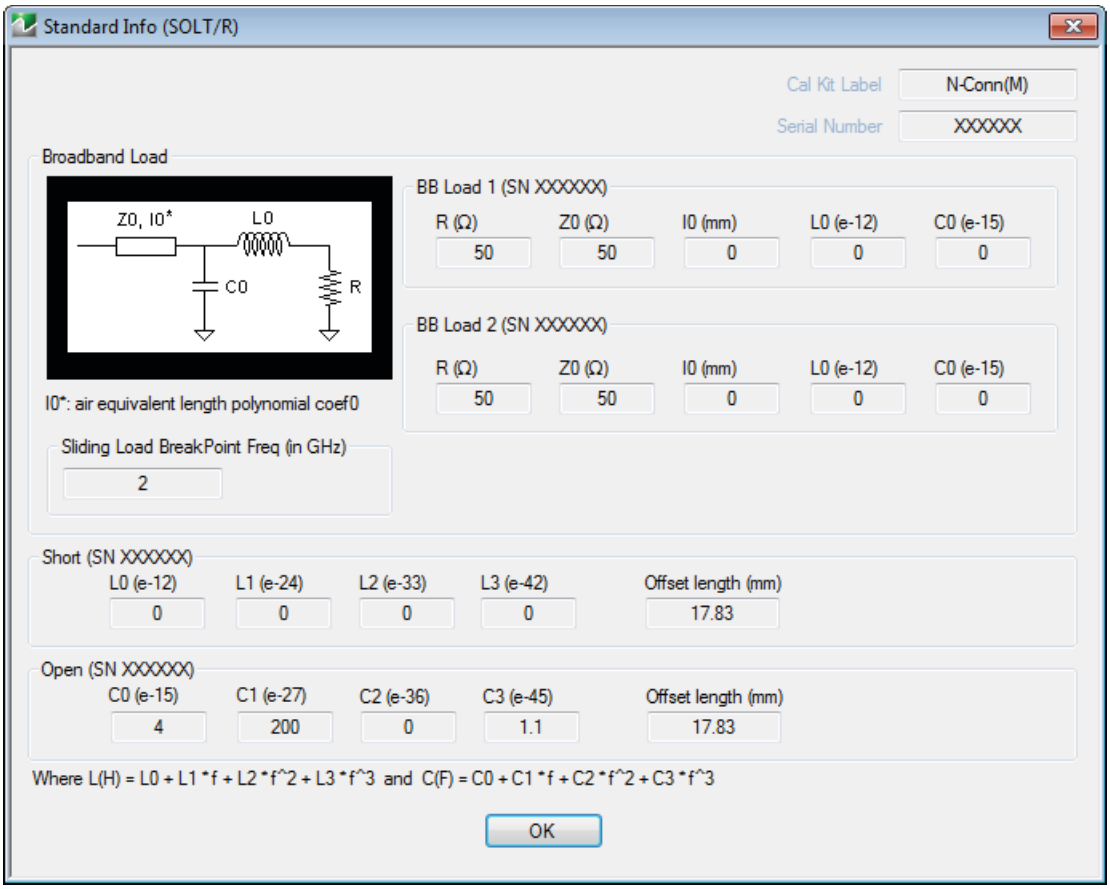


Figure 10-44. STANDARD INFO Dialog Box

RESTORE DEFAULT COEF. Dialog Box – 4-Port VNAs

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 restorable characterization data.

Full Name

- Full Restore Default Coefficients Dialog Box

Previous

- CAL KIT (and AutoCal Kit) Menu – 4-Port VNAs on page 10-68

Navigation

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

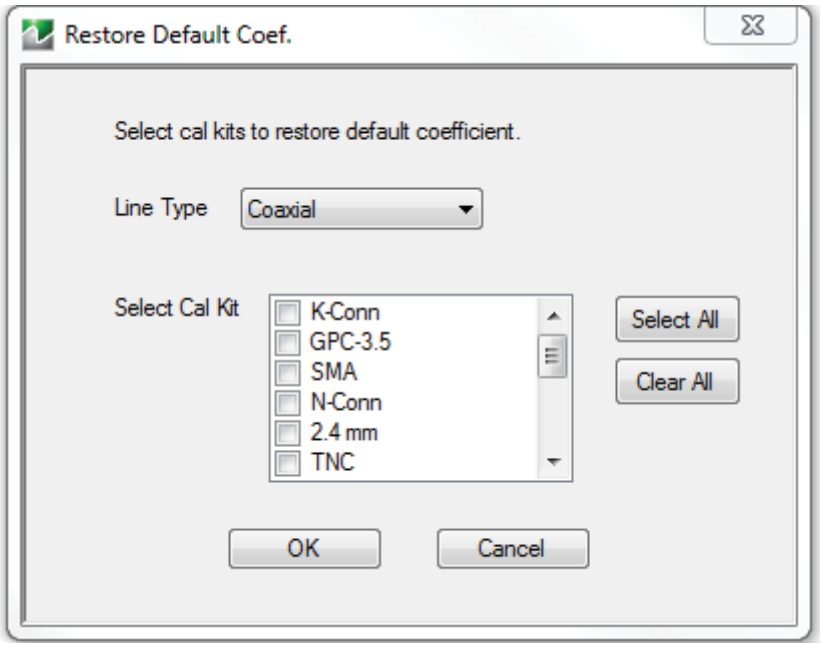


Figure 10-45. RESTORE DEFAULT COEF. (RESTORE DEFAULT COEFFICIENTS) Dialog Box

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 10-3. 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, GPC-3.5, SMA, N-Conn, N-Conn (75), GPC-7, 7/16, TNC, TOSLK50, TOSLN50, GCS35M
	SSLT	W1-Conn
	SSST	W1-Conn
Non-Dispersive	SOLT/SOLR	W1-Conn, V-Conn, K-Conn, 2.4 mm, 2.4 mm V, GPC-3.5, SMA, N-Conn, N-Conn (75), GPC-7, 7/16, TNC, TOSLK50, TOSLN50, GCS35M
	SSLT	W1-Conn
	SSST	W1-Conn
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	No selections available
	SSLT	WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229
	SSST	No selections available

10-5 AutoCal/SmartCal Port Selection Setup – 4-Port VNAs

AUTOCAL/SMARTCAL Menu – 4-Port VNAs

Use the AUTOCAL/SMARTCAL menu to select whether the AutoCal or SmartCal procedure will be for 4-port, 2-port, or 1-port calibration.

Prerequisites

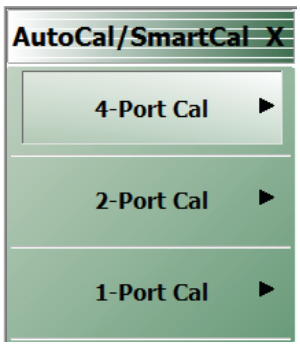
- 4-Port VNA Mode

Previous

- CALIBRATE Menu – 4-Port VNAs on page 10-9

Navigation

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



4-Port Cal (4-Port VNAs)

Sets the AutoCal or SmartCal calibration function for 4-port VNAs to a 4-port method and displays the AUTOCAL (or SMARTCAL) SETUP (4-port Cal) menu.

- "SmartCal 4-Port Cal Setup – 4-Port VNAs" on page 10-77
- "AutoCal 4-Port Cal Setup – 4-Port VNAs" on page 10-82

2-Port Cal (4-Port VNAs)

Sets the AutoCal or SmartCal calibration function for 4-port VNAs to a 2-port method and displays the AUTOCAL SETUP (2-port Cal) menu.

- "SmartCal 2-Port Cal Setup – 4-Port VNAs" on page 10-87
- "AutoCal 2-Port Cal Setup – 4-Port VNAs" on page 10-92

1-Port Cal (4-Port VNAs)

Sets the AutoCal or SmartCal calibration function for 4-port VNAs to a 1-port method and displays the AUTOCAL SETUP (1-port Cal) menu.

- "SmartCal 1-Port Cal Setup – 4-Port VNAs" on page 10-97
- "AutoCal 1-Port Cal Setup – 4-Port VNAs" on page 10-100

Figure 10-46. AUTOCAL PORT Menu – 4-Port VNAs

10-6 SmartCal 4-Port Cal Setup – 4-Port VNAs

SMARTCAL SETUP Menu – 4-Port Cal – 4-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.

Prerequisites

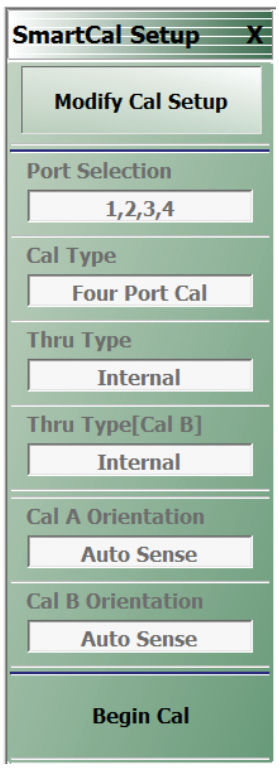
- 4-Port Mode

Previous

- AUTOCAL/SMARTCAL Menu – 4-Port VNAs on page 10-76

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 4-Port Cal | SMARTCAL Setup



Modify Cal Setup

Select displays the MODIFY SMARTCAL 4-PORT SETUP dialog box. The dialog box provides control settings for Auto Sense Module Orientation, Select Cal Type, Through Setup, Adapter Removal Port, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY 4-PORT SMARTCAL SETUP Dialog Box" on page 10-79

Port Selection (Read-only)

Displays the Port Selection for the SmartCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal Type (Read-only)

Displays the Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Thru Type (Read-only)

Displays the Thru Type selected as either Internal Thru or True Thru. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Thru Type (Cal B) (Read-only)

Displays the Cal B Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal A Orientation (Read-only)

Displays the left/right VNA Port orientation and assignment for the Cal A configuration, Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box. Orientation options are either Left=P1, Right =P1 or Left=P2, Right=P1.

Figure 10-47. SMARTCAL SETUP Menu – 4-Port Cal – 4-Port VNAs (1 of 2)

	Cal B Orientation (Read-only) Displays the left/right VNA Port orientation and assignment for the Cal B configuration. Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box. Orientation options are either Left=P1, Right =P1 or Left=P2, Right=P1. **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 – 4-Port VNAs on page 10-7

Figure 10-47. SMARTCAL SETUP Menu – 4-Port Cal – 4-Port VNAs (2 of 2)

MODIFY 4-PORT SMARTCAL SETUP Dialog Box

Use the MODIFY 4-PORT SMARTCAL SETUP dialog box to change the calibration parameters prior to an a SmartCal calibration procedure. Options include the calibration and thru types to be used. The left/right port sense is manually configured.

Previous

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 4-Port Cal | AUTOCAL SETUP | Modify Cal Setup | MODIFY 4-PORT SMARTCAL SETUP Dialog Box

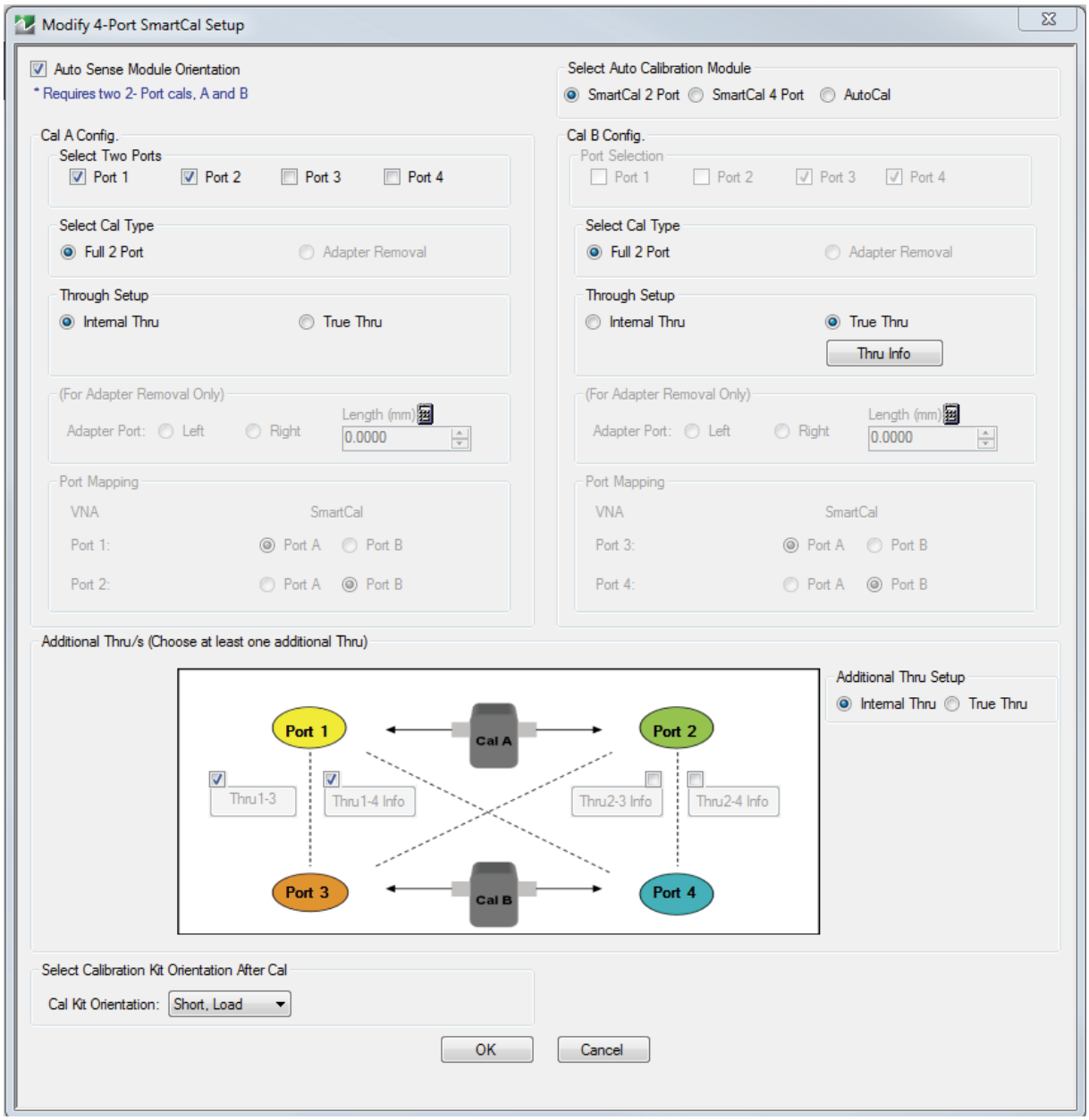


Figure 10-48. MODIFY 4-PORT SMARTCAL SETUP Dialog Box – 2-Port SmartCal Calibration Module

General

The calibration requires two 2-Port calibrations: Cal A and Cal B.

Auto Sense Module Orientation

Check to use Auto Sense Module Orientation.

Cal A Configuration

Select two ports for the Cal A configuration. choose from Port 1, Port 2, Port 3, or Port 4.

Cal A Configuration – Select Cal Type

Only the Full 2 Port selection is available.

Cal A Configuration – Through Setup

Select either Internal Through or True Thru.

If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

For Adapter Removal

The For Adapter Removal area and its controls are not available in 4-Port AutoCal Setup.

Cal A Manual Port Sense Configuration

The selections available are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 2 were selected above, your choices are:
  - Left = Port 1 and Right = Port 2
  - Left = Port 2 and Right = Port 1
- If Port 1 and Port 3 were selected above, your choices are:
  - Left = Port 1 and Right = Port 3
  - Left = Port 3 and Right = Port 1

Cal B Configuration

Auto selects whichever ports were not selected in Cal A Configuration.

Cal B Configuration – Select Cal Type

Only the Full 2 Port selection is available.

Cal B Configuration – Through Setup

Select either Internal Through or True Thru.

If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Cal B Manual Port Sense Configuration

The selections available are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 2 were selected for Cal A above, your choices are:
  - Left = Port 3 and Right = Port 4
  - Left = Port 4 and Right = Port 3
- If Port 1 and Port 3 were selected for Cal A above, your choices are:
  - Left = Port 2 and Right = Port 4
  - Left = Port 4 and Right = Port 2

Additional Throughs

Choose at least one additional external thru from the check boxes in the port diagrams. More than one selection may be made. Select from:

- Thru 1-2
- Thru 1-4
- Thru 2-3
- Thru 3-4

Completing SmartCal Setup

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

10-7 AutoCal 4-Port Cal Setup – 4-Port VNAs

AUTOCAL SETUP Menu – 4-Port Cal – 4-Port VNAs

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

Prerequisites

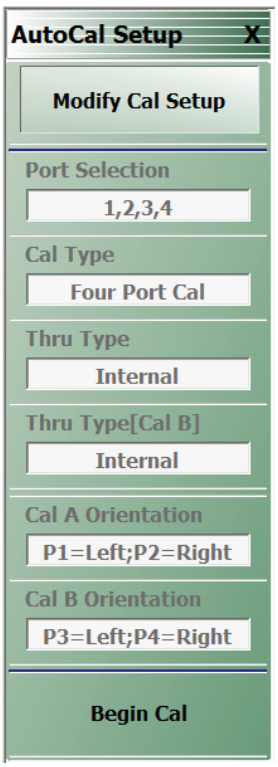
- 4-Port Mode

Previous

- AUTOCAL/SMARTCAL Menu – 4-Port VNAs on page 10-76

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 4-Port Cal | AUTOCAL Setup



Modify Cal Setup

Select displays the MODIFY AUTOCAL 4-PORT SETUP dialog box. The dialog box provides control settings for Auto Sense Module Orientation, Select Cal Type, Through Setup, Adapter Removal Port, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY 4-PORT AUTOCAL SETUP Dialog Box" on page 10-84

Port Selection (Read-only)

Displays the Port Selection for the AutoCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal Type (Read-only)

Displays the Cal Type selected for the AutoCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Thru Type (Read-only)

Displays the Thru Type selected as either Internal Thru or True Thru. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Thru Type (Cal B) (Read-only)

Displays the Cal B Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal A Orientation (Read-only)

Displays the left/right VNA Port orientation and assignment for the Cal A configuration, Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box. Orientation options are either Left=P1, Right =P1 or Left=P2, Right=P1.

Figure 10-49. AUTOCAL SETUP Menu – 4-Port Cal – 4-Port VNAs (1 of 2)

	Cal B Orientation (Read-only) Displays the left/right VNA Port orientation and assignment for the Cal B configuration. Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box. Orientation options are either Left=P1, Right =P1 or Left=P2, Right=P1. **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 – 4-Port VNAs on page 10-7

Figure 10-49. AUTOCAL SETUP Menu – 4-Port Cal – 4-Port VNAs (2 of 2)

MODIFY 4-PORT AUTOCAL SETUP Dialog Box

Use the MODIFY 4-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. The left/right port sense is manually configured.

Previous

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | AutoCal/SmartCal | AUTOCAL/SMARTCAL | 4-Port Cal | AUTOCAL SETUP | Modify Cal Setup | MODIFY 4-PORT AUTOCAL SETUP Dialog Box

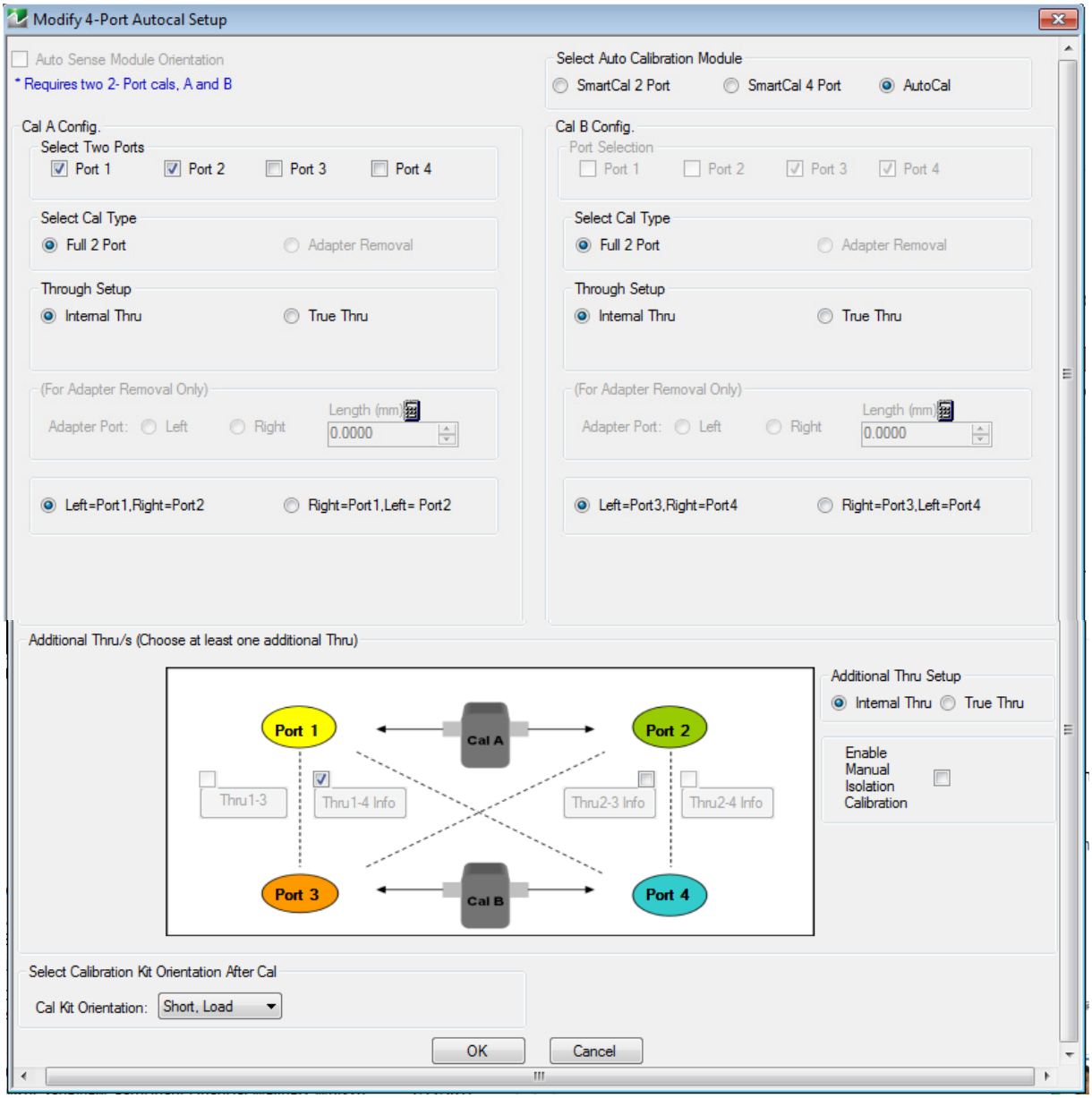


Figure 10-50. MODIFY 4-PORT AUTOCAL SETUP Dialog Box

General

The calibration requires two 2-Port calibrations: Cal A and Cal B.

Auto Sense Module Orientation

Check to use Auto Sense Module Orientation.

Cal A Configuration

Select two ports for the Cal A configuration. choose from Port 1, Port 2, Port 3, or Port 4.

Cal A Configuration – Select Cal Type

Only the Full 2 Port selection is available.

Cal A Configuration – Through Setup

Select either Internal Through or True Thru.

If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

For Adapter Removal

The For Adapter Removal area and its controls are not available in 4-Port AutoCal Setup.

Cal A Manual Port Sense Configuration

The selections available are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 2 were selected above, your choices are:
  - Left = Port 1 and Right = Port 2
  - Left = Port 2 and Right = Port 1
- If Port 1 and Port 3 were selected above, your choices are:
  - Left = Port 1 and Right = Port 3
  - Left = Port 3 and Right = Port 1

Cal B Configuration

Auto selects whichever ports were not selected in Cal A Configuration.

Cal B Configuration – Select Cal Type

Only the Full 2 Port selection is available.

Cal B Configuration – Through Setup

Select either Internal Through or True Thru.

If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Cal B Manual Port Sense Configuration

The selections available are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 2 were selected for Cal A above, your choices are:
  - Left = Port 3 and Right = Port 4
  - Left = Port 4 and Right = Port 3
- If Port 1 and Port 3 were selected for Cal A above, your choices are:
  - Left = Port 2 and Right = Port 4
  - Left = Port 4 and Right = Port 2

Additional Throughs

Choose at least one additional external thru from the check boxes in the port diagrams. More than one selection may be made. Select from:

- Thru 1-2
- Thru 1-4
- Thru 2-3
- Thru 3-4

Enable Manual Isolation Calibration

Enabling this feature adds a manual isolation calibration step to the AutoCal calibration routine. The isolation calibration will require the AutoCal be disconnected and 50 ohm terminations be applied to all the ports simultaneously to complete the calibration.

Completing AutoCal Setup

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

10-8 SmartCal 2-Port Cal Setup – 4-Port VNAs

SMARTCAL SETUP Menu – 2-Port Cal – 4-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:

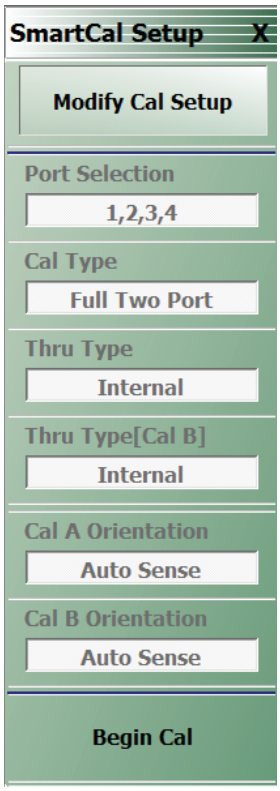
- 4-Port Mode

Previous

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

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 Auto Sense Module Orientation, Select Cal Type, Through Setup, Adapter Removal Port, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY 2-PORT SMARTCAL SETUP Dialog Box" on page 10-89

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.

Thru Type (Cal B) (Read-only)

Displays the Cal B Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal A Orientation (Read-only)

Displays the VNA Port orientation and assignment for the Cal A configuration. Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal B Orientation (Read-only)

Displays the VNA Port orientation and assignment for the Cal B configuration. Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box.

(continued)

Figure 10-51. SMARTCAL SETUP Menu – 2-Port Cal – 4-Port VNAs (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 – 4-Port VNAs on page 10-7

Figure 10-51. SMARTCAL SETUP Menu – 2-Port Cal – 4-Port VNAs (2 of 2)

MODIFY 2-PORT SMARTCAL SETUP Dialog Box

Use the MODIFY 2-PORT AUTOCAL 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 left/right port sense can be automatically or manually configured.

Previous

- "SMARTCAL SETUP Menu – 2-Port Cal – 4-Port VNAs" on page 10-87

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

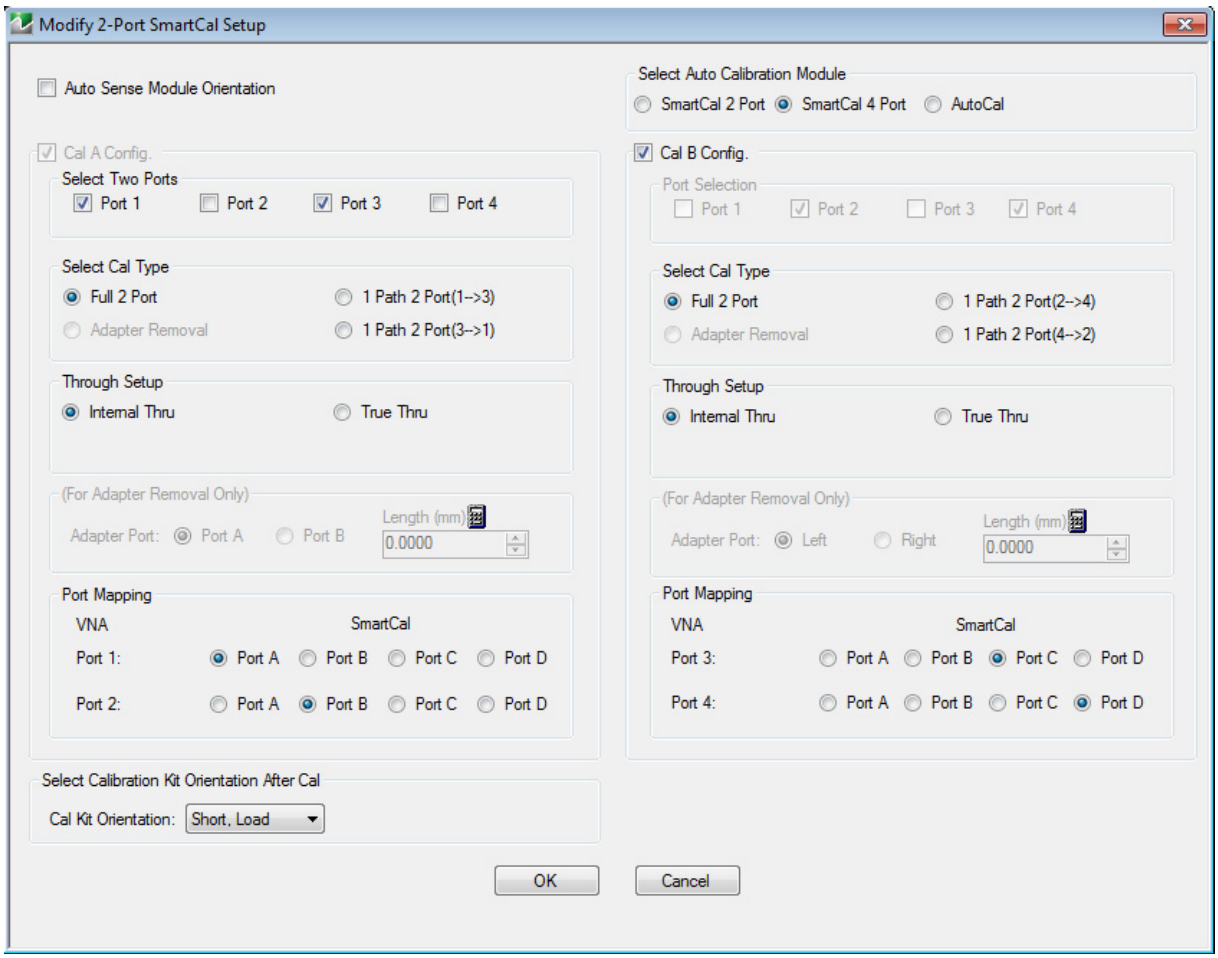


Figure 10-52. MODIFY 2-PORT SMARTCAL SETUP Dialog Box – 4-Port VNAs – 4-Port SmartCal Calibration Module

Auto Sense Module Orientation

Check to use Auto Sense Module Orientation.

Cal A Configuration

The Cal A Configuration is auto-selected.

Select two ports for the Cal A configuration from either:

- Port 1
- Port 2
- Port 3
- Port 4

Whichever two ports are not selected are auto selected for Cal B Configuration.

Cal A Configuration – Select Cal Type

Select calibration types from the following choices. Note that the 1 Path 2 Port choices depend on the ports selected above in Cal A Configuration. The examples below assume that Port 1 and Port 3 were selected above.

- Full 2 Port
- 1 Path 2 Port (1-->3)
- 1 Path 2 Port (3-->1)

Cal A Configuration – Through Setup

Select either:

- Internal Through
- True Thru
  - If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box which is described in the section above.
  - "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

For Adapter Removal

The For Adapter Removal area and its controls are not available in 2-Port AutoCal Setup.

Cal A Manual Port Sense Configuration

The port sense configuration options are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 3 were selected above, your choices are:
  - Left = Port 1 and Right = Port 3
  - Left = Port 3 and Right = Port 1

Cal B Configuration

The configuration auto selects whichever ports were not selected in Cal A Configuration.

Cal B Configuration – Select Cal Type

Select calibration types from the following choices. Note that the 1 Path 2 Port choices depend on the ports selected above in Cal A Configuration. The examples below assume that Port 1 and Port 3 were selected above and that the Cal B ports are Port 2 and Port 4.

- Full 2 Port
- 1 Path 2 Port (2-->4)
- 1 Path 2 Port (4-->2)

Cal B Configuration – Through Setup

Select either:

- Internal Through
- True Thru
  - If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box.
  - "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Cal B Manual Port Sense Configuration

The selections available are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 3 were selected for Cal A above, your choices are:
  - Left = Port 2 and Right = Port 4
  - Left = Port 4 and Right = Port 2

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.

- SMARTCAL SETUP Menu – 2-Port Cal – 4-Port VNAs on page 10-87

10-9 AutoCal 2-Port Cal Setup – 4-Port VNAs

AUTOCAL SETUP Menu – 2-Port Cal – 4-Port VNAs

Note	This menu applies to the AutoCal calibration module. If you are using a SmartCal 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:

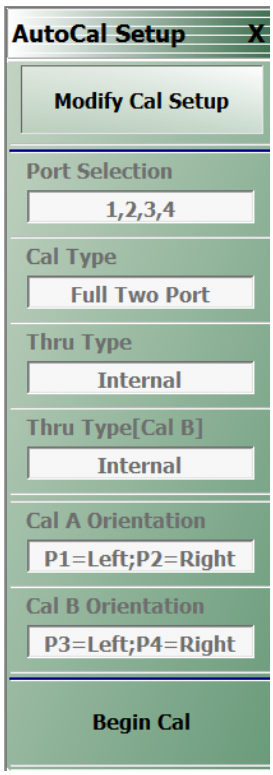
- 4-Port Mode

Previous

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

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 Auto Sense Module Orientation, Select Cal Type, Through Setup, Adapter Removal Port, and links to the THRU INFO and AIR EQUIVALENT LENGTH CONVERSION dialog boxes.

- "MODIFY 2-PORT AUTOCAL SETUP Dialog Box" on page 10-94

Port Selection (Read-only)

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

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.

Thru Type (Cal B) (Read-only)

Displays the Cal B Cal Type selected for the SmartCal procedure. The settings are determined in the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal A Orientation (Read-only)

Displays the VNA Port orientation and assignment for the Cal A configuration. Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Cal B Orientation (Read-only)

Displays the VNA Port orientation and assignment for the Cal B configuration. Opens the MODIFY 4-PORT AUTOCAL SETUP dialog box.

Figure 10-53. AUTOCAL SETUP Menu – 2-Port Cal – 4-Port VNAs (1 of 2)

	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 – 4-Port VNAs on page 10-7

Figure 10-53. AUTOCAL SETUP Menu – 2-Port Cal – 4-Port VNAs (2 of 2)

MODIFY 2-PORT AUTOCAL SETUP Dialog Box

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 – 4-Port VNAs on page 10-92

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

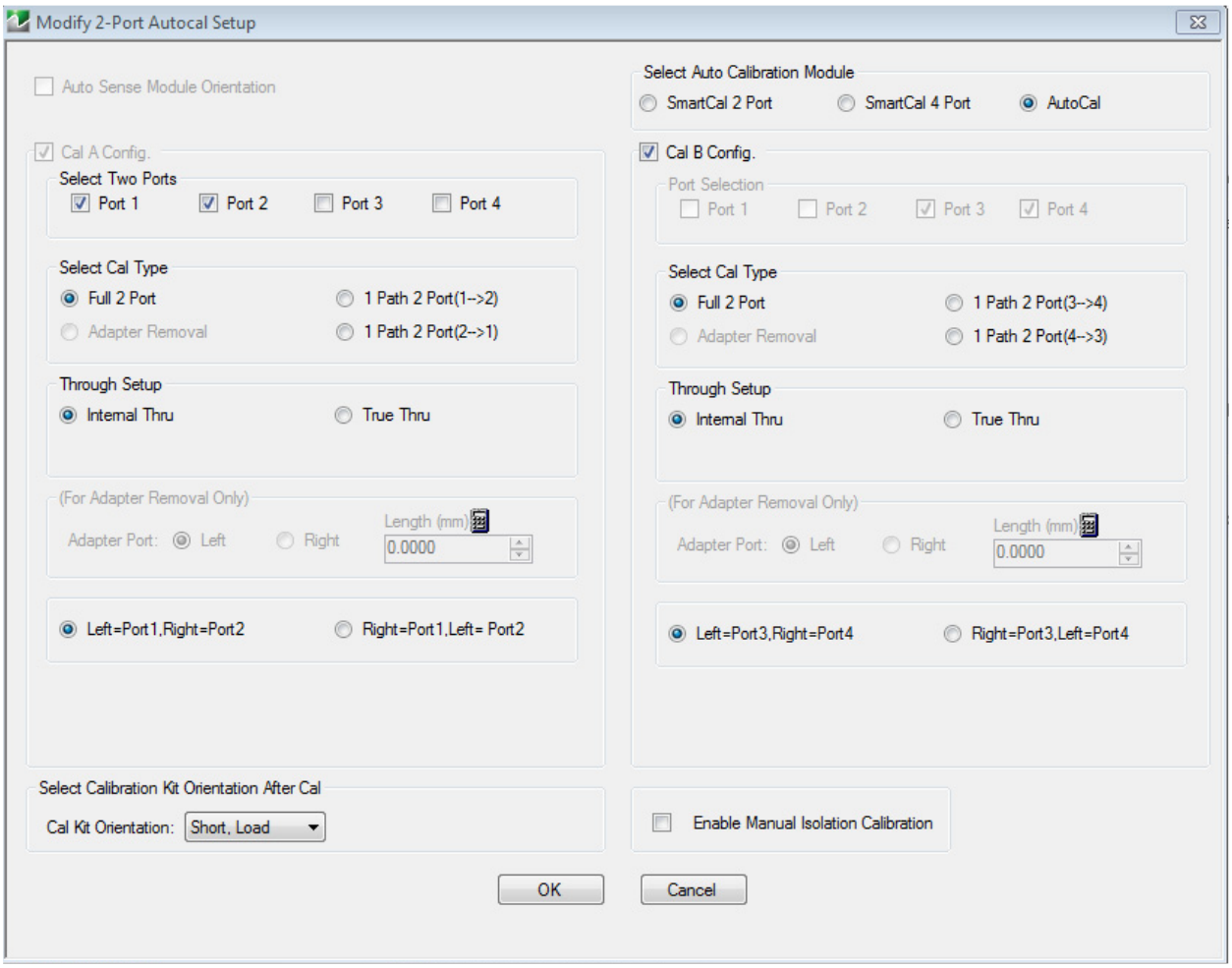


Figure 10-54. MODIFY 2-PORT AUTOCAL SETUP Dialog Box – 4-Port VNAs

Auto Sense Module Orientation

Check to use Auto Sense Module Orientation.

Cal A Configuration

The Cal A Configuration is auto-selected.

Select two ports for the Cal A configuration from either:

- Port 1
- Port 2
- Port 3
- Port 4

Whichever two ports are not selected are auto selected for Cal B Configuration.

Cal A Configuration – Select Cal Type

Select calibration types from the following choices. Note that the 1 Path 2 Port choices depend on the ports selected above in Cal A Configuration. The examples below assume that Port 1 and Port 3 were selected above.

- Full 2 Port
- 1 Path 2 Port (1-->3)
- 1 Path 2 Port (3-->1)

Cal A Configuration – Through Setup

Select either:

- Internal Through
- True Thru
    - If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box which is described in the section above.
    - "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

For Adapter Removal

The For Adapter Removal area and its controls are not available in 2-Port AutoCal Setup.

Cal A Manual Port Sense Configuration

The port sense configuration options are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 3 were selected above, your choices are:
    - Left = Port 1 and Right = Port 3
    - Left = Port 3 and Right = Port 1

Cal B Configuration

The configuration auto selects whichever ports were not selected in Cal A Configuration.

Cal B Configuration – Select Cal Type

Select calibration types from the following choices. Note that the 1 Path 2 Port choices depend on the ports selected above in Cal A Configuration. The examples below assume that Port 1 and Port 3 were selected above and that the Cal B ports are Port 2 and Port 4.

- Full 2 Port
- 1 Path 2 Port (2-->4)
- 1 Path 2 Port (4-->2)

Cal B Configuration – Through Setup

Select either:

- Internal Through
- True Thru
  - If True Thru is selected, the Thru Info button is available. Select displays the THRU INFO dialog box.
  - "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Cal B Manual Port Sense Configuration

The selections available are dependent on the ports selected above in Cal A Configuration. For example:

- If Port 1 and Port 3 were selected for Cal A above, your choices are:
  - Left = Port 2 and Right = Port 4
  - Left = Port 4 and Right = Port 2

Enable Manual Isolation Calibration

Enabling this feature adds a manual isolation calibration step to the AutoCal calibration routine. The isolation calibration will require the AutoCal be disconnected and 50 ohm terminations be applied to all the ports simultaneously to complete the calibration.

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.

- AUTOCAL SETUP Menu – 2-Port Cal – 4-Port VNAs on page 10-92

10-10 SmartCal 1-Port Cal Setup – 4-Port VNAs

SMARTCAL SETUP Menu – 1-Port Cal – 4-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.

Prerequisites

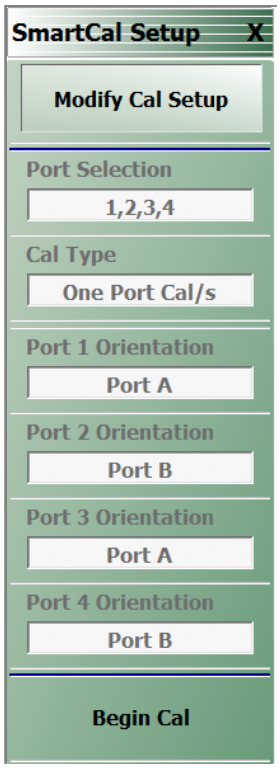
- 4-Port Mode

Previous

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

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 1-Port Calibration Ports and Port Left/Right Identification.

- "MODIFY 1-PORT SMARTCAL SETUP Dialog Box – 4-Port VNAs" on page 10-98

Port Selection (Read-only)

Displays the Port or Ports selected for the SmartCal 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 SmartCal procedure. The setting is defined by the selection of a button on the AUTOCAL/SMARTCAL menu.

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

Port x Orientation (Read-only)

These read-only buttons only appear if Port x (1-4) was selected in the MODIFY 1-PORT SMARTCAL SETUP dialog box. If available, shows the port assignment for Port x.

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 now enabled and set to ON.

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Figure 10-55. SMARTCAL PROCEDURE Menu – 1-Port Calibration – 4-Port VNA

MODIFY 1-PORT SMARTCAL SETUP Dialog Box – 4-Port VNAs

Previous

- SMARTCAL SETUP Menu – 1-Port Cal – 4-Port VNAs on page 10-97

Navigation

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

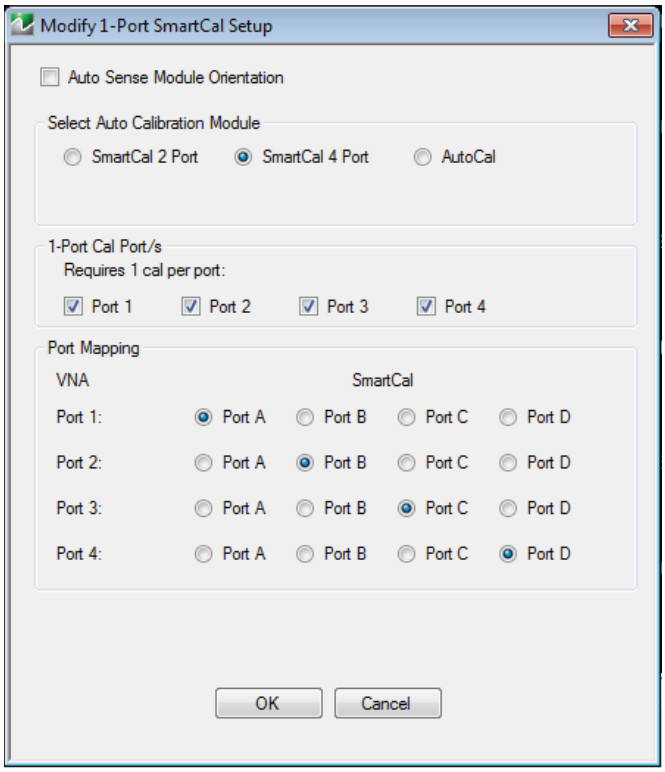


Figure 10-56. MODIFY 1-PORT SMARTCAL SETUP Dialog Box – 4-Port VNAs

Auto Sense Module Orientation

Check to use Auto Sense Module Orientation.

1-Port Cal Port(s)

Select any combination of ports from Port 1, Port 2, Port 3, or Port 4.

For each port selected above, a port mapping radio button becomes available below.

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 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 / Port 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.

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.

- SMARTCAL SETUP Menu – 1-Port Cal – 4-Port VNAs on page 10-97

10-11 AutoCal 1-Port Cal Setup – 4-Port VNAs

AUTOCAL SETUP Menu – 1-Port Cal – 4-Port VNAs

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

Prerequisites

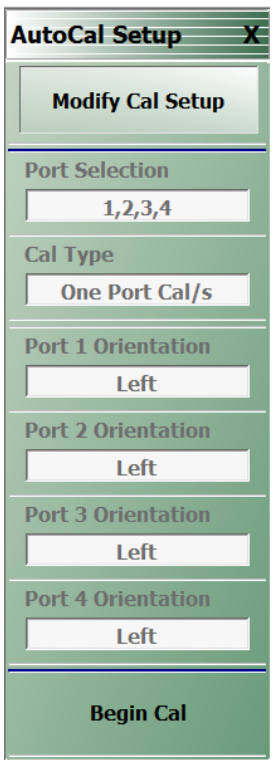
- 4-Port Mode

Previous

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

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 AUTOPORT SETUP dialog box. The dialog box provides control settings for 1-Port Calibration Ports and Port Left/Right Identification.

- "MODIFY 1-PORT AUTOCAL SETUP Dialog Box – 4-Port VNAs" on page 10-101

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 by the selection of a button on the AUTOCAL/SMARTCAL menu.

- "AutoCal/SmartCal Port Selection Setup – 4-Port VNAs" on page 10-76

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 left/right 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 AUTOCAL SETUP dialog box. If available, shows the left/right assignment for Port 2.

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 now enabled and set to ON.

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Figure 10-57. AUTOCAL PROCEDURE Menu – 1-Port Calibration – 4-Port VNA

MODIFY 1-PORT AUTOCAL SETUP Dialog Box – 4-Port VNAs

Previous

- AUTOCAL SETUP Menu – 1-Port Cal – 4-Port VNAs on page 10-100

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

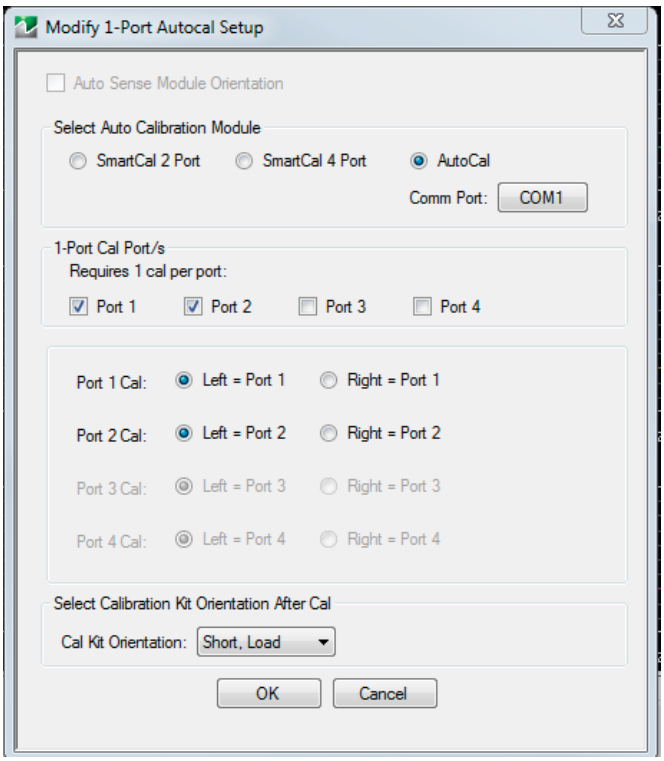


Figure 10-58. MODIFY 1-PORT AUTOCAL SETUP Dialog Box – 4-Port VNAs

Auto Sense Module Orientation

Check to use Auto Sense Module Orientation.

1-Port Cal Port(2)

Select any combination of ports from Port 1, Port 2, Port 3, or Port 4.

For each port selected above, a left/right configuration radio button becomes available below.

Port Sense Left/Right Configuration

For each selected port above, select the left/right assignment:

- Port 1 Cal: Left = Port 1 or Right = Port 1
- Port 2 Cal: Left = Port 2 or Right = Port 2
- Port 3 Cal: Left = Port 3 or Right = Port 3
- Port 4 Cal: Left = Port 4 or Right = Port 4

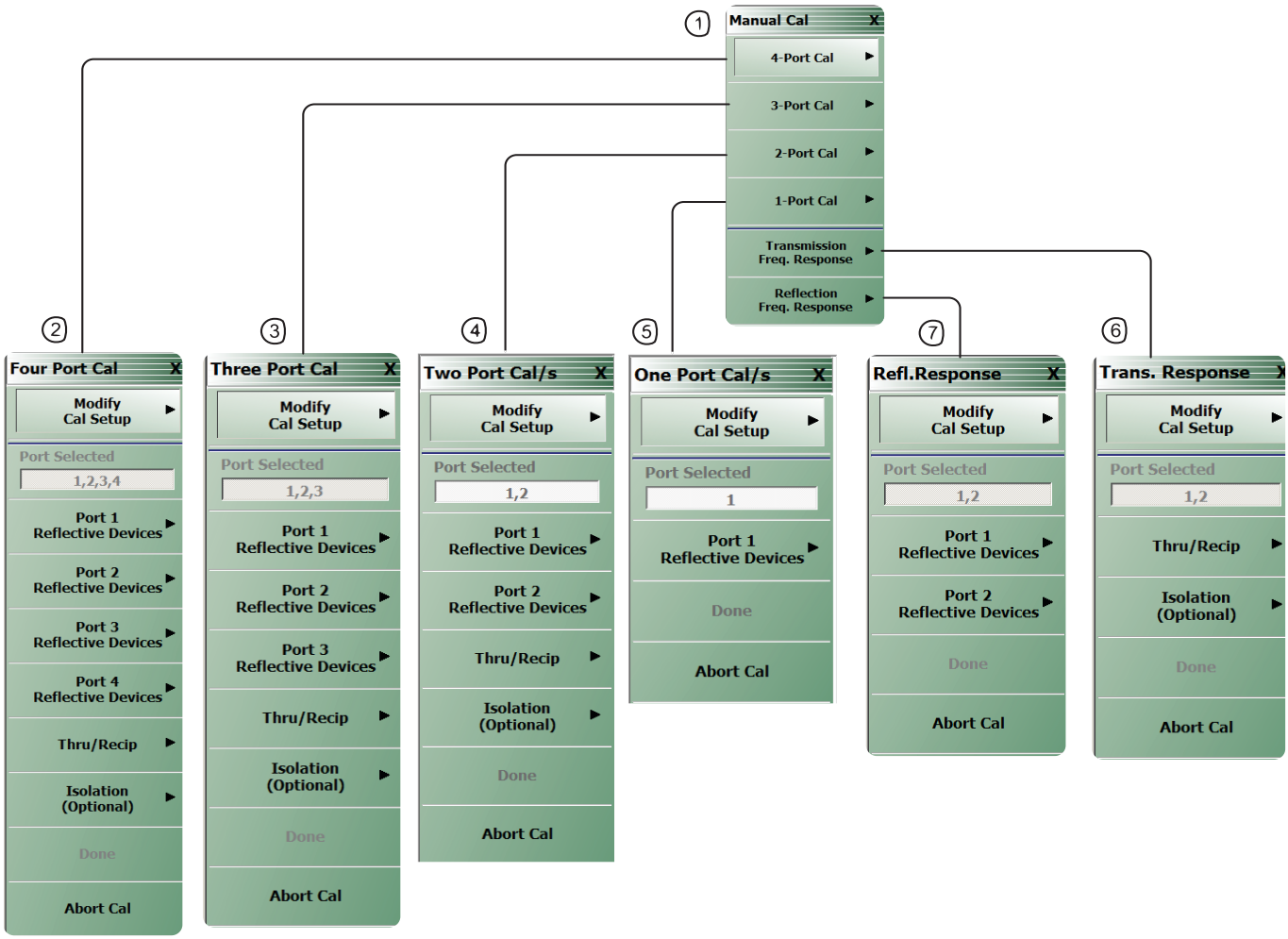
Completing AutoCal Setup

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.

- AUTOCAL SETUP Menu – 1-Port Cal – 4-Port VNAs on page 10-100

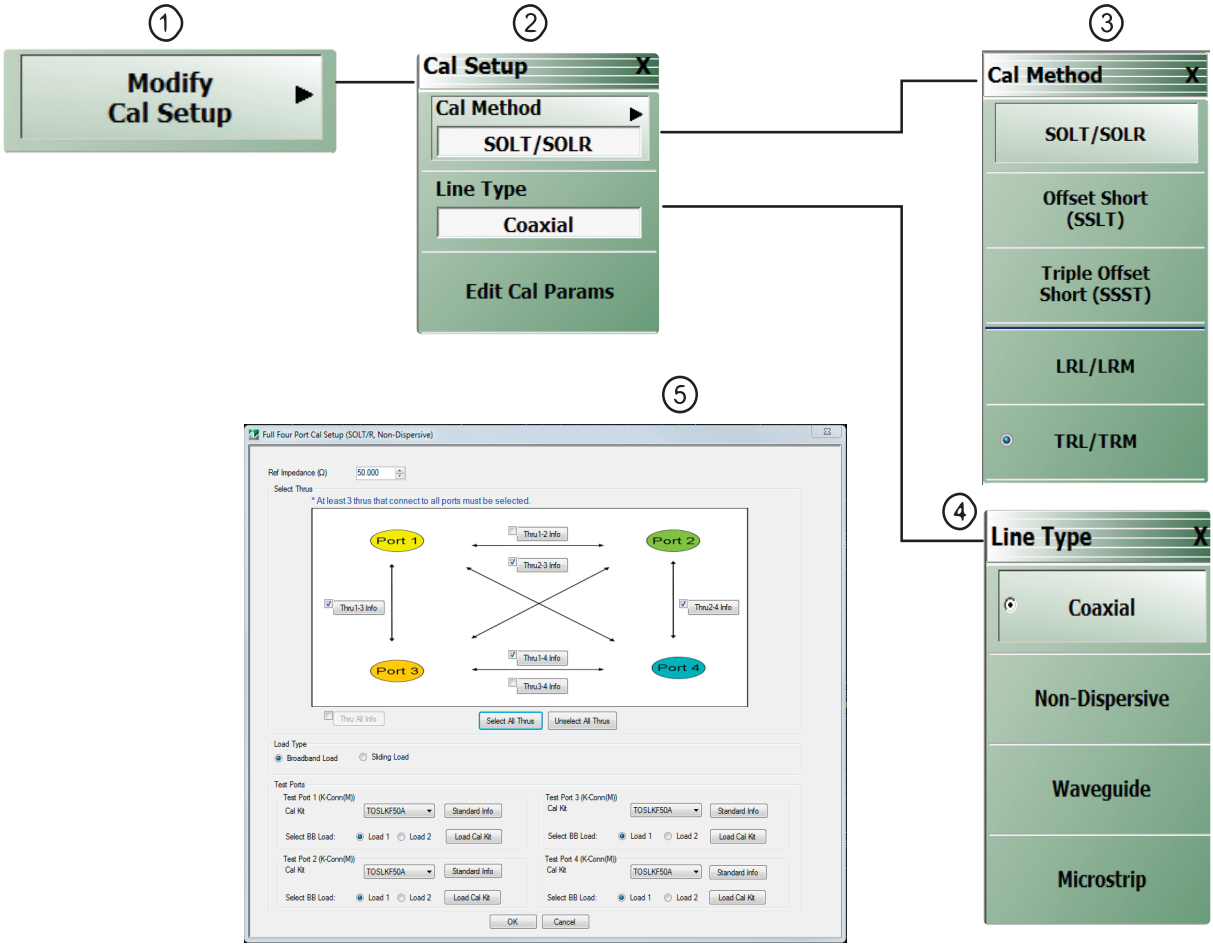
10-12 Manual Calibration Menus and Dialog Boxes – 4-Port VNAs

The MANUAL CAL menu buttons allow selection of the calibration type. The Modify Cal Setup button on the setup menus provides access to the CAL SETUP menu, which allows selection of calibration methods, and access with the Edit Cal Params button to the corresponding configuration dialog box.



1. MANUAL CAL menu.	5. ONE PORT CAL menu
2. FOUR PORT CAL menus	6. TRANS. RESPONSE menu
3. THREE PORT CAL menu	7. REFL. RESPONSE menu
4. TWO PORT CAL menu	

Figure 10-59. Manual Calibration Setup Menus – 4-Port VNAs – Sheet 1



1. MODIFY CAL SETUP menu.	4. LINE TYPE menu
2. CAL SETUP menus	5. FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) dialog box
3. CAL METHOD menu.	

Figure 10-60. Manual Calibration Setup Menus – 4-Port VNAs – Sheet 2

Manual Cal Combinations

The manual calibration setup menus and dialog boxes provide the following port configurations, calibration types, and calibration methods, and line types:

- Manual Calibration Types
  - 4-Port Calibration
  - 3-Port Calibration
  - 2-Port Calibration
  - 1-Port Calibration
  - Transmission Frequency Response Calibration
  - Reflection Frequency Response Calibration

- 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
    - TRL/TRM – Thru-Reflect-Line/Thru-Reflect-Match
- Line Types
    - Coaxial

Manual Cal Dialog Box Settings

Most 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 – 4-Port VNAs

Full Name

- Manual Calibration Menu

Prerequisites

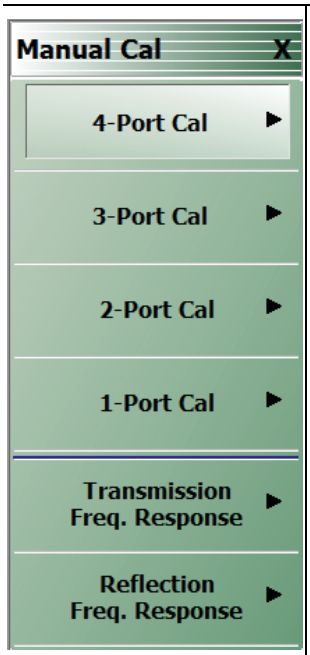
- 4-Port Mode

Previous

- CALIBRATE Menu – 4-Port VNAs on page 10-9

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL



4-Port Cal

Select displays the FOUR PORT CAL menu where the calibration step-by-step procedure is carried out. This is the most complete calibration and fully corrects all S11, S12, S13, S14, S21, S22, S23, S24, S31, S32, S33, S34, S41, S42, S43, S44 four-port S-parameters:

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113

3-Port Cal

Select displays the THREE PORT CAL menu where the calibration step-by-step procedure is carried out.

- THREE PORT CAL Menu – 4-Port VNAs on page 10-150

2-Port Cal

Select displays the TWO PORT CAL menu where the calibration step-by-step procedure is carried out.

- TWO PORT CAL Menu – 4-Port VNAs on page 10-177

1-Port Cal

Select displays the ONE PORT CAL menu.

The menu below is representative of a typical 1-port calibration.

- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195

Transmission Freq. Response

Selecting the Transmission Frequency Response button displays the TRANS. RESPONSE menu. During the calibration configuration in the CAL SETUP menu's EDIT CAL PARAMS dialog, select forward or reverse or both directions.

- TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207

(continued)

Figure 10-61. MANUAL CALIBRATION Menu – 4-Port VNAs (1 of 2)

	Reflection Freq. Response Selecting the Reflection Frequency Response button displays the REFL. RESPONSE menu. During the calibration configuration in the CAL SETUP menu's EDIT CAL PARAMS dialog, select an Open or Short cal component. • REFL. RESPONSE Menu – 4-Port VNAs on page 10-216

Figure 10-61. MANUAL CALIBRATION Menu – 4-Port VNAs (2 of 2)

CAL SETUP Menu – 4-Port VNAs

Use the CAL SETUP menu to set the calibration method (SOLT/R, SSLT, SSST, LRL/M, or TRL/TRM), the calibration line type (default coaxial), and more detailed parameters for ports and connectors through the Edit Cal Parameters button and corresponding CAL SETUP dialogs.

Previous

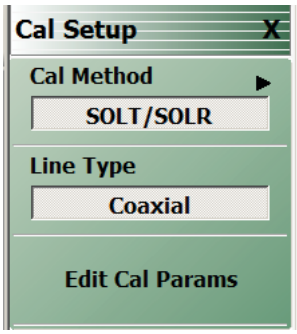
The CAL SETUP menu can be accessed from multiple menus depending on the manual calibration type selected on the MANUAL CAL menu.

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
- THREE PORT CAL Menu – 4-Port VNAs on page 10-150
- TWO PORT CAL Menu – 4-Port VNAs on page 10-177
- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195
- TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207
- REFL. RESPONSE Menu – 4-Port VNAs on page 10-216

Navigation

The navigation path below assumes that 4-Port Cal manual calibration type was selected on the MANUAL CAL menu.

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP
- The general navigation path is:
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | [# of Ports] Cal | [NUM OF PORTS] CAL | Modify Cal Setup | CAL SETUP



Cal Method

Select displays the CAL METHOD menu where the calibration method is selected.

The field displays SOLT/SOLR, SSLT, SSST, LRL/LRM, or TRL/TRM as the currently selected calibration method.

- CAL METHOD Menu – 4-Port VNA on page 10-110

Line Type

Displays the default Coaxial line type.

Edit Cal Params

Select displays the appropriate calibration setup dialog box. The exact name of the dialog box varies depending on the calibration type, calibration method, and line type selected.

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/R, COAXIAL)

(continued)

Figure 10-62. CAL SETUP Menu (1 of 2)

Examples of CAL SETUP dialog boxes using Coaxial line type are available in the links below:

- "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117
- "THREE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-159
- "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-179
- "ONE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-196
- "TRANSMISSION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 10-209
- "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-218

The summary tables below list the contents of all CAL SETUP dialog boxes based on the number of ports involved in the calibration:

- Table: "Manual 4-Port Cal Setup Dialog Box Summary" on page 10-136
- Table: "Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs" on page 10-171
- Table: "Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs" on page 10-190
- Table: "Manual Calibration – 1-PORT CALIBRATION SETUP Dialog Box Contents – 4-Port VNAs" on page 10-204
- Table: "Trans. Freq. Resp. Manual Cal Setup Dialog Box Contents – 4-Port VNAs" on page 10-215
- Table: "Refl. Freq. Resp. Manual Cal. Setup Dialog Box Contents – 4-Port VNAs" on page 10-224

Figure 10-62. CAL SETUP Menu (2 of 2)

CAL METHOD Menu – 4-Port VNA

Use the CAL METHOD menu to select whether the method of SOLT/SOLR, SSLT, SSST, or LRL/LRM will be used during the calibration.

Procedure Reference

- CAL METHOD Menu on page 10-110

Auto-Return Button Selection Group

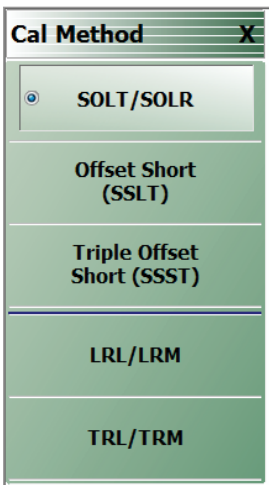
- The four (4) buttons of the CAL METHOD menu form an auto-return button selection group. Selecting any one button marks the selection with the select icon, de-selects the other three (3) buttons, and auto-returns to the CAL SETUP menu.

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108

Navigation

- The navigation path below assumes that Full 2 Port calibration type was selected on the MANUAL CAL menu.
- 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



Selecting any button marks the selection with the select icon, de-selects the other button, and auto-returns to the CAL SETUP menu.

- CAL SETUP Menu – 4-Port VNAs on page 10-108

SOLT/SOLR

Selecting the SOLT/SOLR button sets the calibration method to Short-Open-Load-Thru (or Short-Open-Load-Reciprocal) and then auto-returns to the CAL SETUP menu.

Offset Short (SSLT)

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)

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

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

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.

Figure 10-63. CAL METHOD Menu

LINE TYPE Menu – 4-Port VNA

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.

Procedure Reference

- Figure 10-64, "LINE TYPE Menu" on page 10-111 Callout #4

Auto-Return Button Selection Group

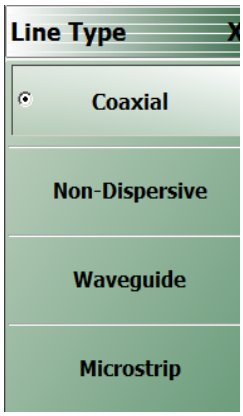
- The four (4) buttons of the LINE TYPE menu form an auto-return button selection group.
- Selecting any one button marks the selection with the select icon, de-selects the other three (3) buttons, and auto-returns to the CAL SETUP menu.

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108 .

Navigation

- The navigation path below assumes that Full 2 Port calibration type was selected on the Manual Cal menu.
- 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



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 – 4-Port VNAs on page 10-108

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 – 4-Port VNAs on page 10-108

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 – 4-Port VNAs on page 10-108

(continued)

Figure 10-64. LINE TYPE Menu (1 of 2)

	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 – 4-Port VNAs on page 10-108

Figure 10-64. LINE TYPE Menu (2 of 2)

10-13 Manual 4-Port Cal Setup – 4-Port VNAs

The FOUR PORT CAL SETUP menu and its related dialog boxes is used to set the calibration parameters for the four port calibration. Dialog boxes for all Cal Method/Line Type combinations are summarized in the table:

- Table: "Manual 4-Port Cal Dialog Box Summary" on page 10-136

FOUR PORT CAL Menu – 4-Port VNAs

Button Availability

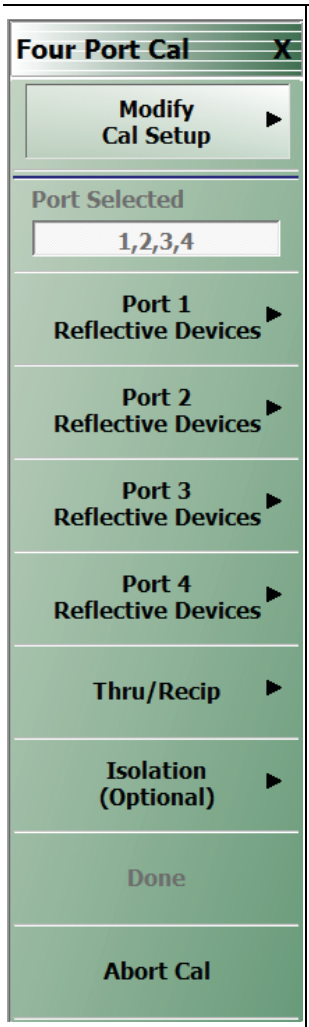
- The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant FULL FOUR PORT CAL SETUP dialog box.
- A representative menu is shown below.
- The example procedures at the end of this chapter show examples of various FOUR PORT CAL menus.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL



Modify Cal Setup

Select opens the CAL SETUP menu.

- CAL SETUP Menu – 4-Port VNAs on page 10-108

The following Cal Method/Line Type combinations are represented with a figure and complete description:

- "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117
-
- "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127

Port Selected

Read-only display of the ports selected for the pending calibration.

Port 1 Reflective Devices

Select displays the REFL. DEVICES PORT 1 submenu. When all procedures are complete, select the Back button to return to the FOUR PORT CAL menu where this button is now marked with a completion checkmark.

Port 2 Reflective Devices

Select displays the REFL. DEVICES PORT 2 submenu. When all procedures are complete, select the Back button to return to the FOUR PORT CAL menu where this button is now marked with a completion checkmark.

Port 3 Reflective Devices

Select displays the REFL. DEVICES PORT 3 submenu. When all procedures are complete, select the Back button to return to the FOUR PORT CAL menu where this button is now marked with a completion checkmark.

Port 4 Reflective Devices

Select displays the REFL. DEVICES PORT 3 submenu. When all procedures are complete, select the Back button to return to the FOUR PORT CAL menu where this button is now marked with a completion checkmark.

Thru/Recip

Select displays the THRU/RECIP submenu. When all procedures are complete, select the Back button to return to the FOUR PORT CAL menu where this button is now marked with a completion checkmark.

Isolation (Optional)

If required, select displays the ISOLATION submenu. When all procedures are complete, select the Back button to return to the FOUR PORT CAL menu where this button is now marked with a completion checkmark.

(continued)

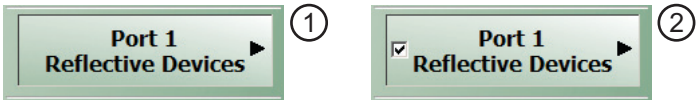
Figure 10-65. FOUR PORT CAL Menu – 4-Port VNAs – Typical Example (1 of 2)

	Done This button is unavailable until the calibration procedure has been completed. When available, it returns to the CALIBRATION menu where the Cal Status button is set to ON. • CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7 **Abort Cal** Select stops the current calibration procedure and returns to the CALIBRATION menu. • CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Figure 10-65. FOUR PORT CAL Menu – 4-Port VNAs – Typical Example (2 of 2)

Completion Menu Button Example

The Port 1 Reflective Devices button (#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 (#2) is now marked with a completion checkmark.

Manual 4-Port Cal Setup Dialog Boxes – 4-Port VNAs

The instrument supports all combinations of 4-port calibration method and line types with configuration dialog boxes. In the interest of document length, not all combinations are described in detail. However, all combinations are summarized in the table at the end of this section.

- "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117
- "FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-120
- "FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-123
- "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127
- "FULL FOUR PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 10-132
- Table: "Manual 4-Port Cal Setup Dialog Box Summary" on page 10-136

FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Prerequisites

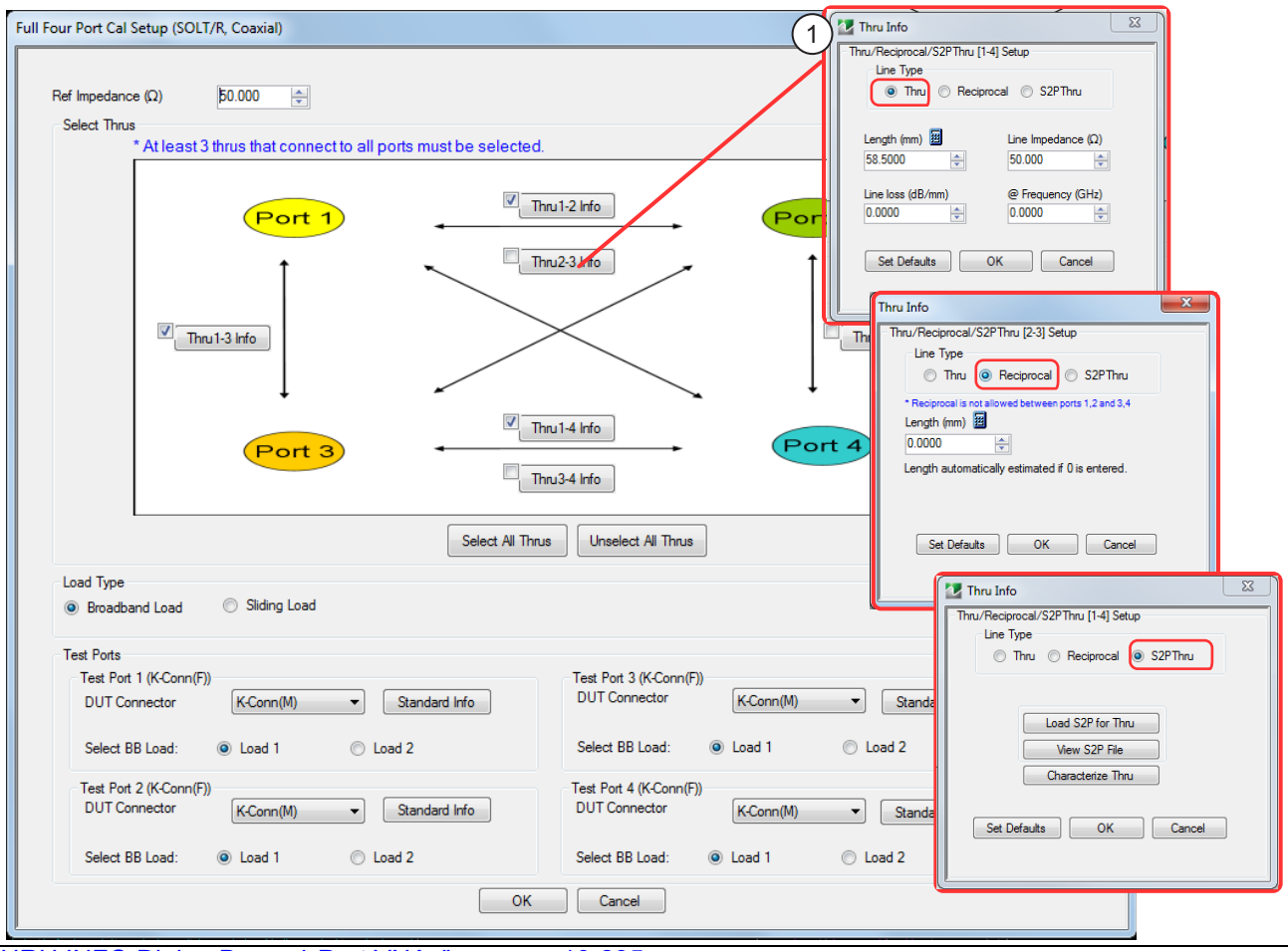
- VNA Mode = 4-Port Mode
- Cal Method = SOLT/SOLR
- Line Type = Coaxial

Previous

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
- CAL SETUP Menu – 4-Port VNAs on page 10-108

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SOLT/SOLR | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-66. FULL FOUR PORT CAL SETUP (SOLT/R, 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 Through Area

Select any combination of throughs as long as three are selected. For a 4-port calibration, the following port pairs are available:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Buttons

Each of the throughs above enables a Thru Info button that displays the THRU INFO dialog box allowing configuration of each through. A Calculator icon in the THRU INFO dialog box allows access to the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

Load Type Area

Select from two options:

- Broadband Load
- Sliding Load (Requires broadband loads below sliding load breakpoint frequency)

Test Port 1 Connector Type Area

Select the **DUT Connector Type** from a drop-down menu list with options of:

- 0.8 mm-Conn (M)
- 0.8 mm-Conn (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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 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 depend on the selected connector, Cal Method, and Line Type. The example here shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 1 Select BB Load Area

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Test Port 2, Test Port 3, and Test Port 4 Connector Type Area

Identical function as with the Test Port 1 Connector Aarea above. Select the DUT Connector Type from a drop-down menu list.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Identical function as with the Test Port 1 Connector Standard Info button above. Select displays the STANDARD INFO dialog box for the selected DUT Connector.

Test Port 2, Test Port 3, and Test Port 4 Select BB Load Area

Identical function as with the Test Port 1 Select BB Load area above. Select between Load 1 and Load 2.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu or click Cancel.

FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

Prerequisites

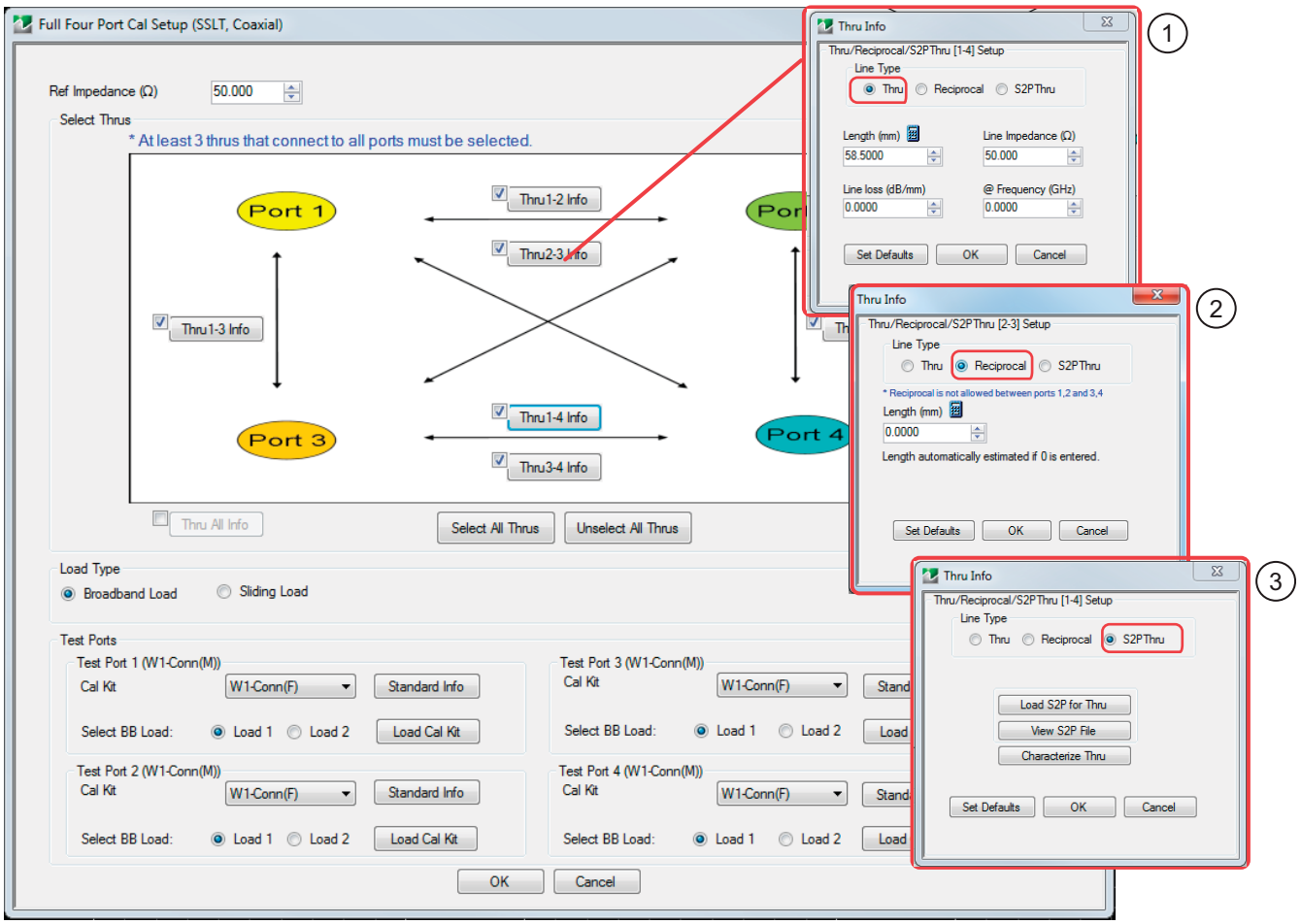
- VNA Mode = 4-Port Mode
- Cal Method = SSLT
- Line Type = Coaxial

Previous

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
- CAL SETUP Menu – 4-Port VNAs on page 10-108

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORTCAL SETUP (SSLT, COAXIAL) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-67. FULL FOUR 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.

Select Throughs

Select any combination of throughs as long as three are selected. For a 4-port calibration, the following port pairs are available:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Buttons

Each of the throughs above enables a Thru Info button that displays the THRU INFO dialog box allowing configuration of each through. A Calculator icon in the THRU INFO dialog box allows access to the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

Load Type

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."

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- 0.8 mm-Conn (M)
- 0.8 mm-Conn (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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 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 depend on the selected connector, Cal Method, and Line Type. The example here shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 1 Select BB Load

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Test Port 2, Test Port 3, and Test Port 4 Connector Type

Identical function as with the Test Port 1 Connector above. Select the DUT Connector Type from a drop-down menu list.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Identical function as with the Test Port 1 Connector Standard Info button above. Select displays the STANDARD INFO dialog box for the selected DUT Connector.

Test Port 2, Test Port 3, and Test Port 4 Select BB Load

Identical function as with the Test Port 1 Select BB Load above. Select between Load 1 and Load 2.

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.

FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box

Prerequisites

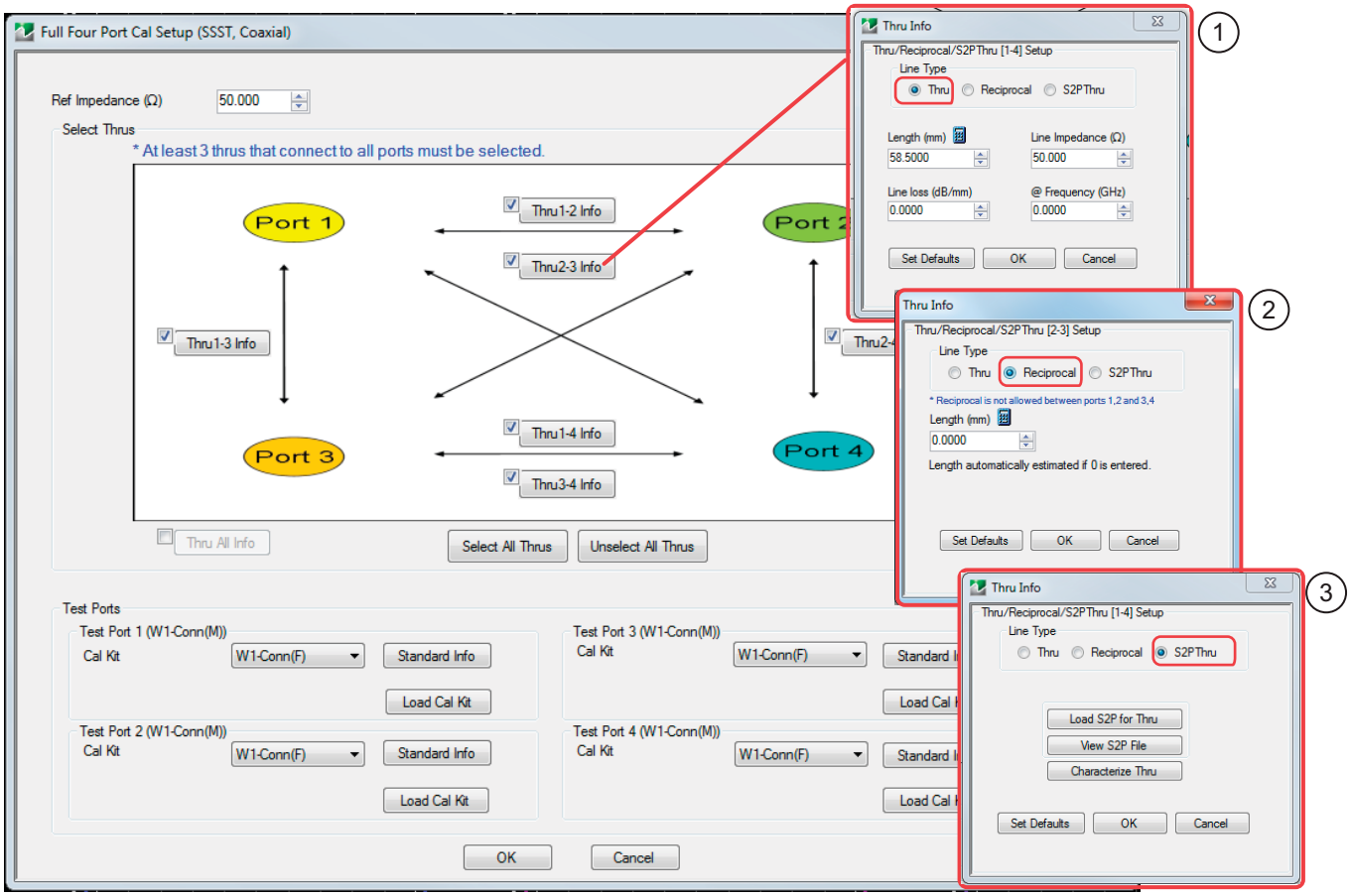
- VNA Mode = 4-Port Mode
- Cal Method = SSST
- Line Type = Coaxial

Previous

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
- CAL SETUP Menu – 4-Port VNAs on page 10-108

Navigation

- This dialog box is available from multiple menus.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSST | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-68. FULL FOUR 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.

Select Throughs

Select any combination of throughs as long as three are selected. For a 4-port calibration, the following port pairs are available:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Info Buttons

Each of the throughs above enables a Thru Info button that displays the THRU INFO dialog box allowing configuration of each through. A Calculator icon in the THRU INFO dialog box allows access to the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

Test Port 1 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 depend on the selected connector, Cal Method, and Line Type. The example here shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 2, Test Port 3, and Test Port 4 Connector Type

Identical function as with the Test Port 1 Connector above. Select the DUT Connector Type from a drop-down menu list.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Identical function as with the Test Port 1 Connector Standard Info button above. Select displays the STANDARD INFO dialog box for the selected DUT Connector.

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.

FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box

Prerequisites

- VNA Mode = 4-Port Mode
- Cal Method = SSST
- Line Type = Waveguide

Previous

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
- CAL SETUP Menu – 4-Port VNAs on page 10-108

Navigation

- This dialog box is available from multiple menus.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSST | Line Type = Waveguide | Edit Cal Params | FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box

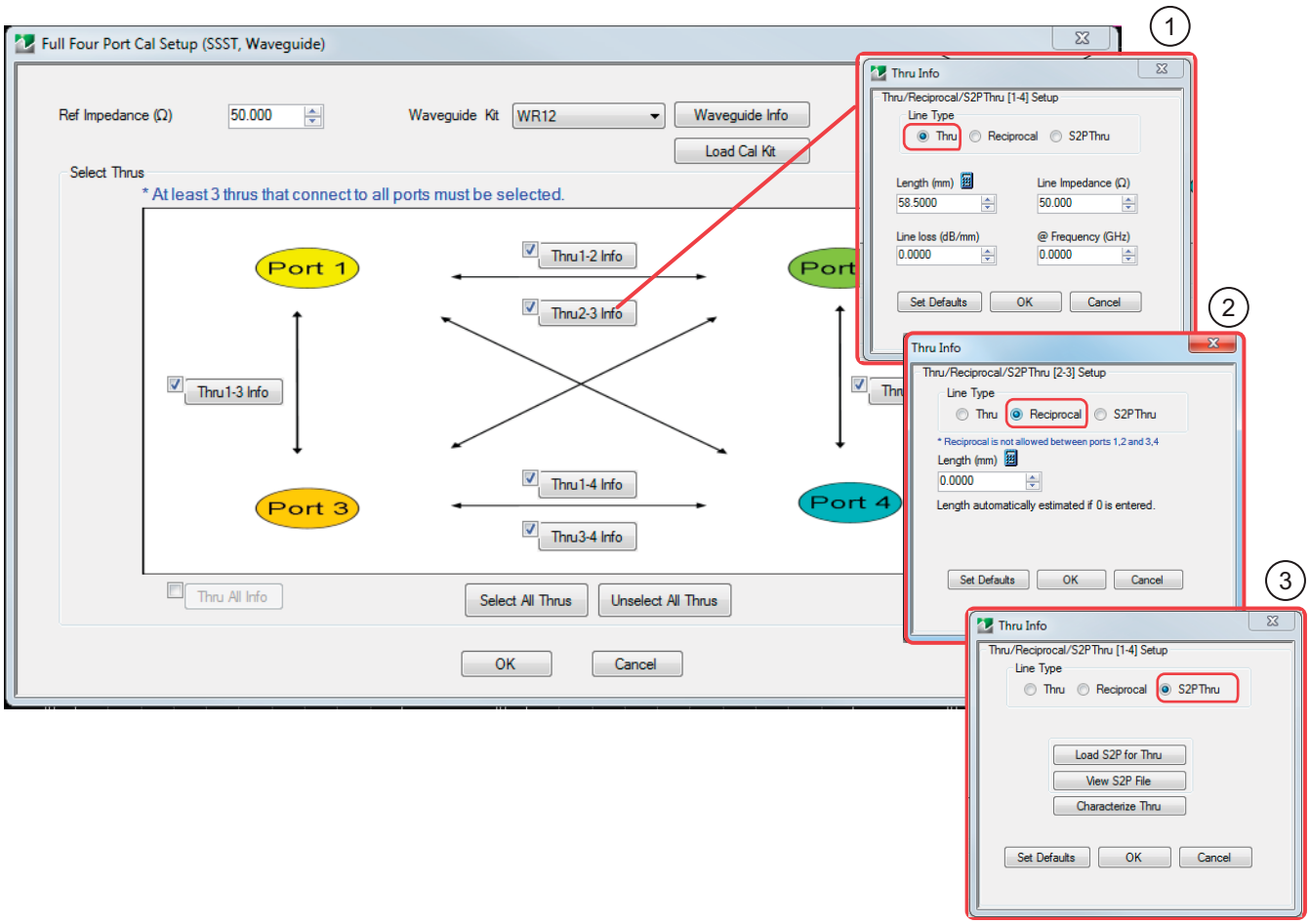


Figure 10-69. FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box (1 of 2)

"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-69. FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box (2 of 2)

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.

Waveguide Kit

Select the **Waveguide Kit** from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Select Throughs

Select any combination of throughs as long as three are selected that connect to all ports. For a 4-port calibration, the following port pairs are available:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Buttons

As each through is selected, it enables a Thru Info button that displays the THRU INFO dialog box for the selected port pair. A Calculator icon in the THRU INFO dialog box allows access to the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

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.

FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

Prerequisites

- VNA Mode = 4-Port Mode; Cal Method = LRL/LRM; Line Type = Coaxial

Previous

- FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
- CAL SETUP Menu – 4-Port VNAs on page 10-108

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = LRL/LRM | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

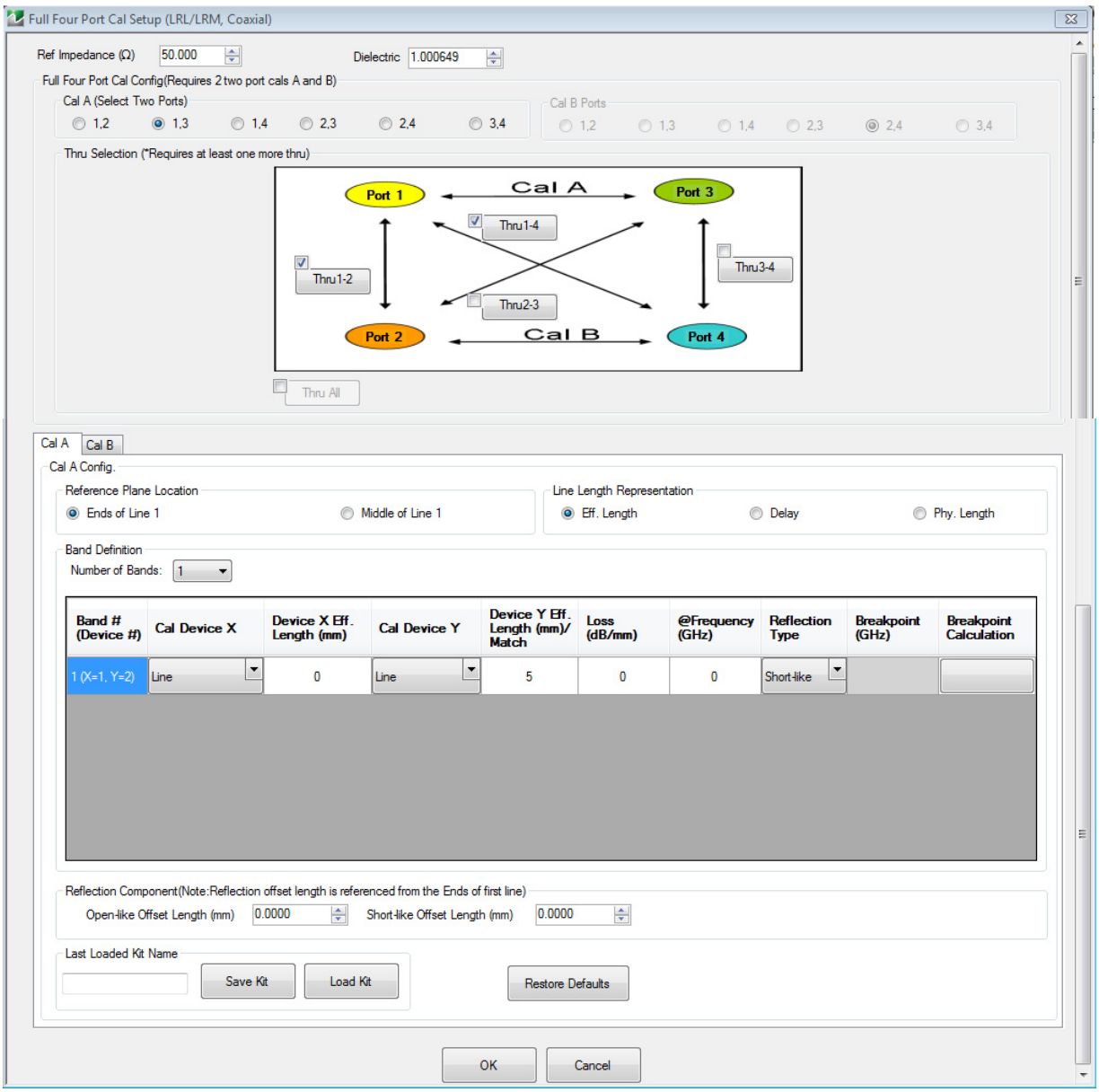
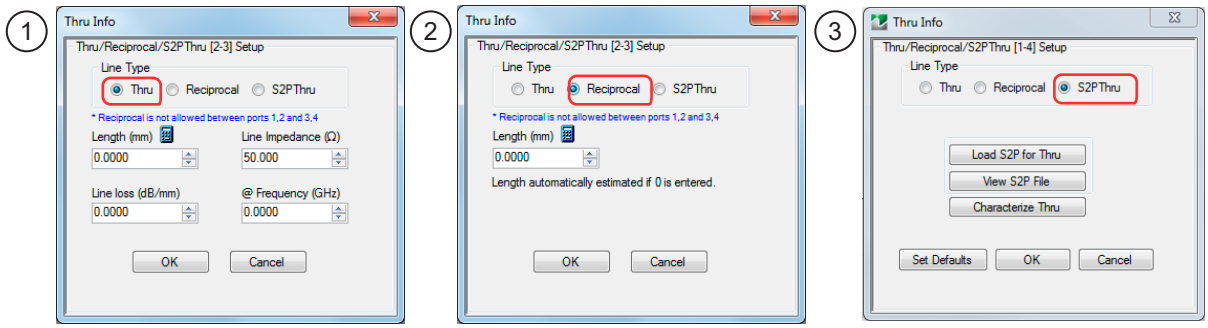


Figure 10-70. FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box (1 of 2)



Thru 2-3 Info Example:

"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-70. FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box (2 of 2)

Overview

The dialog box provides common areas for Reference Impedance, Full Four Port Calibration Configuration, and Thru Selection. Below this common section are two tabbed dialog areas for Cal A and Cal B.

Full Four Port Cal Configuration

Requires two 2-port calibrations as Cal A and Cal B, configured below.

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.

Cal A Ports

Allows selection of the calibration A port pair. Combinations of ports 1-2 and ports 3-4 are not allowed.

- Port 1, 3
- Port 1, 4
- Port 2, 3
- Port 2, 4

Cal B Ports

This area is read-only and defined by the port pair choice for Cal A.

- If Cal A = Ports 1, 3, then Cal B = Ports 2, 4
- If Cal A = Ports 1, 4, then Cal B = Ports 2, 3
- If Cal A = Ports 2, 3, then Cal B = Ports 1, 4
- If Cal A = Ports 2, 4, then Cal B = Ports 1, 3

Thru Selection

Any combination of Throughs may be selected as long as least one additional through is selected from:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 3-4

Cal A / Cal B Tabs

Access the Cal A or Cal B functions and controls by selecting either the Cal A or Cal B tab.

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.

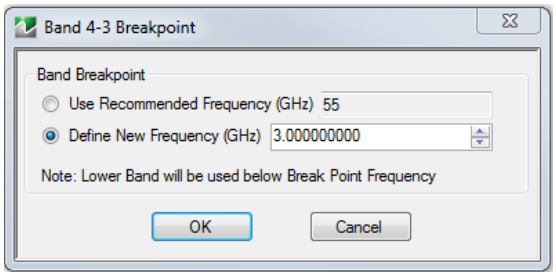
- Number of Bands = 1. Only the Band 1 Definition and editable parameters appear.
- Number of Bands = 2. The Band 2 Definition and editable parameters appear.
- Number of Bands = 3. The Band 3 Definition and editable parameters appear.
- Number of Bands = 4. The Band 4 Definition and editable parameters 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 MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237.
- **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 Bands 2–5. (This area only active for band 2–5.)

- **Breakpoint Calculation**
    - Select to calculate a breakpoint frequency for band 2:



Reflection Component

- Enter Open-like and/or Short-like offset length

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 – Loads a previously saved cal setup.
- Restore Defaults – Loads the instrument default values for the Cal Setup.

OK/Cancel

- OK and Cancel returns user to the CAL SETUP menu.

FULL FOUR 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 – 4-Port VNAs on page 10-108

Navigation

- MAIN | Calibration | CALIBRATION | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | FULL FOUR-PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

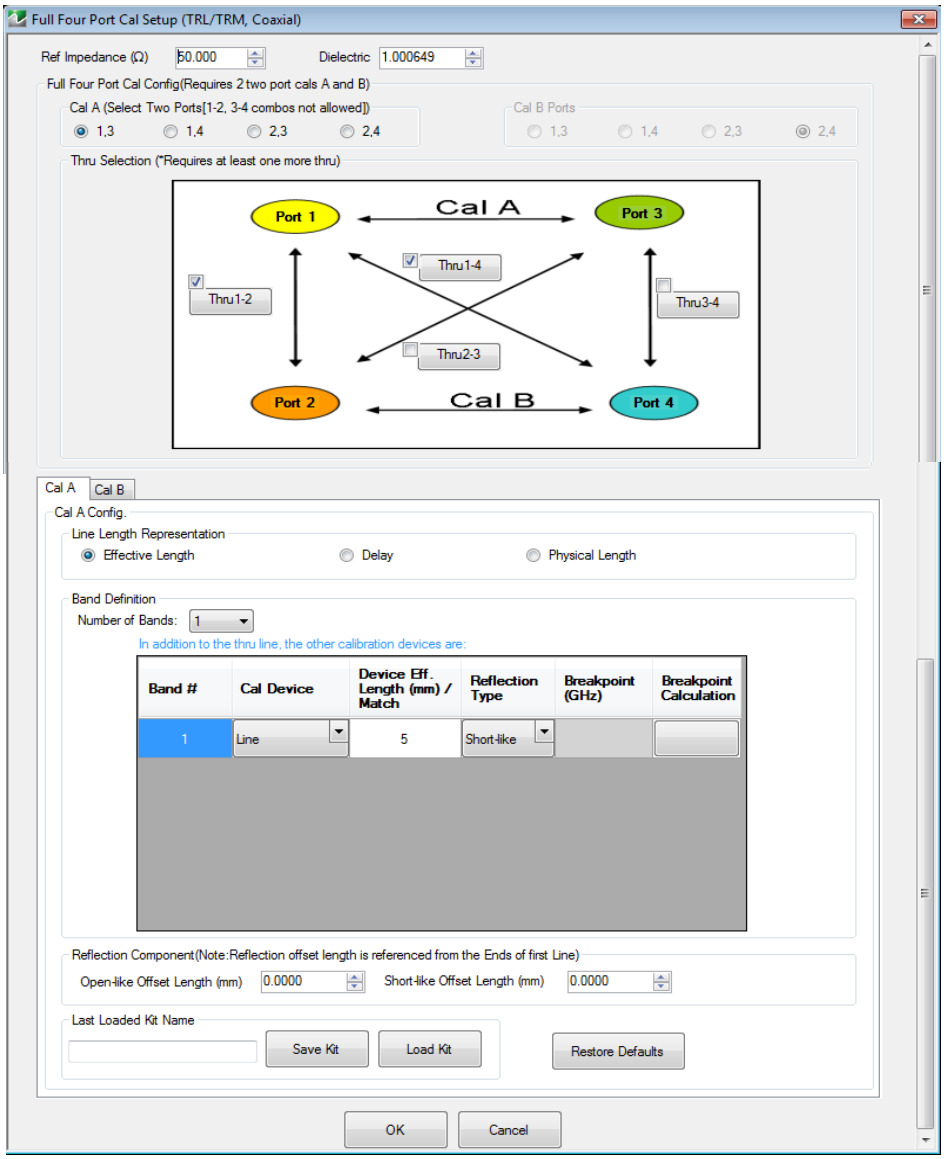


Figure 10-71. Edit Cal Params – FOUR PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

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.

Cal A Ports (1-2, 3-4 combos are not allowed)

Allows selection of the calibration A port pair. Combinations of ports 1-2 and ports 3-4 are not allowed.

- Port 1, 3
- Port 1, 4
- Port 2, 3
- Port 2, 4

Cal B Ports

This area is read-only and defined by the port pair choice for Cal A.

- If Cal A = Ports 1, 3, then Cal B = Ports 2, 4
- If Cal A = Ports 1, 4, then Cal B = Ports 2, 3
- If Cal A = Ports 2, 3, then Cal B = Ports 1, 4
- If Cal A = Ports 2, 4, then Cal B = Ports 1, 3

Thru Selection (Requires at least two Thrus)

Any combination of Throughs may be selected as long as least one additional through is selected from:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 3-4

Cal A / Cal B Tabs

Access the Cal A or Cal B functions and controls by selecting either the Cal A or Cal B tab.

Line Length Representation

Select from three radio button controlled options:

- Eff. (Effective) Length (the free-space equivalent length)
- Delay
- Phy. (Physical) Length

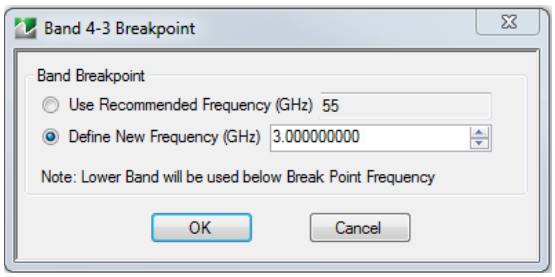
Band Definition

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:



Reflection Type

- Enter Open-like or Short-like.

Reflection Component

- Enter Open-like and/or Short-like offset length

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.

Manual 4-Port Cal Dialog Box Summary

The table below summarizes the available fields in all available 4-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 either FULL FOUR PORT CAL SETUP (*Cal Method*, *Line Type*) or FOUR PORT CAL SETUP (*Cal Method*, *Line Type*).

Table 10-4. Manual 4-Port Cal Setup Dialog Box Summary (1 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SOLT/R Coaxial	See full description at "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117 Reference Impedance (Ohms) Select Throughs: At least 3 throughs that connect to all ports must be selected. Select from Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4. Thru Info buttons: Displays the THRU INFO dialog box for the selected through. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 Load Type: Select from Broadband Load or Sliding Load Test Ports: Port 1, Port 2, Port 3, Port 4. 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), 2.4 mm V (M), 2.4 mm V (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. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port Select BB Load: Load 1, Load 2. Test Port 1, Test Port 2, Test Port 3, and Test Port 4 controls are the same.
SOLT/R Non-Dispersive	Same controls and functions as SOLT/R Coaxial above.
SOLT/R Waveguide	SOLT/R is not recommended for Waveguide calibrations. Same controls as SOLT/R Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box for the waveguide kit selected above. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-4. Manual 4-Port Cal Setup Dialog Box Summary (2 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SOLT/R Microstrip	Same controls as SOLT/R 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 either the MICROSTRIP INFO or the USER DEFINED MICROSTRIP dialog box for the microstrip kit selected above. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port DUT Connector: User-Defined1 through User-Defined32. Test Port DUT Connector Standard Info Button: For each port, displays the USER DEFINED STANDARD dialog box for the selected connector:
SSLT Coaxial	See full description at "FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-120 Reference Impedance (Ohms) Select Throughs: • At least 3 throughs that connect to all ports must be selected. • Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 Thru Info buttons: • Displays the THRU INFO dialog box for the selected through. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 Load Type: Broadband Load, Sliding Load Test Ports: Port 1, Port 2, Port 3, Port 4 Test Port 1 DUT Connector:, 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: • Displays the STANDARD INFORMATION dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port 1 BB Load: Load 1, Load 2. Test Port 2, Test Port 3, and Test Port 4 controls are the same as Test Port 1.
SSLT Non-Dispersive	Same controls and functions as SSLT Coax above.
SSLT Waveguide	Same controls as SSLT Coaxial with the following changes: Waveguide Kit: WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, User-Defined1 to User-Defined32 Waveguide Info button: • Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-4. Manual 4-Port Cal Setup Dialog Box Summary (3 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SSLT MIcostrip	Same controls as SSLT 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 MICROSTRIP INFO dialog box for selected calibration method and kit. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port DUT Connector: User-Defined1 through User-Defined32. Test Port DUT Connector Standard Info Button: • Select displays the USER DEFINED STANDARD dialog box for the selected connector.
SSST Coaxial	See full description at "FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-123 Reference Impedance (Ohms) Select Throughs: At least 3 throughs that connect to all ports must be selected. Select from Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 Thru Info buttons: Displays the THRU INFO dialog box for the selected through. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 Test Ports: Port 1, Port 2, Port 3, Port 4 Test Port DUT Connector: 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: Displays the STANDARD INFORMATION dialog box for the selected connector. • "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229 Test Port 1, Test Port 2, Test Port 3, and Test Port 4 controls are the same.
SSST Non-Dispersive	Same controls as SSST Coaxial above.
SSST Waveguide	See full description at "FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box" on page 10-125 Same controls as SSST Coaxial with the following changes: Waveguide Kit: User-Defined 1 to User-Defined32 Waveguide Info button: • Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-4. Manual 4-Port Cal Setup Dialog Box Summary (4 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SSST Microstrip	Same controls as SSST 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 MICROSTRIP INFO dialog box for selected calibration method and kit. • “MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes” on page 10-228 Test Port DUT Connector: User-Defined1 through User-Defined32. Test Port DUT Connector Standard Info button: • Select displays the USER DEFINED STANDARD dialog box for the selected connector.

Table 10-4. Manual 4-Port Cal Setup Dialog Box Summary (5 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
LRL/LRM Coaxial	See full description of controls and display logic at "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127. Reference Impedance (Ohms) Cal A Ports – Select two from 1-3, 1-4, 2-3, 2-4 Cal B Ports – Auto-selected non-Cal A Ports of 1-3, 1-4, 2-3, 2-4 Select Throughs: • Requires at least one additional through. • Four through combinations of Cal A and Cal B Ports are displayed. • Only four of Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 are shown • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 Cal A and Cal B tabs: The "A" and "B" calibration parameters are selected via a tabbed menu within the dialog box. Number of Bands: 1 through 5 • If 1, only Band 1 Device 1 and Band 1 Device 2 controls appear. • If 2, the above plus Band 2 Device 3 and Band 2 Device 4 controls appear. • If 3, the above plus Band 3 Device 5 and Band 3 Device 6 controls appear. • If 4, the above plus Band 4 Device 7 and Band 4 Device 8 controls appear. • If 5, the above plus Band 5 Device 9 and Band 5 Device 10 controls appear. Cal A Configuration Parameters: • Cal A Reference Plane Location: Ends of Line, Middle of Line 1 • Line Length Representation: Eff. Length, Delay, Phy. Length • Cal A Number of Bands: 1 through 5 • Cal A Band 1 Device 1 Line: Line Length (mm) or Delay (ps), Line Loss (dB/mm), @ Frequency (GHz) • Cal A Band 1 Device 2 Type: Line, Match; Use Short-like component, Use Open-like component, Use both; If Device 2 = Match, Match Info button displays USER DEFINED MATCH DEVICES dialog box for selected calibration kit. • "USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237 • Cal A Band 2 Device 3: Use device 1, Use new line • Cal A Band 2 Device 4: Line, Match, Type of Reflection (Use Open-like component, Use Short-like component), Line Length (mm) • Cal A Band Break Point: Calculate Recommended Value, Use Recommended Frequency (GHz), Define New Frequency (GHz). • Cal A Reflection Component: Open-like Length (mm), Short-like Offset Length (mm) • Last Loaded Kit Name: LRL/LRM Cal Kit file name last loaded • Save Kit: Save calibration kit data to an LRL/LRM cal kit file (.lcf) • Load Kit: Recall existing LRL/LRM cal kit file (.lcf). Cal B Configuration Parameters • Cal B parameters are the same as those for Cal A.
LRL/LRM Non-Dispersive	Same controls as LRL/LRM Coaxial.
LRL/LRM Waveguide	See full description for the "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127 above. Same controls as LRL/LRM Coaxial with the following changes: Cutoff Frequency (GHz) Dielectric Value

Table 10-4. Manual 4-Port Cal Setup Dialog Box Summary (6 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
LRL/LRM Microstrip	Same controls as LRL/LRM 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 MICROSTRIP INFO dialog box for selected calibration kit. "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
TRL/TRM Coaxial	See full description above display logic and controls at "FULL FOUR PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 10-132. Reference Impedance (Ohms) Dielectric: Enter a value if different than the default. Cal A Ports – Select two from 1-3, 1-4, 2-3, 2-4 Cal B Ports – Auto-selected non-Cal A Ports of 1-3, 1-4, 2-3, 2-4 Select Throughs: • Requires at least one additional through. • Four through combinations of Cal A and Cal B Ports are displayed. • Only four of Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 are shown • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 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 Length (mm) and/or Short-like Offset Length (mm). Breakpoint: Set frequency (GHz). Breakpoint Calculation: Calculate a breakpoint frequency for each band. 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-Defined1 to User-Defined32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box – 4-Port VNAs" on page 10-73

10-14 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 – 4-Port VNAs

Full Name

- Reflective Device(s) Menu

Typical Configuration

This menu example is a representative menu based on the following configuration:

- VNA is in 4-port mode
- A 4-port calibration
- A SOLT/SOLR calibration method
- A coaxial line type
- An N(f) Connector

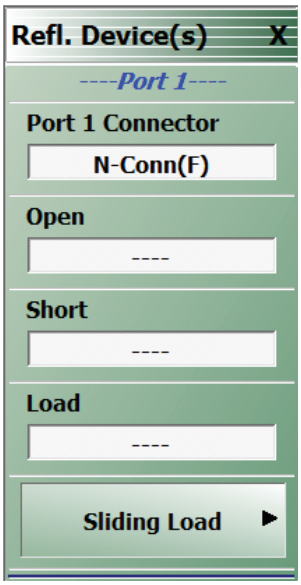
Using a different configuration set can change the appearance of the REFL. DEVICE(S) menu.

Previous

- The previous menu can be any of the following manual calibration menus and their associated configuration dialog boxes.
  - FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
  - THREE PORT CAL Menu – 4-Port VNAs on page 10-150
  - TWO PORT CAL Menu – 4-Port VNAs on page 10-177
  - ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195
  - TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207
  - REFL. RESPONSE Menu – 4-Port VNAs on page 10-216
- The REFL. DEVICE(s) menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu – 4-Port VNAs on page 10-108
  - CAL METHOD Menu – 4-Port VNA on page 10-110
  - LINE TYPE Menu – 4-Port VNA on page 10-111
  - CAL SETUP Menu – 4-Port VNAs on page 10-108

Similar Menus

- The REFL. DEVICE(S) Port 1 menu is nearly identical to typical REFL. DEVICE(S) Port 2, REFL. DEVICE(S) Port 3, and REFL. DEVICE(S) Port 4 menus.



REFL. DEVICE(S) Menu (typical)

REFLECTIVE DEVICE(S) menu. The Open, Short, and Load buttons display a checkmark on completion of the calibration task.

Port 1 Connector

Displays designated connector for the indicated port.

Select opens the Full Four Port Cal Setup (SOLT/R, Coaxial) dialog box.

- "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117

Open

Select starts open calibration procedure for the indicated port.

Short

Select starts the short calibration procedure for the indicated port.

Load

Select starts the load calibration procedure for the indicated port.

Sliding Load

Select opens the Sliding Loads configuration menu. Availability requires selection of Sliding Load as Load Type in the FULL FOUR PORT CALSETUP (SOLT/R, COAXIAL) menu.

- SLIDING LOADS Menu – 4-Port VNAs on page 10-144

Figure 10-72. REFL. DEVICE(S) Menu – 4-Port VNAs – Typical Example

SLIDING LOADS Menu – 4-Port VNAs

Typical Configuration

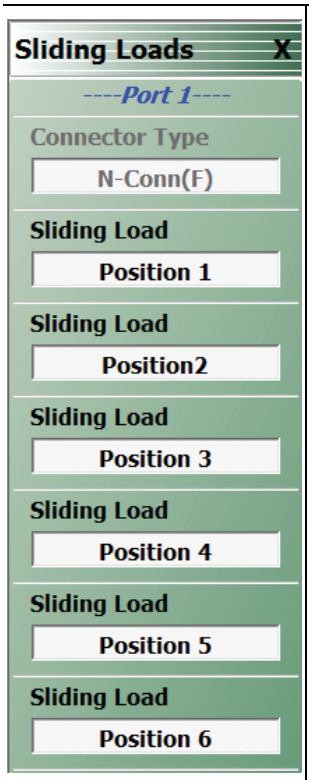
This menu example is a representative menu based on the following configuration:

- VNA is in 4-port mode
- A 4-port calibration
- A SOLT/SOLR calibration method
- Sliding loads selected
- A coaxial line type
- An N(f) Connector

Using a different configuration set can change the appearance of the SLIDING LOADS menu.

Previous

- The previous menu can be any of the following manual calibration menus and their associated configuration dialog boxes.
  - REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142
  - FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
  - THREE PORT CAL Menu – 4-Port VNAs on page 10-150
  - TWO PORT CAL Menu – 4-Port VNAs on page 10-177
  - ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195
  - TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207
  - REFL. RESPONSE Menu – 4-Port VNAs on page 10-216
- The SLIDING LOAD/REFL. DEVICE(s) menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu – 4-Port VNAs on page 10-108
  - CAL METHOD Menu – 4-Port VNA on page 10-110
  - LINE TYPE Menu – 4-Port VNA on page 10-111



Typical SLIDING LOADS Menu

Each button is a completion task button and marked with a checkmark when the calibration task is complete. The number of buttons appearing on the menu is dependent on the calibration settings.

Connector Type

Read-only button showing the designated connector type for the indicated port.

Sliding Load (Position 1)

Select starts the sliding load calibration procedure at position 1.

Sliding Load (Position 2)

Select starts the sliding load calibration procedure at position 2.

Sliding Load (Position 3)

Select starts the sliding load calibration procedure at position 3.

Sliding Load (Position 4)

Select starts the sliding load calibration procedure at position 4.

Sliding Load (Position 5)

Select starts the sliding load calibration procedure at position 5.

Sliding Load (Position 6)

Select starts the sliding load calibration procedure at position 6.

When all calibration procedures are complete, use the Back button to return to the REFL DEVICE menu.

- REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142

Figure 10-73. SLIDING LOADS Menu – 4-Port VNAs – Typical Example

THRU Menu – 4-Port VNAs

Typical Configuration

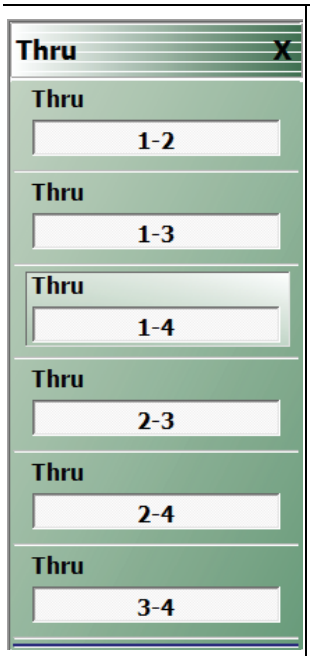
This menu example is a representative menu based on the following configuration:

- VNA in 4-port mode
- 4-port calibration
- SOLT/SOLR calibration method
- Sliding loads selected
- Coaxial line type
- N (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.
  - FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
  - THREE PORT CAL Menu – 4-Port VNAs on page 10-150
  - TWO PORT CAL Menu – 4-Port VNAs on page 10-177
  - ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195
  - TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207
  - REFL. RESPONSE Menu – 4-Port VNAs on page 10-216
- The THRU/RECIP menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu – 4-Port VNAs on page 10-108
  - CAL METHOD Menu – 4-Port VNA on page 10-110
  - LINE TYPE Menu – 4-Port VNA on page 10-111



THRU Menu (typical)

Select a Thru port pair button to start the thru/reciprocal calibration procedure for the indicated port pair. Completion of calibration steps is signified by completion checkmarks on the button.

Thru

Select initiates thru/reciprocal calibration at port pair 1-2.

Thru

Select initiates thru/reciprocal calibration at port pair 1-3.

Thru

Select initiates thru/reciprocal calibration at port pair 1-4.

Thru

Select initiates thru/reciprocal calibration at port pair 2-3.

(continued)

Figure 10-74. THRU/RECIP Menu – 4-Port VNAs – Typical Example (1 of 2)

	Thru Select initiates thru/reciprocal calibration at port pair 2-4. **Thru** Select initiates thru/reciprocal calibration at port pair 3-4. When all calibration procedures are complete, use the Back button to return to the REFL DEVICE menu. REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142

Figure 10-74. THRU/RECIP Menu – 4-Port VNAs – Typical Example (2 of 2)

ISOLATION(S) Menu

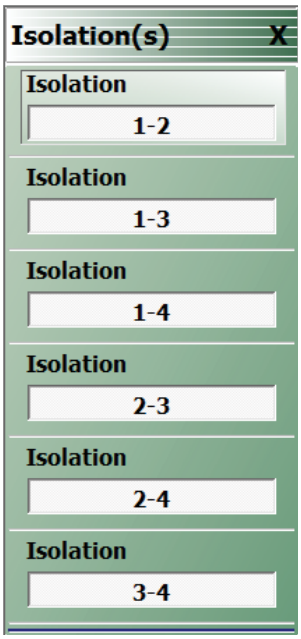
Typical Configuration

This menu example is a representative menu based on the following configuration:

- VNA in 4-port mode
- 4-port calibration
- SOLT/SOLR calibration method
- Coaxial line type
- N (f) Connector

Previous

- The previous menu can be any of the following manual calibration menus and their associated configuration dialog boxes.
  - FOUR PORT CAL Menu – 4-Port VNAs on page 10-113
  - THREE PORT CAL Menu – 4-Port VNAs on page 10-150
  - TWO PORT CAL Menu – 4-Port VNAs on page 10-177
  - ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195
  - TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207
  - REFL. RESPONSE Menu – 4-Port VNAs on page 10-216
- The THRU/RECIP menu controls and functions are also subject to the settings in the following:
  - CAL SETUP Menu – 4-Port VNAs on page 10-108
  - CAL METHOD Menu – 4-Port VNA on page 10-110
  - LINE TYPE Menu – 4-Port VNA on page 10-111



ISOLATION(S) Menu (typical)

Select Isolation port pair button to start isolation calibration procedure for the indicated port pair. Completion of calibration steps is signified by completion checkmarks on the button.

Isolation

Select initiates isolation calibration at port pair 1-2.

Isolation

Select initiates isolation calibration at port pair 1-3.

Isolation

Select initiates isolation calibration at port pair 1-4.

Isolation

Select initiates isolation calibration at port pair 2-3.

Isolation

Select initiates isolation calibration at port pair 2-4.

Isolation

Select initiates isolation calibration at port pair 3-4.

When calibration procedures are complete, use the Back button to return to the REFL DEVICE menu.

Figure 10-75. ISOLATION(S) Menu – 4-Port VNAs – Typical Example

10-15 Manual 3-Port Cal Setup – 4-Port VNAs

This sections described the menus and dialog boxes uses for manual 3-port calibration on a ShockLine 4-Port VNA.

THREE PORT CAL Menu – 4-Port VNAs

Button Availability

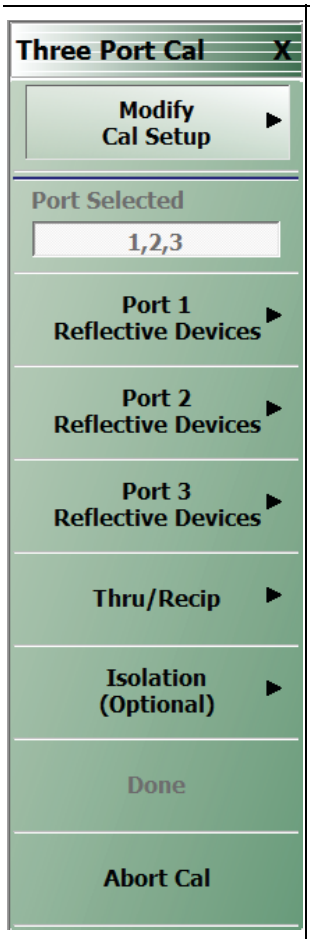
- The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant THREE PORT CAL SETUP dialog box.
- A representative menu is shown below.
- The example procedures at the end of this chapter show examples of various THREE PORT CAL menus.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL



Modify Cal Setup

Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the THREE PORT CAL SETUP dialog box for the selected calibration method and line type.

- CAL SETUP Menu – 4-Port VNAs on page 10-108

The following Cal Method/Line Type combinations and their dialog boxes are represented with a figure and complete description:

- "THREE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-159
- "THREE PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-162

This table summarizes the dialog boxes for all Cal Method/Line Type combinations:

- Table 10-5, "Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs" on page 10-171

Port Selected

Read-only display of the ports selected for the pending calibration.

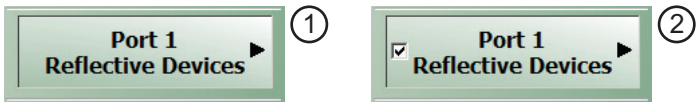
(continued)

Figure 10-76. THREE PORT CAL Menu – 4-Port VNAs – Typical example (1 of 3)

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 THREE PORT CAL menu.



The Port 1 Reflective Devices button (shown above at #2) is now marked with a completion checkmark.

Port 1 Reflective Devices

Select displays the REFL. DEVICES PORT 1 submenu. When all procedures are complete, select the Back button to return to the THREE PORT CAL menu where this button is now marked with a completion checkmark.

- Example: REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142

Port 2 Reflective Devices

Select displays the REFL. DEVICES PORT 2 submenu. When all procedures are complete, select the Back button to return to the THREE PORT CAL menu where this button is now marked with a completion checkmark.

Port 3 Reflective Devices

Select displays the REFL. DEVICES PORT 3 submenu. When all procedures are complete, select the Back button to return to the THREE PORT CAL menu where this button is now marked with a completion checkmark.

Port 4 Reflective Devices

Select displays the REFL. DEVICES PORT 3 submenu. When all procedures are complete, select the Back button to return to the THREE PORT CAL menu where this button is now marked with a completion checkmark.

Thru/Recip

Select displays the THRU/RECIP submenu. When all procedures are complete, select the Back button to return to the THREE PORT CAL menu where this button is now marked with a completion checkmark.

- THRU Menu – 4-Port VNAs on page 10-146

(continued)

Figure 10-76. THREE PORT CAL Menu – 4-Port VNAs – Typical example (2 of 3)

Isolation (Optional)

If required, select displays the ISOLATION submenu. When all procedures are complete, select the Back button to return to the THREE PORT CAL menu where this button is now marked with a completion checkmark.

- ISOLATION(S) Menu on page 10-148

Done

This button is unavailable until a successful calibration procedure has been completed. When available, it returns to the CALIBRATION menu where the Cal Status button is set to ON.

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Abort Cal

This button stops the current calibration procedure and returns to the CALIBRATION menu.

- CALIBRATION [TR] Menu – 4-Port VNAs on page 10-7

Figure 10-76. THREE PORT CAL Menu – 4-Port VNAs – Typical example (3 of 3)

THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box

Prerequisites

- VNA Mode = 4-Port Mode
- Cal Method = SSLT
- Line Type = Microstrip

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- THREE PORT CAL Menu – 4-Port VNAs on page 10-150

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Microstrip | Edit Cal Params | THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box

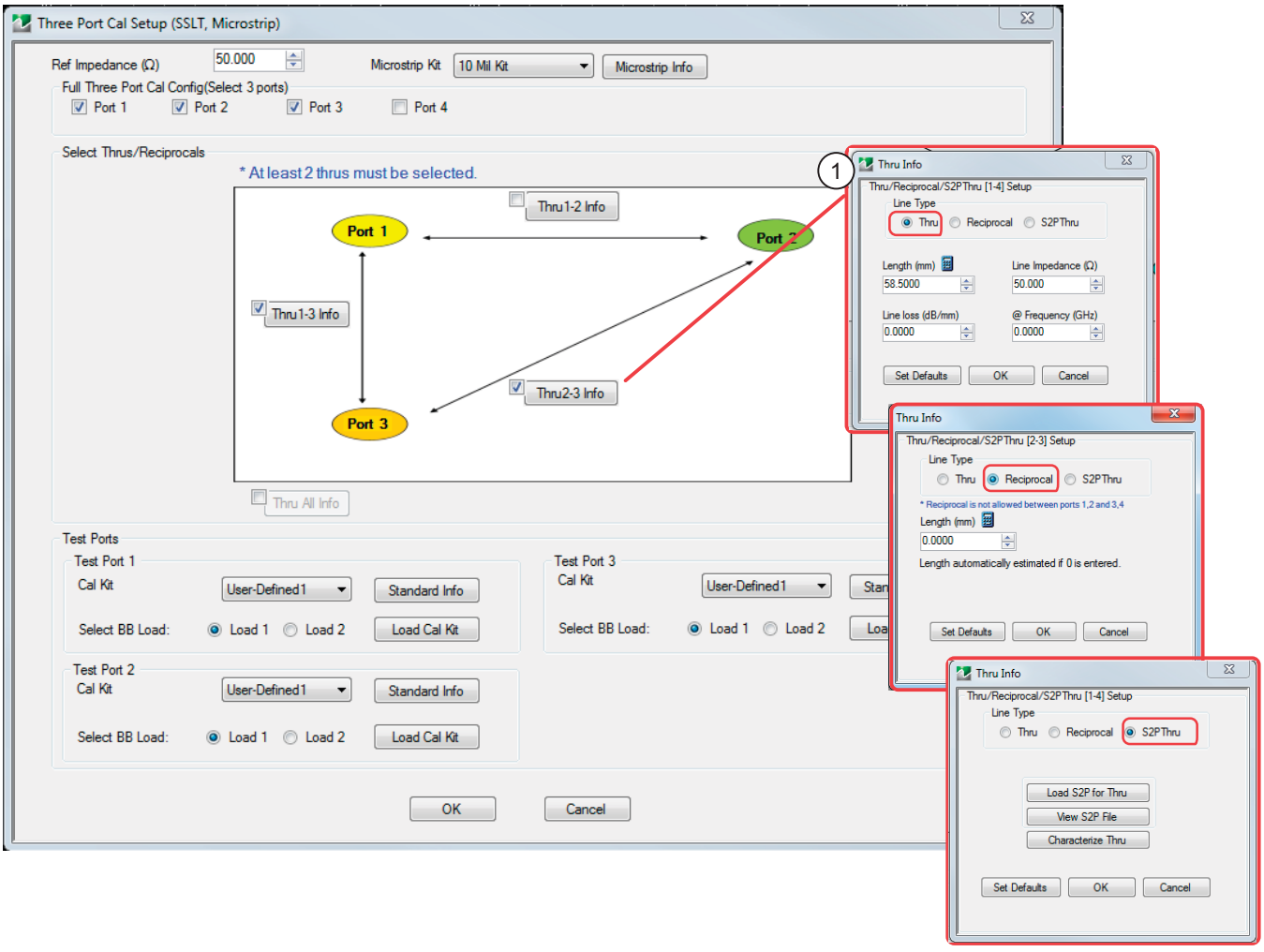


Figure 10-77. THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box (1 of 2)

"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-77. THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box (2 of 2)

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.

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.

Full Three Port Calibration Configuration

Select three ports from the list below. If a fourth port selection is attempted, an earlier port is discarded:

- Port 1
- Port 2
- Port 3
- Port 4

Select Throughs

Select any combination of three possible throughs as long as two are selected. The available port pair throughs are based on the ports selected above. For a 3-port calibration, only three of the following port pairs are available:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Buttons

Each of the throughs above enables a Thru Info button that displays the THRU INFO dialog box allowing configuration of each through. A calculator icon in the THRU INFO dialog box allows access to the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

Only three of the Test Port Configuration areas are available based on the port selection above.

Test Port 1 DUT Connector

If Port 1 was selected above, select the DUT Connector Type from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Test Port 1 DUT Connector Standard Info Button

If Port 1 was selected above, select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depend on the selected connector, Cal Method, and Line Type. The example here shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 1 Select BB Load

If Port 1 was selected above, select BB Load number for Test Port 1:

- Load 1
- Load 2

Test Port 2 Configuration

If Port 2 was selected above, provides the same controls as Test Port 1 Connector above.

Test Port 3 Configuration

If Port 3 was selected above, provides the same controls as Test Port 3 Connector above.

Test Port 4 Configuration

If Port 4 was selected above, provides the same controls as Test Port 4 Connector above.

THREE PORT CAL SETUP (SSST, COAXIAL) Dialog Box

Prerequisites

- VNA Mode = 4-Port Mode
- Cal Method = SSST
- Line Type = Coaxial

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- THREE PORT CAL Menu – 4-Port VNAs on page 10-150

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSST | Line Type = Coaxial | Edit Cal Params | THREE PORT CAL SETUP (SSST, COAXIAL) Dialog Box

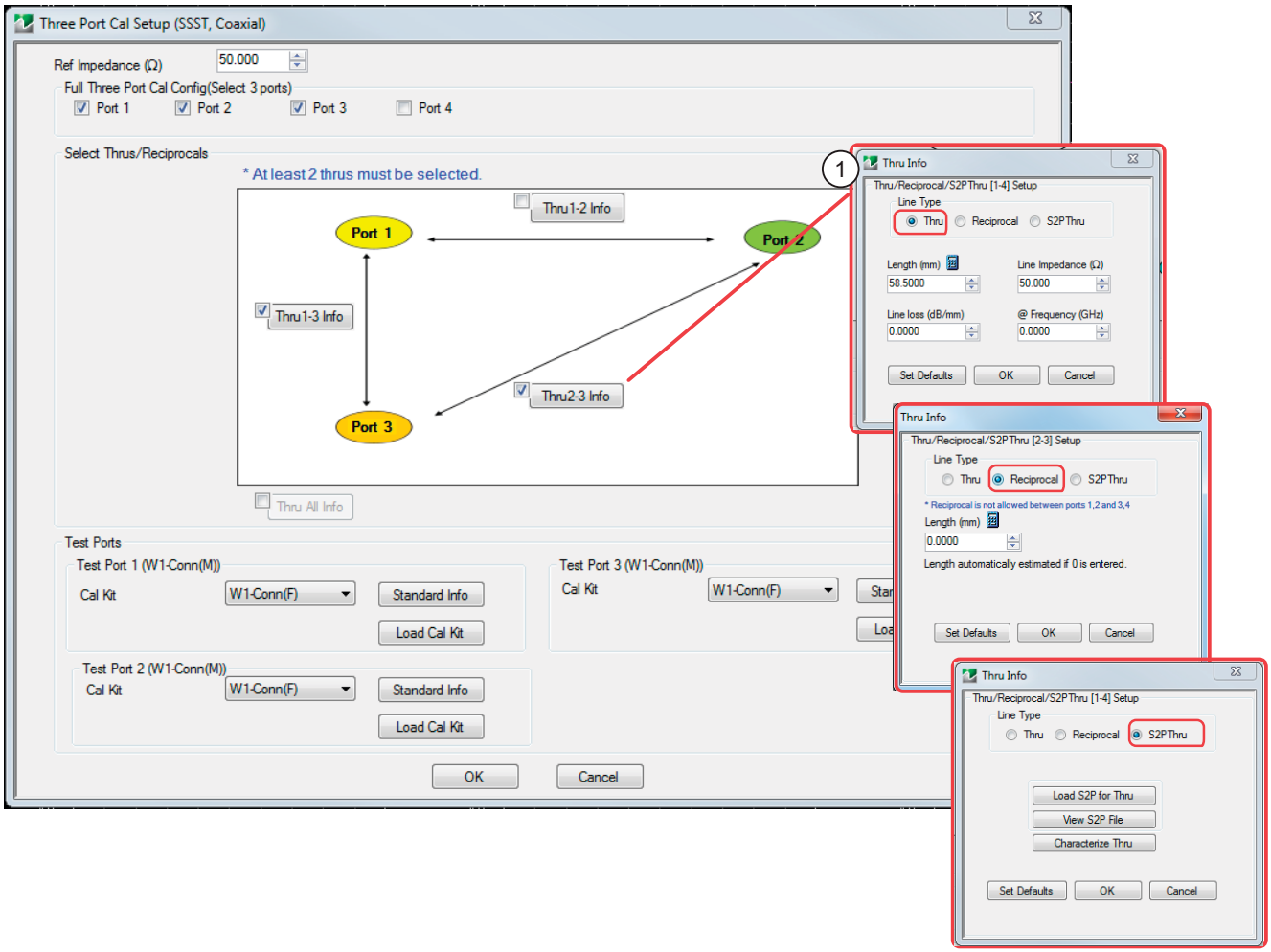


Figure 10-78. THREE PORT CAL SETUP (SSST, COAXIAL) Dialog Box (1 of 2)

"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-78. THREE PORT CAL SETUP (SSST, COAXIAL) Dialog Box (2 of 2)

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.

Full Three Port Calibration Configuration

Select three (3) ports from the list below. If a fourth port selection is attempted, an earlier port is discarded:

- Port 1
- Port 2
- Port 3
- Port 4

Select Throughs/Reciprocals

Select any combination of three possible throughs as long as two (2) are selected. The available port pair throughs are based on the ports selected above. For a 3-port calibration, only three of the following port pairs are available:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Info Buttons

Each of the throughs above enables a Thru Info button that displays the THRU INFO dialog box allowing configuration of each through. A calculator icon in the THRU INFO dialog box accesses the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

Only three of the Test Port Configuration areas are available based on the port selection above.

Test Port 1 DUT Connector

If Port 1 was selected above, 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 DUT Connector Standard Info Button

If Port 1 was selected above, select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depend on the selected connector, Cal Method, and Line Type. The example here shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 2 Configuration

If Port 2 was selected above, provides the same controls as Test Port 1 Connector above.

Test Port 3 Configuration

If Port 3 was selected above, provides the same controls as Test Port 1 Connector above.

Test Port 4 Configuration

If Port 4 was selected above, provides the same controls as Test Port 1 Connector above.

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.

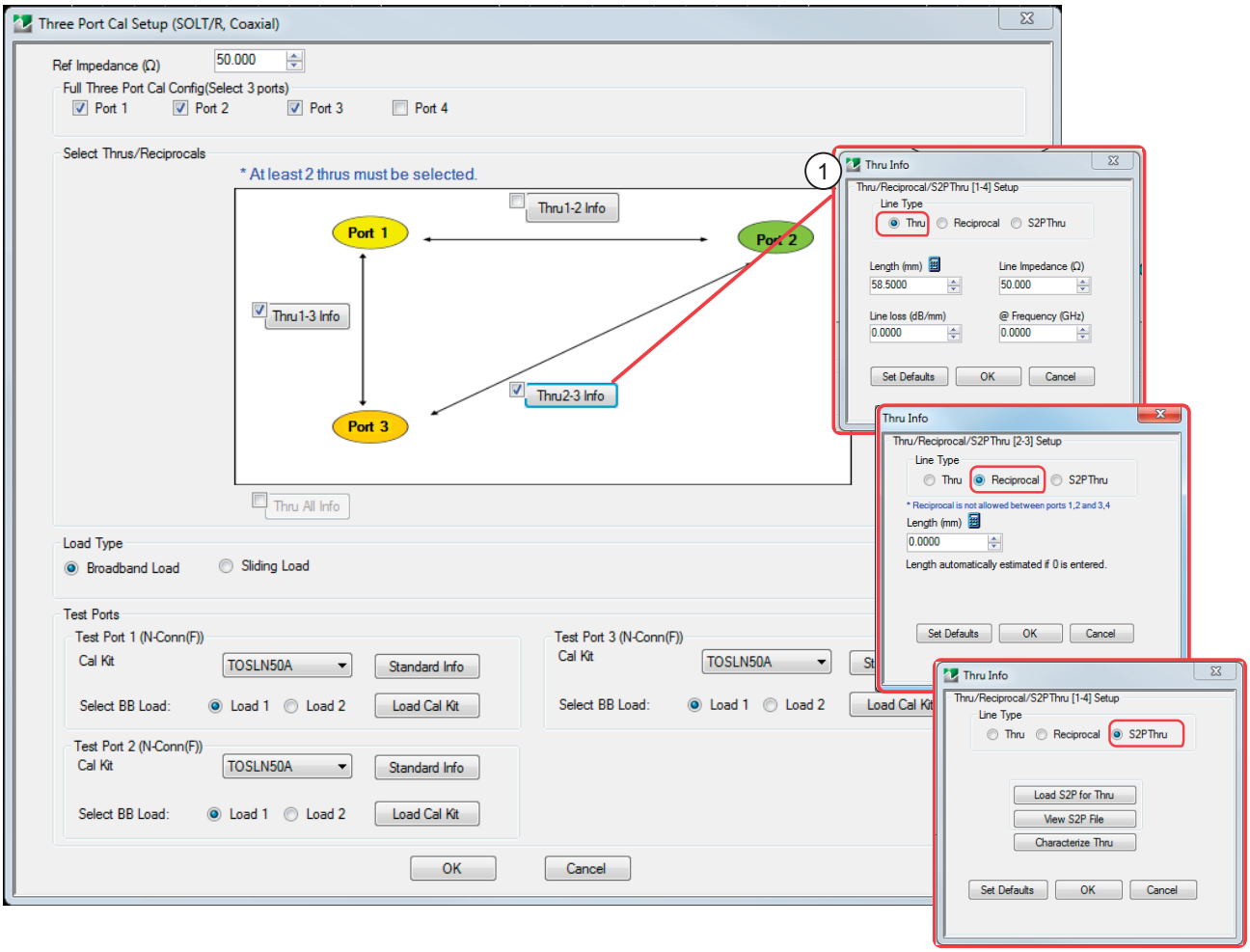
THREE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- THREE PORT CAL Menu – 4-Port VNAs on page 10-150

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SOLT/SOLR | Line Type = Coaxial | Edit Cal Params | THREE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-79. THREE PORT CAL SETUP (SOLT/R, 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.

Full Three Port Calibration Configuration

Select three of the four available ports. Selection of an additional port deselects one of the previously selected ports.

- Port 1
- Port 2
- Port 3
- Port 4

Select Thrus/Reciprocals

Select a minimum two of the three available port pairs determined by the ports selected above. Three of the following port pairs are available for a 3-port calibration:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Thru Buttons

Each selected through enables a corresponding Thru Info button that displays the THRU INFO dialog box, allowing configuration of the selected through, including a Length calculator icon that opens the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

Load Type

Select from two options:

- Broadband Load
- Sliding Load (requires broadband loads below sliding load breakpoint frequency).

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- 0.8 mm (M)
- 0.8 mm (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- SMA (M)
- SMA (F)
- N-Conn (M)
- N-Conn (F)
- N-Conn (75) (M)
- N-Conn (75) (F)
- GPC-7

- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 2.4 mm (M)
- 2.4 mm (F)
- GPC-3.5 (M)
- GPC-3.5 (F)
- 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 1 DUT Connector Standard Info Button

If Port 1 was selected above, select displays the STANDARD INFO dialog box for the selected connector and calibration method that displays the connector calibration coefficients. The dialog box contents depend on the selected connector, Cal Method, and Line Type. The example here shows a typical standard information dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 1 Select BB Load

If Port 1 was selected above, select BB Load number for Test Port 1:

- Load 1
- Load 2

Test Port 2 Configuration

If Port 2 was selected above, provides the same controls as Test Port 1 Connector above.

Test Port 3 Configuration

If Port 3 was selected above, provides the same controls as Test Port 1 Connector above.

Test Port 4 Configuration

If Port 4 was selected above, provides the same controls as Test Port 1 Connector above.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu, or click Cancel.

THREE PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- THREE PORT CAL Menu – 4-Port VNAs on page 10-150

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = LRL/LRM | Line Type = Coaxial | Edit Cal Params | THREE PORT CAL SETUP (LRL/LRM, COAXIAL)

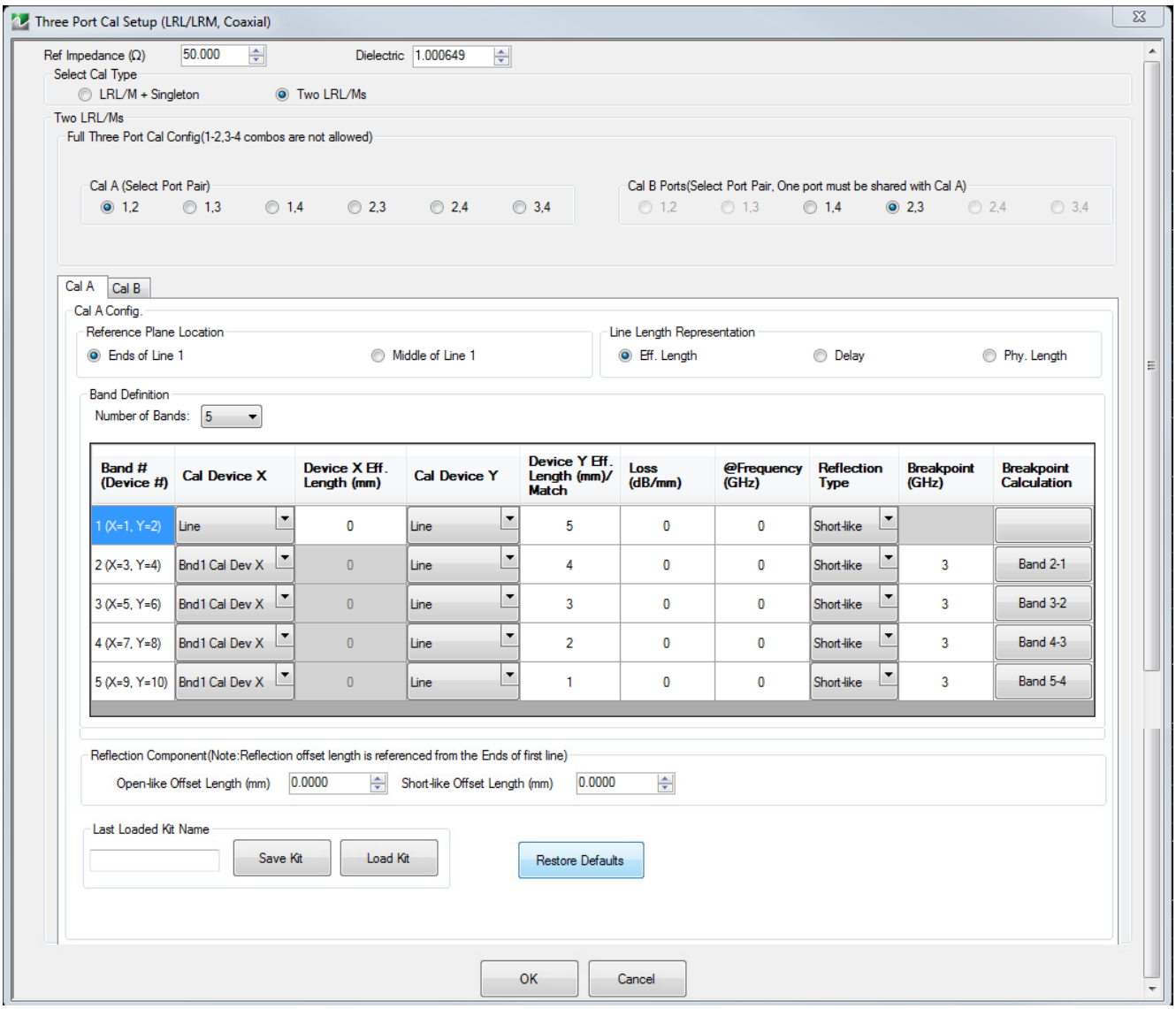


Figure 10-80. THREE PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box – Cal A Tab

Overview

The dialog box provides common areas at the top for Reference Impedance, Three Port Calibration Configuration, and Thru Selection. Below these common sections are two tabbed dialog areas for Cal A and Cal B.

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.

Select Cal Type

Select one of the calibration options from:

- LRL/M + Singleton
- Two LRL/Ms

Full Three Port Cal Config (1-2, 3-4 combos are not allowed):

Cal A (Select Port Pair)

- 1,3
- 1,4
- 2,3
- 2,4

Cal B (Select Port Pair, One port must be shared with Cal A)

- 1,3
- 1,4
- 2,3
- 2,4

Cal A / Cal B Tabs

Access the Cal A or Cal B functions and controls by selecting either the Cal A or Cal B tab.

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

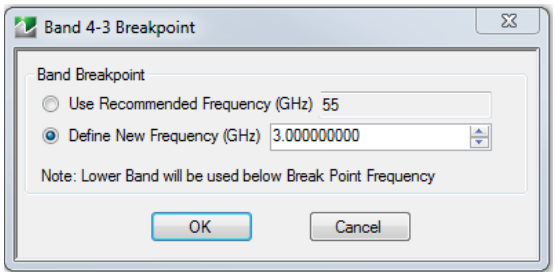
Select one to five bands from the pull-down menu.

- 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 MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237.
- **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 Band 2–5. (The entries are active for bands 2–5.)
- **Breakpoint Calculation**
  - Select to calculate a breakpoint frequency for band:



Reflection Component

- Enter Open-like and/or Short-like offset length

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

- OK and Cancel returns user to the CAL SETUP menu.

THREE 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 – 4-Port VNAs on page 10-108

Navigation

- MAIN | Calibration | CALIBRATION | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | TWO-PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | THREE-PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

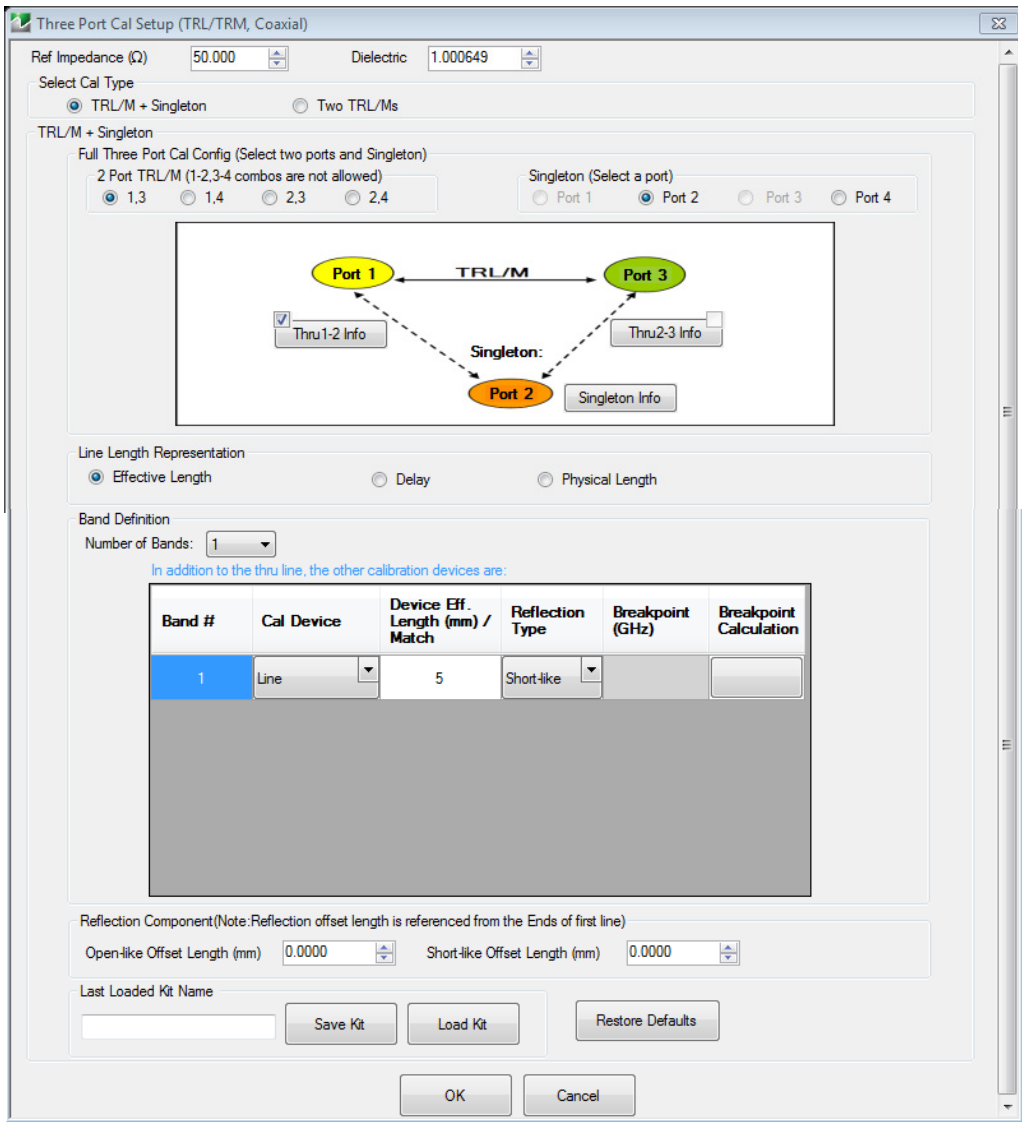


Figure 10-81. Edit Cal Params – THREE PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box — TRL/M + Singleton

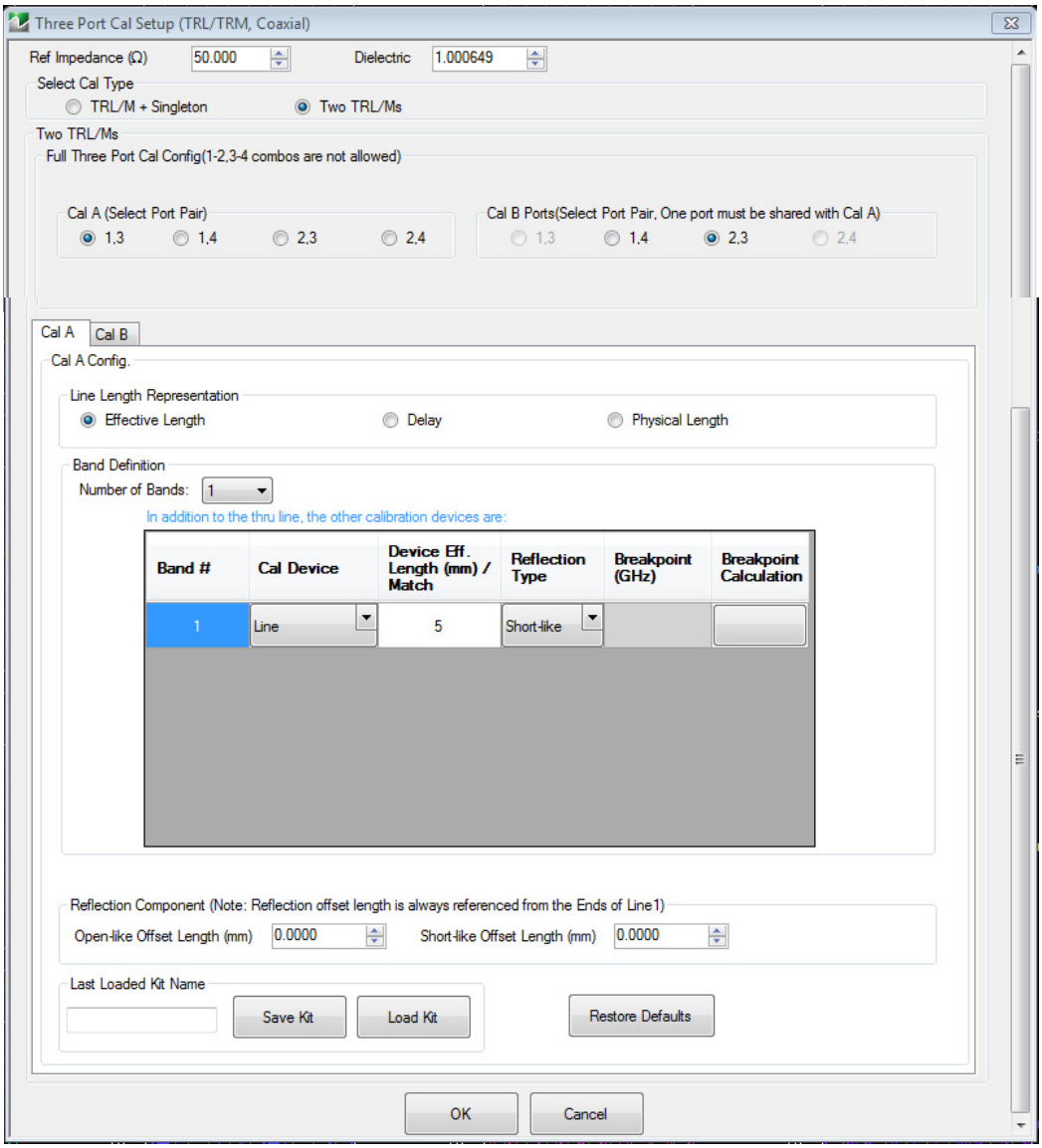


Figure 10-82. Edit Cal Params – THREE PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box — Two TRL/Ms

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.

Select Cal Type

- If TRL/M + Singleton is selected, the dialog will look like Figure 10-81.
- If Two TRL/Ms is selected, the dialog will look like Figure 10-82.

Full Three Port Cal Config (Select two ports and Single ton)

Select for Cal A:

- 1,3
- 1,4
- 2,3
- 2,4

Select for Cal B:

- Port 1
- Port 2
- Port 3
- Port 4

Full Three Port Cal Config (1-2, 3-4 combos are not allowed)

Select for Cal A and Cal B (One Cal B port must be shared with Cal A)

- 1,3
- 1,4
- 2,3
- 2,4

Select one of the two available port pairs as a through, as determined by the port pair selected above.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Singleton

Select opens the SINGLETON REFLECT dialog.

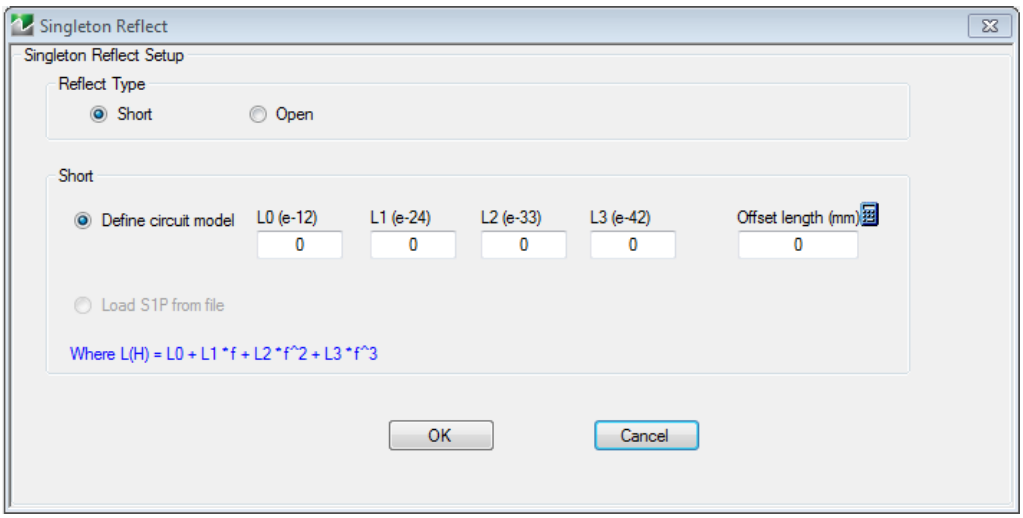


Figure 10-83. SINGLETON REFLECT Dialog Box

Cal A/ Cal B Tabs

Line Length Representation

Select from three radio button controlled options:

- Eff. (Effective) Length (the free-space equivalent length)
- Delay
- Phy. (Physical) Length

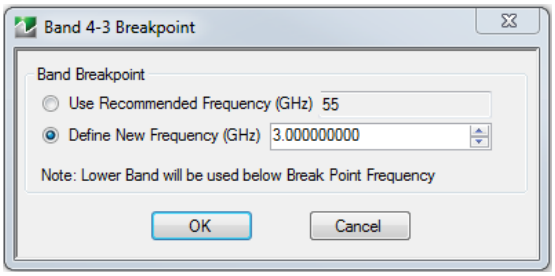
Band Definition

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:



Reflection Component

- Enter Open-like and/or Short-like offset length

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.

Summary of 3-Port Calibration Setup Dialog Boxes

The table below summarizes the available fields in all available 3-port calibration setup dialog boxes. If the dialog box is described in greater detail 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 three-port dialog boxes are named THREE PORT CAL SETUP (*Cal Method*, *Line Type*).

Table 10-5. Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (1 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SOLT/R **Coaxial**	See full description at "THREE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-159 Reference Impedance (Ohms) Test Ports: Select 3 ports from Port 1, Port 2, Port 3, Port 4. Select Throughs: • At least 2 throughs that connect to all ports must be selected. Only three throughs are available from the ports selected above. • Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 Thru Info buttons: Displays the THRU INFO dialog box for the selected through. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 Load Type: Broadband Load, Sliding Load The Test Port Configuration areas below are only available if the port was selected above. Test Port 1 DUT Connector: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), 2.4 mm V (M), 2.4 mm V (M), 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) to User-Defined32 (M), User-Defined1 (F) to User-Defined32 (F) Test Port 1 Connector Standard Info button: For each DUT port connector, displays the STANDARD INFO dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port 1 Select BB Load: Load 1, Load 2. Test Port 2, Test Port 3, and Test Port 4 controls are the same as Test Port 1, but only available if that test port was selected.
SOLT/R **Non-Dispersive**	Same controls and functions as SOLT/R Coaxial above.
SOLT/R **Waveguide**	SOLT/R is not recommended for Waveguide calibrations. Same controls as SOLT/R Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box for the waveguide kit selected above. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-5. Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (2 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SOLT/R Microstrip	Same controls as SOLT/R Coaxial with the following changes: Microstrip Kit: 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, User-User-Defined1 to User-Defined32 Microstrip Info button: Displays either the MICROSTRIP INFO or the USER DEFINED MICROSTRIP dialog box for the microstrip kit selected above. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port DUT Connector: User-Defined1 to User-Defined32 Test Port 1 Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector.
SSLT Coaxial	See full description at "THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box" on page 10-153 above. Reference Impedance (Ohms) Test Ports: Select 3 ports from Port 1, Port 2, Port 3, Port 4. Select Throughs: • At least 2 throughs that connect to all ports must be selected. Only three throughs are available from the ports selected above. • Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 Thru Info buttons: Displays the THRU INFO dialog box for the selected through. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 Load Type: Broadband Load, Sliding Load The Test Port Configuration areas below are only available if the port was selected above. Test Port DUT Connector: W1-Conn (M), W1-Conn (F), User-Defined1 (M) to User-Defined32 (M), User-Defined1 (F) to User-Defined32 (F) Test Port Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port Select BB Load: Load 1, Load 2. Test Port 1, Test Port 2, Test Port 3, and Test Port 4 controls are the same.
SSLT Non-Dispersive	Same controls SSLT Coaxial above.
SSLT Waveguide	Warning: Not recommended to perform waveguide cal with SOLT/R method. Same controls as SSLT Coaxial with the following changes: Waveguide Kit: Select from WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, User-Defined1 to User-Defined32 Waveguide Info button: Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-5. Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (3 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SSLT Microstrip	See full description at "THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box" on page 10-153 Same controls as SSLT Coaxial with the following changes: Microstrip Kit: Select from 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. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port DUT Connector: User-Defined1 to User-Defined32 Test Port Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector.
SSST Coaxial	See full description at "THREE PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-156 above. Reference Impedance (Ohms) Test Ports: Select 3 ports from Port 1, Port 2, Port 3, Port 4. Select Throughs: • At least 2 throughs that connect to all ports must be selected. Only three throughs are available from the ports selected above. • Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, Thru 3-4 Thru Info buttons: Displays the THRU INFO dialog box for the selected through. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 The Test Port Configuration areas below are only available if the port was selected above. Test Port DUT Connector: W1-Conn (M), W1-Conn (F), User-Defined1 (M) to User-Defined32 (M), User-Defined 1 (F) to User-Defined32 (F) Test Port Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port 1, Test Port 2, Test Port 3, and Test Port 4 controls are the same.
SSST Non-Dispersive	Same controls as SSST Coaxial.
SSST Waveguide	Same controls as SSST Coaxial 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. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-5. Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (4 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
SSST Microstrip	Same controls as SSST 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 MICROSTRIP INFO dialog box for selected calibration method and kit. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port DUT Connector: User-Defined1 to User-Defined32 Test Port Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector.
LRL/LRM Coaxial	See full description of controls and display logic at "THREE PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-162. Reference Impedance (Ohms) Select Cal Type: LRL/M + Singleton, Two LRL/Ms Cal A Ports: Select two port pairs from 1-3, 1-4, 2-3, 2-4 Cal B Ports: Auto-selected non-Cal A Port Pairs: 1-3, 1-4, 2-3, 2-4 Cal A and Cal B tabs: The "A" and "B" calibration parameters are selected via a tabbed menu within the dialog box. Reference Plane Location: Ends of Line 1, Middle of Line 1 Number of Bands: 1 through 5 • If 1, only Band 1 Device 1 and Band 1 Device 2 controls appear. • If 2, the above plus Band 2 Device 3 and Band 2 Device 4 controls appear. • If 3, the above plus Band 3 Device 5 and Band 3 Device 6 controls appear. • If 4, the above plus Band 4 Device 7 and Band 4 Device 8 controls appear. • If 5, the above plus Band 5 Device 9 and Band 5 Device 10 controls appear. Cal A Configuration Parameters: • Cal A Reference Plane Location: Ends of Line, Middle of Line 1 • Cal A Number of Bands: 1 or 2 • Cal A Band 1 Device 1 Line: Line Length (mm), Line Loss (dB/mm), @ Frequency (GHz) • Cal A Band 1 Device 2 Type: Line, Match; Use Short-like component, Use Open-like component, Use both; If Device 2 = Match, Match Info button displays USER DEFINED MATCH DEVICES dialog box for selected calibration kit. • "USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237 • Cal A Band 2 Device 3: Use device 1, Use new line • Cal A Band 2 Device 4: Line, Match, Type of Reflection (Use Open-like component, Use Short-like component), Line Length (mm) • Cal A Band Break Point: Calculate Recommended Value, Use Recommended Frequency (GHz), Define New Frequency (GHz). • Cal A Reflection Component: Open-like Length (mm), Short-like Offset Length (mm) Cal B Configuration Parameters • Cal B parameters are the same as those for Cal A.

Table 10-5. Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (5 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
LRL/LRM Non-Dispersive	Same controls as LRL/LRM Coaxial above.
LRL/LRM Waveguide	Same controls as LRL/LRM Coaxial above with the following changes: Cutoff Frequency (GHz) Dielectric Value
LRL/LRM Microstrip	Same controls as LRL/LRM 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 kit. • “MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes” on page 10-228
TRL/TRM Coaxial	See full description above display logic and controls at “THREE PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box” on page 10-166. Reference Impedance (Ohms) Dielectric: Enter a value if different than the default. Select Cal Type: TRL/M + Singleton or Two TRL/Ms. Thru Info buttons: Displays the THRU INFO dialog box for the selected through. • “THRU INFO Dialog Box – 4-Port VNAs” on page 10-235 Singleton button: Displays the SINGLETON REFLECT dialog box. Cal A: Select port pair. Cal B: Select port pair – one port must be shared with Cal A. 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: Open-like Length (mm), Short-like Offset Length (mm) 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)

Table 10-5. Manual Calibration – 3-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (6 of 6)

Cal Method Line Type	Dialog Box Controls and Functions
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-Defined1 to User-Defined32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical “MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes” on page 10-228

10-16 Manual 2-Port Cal Setup – 4-Port VNAs

TWO PORT CAL Menu – 4-Port VNAs

Summary of all 2-Port Cal Method and Line Type combinations is available at:

- Table 10-6, "Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs" on page 10-190

Button Availability:

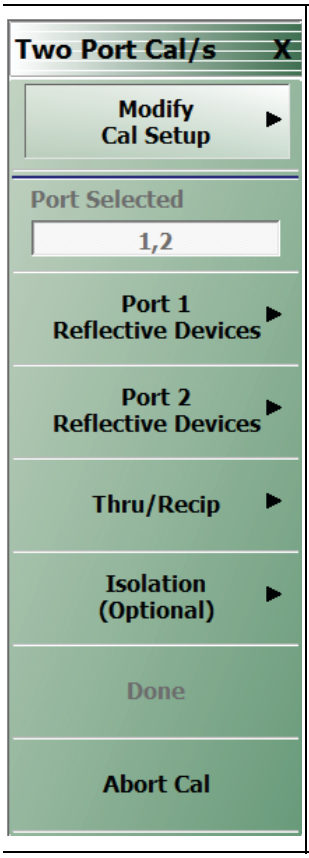
- The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant TWO PORT CAL SETUP dialog box.
- A representative menu is shown below.
- The example procedures at the end of this chapter show examples of various TWO PORT CAL menus.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

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 with access to the THREE PORT CAL SETUP dialog box for the selected calibration method and line type.

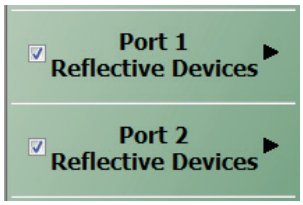
Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the THREE PORT CAL SETUP dialog box for the selected calibration method and line type.

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-179

Port Selected

Read-only display of the ports selected for the pending calibration.

Port 1 / Port 2 Reflective Devices

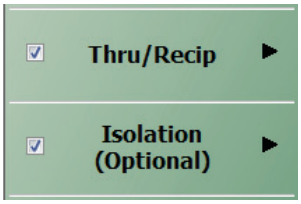


Select Port 1 Reflective Devices and Port 2 Reflective Devices buttons to display REFL. DEVICE(S) ----*Port 1*---- and REFL. DEVICE(S) ----*Port 2*---- calibration submenus. Completion of submenu calibration steps is signified by completion checkmarks on the Port 1 Reflective Devices and Port 2 Reflective Devices buttons.

- REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142

Figure 10-84. TWO PORT CAL Menu – 4-Port VNAs – Typical example (1 of 2)

Thru/Recip / Isolation (Optional)



Select Thru/Recip and Isolation (Optional) buttons to display THRU and ISOLATION(S) calibration submenus. Completion of submenu calibration steps is signified by completion checkmarks on the Thru/Recip and Isolation (Optional) buttons.

- THRU Menu – 4-Port VNAs on page 10-146
- ISOLATION(S) Menu on page 10-148

Done

Available after completion of calibration procedures. Select returns to CALIBRATION menu with Cal Status button set to ON.

Abort Cal

Select stops calibration procedure and returns to the CALIBRATION menu.

Figure 10-84. TWO PORT CAL Menu – 4-Port VNAs – Typical example (2 of 2)

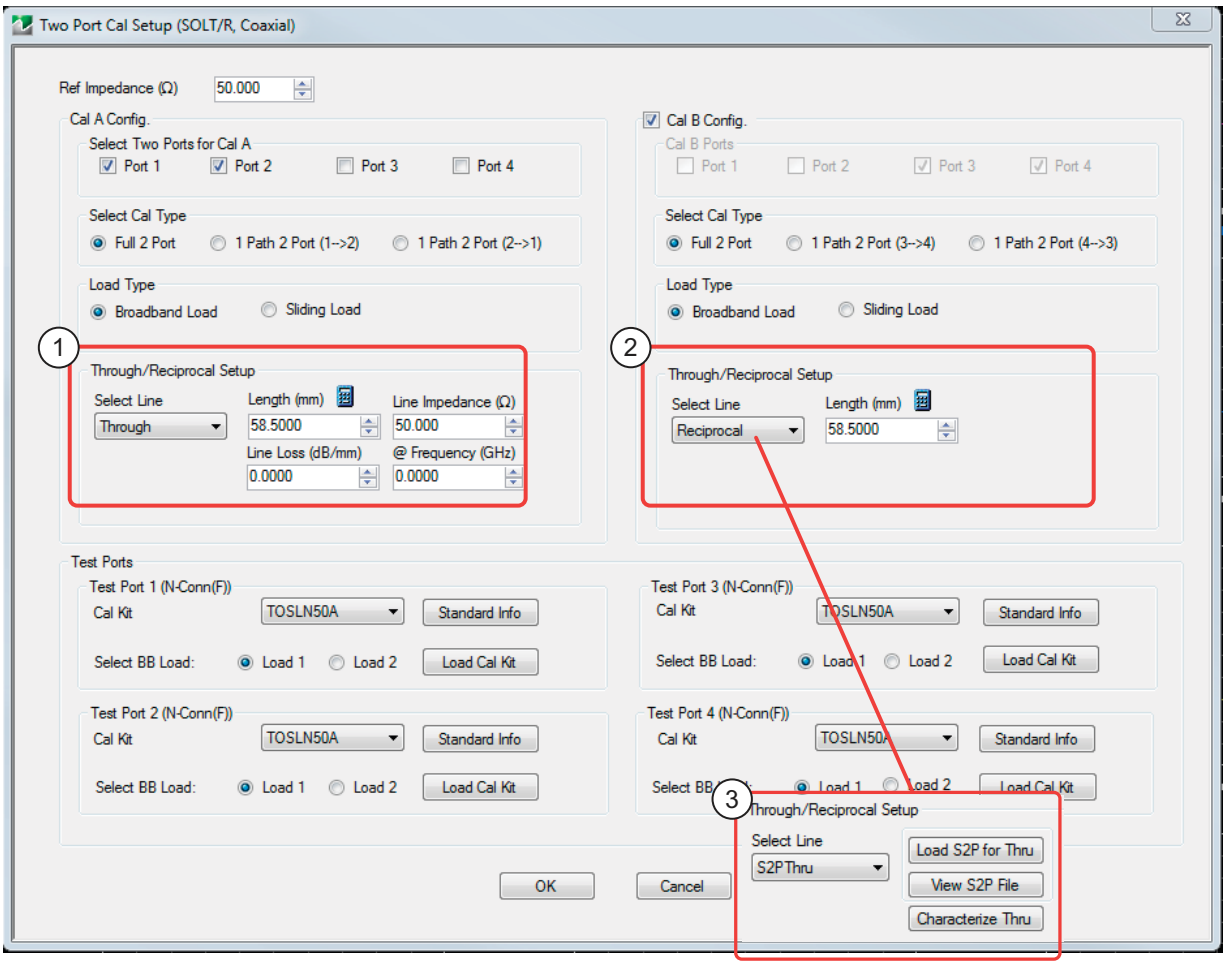
TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- TWO PORT CAL Menu – 4-Port VNAs on page 10-177

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/R, COAXIAL)



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-85. TWO PORT CAL SETUP (SOLT/R, 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.

Cal A and Cal B Configuration

The dialog box is divided into two calibration areas for Calibration A and Calibration B. Of the four test ports, the user selects two ports for the Cal A procedure. The instrument auto-selects the remaining two test ports for the Cal B procedure.

Cal A Test Ports

Select two test ports from Port 1, Port 2, Port 3, and Port 4. The non-selected ports are auto-selected for Cal B.

Cal A Cal Type

Select the calibration type from the following options:

- Full 2 Port
- 1 Path 2 Port forward. If port 1 and port 2 are selected, this is labeled as 1 Path 2 Port (1-->2).
- 1 Path 2 Port reverse. If port 1 and port 2 are selected, this is labeled as 1 Path 2 Port (2-->1).

Cal A Load Type

Select from:

- Broadband Load
- Sliding Load. If selected, a message appears: “Still required broadband loads below sliding load breakpoint frequency.”

Cal A Through/Reciprocal Setup

- Select Line:
  - Through
  - Reciprocal. Reciprocal is not allowed between 1-2 and 3-4.
- Length (mm).
  - Select the Calculator icon to convert time to length:
  - “AIR EQUIVALENT LENGTH CONVERSION Dialog Box” on page 10-226
- Line Impedance (Ohms)
- Line Loss (dB/mm)
- @ Frequency (GHz)

Cal B Setup Areas

The Cal B functions and controls are the same as Cal A above.

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- 0.8 mm (M)
- 0.8 mm (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- SMA (M)
- SMA (F)
- N-Conn (M)
- N-Conn (F)
- N-Conn (75) (M)
- N-Conn (75) (F)

- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 2.4 mm (M)
- 2.4 mm (F)
- GPC-3.5 (M)
- GPC-3.5 (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 1 DUT Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector with its calibration coefficients. The dialog box contents depend on the selected connector, Cal Method, and Line Type. The example here shows a typical STANDARD INFO dialog box.

- "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Test Port 1 Select BB Load

Select BB Load:

- Load 1
- Load 2

Test Port 2 Configuration

Provides the same controls as Test Port 1 Connector above.

Test Port 3 Configuration

Provides the same controls as Test Port 1 Connector above.

Test Port 4 Configuration

Provides the same controls as Test Port 1 Connector above.

OK / Cancel

Click OK to accept the changes or click Cancel.

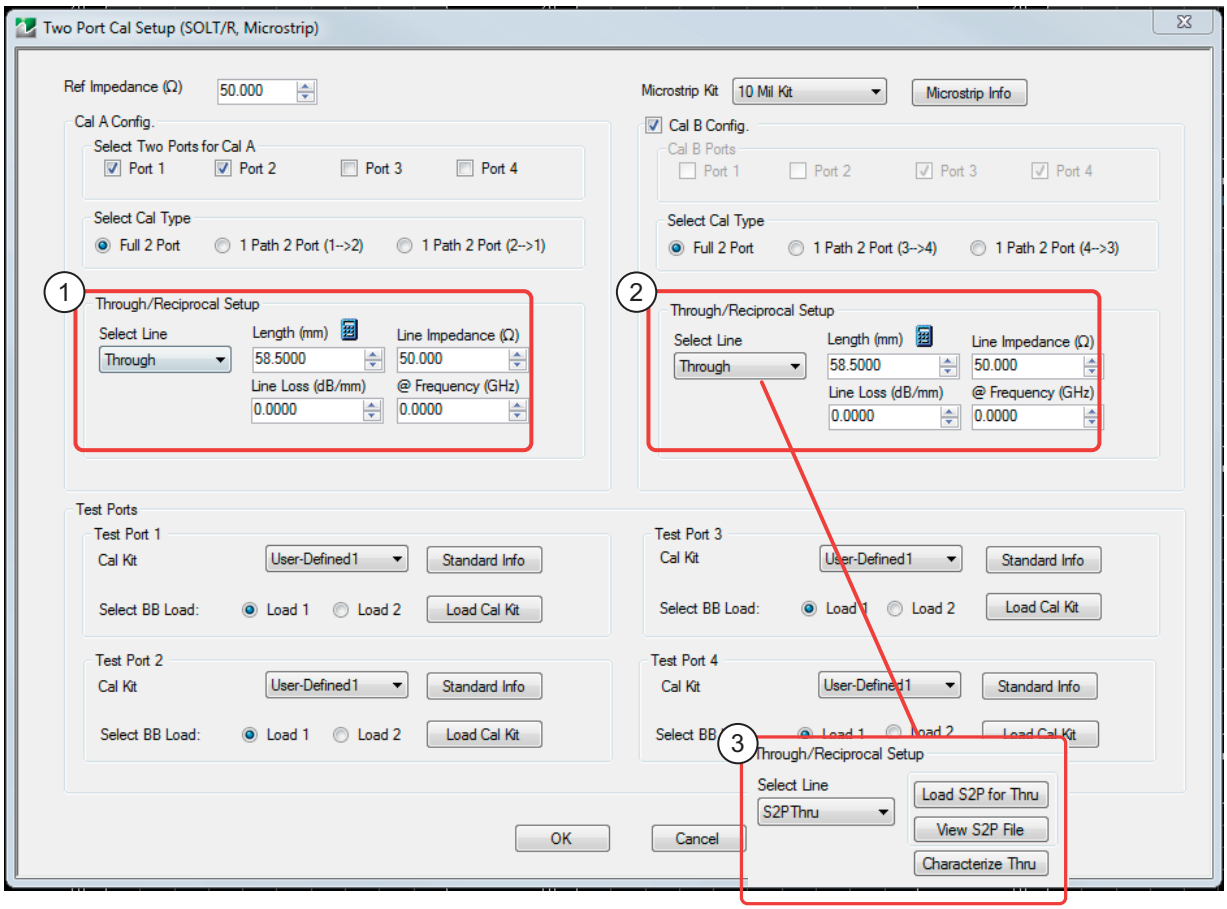
TWO PORT CAL SETUP (SOLT/SOLR, MICROSTRIP) Dialog Box

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- TWO PORT CAL Menu – 4-Port VNAs on page 10-177

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 = Microstrip |Edit Cal Params | TWO PORT CAL SETUP (SOLT/R, MICROSTRIP) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

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

Figure 10-86. TWO PORT CAL SETUP (SOLT/R, MICROSTRIP) Dialog Box

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted.

Cal A and Cal B Configuration

The dialog box is divided into two calibration areas for Calibration A and Calibration B. Of the four test ports, the user selects two ports for the Cal A procedure. The instrument auto-selects the remaining two test ports for the Cal B procedure.

Cal A Test Ports

Select any two test ports from Port 1, Port 2, Port 3, and Port 4. The non-selected ports are auto-selected for Cal B.

Cal A Cal Type

Select the calibration type from the following options:

- Full 2 Port
- 1 Path 2 Port forward. If port 1 and port 2 are selected, this is labeled as 1 Path 2 Port (1-->2).
- 1 Path 2 Port reverse. If port 1 and port 2 are selected, this is labeled as 1 Path 2 Port (2-->1).

Cal A Load Type

Select from:

- Broadband Load
- Sliding Load. If selected, a message appears: “Still required broadband loads below sliding load breakpoint frequency.”

Cal A Through/Reciprocal Setup

- Select Line:
  - Through
  - Reciprocal. Reciprocal is not allowed between 1-2 and 3-4.
- Length (mm).
  - Select the Calculator icon to convert time to length:
  - “AIR EQUIVALENT LENGTH CONVERSION Dialog Box” on page 10-226
- Line Impedance (Ohms)
- Line Loss (dB/mm)
- @ Frequency (GHz)

Cal B Setup Areas

The functions of the Cal B areas is the same as the Cal A above.

Test Port 1 DUT Connector

If Port 1 was selected above, select the DUT Connector Type from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Test Port 1 DUT Connector Standard Info Button

Select displays the STANDARD INFO dialog box for the selected connector with its calibration coefficients. The dialog box contents depend on the selected connector, Cal Method, and Line Type. The example here shows a typical standard information dialog box.

- “MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes” on page 10-228

Test Port 1 Select BB Load

Select BB Load number for Test Port 1:

- Load 1
- Load 2

Reference Impedance

Input the reference impedance.

- Input field defaulted to 50 Ohms.
- Any numerical value accepted.

Microstrip Kit

Select from:

- 10 Mil Kit
- 15 Mil Kit
- 25 Mil Kit
- User-Defined1 to User-Defined32

Microstrip Info Button

Select the Microstrip Info button to display the parameter information dialog box for the selected kit. The contents of the box vary depending on the selected Cal Method, Line Type, and connector type.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Cal A Ports

Select one (1) Calibration A Port Pair noting that combinations of **Port Pair 1-2** and **Port Pair 3-4** are not allowed.

- Select one (1) from: Port 1-3, Port 1-4, Port 2-3, Port 2-4

Access the **Cal A** functions and controls by selecting the Cal A tab.

Cal A – Reference Plane Location

Select from two radio button controlled options:

- Ends of Line 1
- Middle of Line 1

Cal A – Band Definition

Select one or two bands from the pull-down menu.

- Number of Bands = 1. Only the Band 1 Definition area is present.
- Number of Bands = 2. The Band 1 Definition area remains, and the Band 2 Definition and the Band Break Point areas appear.

Cal A – Band 1 Device 1 Definition

Provides the following fields and controls for Band 1:

- Band 1 Device 1 = Defaulted to Line.
- Line Length (mm) for Device 1. Allows input of the line length in mm.
- 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.

Cal A – Band 1 Device 2 Definition

- Band 1 Device 2. Select from Line or Match in pull-down menu.
- If Line is selected, the Type of Reflection allows selection of Use Open-like component or Use Short-like component.
  - If Use Open-line component is selected, the Reflection Component area at bottom of dialog box displays the Open-like Offset Length (mm) field.
  - If Use Short-like component is selected, the Reflection Component area at bottom of dialog box displays Short-line Offset Length (mm) field.

Cal A – Band 2 Definition

The Number of Bands field above must be set to "2" for this area and the Band Break Point area described below to be displayed. Provides the following fields and controls for Band 2.

Cal A – Band 2 Device 3 Definition

A pull-down menu with selections of:

- Use device 1
- Use device 2
- Use new line. If selected, additional fields appear as Line Length (mm), Line Loss (dB/mm), and @ Frequency (GHz).

Cal A – Band 2 Device 4 Definition

A pull-down menu with selections of:

- Line
- Match

If Line is selected for Band 2 Device 4, the Type of Reflection and Line Length (mm) fields are available.

The Type of Reflection field choices are limited to:

- Use Short-like component. If selected, the Reflection Component area below has one field for Short-like Offset Length (mm).
- Use Open-like component. If selected, the Reflection Component area below has two fields of Open-like Offset Length (mm) and Short-like Offset Length (mm).

If Match is selected for Band 2 Device 4, the Match Info button and the Type of Reflection fields appear with choices of:

- The Match Info button appears. Select displays the USER DEFINED MATCH DEVICES dialog box appears which allows configuration of the match devices.
  - "USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237
- The Type of Reflection field has the following choices:
  - Use Short-like component. If selected, the Reflection Component area below has one field of Short-like Offset Length (mm) field.
  - Use Open-like component. If selected, the Reflection Component area below has two fields of Open-like Offset Length (mm) and Short-like Offset Length (mm).
  - Use both. If selected, pair of radio button fields appear and allow selection of either Use Port 1 Match or Use Port 2 Match. Also, if selected, the Reflection Component area below has two fields of Open-like Offset Length (mm) and Short-like Offset Length (mm).

Cal A – Band Break Point

This area only appears if the Number of Bands in the Band Definition area is set to "2".

The Calculate Recommended Value button calculates the recommended break point value based on the input parameters in the fields above. Clicking the button calculates a break point frequency value and populates the Use Recommended Frequency (GHz) field.

A radio button set allows selection of either:

- Use Recommended Frequency (GHz) which was calculated by the button above.
- Define New Frequency (GHz) field which allows direct user input of a break frequency value.

Cal A – Reflection Component

Depending on the settings in the fields above, this area has one or two input fields as:

- Open-like Offset Length (mm)
- Short-like Offset Length (mm)

Access the Cal B functions and controls by selecting the Cal B tab where the controls and functions are the same as the Cal A tab above.

Cal B Ports

The Calibration B Port Pair is auto-selected from the remaining unused port pairs:

- If Cal A = Ports 1-3, then Cal B = Ports 2-4
- If Cal A = Ports 1-4, then Cal B = Ports 2-3
- If Cal A = Ports 2-3, then Cal B = Ports 1-4
- If Cal A = Ports 2-4, then Cal B = Ports 1-3

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 (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 – 4-Port VNAs on page 10-108

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

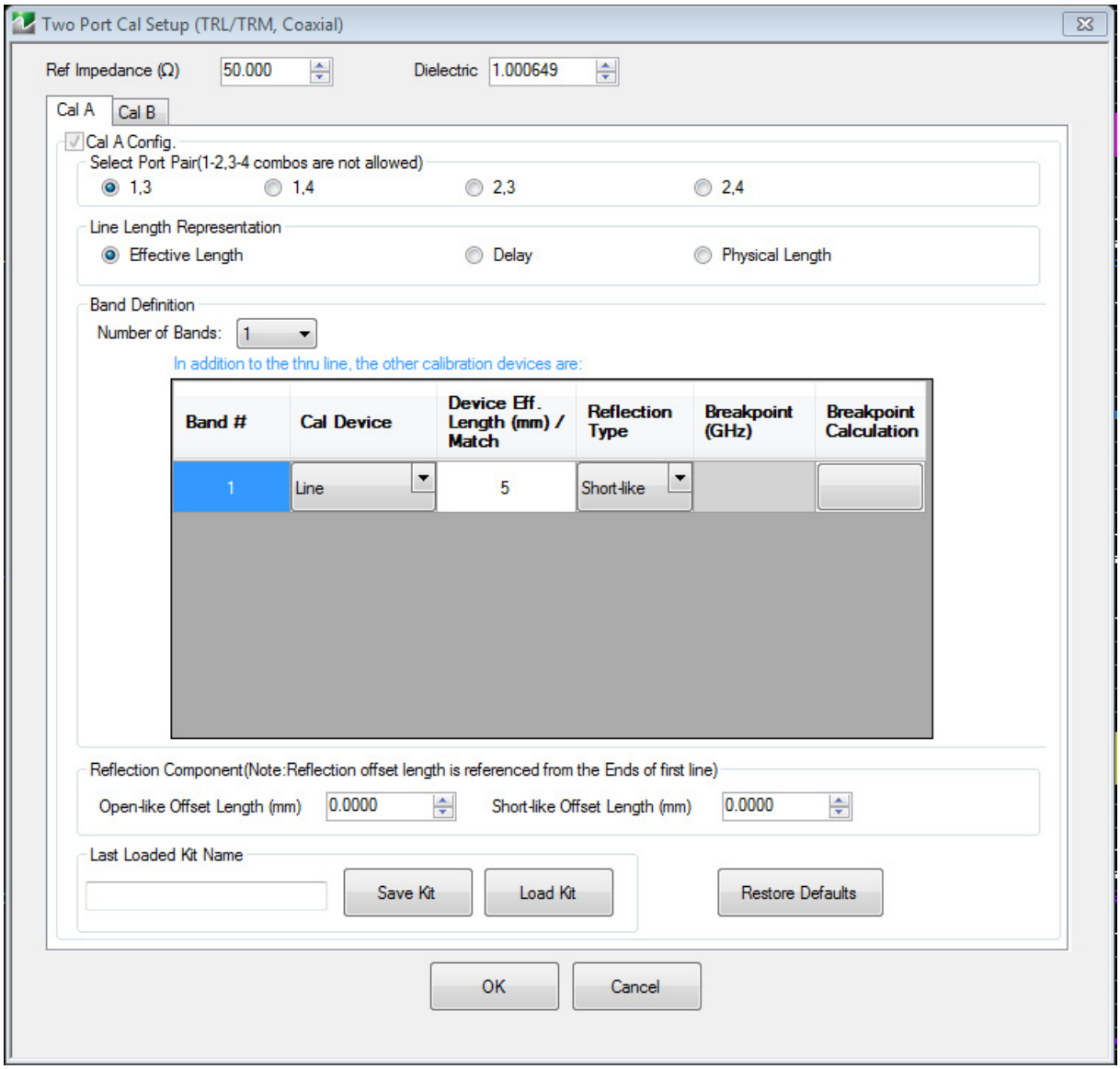


Figure 10-87. Edit Cal Params – TWO PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box

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.

Cal A/ Cal B Tabs

Select Port Pair (1-2, 3-4 combos are not allowed)

- 1,3
- 1,4
- 2,3
- 2,4

Line Length Representation

Select from three radio button controlled options:

- Eff. (Effective) Length (the free-space equivalent length)
- Delay
- Phy. (Physical) Length

Band Definition

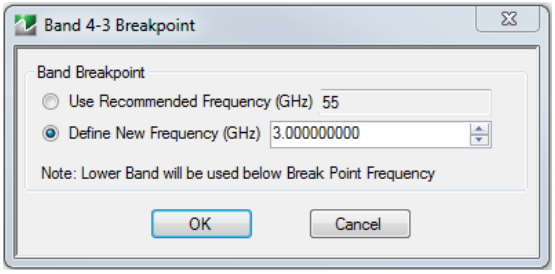
Select one to five bands from the pull-down menu.

- 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:



Reflection Component

- Enter Open-like and/or Short-like offset length

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

Summary of 2-Port Calibration Setup Dialog Boxes

The table below summarizes the available fields in all available 3-port calibration setup dialog boxes. If the dialog box is described in greater detail 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 three-port dialog boxes are named THREE PORT CAL SETUP (*Cal Method*, *Line Type*).

Table 10-6. Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (1 of 5)

Cal Method Line Type	Input Selections
SOLT/R Coaxial	See full description at "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-179 Reference Impedance (Ohms) Cal A Test Ports: Select 2 ports from Port 1, Port 2, Port 3, Port 4. Ports not selected are assigned to Cal B Cal A Cal Type: Select Full 2 Port, 1 Path 2 Port Forward, or 1 Path 2 Port Reverse Cal A Load Type: Select Broadband Load or Sliding Load Cal A Through/Reciprocal: Select Through or Reciprocal • Length (mm). Use the Calculator icon to display the AIR EQUIVALENT LENGTH CONVERSION dialog box at "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226. • Line Impedance (Ohms) • Line Loss (dB/mm) • @ Frequency (GHz) Cal B Test Ports: Test Ports are auto-selected the remaining non-Cal A Ports • All other controls and functions are the same as Cal A. Test Port DUT Connector: Select from 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), 2.4 mm V (M), 2.4 mm V (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) to User-Defined32 (M), User-Defined1 (F) to User-Defined32 (F) Test Port Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port Select BB Load: Select Load 1 or Load 2. Test Port 1, Test Port 2, Test Port 3, and Test Port 4 controls are the same.
SOLT/R Non-Dispersive	Same controls as SOLT/R Coaxial above.
SOLT/R Waveguide	SOLT/R is not recommended for Waveguide calibrations. Same controls as SOLT/R Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box for the waveguide kit selected above. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

Table 10-6. Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (2 of 5)

Cal Method Line Type	Input Selections
SOLT/R Microstrip	See full description at "TWO PORT CAL SETUP (SOLT/SOLR, MICROSTRIP) Dialog Box" on page 10-182 Same controls as SOLT/R 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 either the Microstrip Info or the USER DEFINED MICROSTRIP dialog box for the microstrip kit selected above. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port 1, 2, 3, and 4 Connector Standard Info button: Select displays the USER DEFINED STANDARD dialog box for the selected connector.
SSLT Coaxial	See full description at "TWO PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-179 Same controls as SOLT/R Coaxial with the following exception: Test Port DUT Connector: W1-Conn (M), W1-Conn(F), User-Defined1(M) to User-Defined32 (M), User-Defined1(F) to User-Defined32 (F) Test Port Connector Standard Info button: Select displays either the STANDARD INFO or the USER DEFINED dialog box for the selected connector. • "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229
SSLT Non-Dispersive	Same controls as SSLT Coaxial.
SSLT Waveguide	Same controls as SSLT Coaxial with the following changes: Waveguide Kit: WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, User-Defined1 to User-Defined32 Waveguide Info button: Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238
SSLT Microstrip	Same controls as SSLT 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 MICROSTRIP INFO dialog box for selected calibration method and kit. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Table 10-6. Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (3 of 5)

Cal Method Line Type	Input Selections
SSST Coaxial	See full description at above. Reference Impedance (Ohms) Cal A Test Ports: Select 2 ports from Port 1, Port 2, Port 3, Port 4. Cal A Cal Type: Select from Full 2 Port, 1 Path 2 Port Forward, or 1 Path 2 Port Reverse Cal A Through/Reciprocal: Through, Reciprocal • Length (mm). Use the Calculator icon to display the AIR EQUIVALENT LENGTH CONVERSION dialog box at "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226. • Line Impedance (Ohms) • Line Loss (dB/mm) • @ Frequency (GHz) Cal B Configuration • Cal B can be included or not in the calibration. • If included, Test Ports are auto-selected from the remaining non-Cal A Ports • All other controls and functions are the same Test Port 1, Test Port 2, Test Port 3, and Test Port 4 Controls are the same. Test Port DUT Connector: W1-Conn (M), W1-Conn(F), User-Defined1(M) to User-Defined32 (M), User-Defined1(F) to User-Defined32 (F) Test Port DUT Connector Standard Info Button: Select displays the USER DEFINED STANDARD dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
SSST Non-Dispersive	Same controls as SSST Coaxial.
SSST Waveguide	Same controls as SSST Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays WAVEGUIDE INFO dialog box for selected kit. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238 Test Port DUT Connector: User-Defined1 to User-Defined32
SSST Microstrip	Same controls as SSST Coaxial with the following exception: 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. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port DUT Connector Standard Info Button: Select displays the USER DEFINED STANDARD dialog box for the selected connector.

Table 10-6. Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (4 of 5)

Cal Method Line Type	Input Selections
LRL/LRM Coaxial	See full description at LRLabove. Reference Impedance (Ohms) Cal A Ports – Select two port pairs from 1-3, 1-4, 2-3, 2-4 Cal B Ports – Auto-selected non-Cal A Port Pairs: 1-3, 1-4, 2-3, 2-4 Cal A and Cal B tabs: The “A” and “B” calibration parameters are selected via a tabbed menu within the dialog box. Reference Plane Location: Ends of Line 1, Middle of Line 1 Number of Bands: 1, 2 • If 1, only Band 1 Device 1 and Band 1 Device 2 controls appear. • If 2, the above plus Band 2 Device 3 and Band 2 Device 4 controls appear. Cal A Configuration Parameters: • Cal A Reference Plane Location: Ends of Line, Middle of Line 1 • Cal A Number of Bands: 1 or 2 • Cal A Band 1 Device 1 Line: Line Length (mm), Line Loss (dB/mm), @ Frequency (GHz) • Cal A Band 1 Device 2 Type: Line, Match; Use Short-like component, Use Open-like component, Use both; If Device 2 = Match, Match Info button displays USER DEFINED MATCH DEVICES dialog box for selected calibration kit. • “USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM” on page 10-237 • Cal A Band 2 Device 3: Use device 1, Use new line • Cal A Band 2 Device 4: Line, Match, Type of Reflection (Use Open-like component, Use Short-like component), Line Length (mm) • Cal A Band Break Point: Calculate Recommended Value, Use Recommended Frequency (GHz), Define New Frequency (GHz). • Cal A Reflection Component: Open-like Length (mm), Short-like Offset Length (mm) Cal B Configuration Parameters • Cal B parameters are the same as those for Cal A.
LRL/LRM Non-Dispersive	Same controls as LRL/LRM Coaxial.
LRL/LRM Waveguide	Same controls as LRL/LRM Coaxial above with the following changes: Cutoff Frequency (GHz) Dielectric Value
LRL/LRM Microstrip	Same controls as LRL/LRM 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 MICROSTRIP INFO dialog box for selected calibration method and kit. • “MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes” on page 10-228

Table 10-6. Manual Calibration – 2-Port Calibration Setup Dialog Box Contents – 4-Port VNAs (5 of 5)

Cal Method Line Type	Input Selections
TRL/TRM **Coaxial**	See full description above display logic and controls at "FULL FOUR PORT CAL SETUP (TRL/TRM, COAXIAL) Dialog Box" on page 10-132. 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: Open-like Length (mm), Short-like Offset Length (mm) 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-Defined1 to User-Defined32 • Microstrip Info button: Displays a dialog box for selected calibration method and kit. • Typical "STANDARD INFO Dialog Box – 4-Port VNAs" on page 10-73

10-17 Manual 1-Port Cal Setup

ONE PORT CAL/S Menu – 4-Port VNAs

Button Availability:

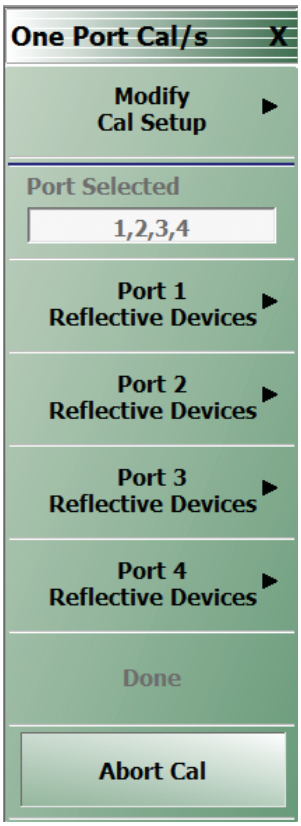
- The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus, and on the resultant ONE PORT CAL SETUP dialog box.
- A representative menu is shown below.
- The example procedures at the end of this chapter show examples of various TWO PORT CAL menus.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE PORT CAL



Modify Cal Setup

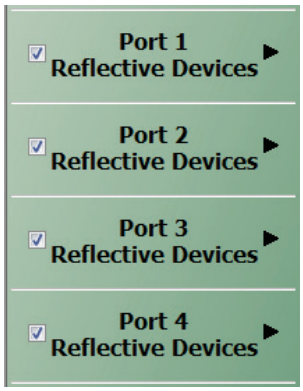
Select displays the CAL SETUP menu with access to the FULL ONE PORT CAL SETUP dialog box for the selected calibration method and line type.

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- ONE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box on page 10-196

Port Selected

Read-only display of ports selected for the calibration.

Port 1 / Port 2 / Port 3 / Port 4 Reflective Devices



Select Port 1 Reflective Devices, Port 2 Reflective Devices, Port 3 Reflective Devices, and Port 4 Reflective Devices buttons to display REFL. DEVICE(S) ----*Port 1*----, REFL. DEVICE(S) ----*Port 2*----, REFL. DEVICE(S) ----*Port 3*----, and REFL. DEVICE(S) ----*Port 4*---- calibration submenus. Completion of submenu calibration steps is signified by completion checkmarks on the button.

- REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142

Done

Available after completion of calibration procedures. Select returns to CALIBRATION menu with Cal Status button set to ON.

Abort Cal

Select stops calibration procedure and returns to the CALIBRATION menu.

Figure 10-88. ONE PORT CAL Menu – 4-Port VNAs – Typical example

ONE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195

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 (SOLT/R, COAXIAL Dialog Box

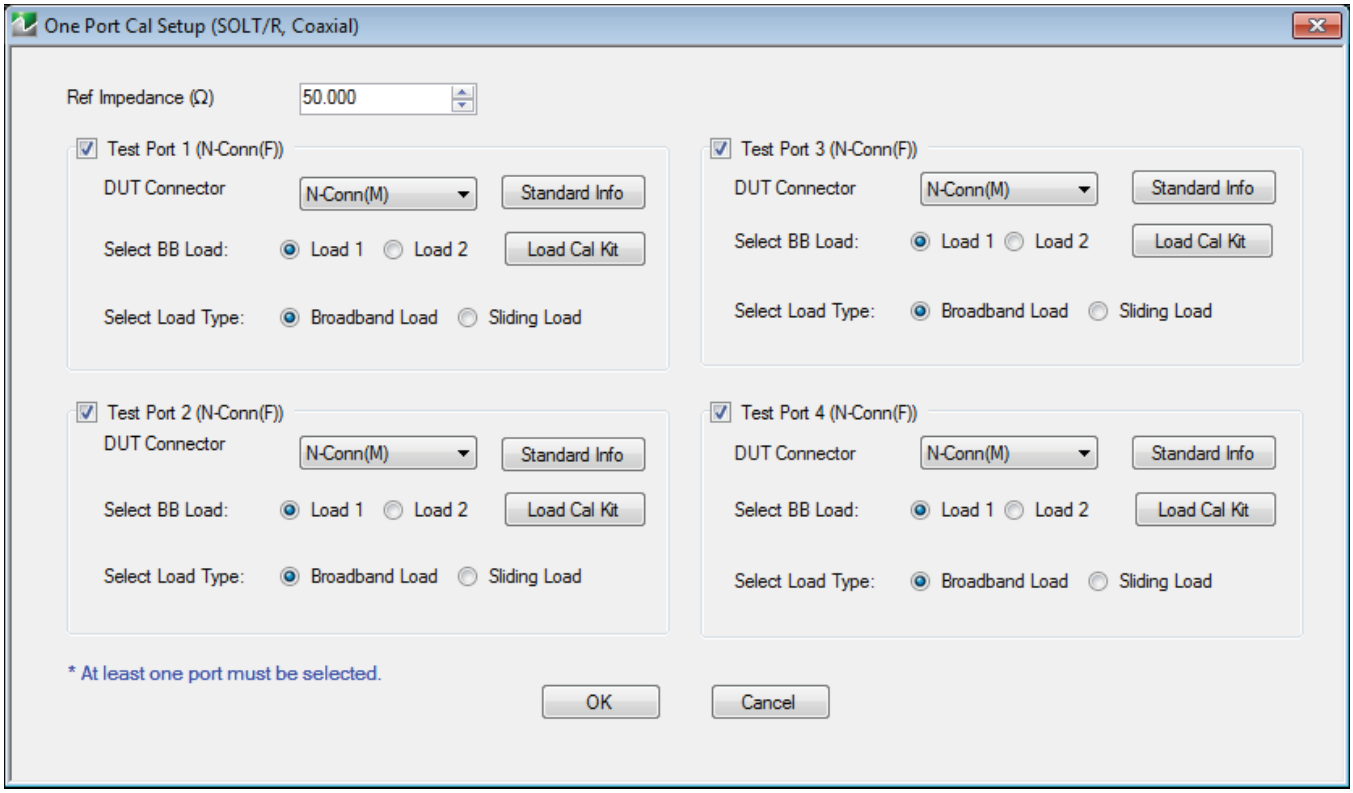


Figure 10-89. ONE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box

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 Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4 as long as one port is selected.

If a port is not selected, its buttons and controls are not available.

Test Port 1 Connector Type Area

Select the DUT Connector Type from a drop-down menu list with options of:

- 0.8 mm (M)
- 0.8 mm (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box with connector calibration coefficients for the selected connector and calibration method. The dialog box contents depend on the selected connector, calibration method, and line type. The example in the link below shows a typical standard information dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 1 Load Type

Select the load for Test Port 1:

- Broadband Load
- Sidling Load
    - If sliding load is selected, a message appears: "Still required broadband loads below sliding load breakpoint frequency."

Test Port 2, Test Port 3, and Test Port 4 DUT Connector

Select the DUT Connector Type from a drop-down menu list, as shown above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Select displays the STANDARD INFO dialog box with connector calibration coefficients for the selected connector and calibration method as described above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Load Type

Select the load as either Broadband Load or Sidling Load as describe above in Test Port 1.

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

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195

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

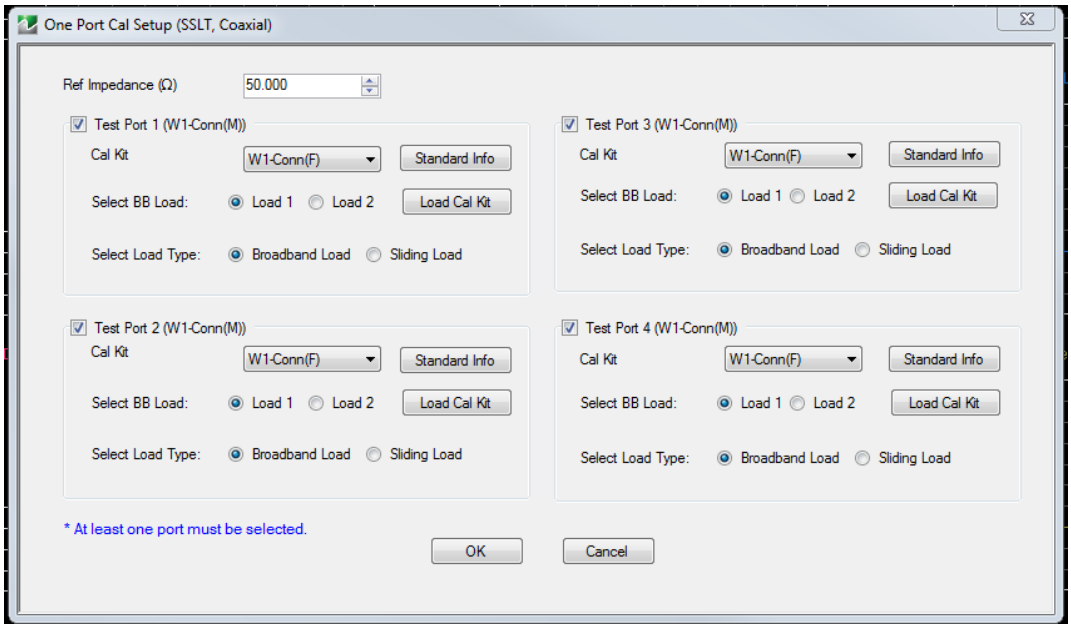


Figure 10-90. ONE PORT CAL SETUP (SSLT, COAXIAL) Dialog Box

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 Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4 as long as one port is selected.

If a port is not selected, its buttons and controls are not available.

Test Port 1 DUT Connector

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 with connector calibration coefficients for the selected connector and calibration method. The dialog box contents depend on the selected connector, calibration method, and line type. The examples in the link below shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
- "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229

Test Port 1 BB Load

Select the broadband load for Test Port 1:

- Load 1
- Load 2

Test Port 1 Load Type

Select the load for Test Port 1:

- Broadband Load
- Sidling Load
    - If sliding load is selected, a message appears: "Still required broadband loads below sliding load breakpoint frequency."

Test Port 2, Test Port 3, and Test Port 4 DUT Connector

Select the DUT Connector Type from a drop-down menu list, as shown above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Select displays the STANDARD INFO dialog box with connector calibration coefficients for the selected connector and calibration method as described above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 BB Load

Select the broadband load as either Load 1 or Load 2 as describe above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Load Type

Select the load as either Broadband Load or Sidling Load as describe above in Test Port 1.

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

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE PORT CAL/S | Modify Cal Setup | CAL SETUP | Cal Method = SSST; Line Type = Coaxial | Edit Cal Params | ONE PORT CAL SETUP (SSST, COAXIAL Dialog Box

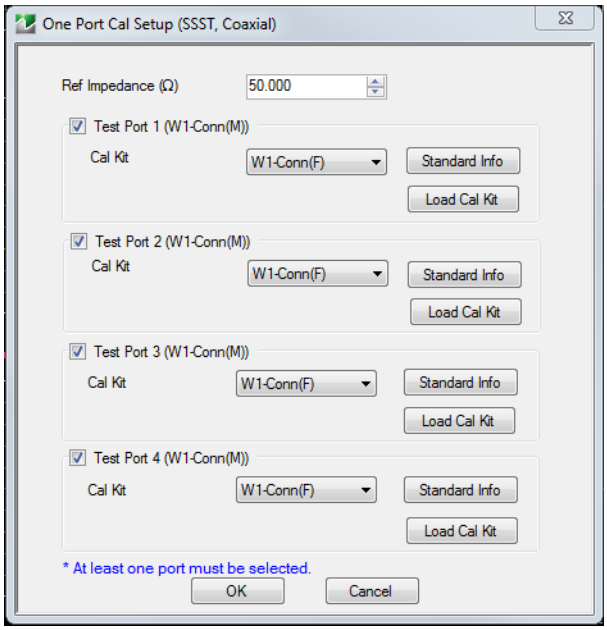


Figure 10-91. ONE PORT CAL SETUP (SSST, COAXIAL) Dialog Box

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 Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4 as long as one port is selected.

If a port is not selected, its buttons and controls are not available.

Test Port 1 DUT Connector

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 with connector calibration coefficients for the selected connector and calibration method. The dialog box contents depend on the selected connector, calibration method, and line type. The examples in the link below shows a typical STANDARD INFO dialog box.

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
- "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229

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, WAVEGUIDE) Dialog Box

Previous

- CAL SETUP Menu – 4-Port VNAs on page 10-108
- ONE PORT CAL/S Menu – 4-Port VNAs on page 10-195

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE PORT CAL | Modify Cal Setup | Cal Method = SSLT; Line Type = Waveguide | Edit Cal Params | ONE PORT CAL (SSLT, WAVEGUIDE) Dialog Box

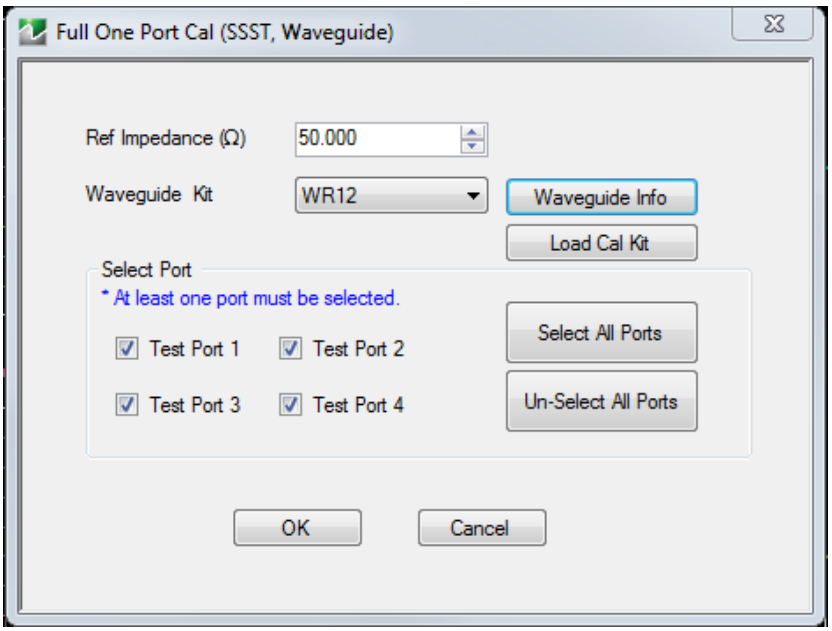


Figure 10-92. ONE PORT CAL SETUP (SSLT, WAVEGUIDE) Dialog Box

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.

Waveguide Kit Selection

Select the Waveguide Kit Type from a drop-down menu list with options of:

- User-Defined 1 through User-Defined32

Waveguide Info Button

Select displays the USER DEFINED WAVEGUIDE (SSST) dialog box. The dialog box allows user input of waveguide calibration parameters of:

- Waveguide kit label. A user-defined kit label can be input here.
- Cutoff frequency (GHz)
- Dielectric
- Offset short 1 length (mm)
- Offset short 2 length (mm)

- Offset short 3 length (mm)
- A calculator icon provides access to the AIR EQUIVALENT LENGTH CONVERSION dialog box described in the AutoCal sections above.
  - “AIR EQUIVALENT LENGTH CONVERSION Dialog Box” on page 10-226

The dialog box contents depend on the selected connector, calibration method, and line type. The example in the link below shows a typical STANDARD INFO dialog box.

- “WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes” on page 10-238

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

The table below summarizes the fields and controls in all 1-port calibration setup dialog boxes. If the dialog box is described in greater detail 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 three-port dialog boxes are named THREE PORT CAL SETUP (*Cal Method*, *Line Type*).

Table 10-7. Manual Calibration – 1-PORT CALIBRATION SETUP Dialog Box Contents – 4-Port VNAs (1 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/R Coaxial	See full description above at "ONE PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-196 Reference Impedance (Ohms) Select Test Ports: Select any combination of Test Port 1, Test Port 2, Test Port 3, and/or Test Port 4 as long as one port is selected. Test Port DUT Connector: For each test port, select one of the following connectors from a drop-down list: 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), 2.4 mm V (M), 2.4 mm V (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 DUT Connector Standard Info Button: Select displays the STANDARD INFO dialog box for the selected connector above. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port BB Load: For each Test Port selected above, select either Load 1 or Load 2. Test Port Load Type: For each Test Port selected above, select either Broadband Load, Sidling Load.
SOLT/R Non-Dispersive	Same controls as SOLT/R Coaxial.
SOLT/R Waveguide	SOLT/R is not recommended for Waveguide calibrations. The same controls as SOLT/R Coaxial with the following changes: Waveguide Kit: User-Defined1 to User-Defined32 Waveguide Info button: Displays USER DEFINED WAVEGUIDE dialog box for the waveguide kit selected above. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238
SOLT/R Microstrip	Same controls as SOLT/R Coaxial with the following changes: Microstrip Kit: Select from 10 Mil Kit, 15 Mil Kit, 25 Mil Kit, or User-Defined1 to User-Defined32 Microstrip Info button: Displays either the MIICROSTRIP INFO or the USER DEFINED MICROSTRIP dialog box for the microstrip kit selected above. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Table 10-7. Manual Calibration – 1-PORT CALIBRATION SETUP Dialog Box Contents – 4-Port VNAs (2 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSLT Coaxial	See full description above at "ONE PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-198 Reference Impedance (Ohms). Select Test Ports: Select any combination of Test Port 1, Test Port 2, Test Port 3, and/or Test Port 4 as long as one port is selected. Test Port DUT Connector: For each test port, select one of the following connectors from a drop-down list: 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), 2.4 mm V (M), 2.4 mm V (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 DUT Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector above. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 • "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229 Test Port BB Load: For each Test Port selected above, select either Load 1 or Load 2. Test Port Load Type: For each Test Port selected above, select either Broadband Load, Sidling Load.
SSLT Non-Dispersive	Same controls and functions options as SSLT Coax.
SSLT Waveguide	See full description above at "ONE PORT CAL SETUP (SSLT, WAVEGUIDE) Dialog Box" on page 10-202 Same controls and functions as SSLT Coaxial with the following changes: Waveguide Kit: WR10, WR12, WR15, WR28, WR42, WR62, WR75, WR90, WR112, WR137, WR159, WR187, WR229, User-Defined1 to User-Defined32 Waveguide Info button: Displays WAVEGUIDE INFO dialog box for selected calibration method and kit. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238
SSLT Microstrip	Same controls and functions as SSLT 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 the MICROSTRIP INFO or USER DEFINED MICROSTRIP dialog box for selected calibration method and kit. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228 Test Port Connector Standard Info button: For each port selected, displays the USER DEFINED STANDARD dialog box for the selected calibration method and connector. See the following links for typical examples: • "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229

Table 10-7. Manual Calibration – 1-PORT CALIBRATION SETUP Dialog Box Contents – 4-Port VNAs (3 of 3)

Cal Method Line Type	Dialog Box Input Selections and Controls
SSST Coaxial	See full description above at "ONE PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-200 Reference Impedance (Ohms) Test Ports: Select any combination of Test Port 1, Test Port 2, Test Port 3, Test Port 3 as long a one port is selected. Test Port DUT Connector: W1-Conn (M), W1-Conn (F), User-Defined1 (M) to User-Defined32 (M), User-Defined 1 (F) to User-Defined32 (F) Test Port DUT Connector Standard Info button: Displays the STANDARD INFO (Triple Offset Short) dialog box for selected connector. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
SSST Non-Dispersive	Same controls and functions as SSST Coaxial.
SSST Waveguide	Same controls and functions as SSST Coaxial 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. • "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238
SSST Microstrip	Same controls and functions as SSST 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 MICROSTRIP INFO dialog box for selected calibration method and kit. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
LRL/LRM	LRL/LRM calibration method is not available for 1-port calibrations.
TRL/TRM	TRL/TRM calibration method is not available for 1-port calibrations.

10-18 Manual Trans. Freq. Response Cal Menus and Dialog Boxes

- "TRANS. FREQ. RESP. CAL SETUP (SSLT, WAVEGUIDE) Dialog Box" on page 10-211
- "TRANS. FREQ. RESP. CAL SETUP (SSST, MICROSTRIP) Dialog Box" on page 10-213

Summary table of all transmission frequency response calibration configuration dialog boxes:

- Table 10-8, "Trans. Freq. Resp. Manual Cal Setup Dialog Box Contents – 4-Port VNAs" on page 10-215

Full Name

- Transmission Frequency Response Calibration Menu

Menu Name

- TRANS. RESPONSE

Button Name

- Transmission Freq. Response

TRANS. RESPONSE Menu – 4-Port VNAs

Composition of menu depends on settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant TRANSMISSION FREQUENCY RESPONSE CAL SETUP dialog box.

Full Name

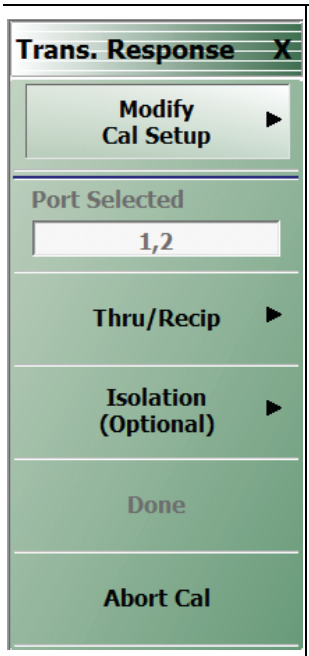
- Transmission Frequency Response Menu

Previous

- "MANUAL CAL Menu – 4-Port VNAs" on page 10-106

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq. Response | TRANS. RESPONSE



Modify Cal Setup

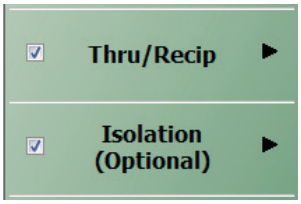
Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the Transmission Frequency RESPONSE CAL SETUP dialog box for the selected calibration method and line type.

- "TRANSMISSION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 10-209

Port Selected

Read-only display of the ports selected for the pending calibration.

Thru/Recip / Isolation (Optional)



Select Thru/Recip and Isolation (Optional) buttons to display THRU and ISOLATION(S) calibration submenus. Completion of submenu calibration steps is signified by completion checkmarks on the buttons.

- THRU Menu – 4-Port VNAs on page 10-146
- ISOLATION(S) Menu on page 10-148

Done

Available after completion of calibration procedures. Select returns to CALIBRATION menu with Cal Status button set to ON.

Abort Cal

Select stops calibration procedure and returns to the CALIBRATION menu.

Figure 10-93. TRANS. RESPONSE Menu – 4-Port VNAs – Typical example

TRANSMISSION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box

Full Name

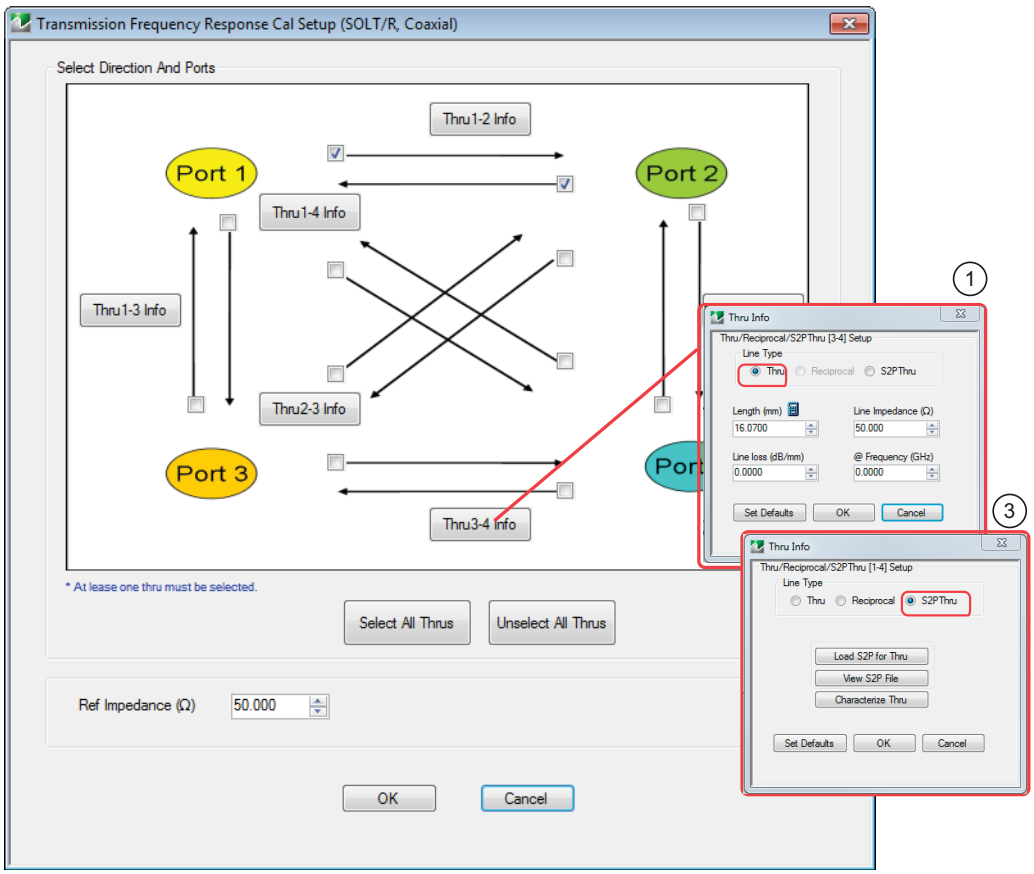
- Transmission Frequency Response Calibration Setup Dialog Box

Previous

- TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq. Response | TRANS. RESPONSE | Modify Cal Setup | CAL SETUP | Cal Method = SOLT/SOLR; Line Type = Coaxial | Edit Cal Params | TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

1. Thru selected allows user entries for length, line impedance, line loss and frequency.
2. Reciprocal not supported here.
3. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files).

Figure 10-94. TRANSMISSION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Test Port Thru Selection Boxes

Allows selection of any combination of the test port throughs for the available port pairs:

- Thru 1-2
- Thru 1-3
- Thru 1-4
- Thru 2-3
- Thru 2-4
- Thru 3-4

Test Port Pair Thru Info Buttons

A Thru Info button becomes available for each port pair through selected above. Select displays the THRU INFO dialog box for the selected port pair. A calculator icon in the THRU INFO dialog box allows access to the AIR EQUIVALENT LENGTH CONVERSION dialog box.

- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226

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.

OK / Cancel

Click OK to accept the changes, or click Cancel.

TRANS. FREQ. RESP. CAL SETUP (SSLT, WAVEGUIDE) Dialog Box

Full Name

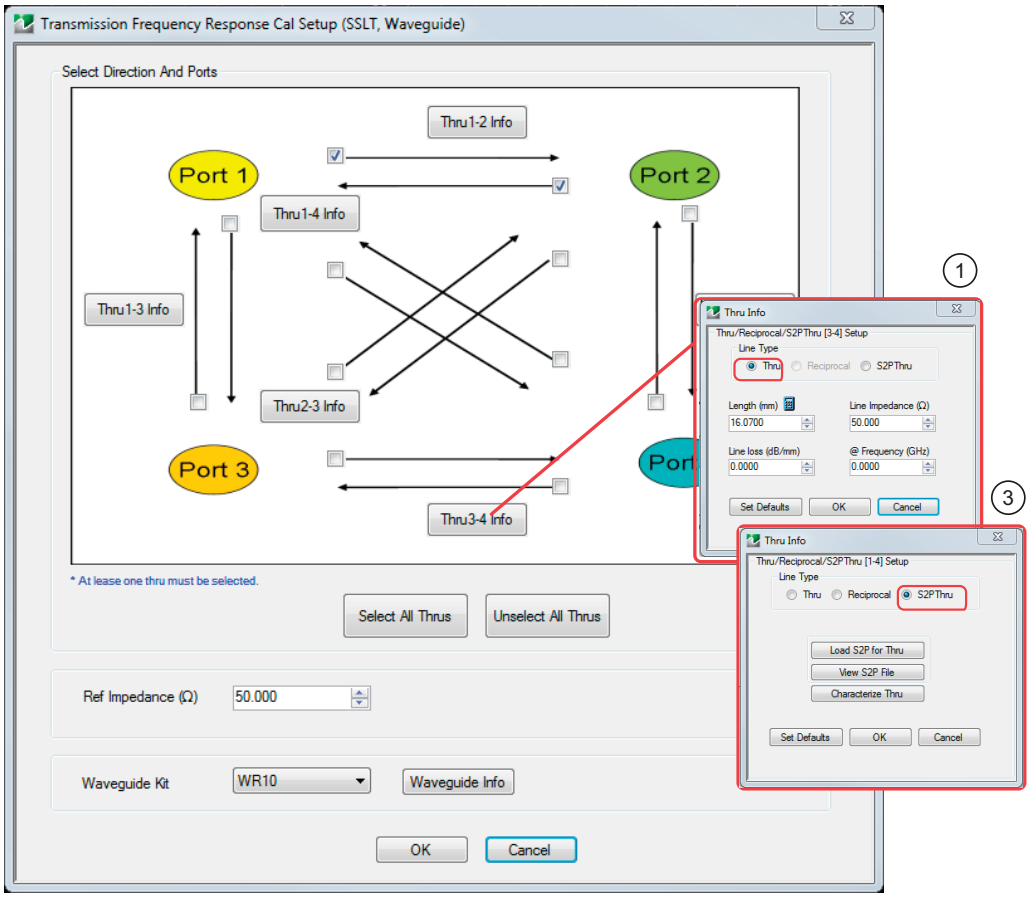
- Transmission Frequency Response Calibration Setup Dialog Box

Previous

- TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq. Response | TRANS. RESPONSE | Modify Cal Setup | CAL SETUP | Edit Cal Params | TRANSMISSION FREQUENCY RESPONSE | Modify Cal Setup | CAL SETUP | Cal Method = SSLT; Line Type = Waveguide) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

1. Thru selected allows user entries for length, line impedance, line loss and frequency.
2. Reciprocal not supported here.
3. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files).

Figure 10-95. TRANS. FREQ. RESP. CAL SETUP (SSLT, WAVEGUIDE) 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.

Waveguide Kit Selection

Select the Waveguide Kit Type from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Waveguide Info Button

Select displays the USER DEFINED WAVEGUIDE (SSST) dialog box. The dialog box allows user input of waveguide calibration parameters of:

- Waveguide kit label. A user-defined kit label can be input here.
- Cutoff frequency (GHz)
- Dielectric
- Offset short 1 length (mm)
- Offset short 2 length (mm)
- Offset short 3 length (mm)
- A calculator icon provides access to the AIR EQUIVALENT LENGTH CONVERSION dialog box described in the AutoCal sections above.
    - “AIR EQUIVALENT LENGTH CONVERSION Dialog Box” on page 10-226

The dialog box contents depend on the selected connector, calibration method, and line type. The example in the link below shows a typical STANDARD INFO dialog box.

- “WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes” on page 10-238

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.

TRANS. FREQ. RESP. CAL SETUP (SSST, MICROSTRIP) Dialog Box

Full Name

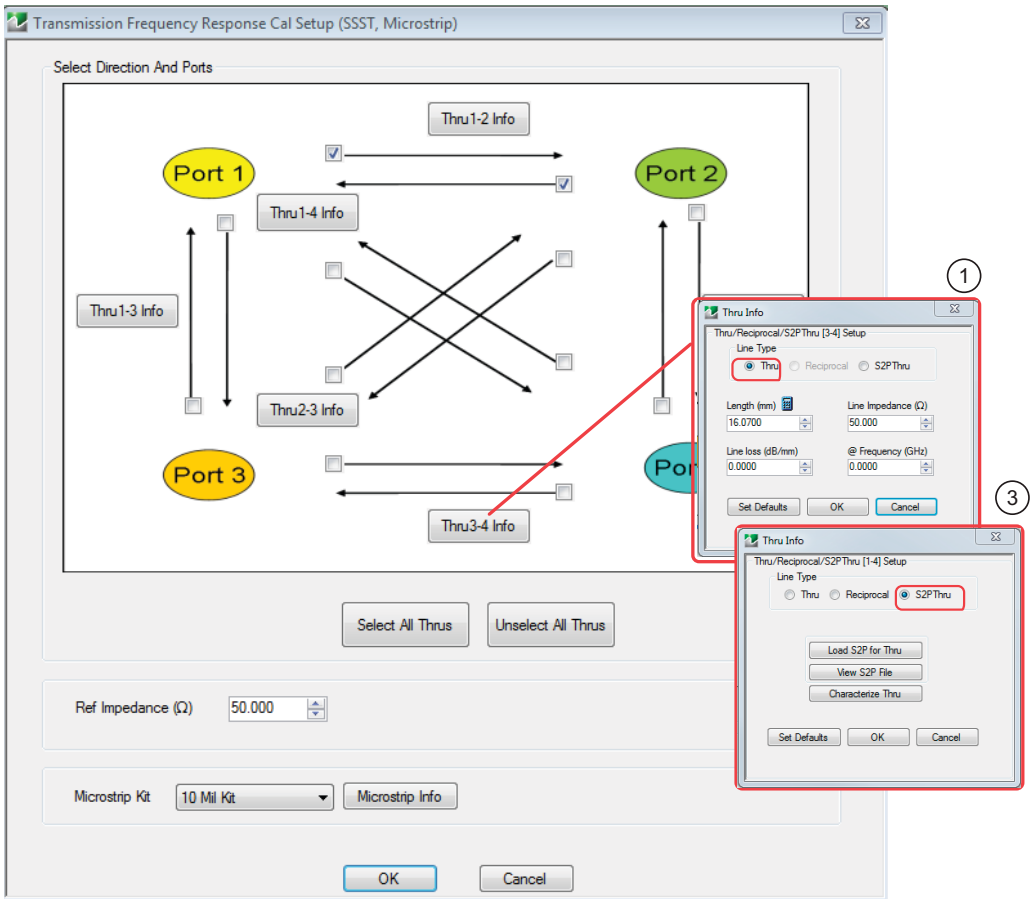
- Transmission Frequency Response Calibration Setup Dialog Box

Previous

- TRANS. RESPONSE Menu – 4-Port VNAs on page 10-207

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Transmission Freq. Response | TRANS. RESPONSE | Modify Cal Setup | CAL SETUP | Cal Method = SSST; Line Type = Microstrip | Edit Cal Params | TRANSMISSION FREQUENCY RESPONSE CAL SETUP (SSST, COAXIAL) Dialog Box



"THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

1. Thru selected allows user entries for length, line impedance, line loss and frequency.
2. Reciprocal not supported here.
3. S2P Thru selected provides buttons for loading, viewing, and characterization (to generate S2P files).

Figure 10-96. TRANS. FREQ. RESP. CAL SETUP (SSST, MICROSTRIP) 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 Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4 as long as one port is selected.

If a port is not selected, its buttons and controls are not available.

Test Port 1 Select Cal Component

Select from Offset Short 1, Offset Short 2, or Offset Short 3.

Test Port 1 DUT Connector

Select the DUT Connector Type from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Test Port 1 Connector Standard Info Button

Select displays the USER DEFINED OFFSET SHORT INFO dialog box with connector calibration coefficients for the selected connector and calibration method. The dialog box contents depend on the selected connector, calibration method, and line type. See the following links for typical examples:

- “WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes” on page 10-238
- “USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM” on page 10-237

Test Port 2, Test Port 3, and Test Port 4 DUT Connector

Select the DUT Connector Type from a drop-down menu list, as shown above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Select displays the USER DEFINED OFFSET SHORT INFO dialog box with connector calibration coefficients for the selected connector and calibration method as described above in Test Port 1.

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 Trans. Freq. Resp. Cal Setup Dialog Boxes

The table below summarizes the fields and controls in all transmission frequency response calibration setup dialog boxes. If the dialog box is described in greater detail 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 transmission frequency response dialog boxes are named Transmission Frequency Response Cal Setup (*Cal Method*, *Line Type*).

Table 10-8. Trans. Freq. Resp. Manual Cal Setup Dialog Box Contents – 4-Port VNAs

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/R **Coaxial**	See full description above at "TRANSMISSION FREQ. RESPONSE CAL SETUP (SOLT/SOLR, COAXIAL) Dialog Box" on page 10-209 Select Test Port Throughs: Select any combination of port pair throughs from Thru 1-2, Thru 1-3, Thru 1-4, Thru 2-3, Thru 2-4, and/or Thru 1-3. At least one through must be selected. Thru Info Button: For each through selected above, the Thru Info [Port Pair] button is enabled. Select Thru Info button to display corresponding THRU INFO dialog box. • "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235 • In the THRU INFO dialog box, select the Calculator icon to display the AIR EQUIVALENT LENGTH CONVERSION dialog box to change units. • "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226 Reference Impedance (Ohms)
SOLT/R **Non-Dispersive**	Same controls and functions as SOLT/R Coaxial above.
LRL/LRM	LRL/LRM calibration method is not available for the Transmission Frequency Response calibration type.
TRL/TRM	TRL/TRM calibration method is not available for the Transmission Frequency Response calibration type.

10-19 Manual Refl. Freq. Response Menus and Dialog Boxes

- "REFL. FREQ. RESP. CAL SETUP (SSLT, MICROSTRIP) Dialog Box" on page 10-220
- "REFL. FREQ. RESP. CAL SETUP (SSST, WAVEGUIDE) Dialog Box" on page 10-222

Summary table of reflection frequency response calibration dialog boxes is at:

- Table 10-9, "Refl. Freq. Resp. Manual Cal. Setup Dialog Box Contents – 4-Port VNAs" on page 10-224

Calibration Full Name

- Reflection Frequency Response Calibration

Menu Full Name

- Reflection Frequency Response Menu

Button Name

- Reflection Freq. Response

REFL. RESPONSE Menu – 4-Port VNAs

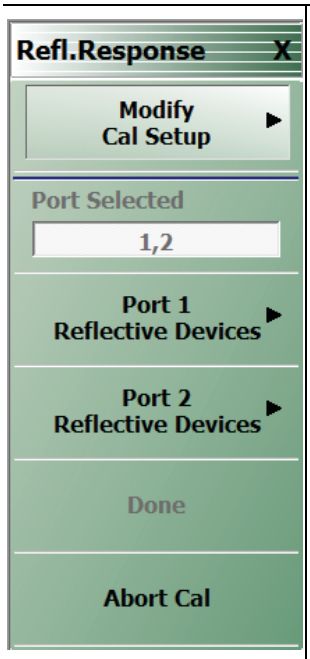
The exact composition of the menu depends on the settings made on the CAL SETUP, CAL METHOD, and LINE TYPE menus and on the resultant TRANSMISSION FREQUENCY RESPONSE CAL SETUP dialog box. A representative menu is shown below. The example procedures in this chapter show one example of a TRANS. RESPONSE menu.

Previous

- MANUAL CAL Menu – 4-Port VNAs on page 10-106

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Freq. Response | REFL. RESPONSE



Modify Cal Setup

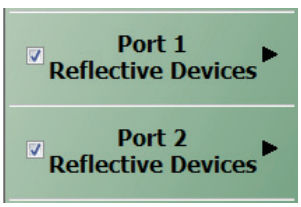
Select displays the CAL SETUP menu where the Edit Cal Params button provides access to the Reflection FREQ. RESPONSE CAL SETUP dialog box for the selected calibration method and line type.

- "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-218

Port Selected

Read-only display of ports selected for the calibration.

Port 1 / Port 2 Reflective Devices



Select Port 1 Reflective Devices and Port 2 Reflective Devices buttons to display REFL. DEVICE(S) ----*Port 1*---- and REFL. DEVICE(S) ----*Port 2*---- calibration submenus. Completion of submenu calibration steps is signified by completion checkmarks on the Port 1 Reflective Devices and Port 2 Reflective Devices buttons.

- REFL. DEVICE(S) Menu – 4-Port VNAs on page 10-142

Figure 10-97. REFL. RESPONSE Menu – 4-Port VNAs – Typical example (1 of 2)

	Done Available after completion of calibration procedures. Select returns to CALIBRATION menu with Cal Status button set to ON. **Abort Cal** Select stops calibration procedure and returns to the CALIBRATION menu.

Figure 10-97. REFL. RESPONSE Menu – 4-Port VNAs – Typical example (2 of 2)

REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box

Full Name

- Reflection Frequency Response Calibration Setup (SOLT/R, COAXIAL) Dialog Box

Previous

- REFL. RESPONSE Menu – 4-Port VNAs on page 10-216

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. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box
- CAL SETUP must be set to Cal Method = SOLT/R and Line Type = Coaxial.

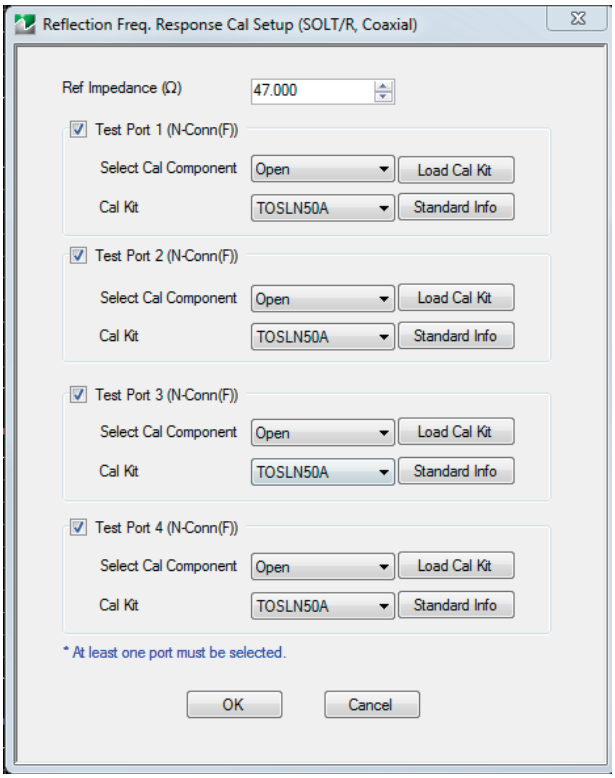


Figure 10-98. REFLECTION FREQ. RESPONSE. CAL SETUP (SOLT/R, COAXIAL) Dialog Box

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 Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4, with minimum one selected port required.

Test Port 1 Select Cal Component and Load Cal Kit Button

Select Open or Short from the drop-down menu, or click Load Cal Kit to install a custom Cal Kit file.

Test Port 1 DUT Connector

Select the DUT Connector Type from the drop-down menu.

- 0.8 mm (M)
- 0.8 mm (F)
- W1-Conn (M)
- W1-Conn (F)
- V-Conn (M)
- V-Conn (F)
- K-Conn (M)
- K-Conn (F)
- TOSLN50A
- TOSLNF50A
- 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 1 Connector Standard Info Button

Select displays the STANDARD INFO dialog box with connector calibration coefficients for the selected connector and calibration method, as in the following example:

- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228

Test Port 2, Test Port 3, and Test Port 4 Select Cal Component and Load Cal Kit Button

Select Open or Short from the drop-down menu, or click Load Cal Kit to install a custom Cal Kit file, as described above for Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 DUT Connectors

Select the DUT Connector Type from the drop-down menu list as described above for Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Buttons

Select displays the STANDARD INFO dialog box with connector calibration coefficients for the selected connector and calibration method as described above for Test Port 1.

OK / Cancel

Click OK to accept the changes and return to the CAL SETUP menu, or click Cancel.

REFL. FREQ. RESP. CAL SETUP (SSLT, MICROSTRIP) Dialog Box

Full Name

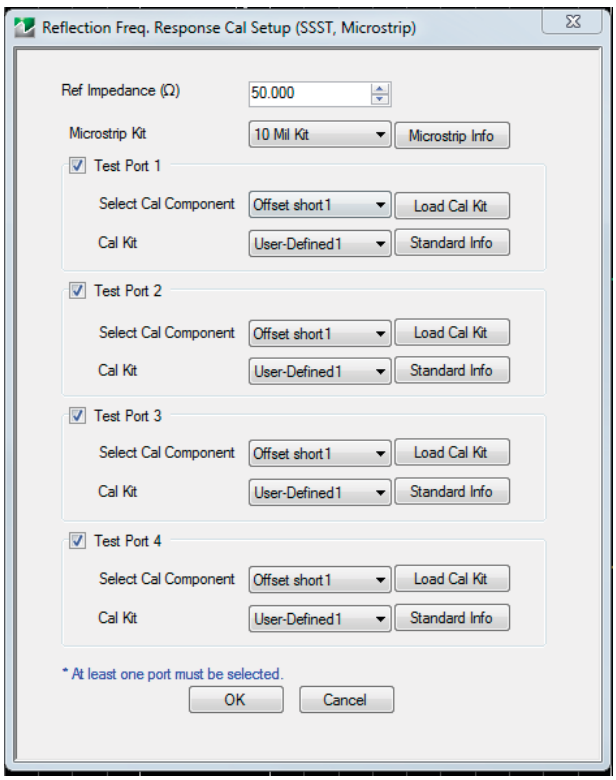
- Reflection Frequency Response Calibration Setup (SSLT, Microstrip) Dialog Box

Previous

- REFL. RESPONSE Menu – 4-Port VNAs on page 10-216

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Freq. Response | REFL. RESPONSE | Modify Cal Setup | CAL SETUP | Cal Method = SSLT; Line Type = Microstrip | Edit Cal Params | REFLECTION FREQ. RESPONSE CAL SETUP (SSLT, MICROSTRIP) Dialog Box
- CAL SETUP must be set to Cal Method = SSLT and Line Type = Microstrip.



REFLECTION FREQUENCY RESPONSE CALIBRATION SETUP

Figure 10-99. REFL. FREQ. RESP. CAL SETUP (SSLT, MICROSTRIP) 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 Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4 as long as one port is selected.

If a port is not selected, its buttons and controls are not available.

Test Port 1 Select Cal Component

Select from Offset Short 1 or Offset Short 2

Test Port 1 DUT Connector

Select the DUT Connector Type from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Test Port 1 Connector Standard Info Button

Select displays the USER DEFINED SHORT INFO dialog box with connector calibration coefficients for the selected connector and calibration method. The dialog box contents depend on the selected connector, calibration method, and line type. See the following links for typical examples:

- "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238
- "USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237

Test Port 2, Test Port 3, and Test Port 4 DUT Connector

Select the DUT Connector Type from a drop-down menu list as shown above in Test Port 1.

Test Port 2, Test Port 3, and Test Port 4 Connector Standard Info Button

Select displays the USER DEFINED SHORT INFO dialog box with connector calibration coefficients for the selected connector and calibration method as described above in Test Port 1.

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.

REFL. FREQ. RESP. CAL SETUP (SSST, WAVEGUIDE) Dialog Box

Full Name

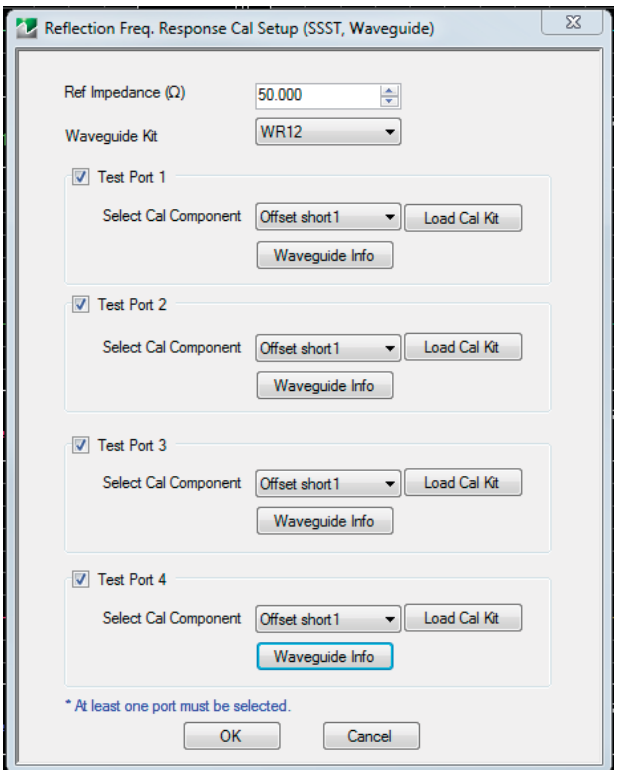
- Reflection Frequency Response Calibration Setup (SSST, Waveguide) Dialog Box

Previous

- REFL. RESPONSE Menu – 4-Port VNAs on page 10-216

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Reflection Freq. Response | REFL. RESPONSE | Modify Cal Setup | CAL SETUP | Cal Method = SSST; Line Type = Waveguide | Edit Cal Params | REFLECTION FREQ. RESPONSE CAL SETUP (SSST, WAVEGUIDE) Dialog Box



REFLECTION FREQUENCY RESPONSE CALIBATION SETUP

Figure 10-100. REFL. FREQ. RESP. CAL SETUP (SSST, WAVEGUIDE) 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.

Waveguide Kit Selection

Select the Waveguide Kit Type from a drop-down menu list with options of:

- User-Defined1 through User-Defined32

Test Port Selection Boxes

Allows selection of any combination of Test Port 1, Test Port 2, Test Port 3, or Test Port 4 as long as one port is selected.

If a port is not selected, its buttons and controls are not available.

Select Test Port 1 Cal Component

Select a cal component from:

- Offset short 1
- Offset short 2
- Offset short 3

Test Port 1 Waveguide Info Button

Select displays the USER-DEFINED WAVEGUIDE (SSST) dialog box. The dialog box allows user input of waveguide calibration parameters of:

- Waveguide kit label. A user-defined kit label can be input here.
- Cutoff frequency (GHz)
- Dielectric
- Offset short 1 length (mm)
- Offset short 2 length (mm)
- Offset short 3 length (mm)
- A calculator icon provides access to the AIR EQUIVALENT LENGTH CONVERSION dialog box described in the AutoCal sections above.
    - “AIR EQUIVALENT LENGTH CONVERSION Dialog Box” on page 10-226

The dialog box contents depend on the selected connector, calibration method, and line type. The example in the link below shows a typical STANDARD INFO dialog box.

- “WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes” on page 10-238

Test Port 2, Test Port 3, and Test Port 4 Controls

The controls for these test ports are the same as those for Test Port 1.

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 Reflection Freq. Response Calibration Setup Dialog Boxes

The table below summarizes the fields and controls in all Reflection Frequency Response calibration setup dialog boxes. If the dialog box is described in greater detail 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.

Table 10-9. Refl. Freq. Resp. Manual Cal. Setup Dialog Box Contents – 4-Port VNAs

Cal Method Line Type	Dialog Box Input Selections and Controls
SOLT/R **Coaxial**	See full description above at "REFLECTION FREQ. RESPONSE CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-218 Reference Impedance (Ohms) Select Test Ports: Select any combination of Test Port 1, Test Port 2, Test Port 3, and/or Test Port 4 as long as one port is selected. Select Test Port Cal Component: For each selected test port, select Open or Short. Test Port DUT Connector: Select from K-Conn (M), K-Conn (F); GPC-3.5 (M), GPC-3.5 (F); SMA (M), SMA (F); N-Conn (M), N-Conn (F). DUT Connector Standard Info button: Select displays the STANDARD INFO dialog box for the selected connector. • "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
SOLT/R **Non-Dispersive**	Same controls and functions as SOLT/R Coaxial
LRL/LRM	LRL/LRM calibration method is not available for the Reflection Frequency Response calibration type.
TRL/TRM	TRL/TRM calibration method is not available for the Reflection Frequency Response calibration type.

10-20 Manual Calibration General Dialog Boxes

These are general information dialog boxes that can be linked to from most manual calibration procedures. A typical representative of dialog box contents are shown below:

- "AIR EQUIVALENT LENGTH CONVERSION Dialog Box" on page 10-226
- "MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes" on page 10-228
- "STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box" on page 10-229
- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235
- "USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM" on page 10-237
- "WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes" on page 10-238

AIR EQUIVALENT LENGTH CONVERSION Dialog Box

Use the AIR EQUIVALENT LENGTH CONVERSION dialog box to speed configuration of a through 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.
- "THRU INFO Dialog Box – 4-Port VNAs" on page 10-235

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Thru Update| THRU | Define Thru/Reciprocal | Define Thru Reciprocal Dialog Box | Thru Info | Thru Info Dialog Box | Calculator Icon | Air Equivalent Length Conversion Dialog Box

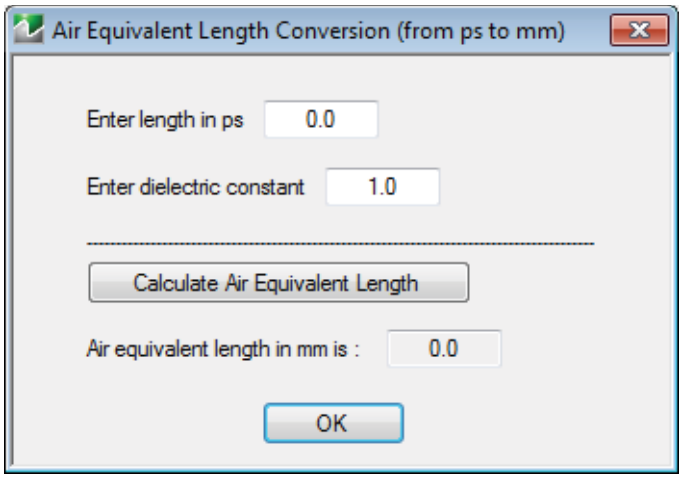


Figure 10-101. AIR EQUIVALENT LENGTH CONVERSION Dialog Box

Using the Calculator

1. Use the Enter length in ps (picoseconds) field to input a length.
   - For example, enter a value of 250 ps.
2. Use the Enter constant field 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 – 4-Port VNAs" on page 10-235
8. Click OK on the THRU INFO dialog box.

9. The MODIFY AUTOCAL SETUP dialog box reappears.

- "MODIFY 4-PORT SMARTCAL SETUP Dialog Box" on page 10-79
- "MODIFY 2-PORT SMARTCAL SETUP Dialog Box" on page 10-89
- "MODIFY 1-PORT SMARTCAL SETUP Dialog Box – 4-Port VNAs" on page 10-98

MICROSTRIP KIT INFO and USER DEFINED MICROSTRIP Dialog Boxes

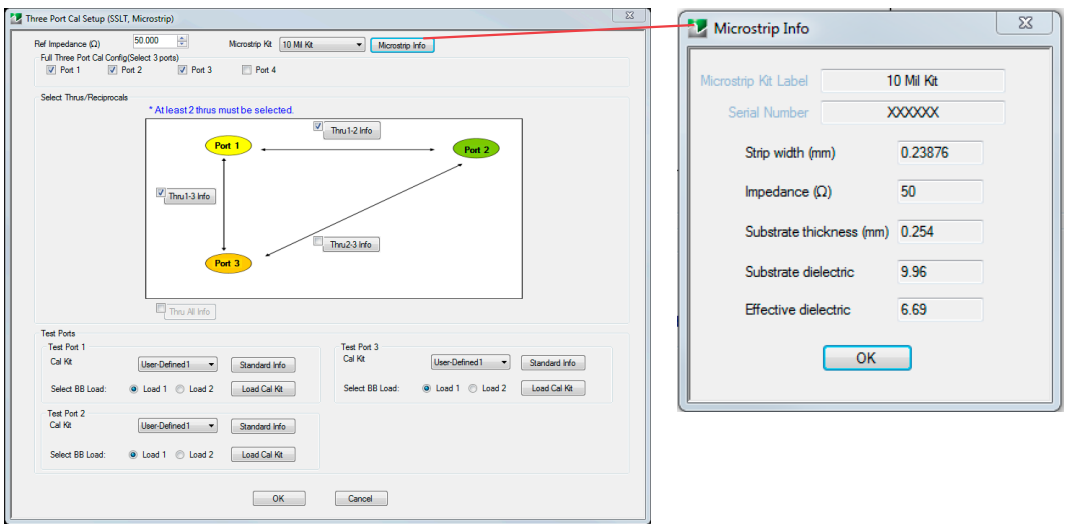
Dialog Box Name Changes

The exact names of these dialog boxes change depending on the calibration method and connector type selected.

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- "TWO PORT CAL SETUP (SOLT/SOLR, MICROSTRIP) Dialog Box" on page 10-18204.
- "TRANS. FREQ. RESP. CAL SETUP (SSST, MICROSTRIP) Dialog Box" on page 10-213.
- "REFL. FREQ. RESP. CAL SETUP (SSLT, MICROSTRIP) Dialog Box" on page 10-220.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Microstrip | Edit Cal Params | THREE PORT CAL SETUP (SSLT, MICROSTRIP) Dialog Box
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 2-Port Cal | TWO PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SOLT/R | Line Type = Microstrip | Edit Cal Params | TWO PORT CAL SETUP (SOLT/R, MICROSTRIP) Dialog Box
- 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 | Line Type = Microstrip | Edit Cal Params | TWO PORT CAL SETUP (LRL/LRM, MICROSTRIP) Dialog Box
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Trans. Freq. Resp.| TRANS. RESP. | Modify Cal Setup | CAL SETUP | Cal Method = SSST | Line Type = Microstrip | Edit Cal Params | TRANSMISSION REFLECTION RESPONSE SETUP (SSST, MICROSTRIP) Dialog Box
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | Refl. Freq. Resp. | REFL. RESP. | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Microstrip | Edit Cal Params | REFLECTION RESPONSE SETUP (SSLT, MICROSTRIP) Dialog Box



1. At left MICROSTRIP INFO for 10 Mil Kit.
2. At right USER DEFINED MICROSTRIP Input Dialog Box, Microstrip Kit = User Defined1 then click Microstrip Info

Figure 10-102. MICROSTRIP INFO and USER DEFINED MICROSTRIP Dialog Boxes

STANDARD INFO (OFFSET SHORT) W1-Connector (F) Dialog Box

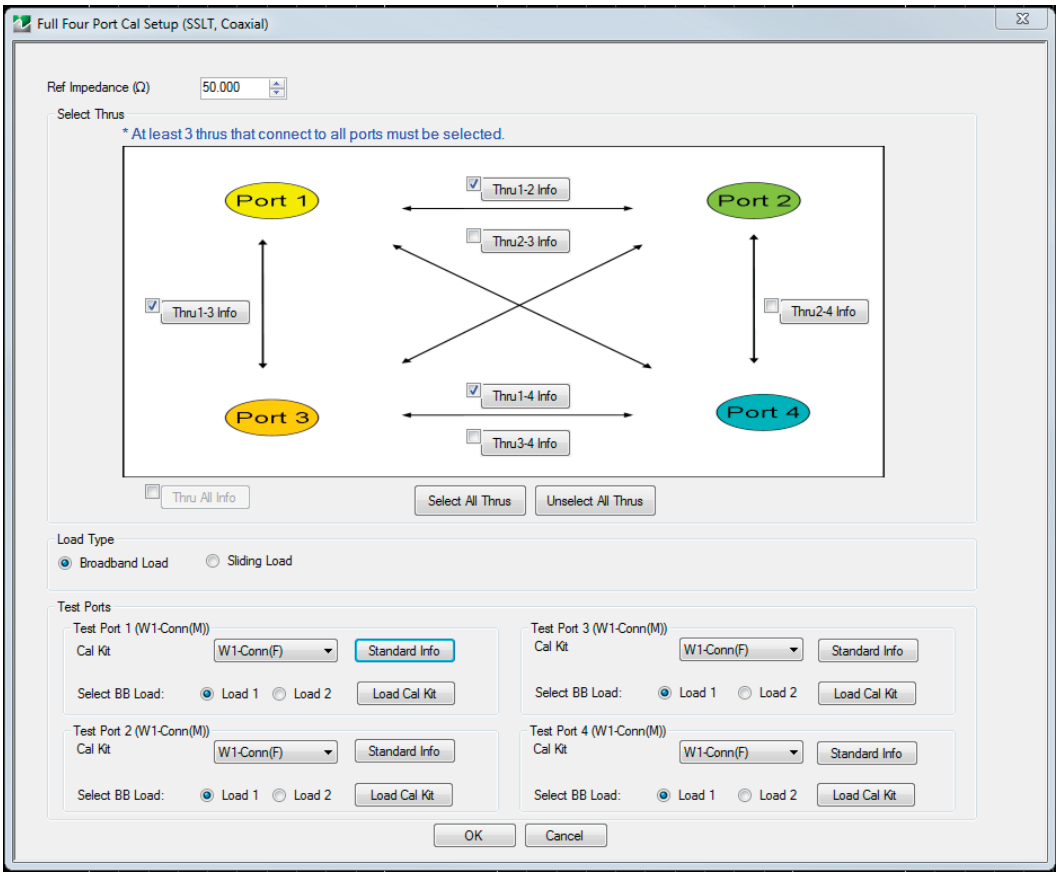
The figure below shows a typical connector standard information dialog box. The box format and contents depending on the calibration method, the calibration line type, and the calibration connectors and genders used. Anritsu-provided dialogs provide read-only information. User-defined dialogs allow user input of parameters and names.

Previous

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- "FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-120.
- "FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-120.
- "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box | DUT Connector = W1-Conn (F) | Standard Info | STANDARD INFO (OFFSET SHORT, W1-CONN (F)) Dialog Box



Representative Standard Information Dialog Box

Figure 10-103. STANDARD INFO (OFFSET SHORT) W-1Conn (F)

STANDARD INFO (SOLT/R) N-Connector (M) Dialog Box

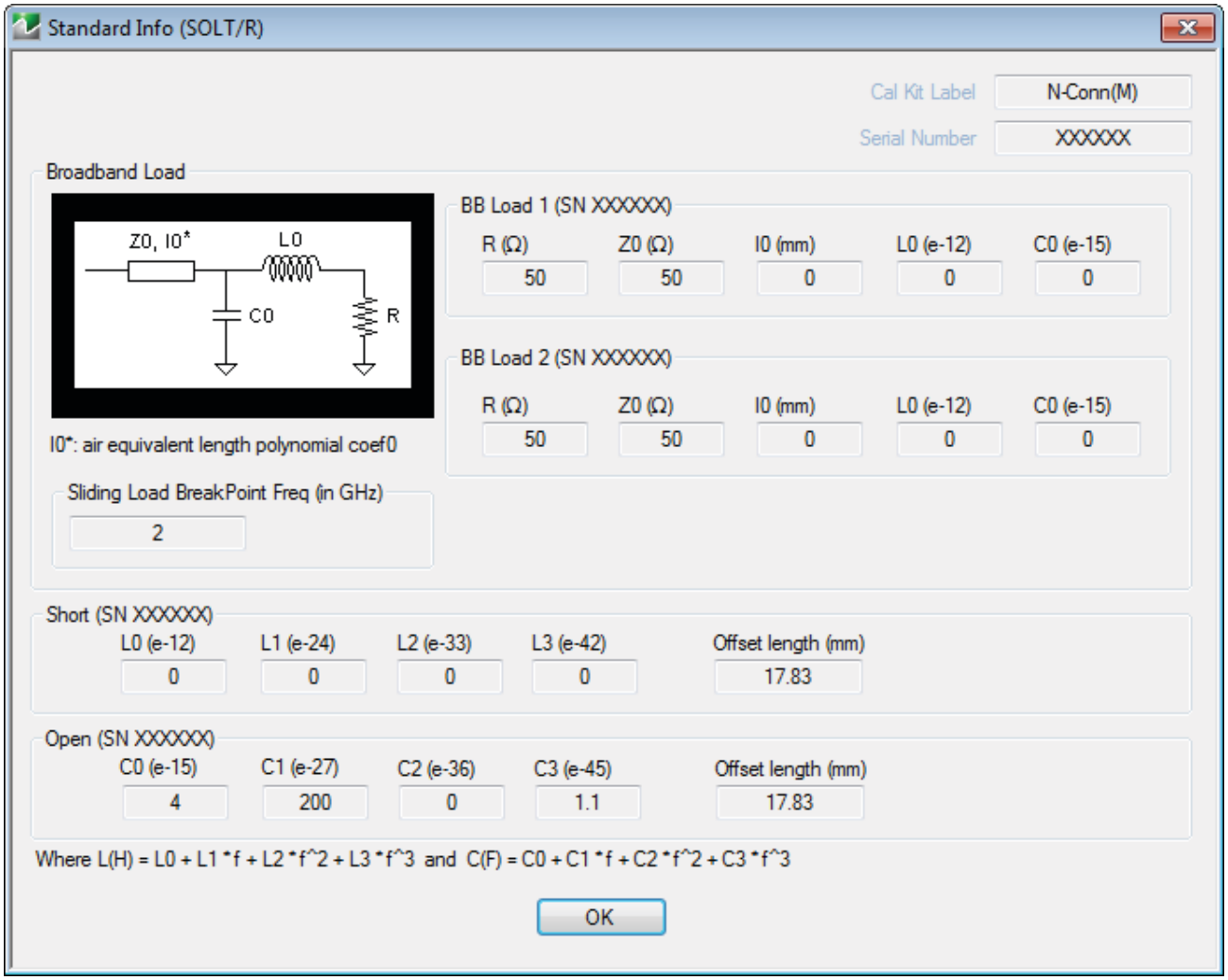
The figure below shows a typical connector standard information dialog box. The box format and contents depending on the calibration method, the calibration line type, and the calibration connectors and genders used. Anritsu-provided dialogs provide read-only information. User-defined dialogs allow user input of parameters and names.

Previous

- This dialog box can be linked from multiple dialog sources. The links below are for dialogs that appear in this chapter.
- “FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box” on page 10-117.
- “FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box” on page 10-127.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Edit Cal Params | FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box | DUT Connector = N-Conn (M) | Standard Info | STANDARD INFO (SOLT/R, N-CONN(M))



Representative Standard Information Dialog Box

Figure 10-104. STANDARD INFO (SOLT/R) N-Conn (M)

STANDARD INFO (SOLT/R) V-Connector (M) Dialog Box

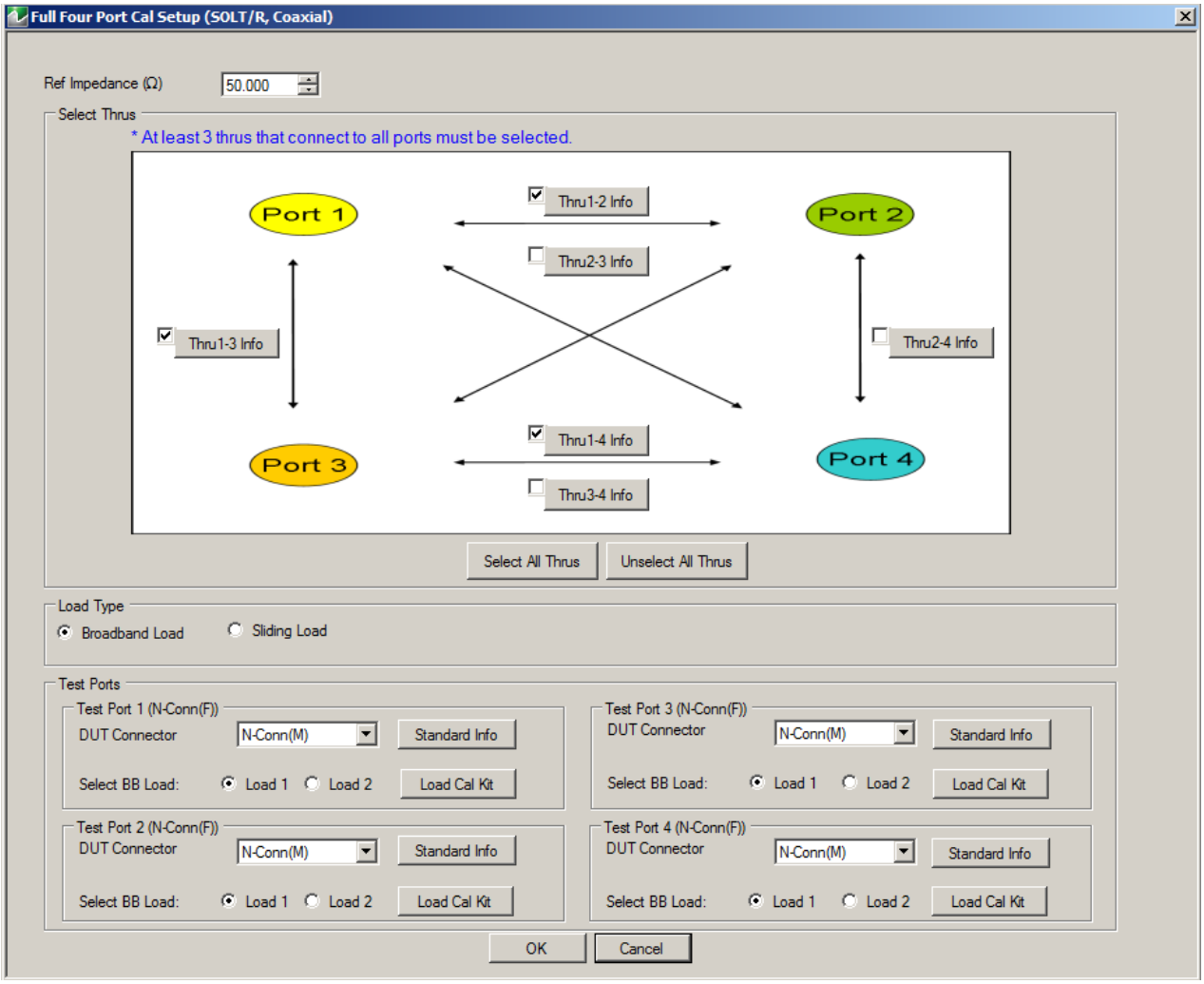
The figure below shows a typical connector STANDARD INFO dialog box. The box format and contents depending on the calibration method, the calibration line type, and the calibration connectors and genders used. Anritsu-provided dialogs provide read-only information. User-defined dialogs allow user input of parameters and names.

Previous

- This dialog box can be linked from multiple dialog sources. The links below are for dialogs that appear in this chapter.
- "FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box" on page 10-117.
- "FULL FOUR PORT CAL SETUP (SSLT, COAXIAL) Dialog Box" on page 10-120.
- "FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box" on page 10-123.
- "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SOLT/SOLR | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (SOLT/R, COAXIAL) Dialog Box | DUT Connector = V-Conn (M) | Standard Info | STANDARD INFO (SOLT/R, V-CONN(M))



Representative Standard Information Dialog Box

Figure 10-105. STANDARD INFO (SOLT/R) V-Conn (M)

STANDARD INFO (TRIPLE OFFSET SHORT) W1-Connector (M) Dialog Box

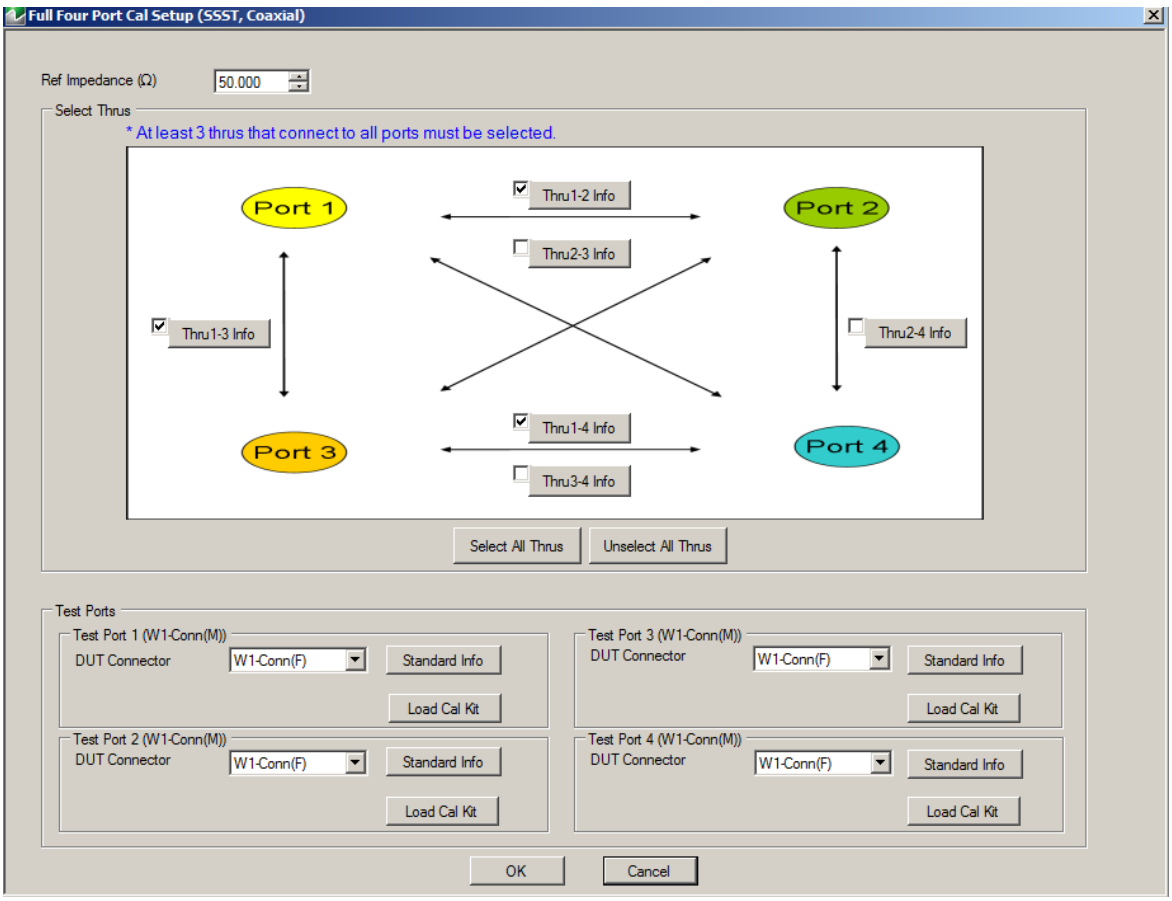
The figure below shows a typical connector standard information dialog box. The box format and contents depending on the calibration method, the calibration line type, and the calibration connectors and genders used. Anritsu-provided dialogs provide read-only information. User-defined dialogs allow user input of parameters and names.

Previous

- This dialog box can be linked from multiple dialog sources. The links below are for dialogs that appear in this chapter.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSST | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (SSST, COAXIAL) Dialog Box | DUT Connector = W1-Conn (M) | Standard Info | STANDARD INFO (TRIPLE OFFSET SHORT, W1-CONN(M))



Representative Standard Information Dialog Box

Figure 10-106. STANDARD INFO (TRIPLE OFFSET SHORT) W1-Conn (M)

THRU INFO Dialog Box – 4-Port VNAs

The THRU INFO dialog provides controls to update thru information. The dialog title includes the port-pair being configured.

Previous

- The THRU INFO dialog box can be accessed from multiple locations.

Navigation

- MAIN | Calibration | CALIBRATION [TR] | Thru Update| THRU | Define Thru/Reciprocal | DEFINE THRU RECIPROCAL Dialog Box | Thru Info | THRU INFO Dialog Box

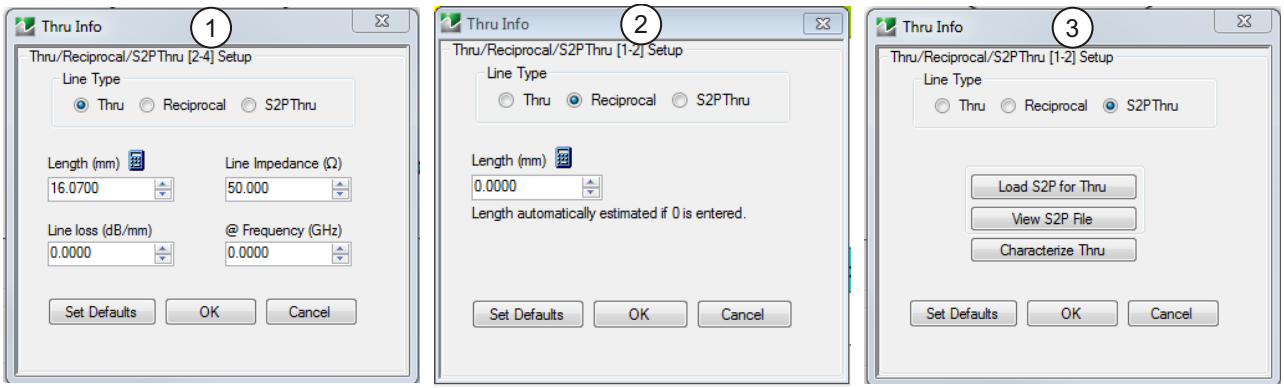


Figure 10-107. THRU INFO (Thru/Reciprocal/S2PThru Setup Dialog Box

Overview

The THRU INFO dialog box is available for all possible through combinations for all 4-port, 3-port, and 2-port calibrations. Each box is labeled with the port pair it represents.

THRU INFO Dialog Box

The THRU INFO dialog box allows user input field for the thru connection parameters of:

- **Line Type**. Allows options of:
  - Thru
  - Reciprocal
  - S2P Thru
- **Through** Selected
  - Length (mm)
    - Input line length in mm.
    - Calculator icon displays the AIR EQUIVALENT LENGTH CONVERSION dialog box.
      - “AIR EQUIVALENT LENGTH CONVERSION Dialog Box” on page 10-226
  - 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 Dialog Box" on page 10-226
- **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.

USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM

Previous

- This dialog box can be linked to from multiple dialog sources. The links below are for dialogs that appear in this chapter.
- "FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-127.
- "THREE PORT CAL SETUP (LRL/LRM, COAXIAL) Dialog Box" on page 10-162.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = LRL/LRM | Line Type = Coaxial | Edit Cal Params | FULL FOUR PORT CAL SETUP (LRL/LRM, COAXIAL) | Band 1, Device 2 (Match) | Match Info | USER DEFINE MATCH DEVICES Dialog Box
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 3-Port Cal | THREE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = LRL/LRM | Line Type = Coaxial | Edit Cal Params | THREE PORT CAL SETUP (LRL/LRM, COAXIAL) | Band 1, Device 2 (Match) | Match Info | USER DEFINE MATCH DEVICES Dialog Box
- 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 | Line Type = Coaxial | Edit Cal Params | THREE PORT CAL SETUP (LRL/LRM, COAXIAL) | Band 1, Device 2 (Match) | Match Info | USER DEFINE MATCH DEVICES Dialog Box

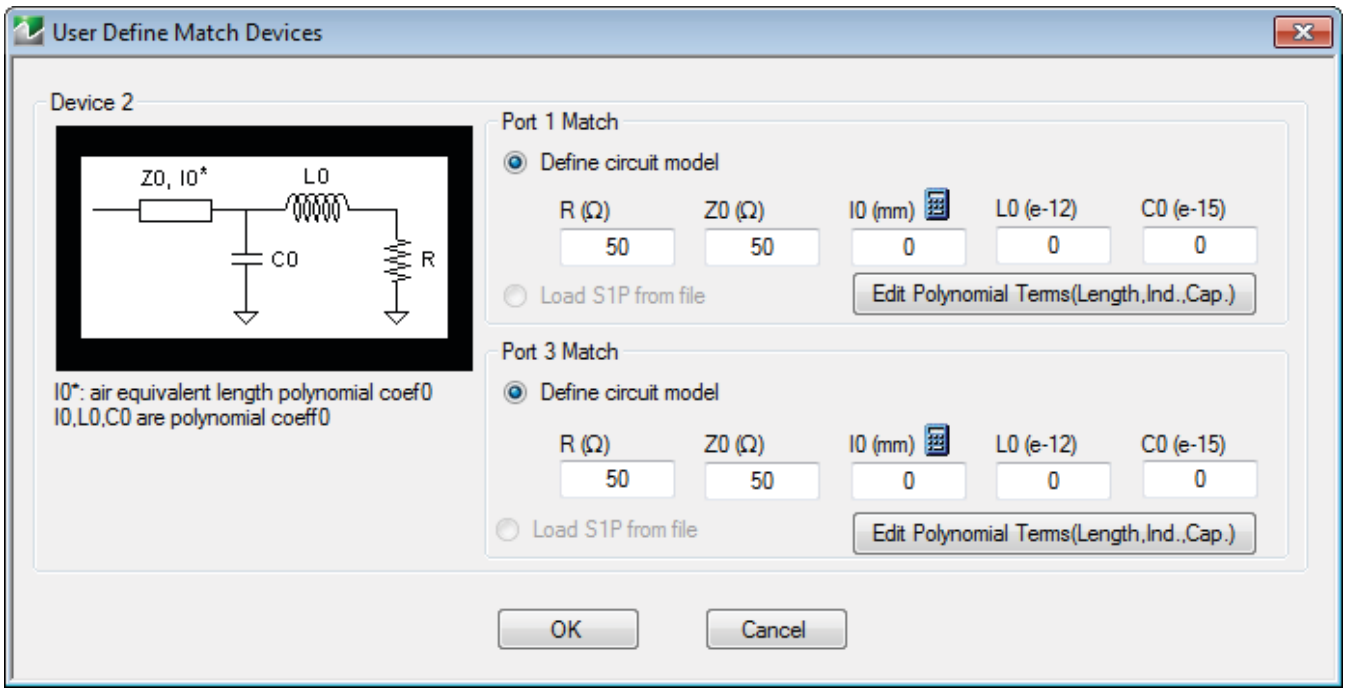


Figure 10-108. USER DEFINED MATCH DEVICES Dialog Box – LRL/LRM

WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes

Dialog Box Name Changes

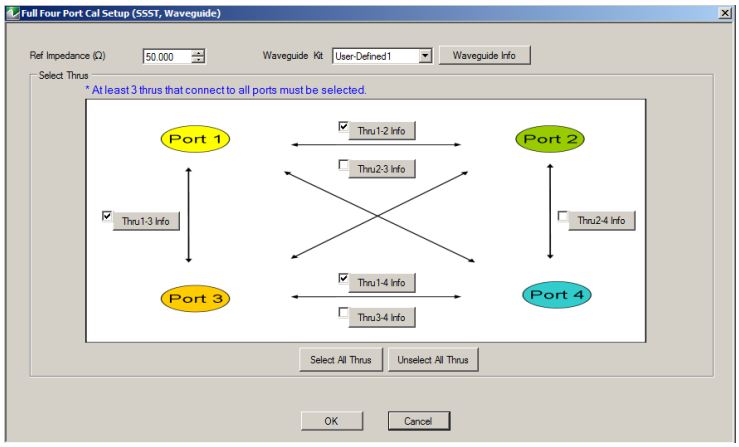
- The exact title of this dialog box varies depending on the selected calibration method and waveguide kit. See section immediately below.

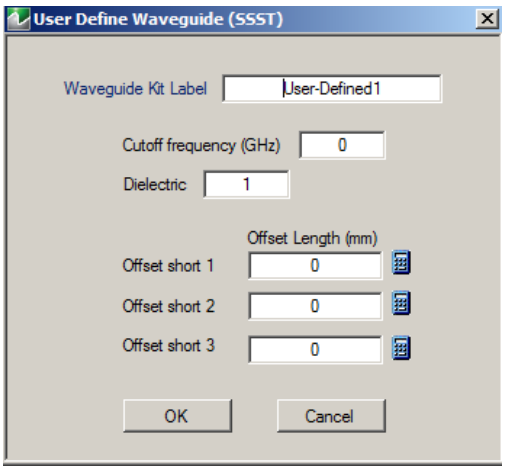
Previous

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- “FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box” on page 10-125.
- “ONE PORT CAL SETUP (SSLT, WAVEGUIDE) Dialog Box” on page 10-202.

Navigation

- This dialog box can be linked to from a multiple dialog sources. The links below are for dialogs that appear in this chapter.
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 4-Port Cal | FOUR PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSST | Line Type = Waveguide | Edit Cal Params | FULL FOUR PORT CAL SETUP (SSST, WAVEGUIDE) Dialog Box
- MAIN | Calibration | CALIBRATION [TR] | Calibrate | CALIBRATE | Manual Cal | MANUAL CAL | 1-Port Cal | ONE PORT CAL | Modify Cal Setup | CAL SETUP | Cal Method = SSLT | Line Type = Waveguide | Edit Cal Params | FULL ONE PORT CAL (SSLT, WAVEGUIDE) | Waveguide Info Button | WAVEGUIDE INFO (SSLT) Dialog Box





1. At left, USER DEFINED WAVEGUIDE Input Dialog Box.
2. At right WAVEGUIDE INFO for WR10 Connector.

Figure 10-109. WAVEGUIDE INFO and USER DEFINED WAVEGUIDE Dialog Boxes

Chapter 11 — Measurement Menus

11-1 Chapter Overview

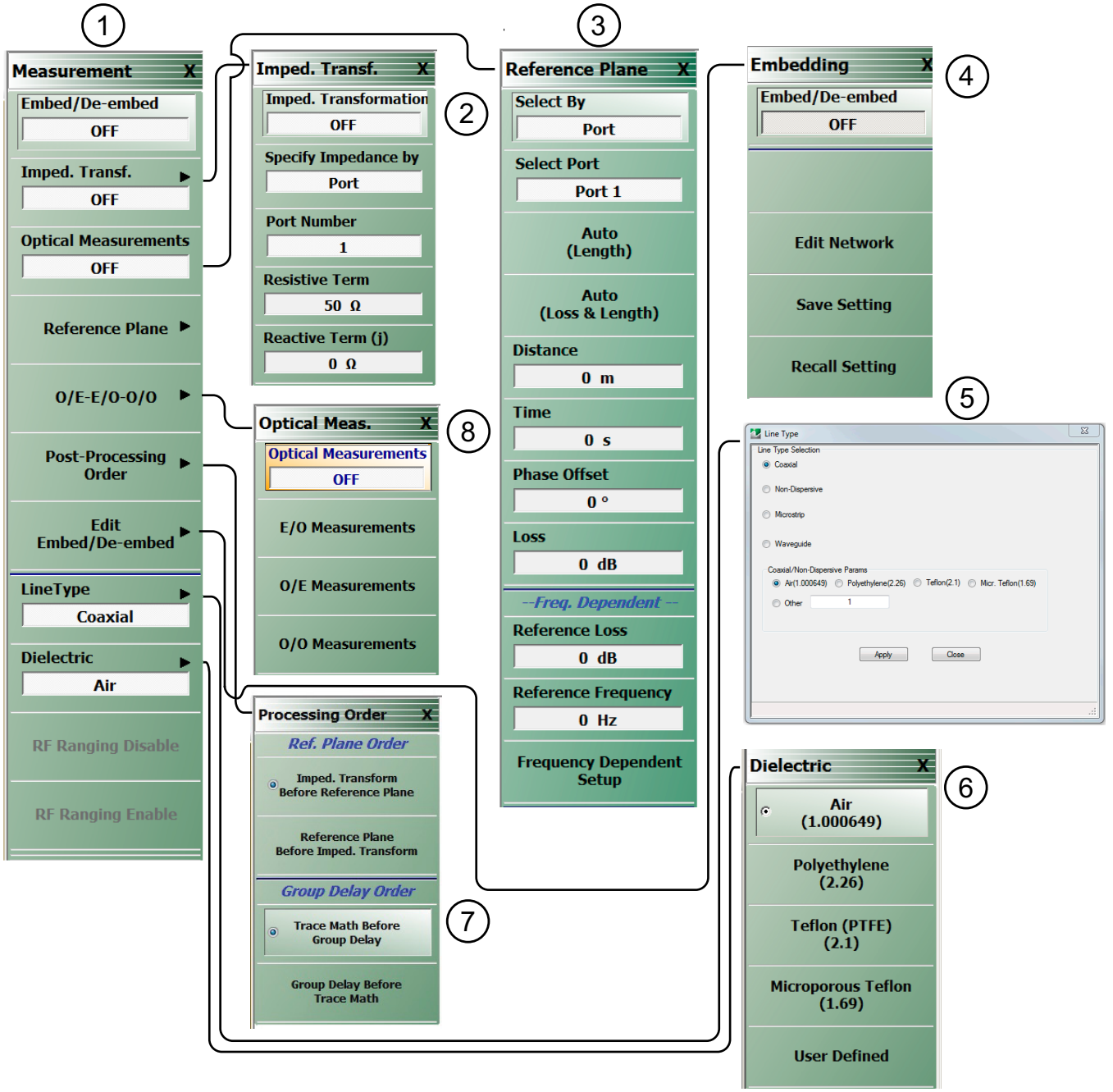
This chapter provides information for the measurement menu system which controls the embed/de-embed functions, the impedance transformations, reference plane location, post-processing order functions, and dielectric parameters along with their related configuration dialog boxes.

11-2 Overview of Measurement Menus

There are six menus in the measurement menus:

- MEASUREMENT Menu on page 11-3
- IMPED. TRANSF. Menu on page 11-5
- REFERENCE PLANE Menu on page 11-8
  - "FREQUENCY DEPENDENT SETUP Dialog Box" on page 11-12
  - "SELECT TERMINATOR TYPE FOR PORT1 Dialog Box" on page 11-13
  - "SELECT TERMINATOR TYPE FOR TRACE1 Dialog Box" on page 11-14
- EMBEDDING Menu on page 11-15
  - "EDIT EMBEDDING/DE-EMBEDDING (2 Port DUT) Dialog Box" on page 11-16
  - "SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box" on page 11-19
  - "OPEN (EMBED/DE-EMBED EDL File) Dialog Box" on page 11-20
  - "LINE TYPE Dialog Box" on page 11-21
- DIELECTRIC Menu on page 11-25
- PROCESSING ORDER Menu on page 11-27
- OPTICAL MEASUREMENTS Menu on page 11-28
  - "2-Port E/O Measurement Dialog Box" on page 11-30
  - "2-Port O/E Measurement Dialog Box" on page 11-32
  - "2-PORT O/O MEASUREMENT Dialog Box" on page 11-34
    - "2-Port MEASURE E/O (or MEASURE O/E) Dialog Box" on page 11-36
  - "4-Port E/O MEASUREMENT Dialog Box" on page 11-37
  - "4-Port O/E MEASUREMENT Dialog Box" on page 11-38
  - "4-PORT O/O MEASUREMENT Dialog Box" on page 11-39
    - "4-Port MEASURE E/O (or MEASURE O/E) Dialog Box" on page 11-42

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 UserDefined is selected, Value field is available for input.
7. PROCESSING ORDER Menu
8. OPTICAL MEASUREMENTS Menu

Figure 11-1. MEASUREMENT Menu and Related Submenus

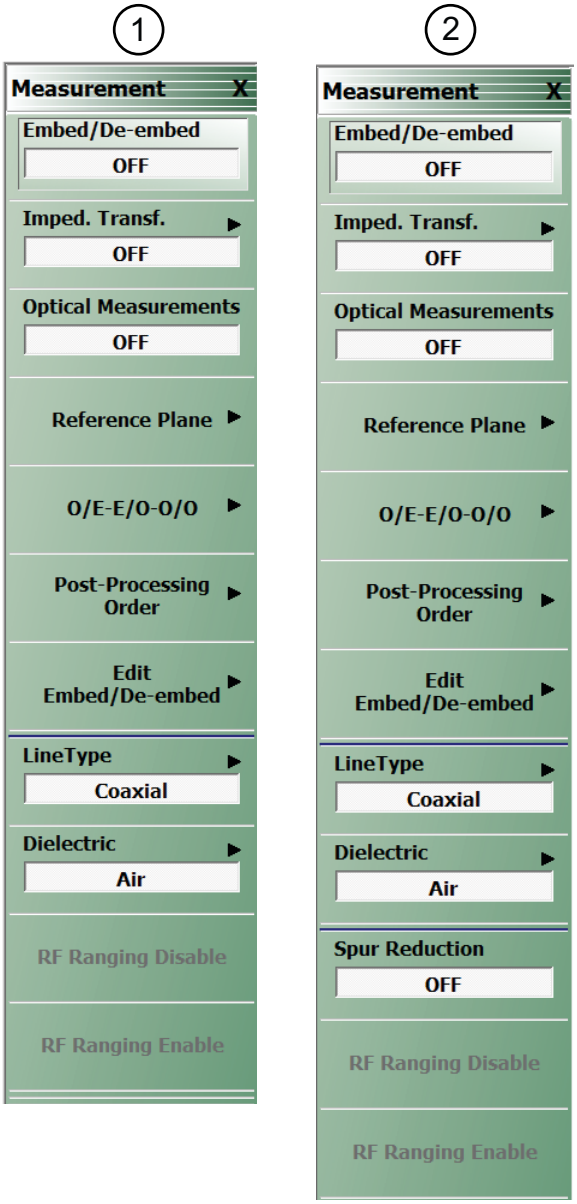
MEASUREMENT Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Measurement | MEASUREMENT



1. MS4652xB Measurement Menu	2. MS46522B-082 Measurement Menu

Figure 11-2. Measurement Menus

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 Impedance Transfer displays the IMPED TRANSF menu.

- IMPED. TRANSF. Menu on page 11-5

Optical Measurements

Indicates whether Optical Calibration has been applied.

Reference Plane

Select displays the REFERENCE PLANE menu.

- REFERENCE PLANE Menu on page 11-8

O/E-E/O-O/O

Select displays the OPTICAL MEASUREMENTS menu.

- OPTICAL MEASUREMENTS Menu on page 11-28

Post-Processing Order

Select displays the PROCESSING ORDER menu.

- PROCESSING ORDER Menu on page 11-27

Edit Embed/De-embed

Select displays the EMBEDDING menu.

- EMBEDDING Menu on page 11-15

Dielectric

Select displays the DIELECTRIC menu and allows the user to select from pre-defined dielectric materials or create the value for a user-defined material.

- DIELECTRIC Menu on page 11-25

Line Type

Select displays the LINE TYPE dialog box.

- LINE TYPE Dialog Box on page 11-21

RF Ranging Disable

- Select to disable RF ranging

RF Ranging Enable

- Select to enable RF ranging

RF ranging in the MS465xxB series enhances the measurement dynamic range of the VNA. The ranging may induce measurement error in some applications that are sensitive to s-parameter crosstalk parameters as in low insertion loss differential measurements. For those applications, the enable/disable ranging buttons are available in the measurement menu to allow the user to optimize the performance of the VNA for their application.

Spur Reduction (OFF/ON)

Available only in MS46522B-082 Rev 02 and higher. Select toggles Spur Reduction OFF and ON. Turning Spur Reduction ON eliminates the effect of spurious signals being reflected back from DUTs such as deep stop-band filters, which will cause a decrease in dynamic range. Spur Reduction ON turns off the unused test receiver during each S-parameter measurement, thus requiring 4 sweeps to measure all 4 S-parameters.

IMPED. TRANSF. Menu

Full Name

- Impedance Transformation Menu

Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | Imped Transf | IMPED TRANSF (IMPEDANCE TRANSFORMATION)

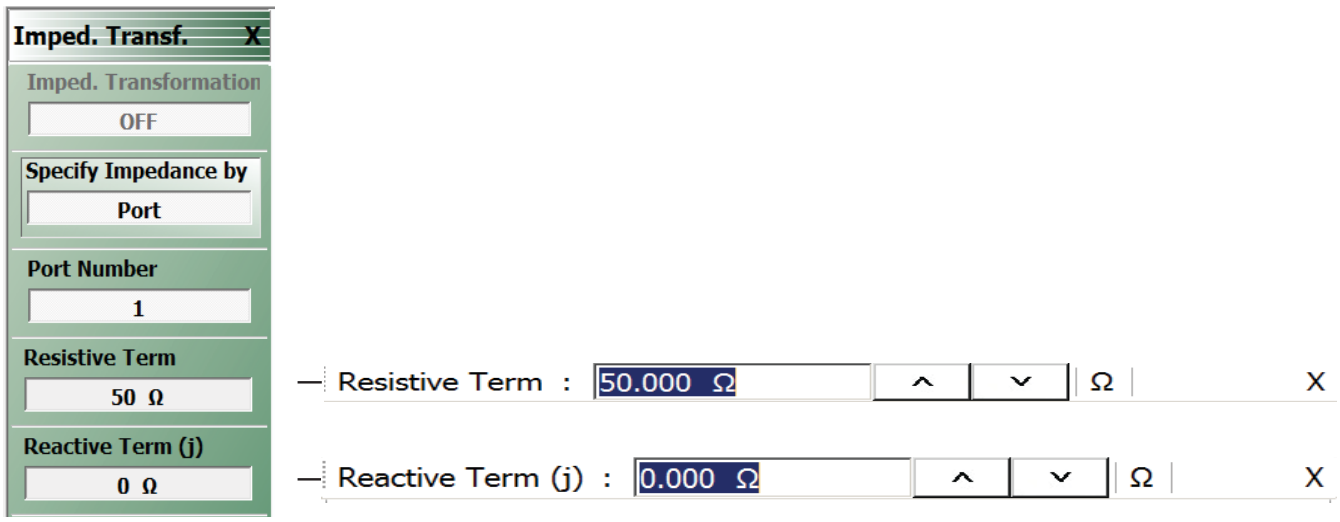


Figure 11-3. IMPED. TRANSF. (IMPEDANCE TRANSFORMATION) Menu – Specify Impedance by Port

Impedance Trans

Select toggles impedance transformation OFF and ON.

Specify Impedance by

Toggles between Port and Port Pair.

Port Number

When the VNA is in 2-Port Mode, select toggles between Port 1 or Port 2.

When the VNA is in 4-Port Mode, select displays the SELECT PORT dialog box with large easy-to-select buttons. Selecting a port auto-returns to the IMPED. TRANSF. menu.

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.

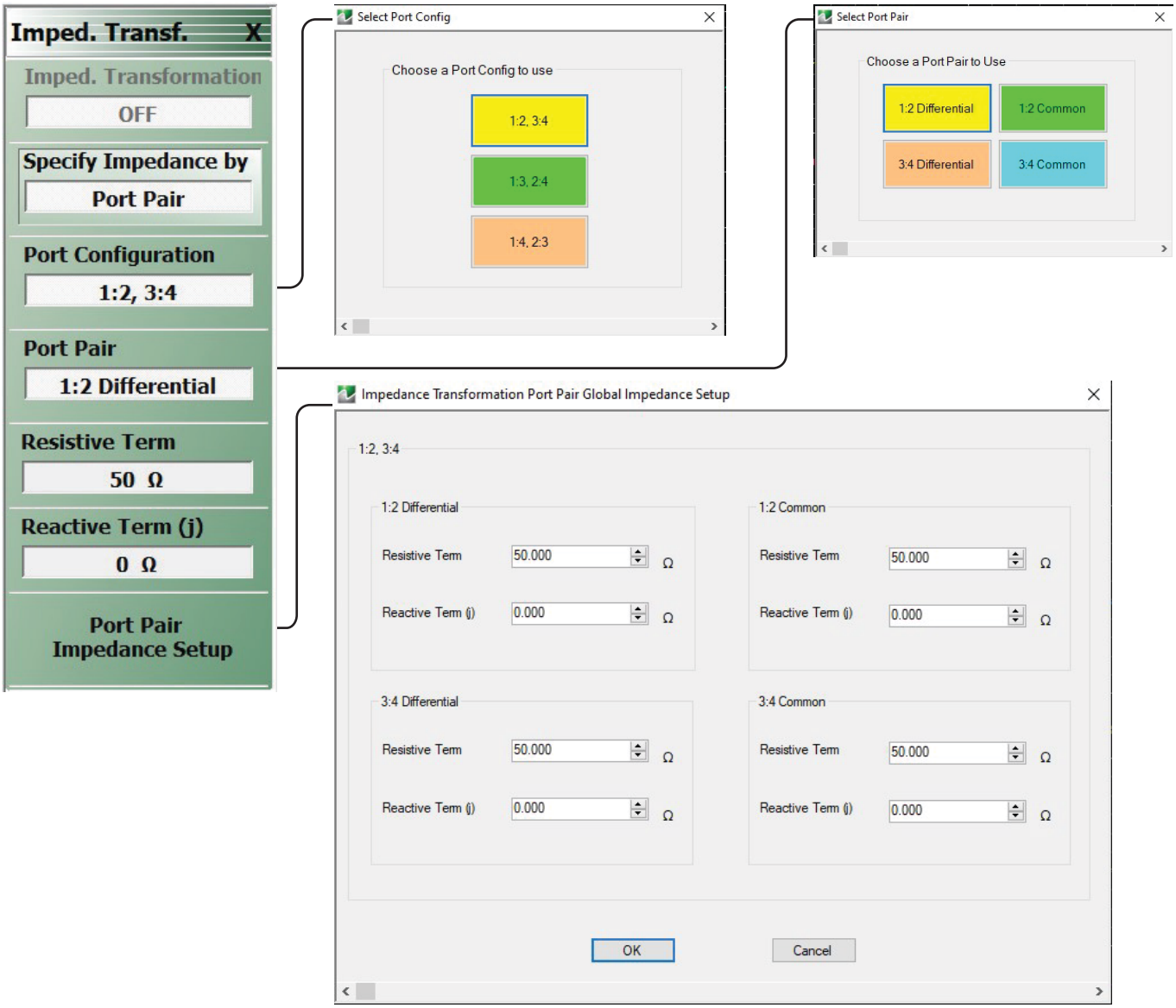


Figure 11-4. IMPED. TRANSF. (IMPEDANCE TRANSFORMATION: Specify Impedance by Port Pair) Menu Set – 4-Port

Imped. Transf.

Select toggles impedance transformation OFF and ON.

Specify Impedance by

Toggles between Port and Port Pair.

Port Configuration

When the VNA is in 2-Port Mode, select toggles between Port 1 or Port 2.

When the VNA is in 4-Port Mode, select displays the SELECT PORT dialog box with large easy-to-select buttons. Selecting a port auto-returns to the IMPED. TRANSF. menu.

Port Pair

When the VNA is in 2-Port Mode, select toggles between 1:2 Common and 1:2 Differential.

When the VNA is in 4-Port Mode, select displays the SELECT PORT PAIR dialog box with large easy-to-select buttons. Selecting a port pair auto-returns to the IMPED. TRANSF. menu. When the port configuration is changed, the port pair shown on the menu will be the default one for that particular Port Configuration. For Port Configuration 1:2, 3:4 the default port pair is 1:2 Differential, for 1:3, 2:4 the default port pair is 1:3 Differential and for 1:4, 2:3 the default port pair is 1:4 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.

Port Pair Impedance Setup

4-Port Mode only. Select displays the IMPEDANCE TRANSFORMATION PORT PAIR GLOBAL IMPEDANCE SETUP dialog box. Use to set all the reactive and resistive terms for all the port pairs for a given port configuration at once.

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.

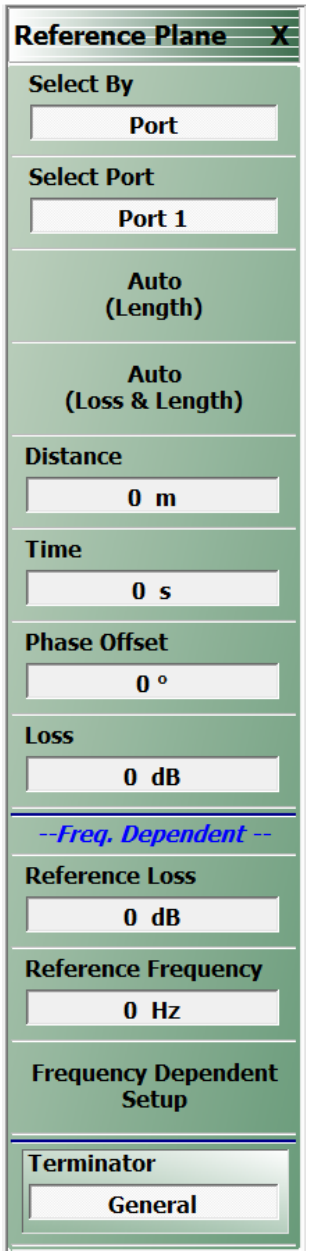
Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | Reference Plane | REFERENCE PLANE

Select By Port Enabled



Select By Trace Enabled

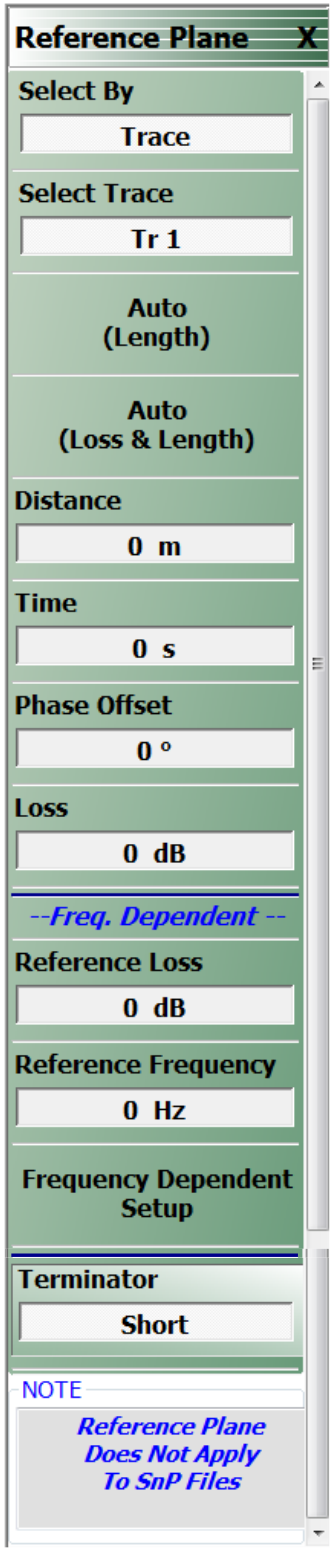


Figure 11-5. REFERENCE PLANE Menu

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 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 11-6. 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 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 µm (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 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 Loss setting in dB. Selecting this field opens the Reference Frequency field toolbar.

Frequency Dependent Setup

Opens the 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 11-12

Terminator

Opens the SELECT TERMINATOR TYPE FOR PORT1/TRACE1 dialog box. Allows selection of terminator type from General, Open and Short.

- “SELECT TERMINATOR TYPE FOR PORT1 Dialog Box” on page 11-13
- “SELECT TERMINATOR TYPE FOR TRACE1 Dialog Box” on page 11-14

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

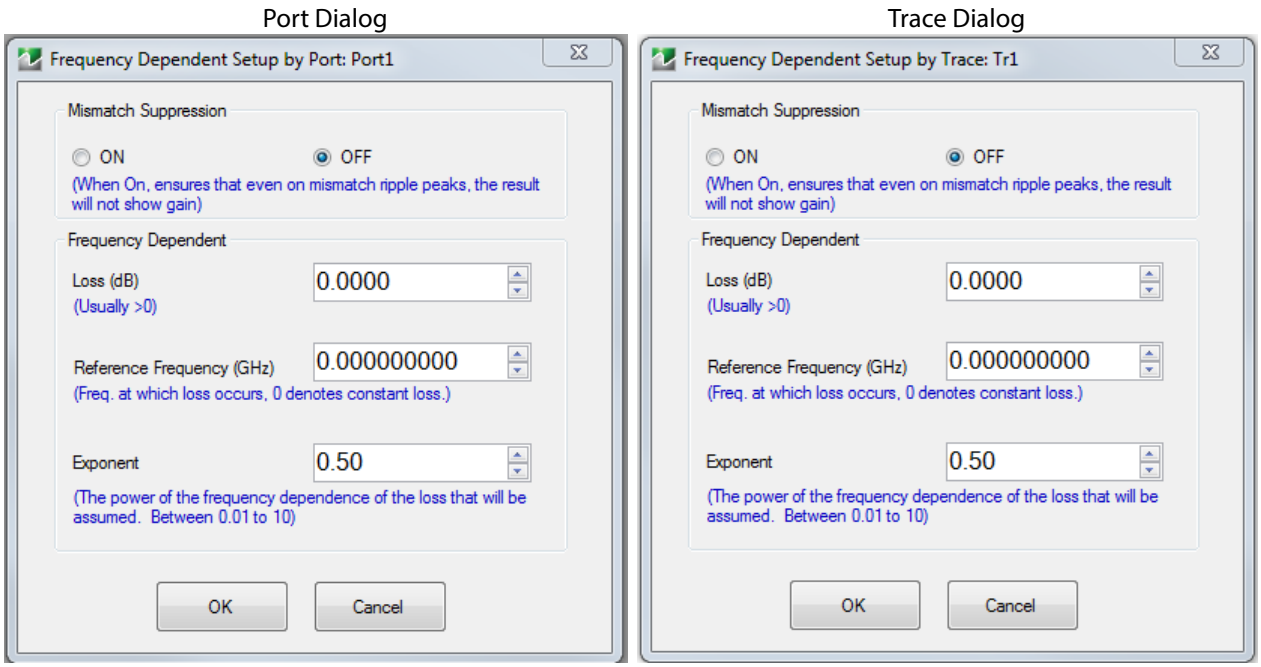


Figure 11-7. FREQUENCY DEPENDENT SETUP Dialog

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

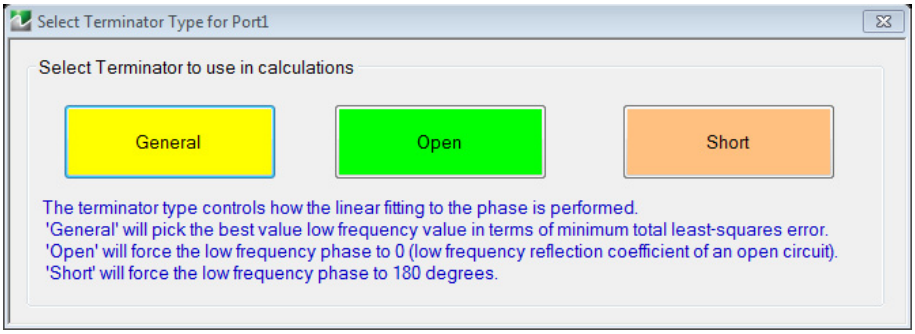


Figure 11-8. SELECT TERMINATOR TYPE FOR PORT1 Dialog Box

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

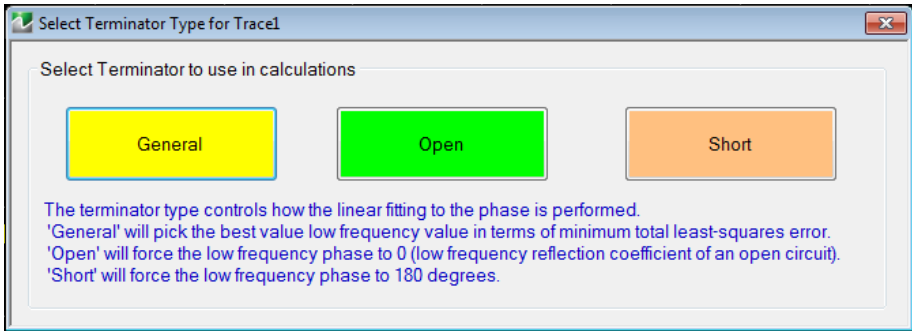


Figure 11-9. SELECT TERMINATOR TYPE FOR TRACE1 Dialog

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.

EMBEDDING Menu

Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING

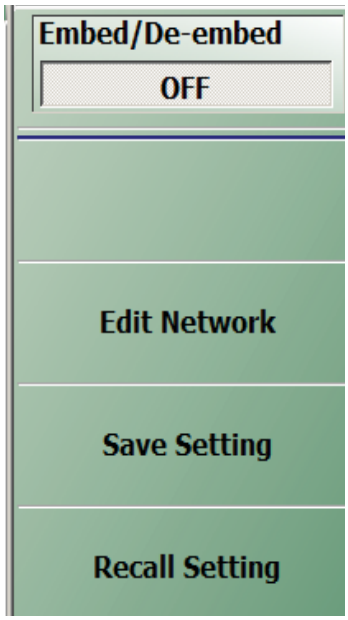


Figure 11-10. EMBEDDING Menu

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 11-16

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 11-19

Recall Setting (Embedding)

Select displays the OPEN (Embed/Ce-embed EDL File) dialog box.

- "OPEN (EMBED/DE-EMBED EDL File) Dialog Box" on page 11-20

EDIT EMBEDDING/DE-EMBEDDING (2 Port DUT) Dialog Box

Previous

- EMBEDDING Menu on page 11-15

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING | Edit Network | EDIT EMBEDDING/DE-EMBEDDING (DUT TYPE) Dialog Box

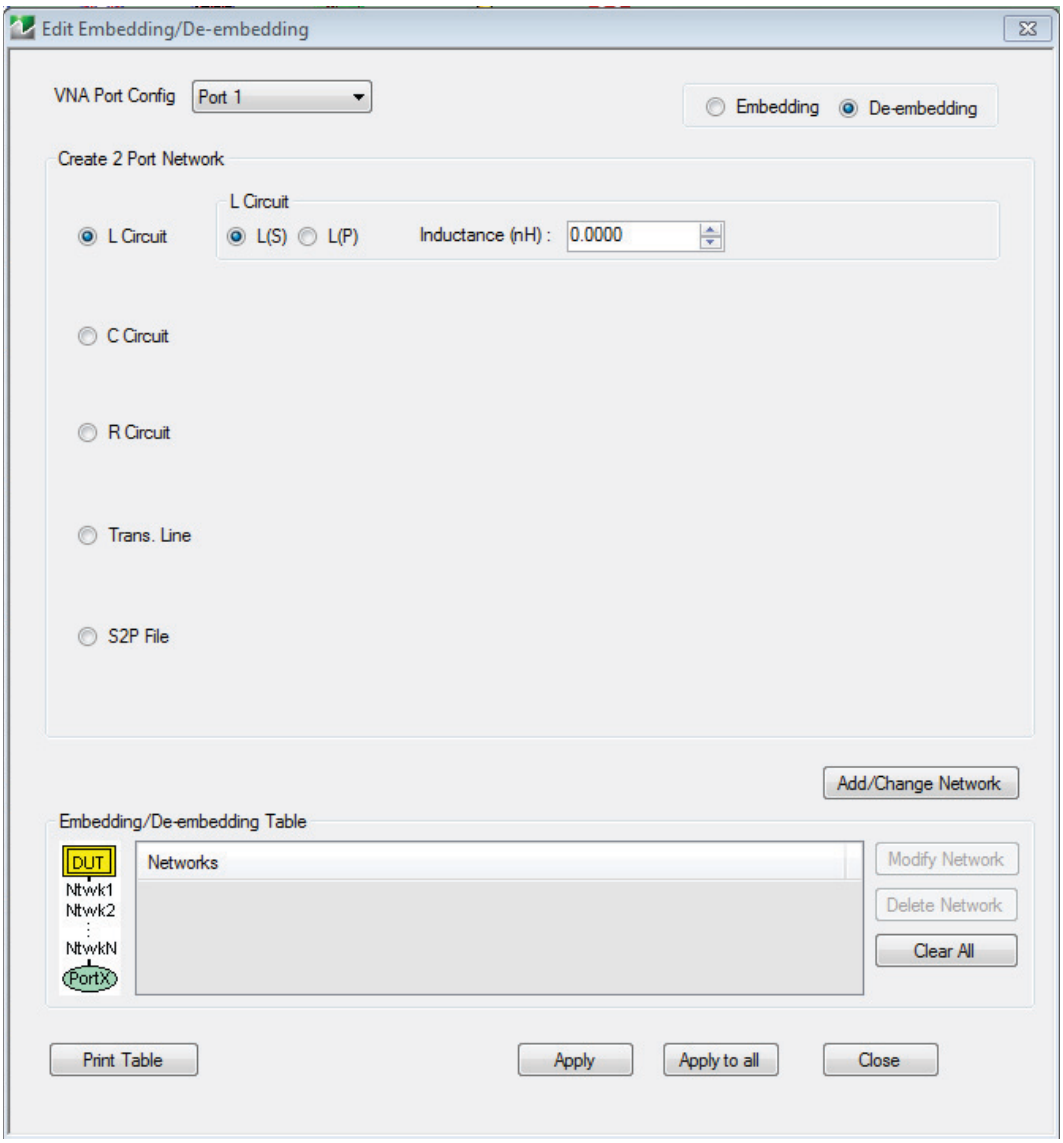


Figure 11-11. EDIT EMBEDDING/DE-EMBEDDING (DUT Type) Dialog Box

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

The available port list depends on whether the VNA is in 2-Port Mode or in 4-Port Mode. Port 3 and/or Port 4 are only available if the VNA is in 4-Port Mode:

- Port 1
- Port 2
- Port 3
- Port 4
- Ports 1,2
- Ports 1,3
- Ports 1,4
- Ports 2,3
- Ports 3,4

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 11-15

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING | Save Setting | SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box

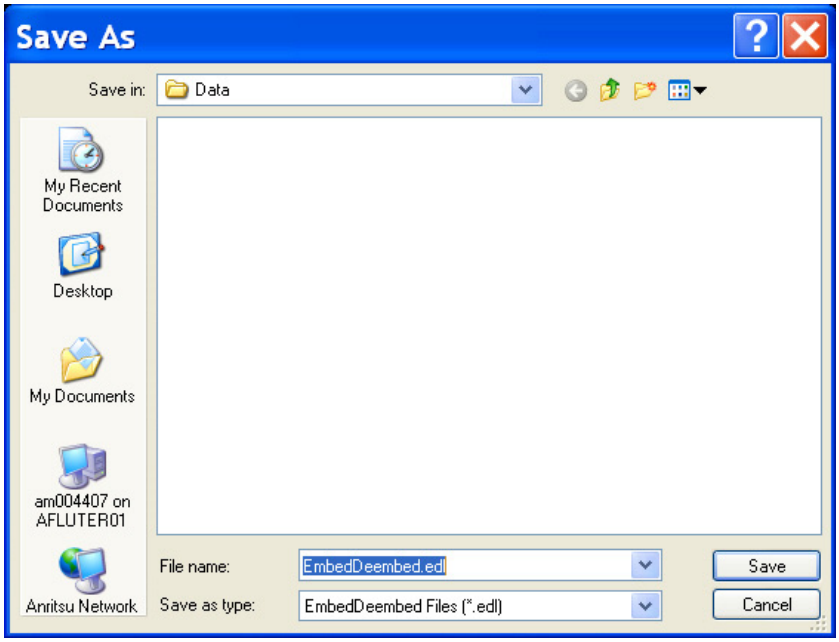


Figure 11-12. SAVE AS (EMBED/DE-EMBED EDL FILE) Dialog Box

OPEN (EMBED/DE-EMBED EDL File) Dialog Box

Previous

- EMBEDDING Menu on page 11-15

Navigation

- MAIN | Measurement | MEASUREMENT | Edit Embed/De-embed | EMBEDDING | Recall Setting | OPEN (EMBED/DE-EMBED EDL FILE) Dialog Box

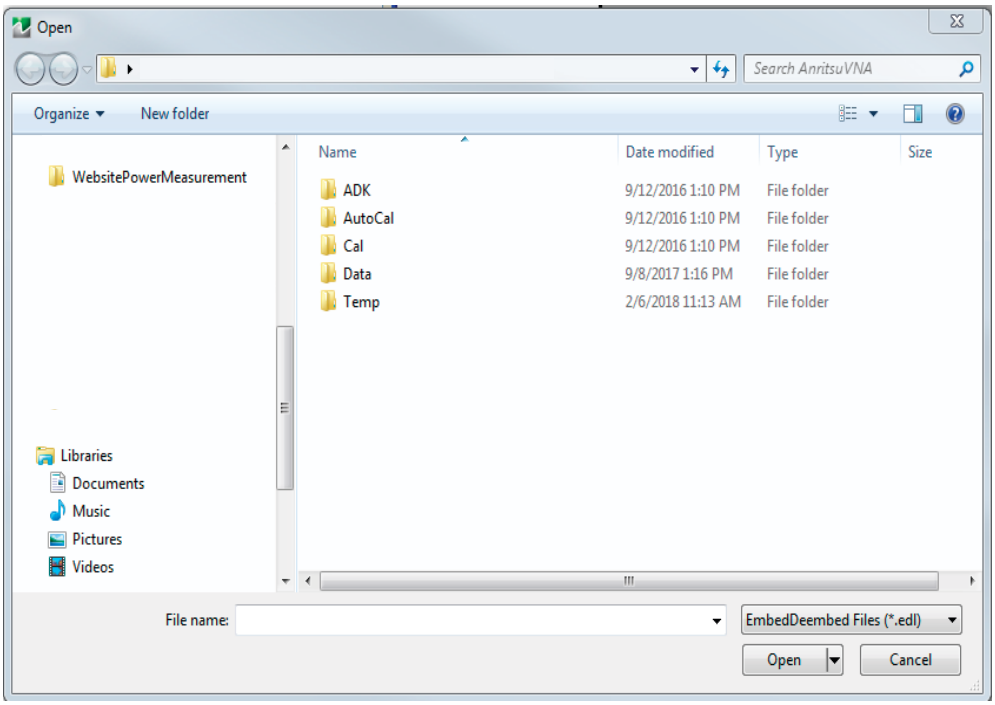


Figure 11-13. OPEN (EMBED/DE-EMBED EDL FILE) Dialog Box

LINE TYPE Dialog Box

Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | Line Type | LINE TYPE Dialog Box

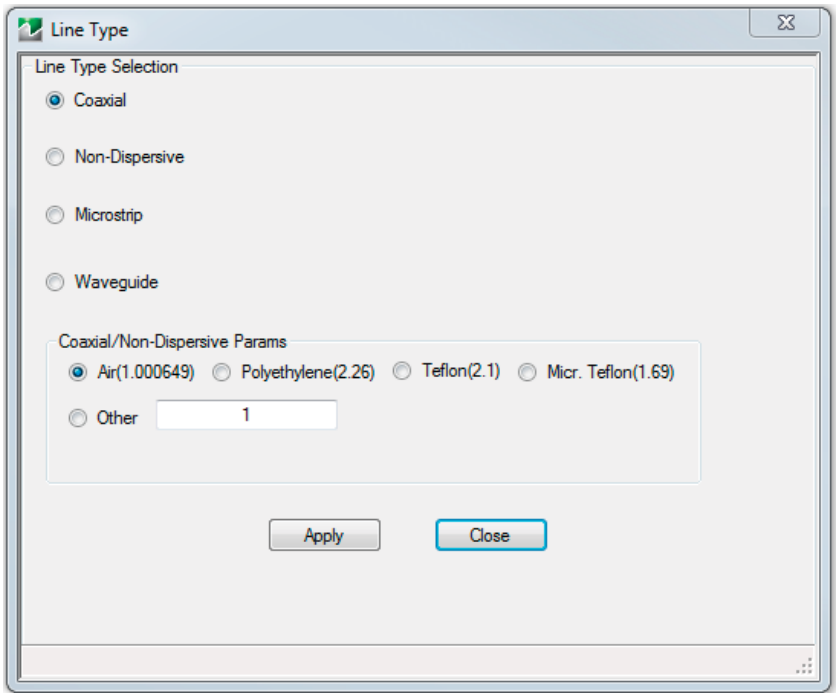


Figure 11-14. LINE TYPE Dialog Box – Coaxial, Non-Dispersive, Microstrip, or Waveguide

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.

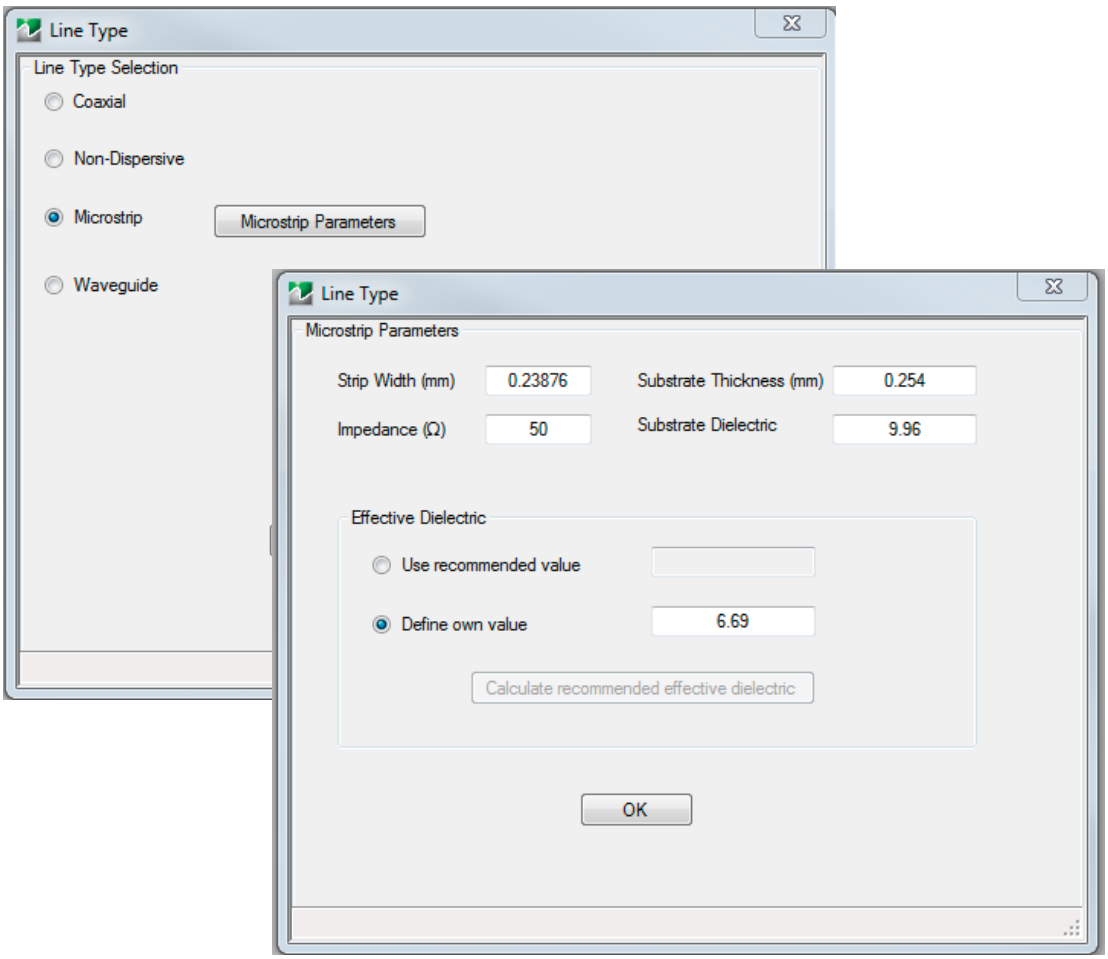
Coaxial or Non-Dispersive Line Types Area

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 altered LINE TYPE dialog with fields 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 11-15. 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.

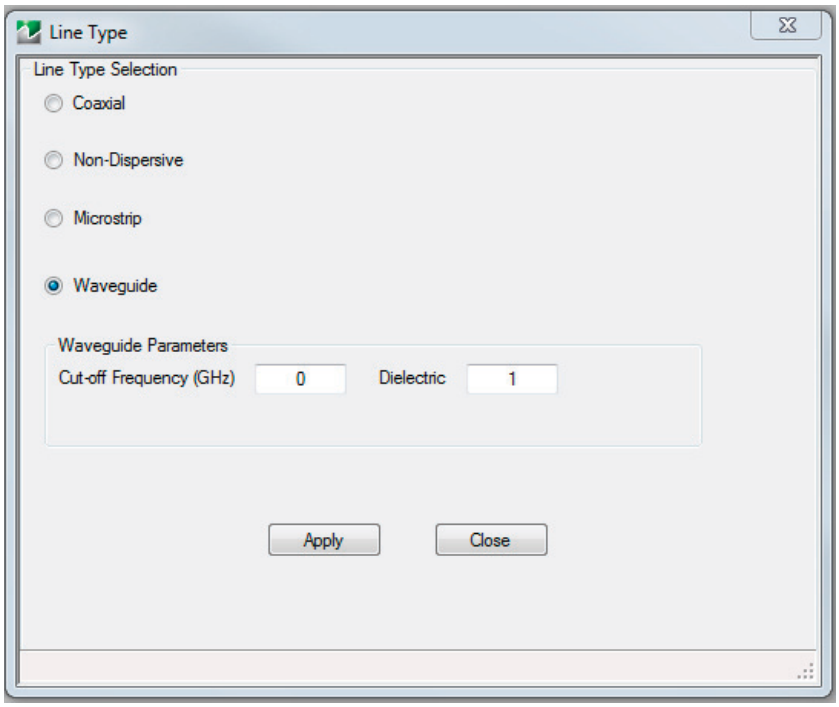


Figure 11-16. LINE TYPE Dialog Box -Waveguide Selected – Waveguide Parameters Area

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.

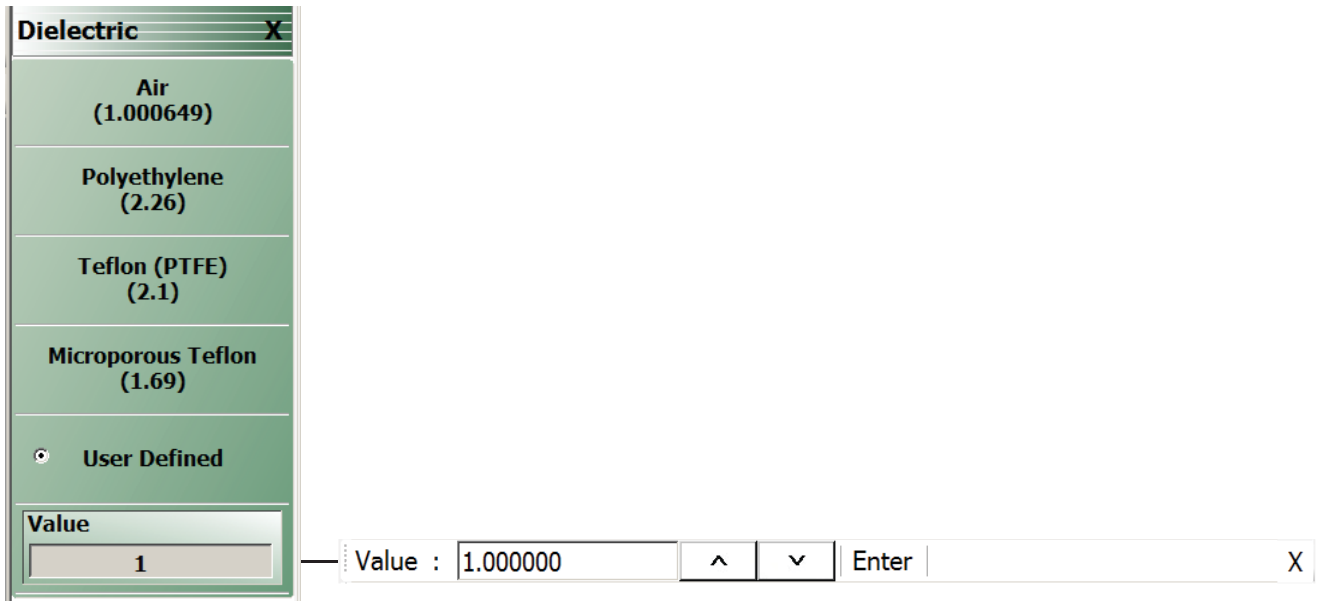
DIELECTRIC Menu

Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | Dielectric | DIELECTRIC | User Defined



Select the User Defined button to access the Value button and related Field Toolbar.

Figure 11-17. 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 11-3
- 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.

PROCESSING ORDER Menu

Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | Post-Processing Order | PROCESSING ORDER

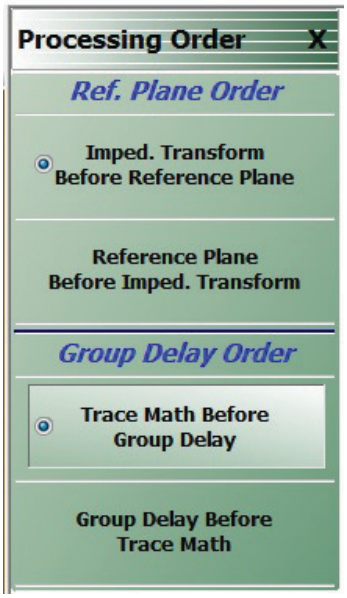


Figure 11-18. PROCESSING ORDER Menu

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.

OPTICAL MEASUREMENTS Menu

Previous

- MEASUREMENT Menu on page 11-3

Navigation

- MAIN | Measurement | MEASUREMENT | O/E-E/O-O/O | OPTICAL MEASUREMENTS

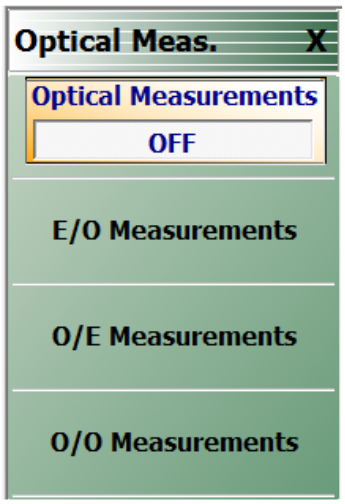


Figure 11-19. OPTICAL MEASUREMENTS Menu

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 11-20.

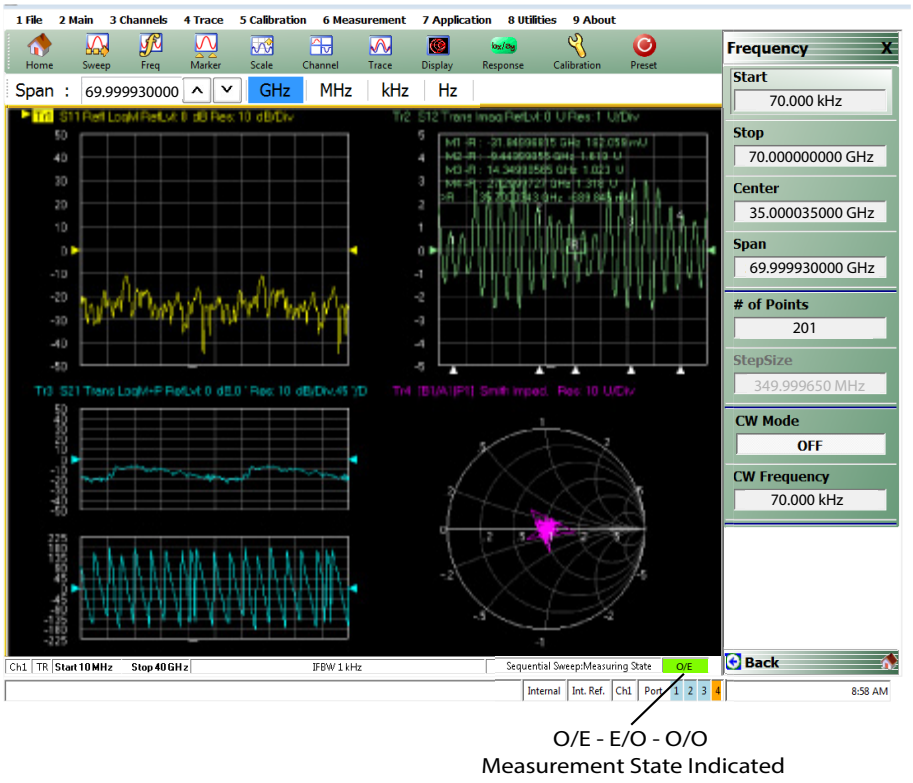


Figure 11-20. O/E – E/O – O/O Measuring State Indication

2-Port E/O Measurement Dialog Box

Upon clicking E/O Measurements button, the 2-PORT E/O MEASUREMENT dialog appears.

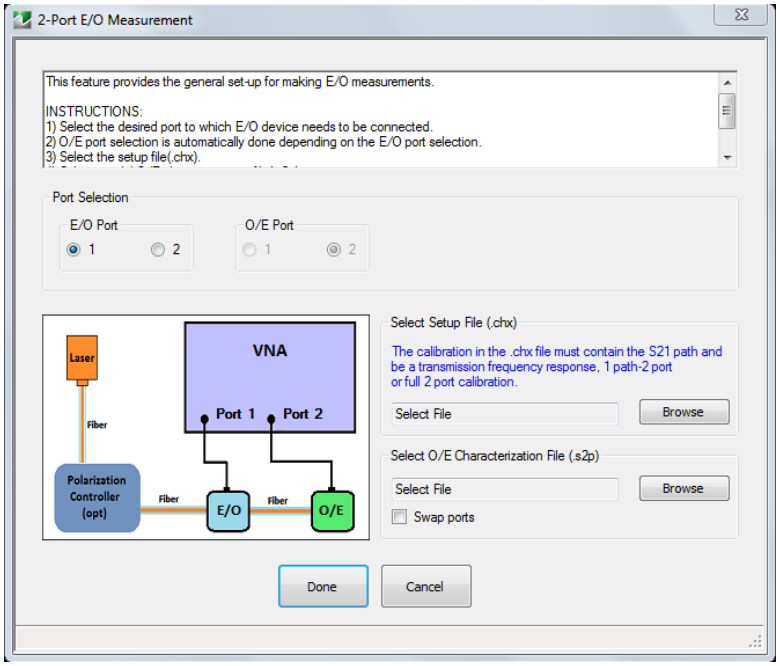


Figure 11-21. 2-PORT E/O MEASUREMENT Dialog

Port Selection Radio Buttons

- Select a valid port configuration.

Select Setup File (.chx)

- Choose a .chx setup file that satisfies the requirements for the particular configuration case selected.

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 4-port E/O measurements.

1. Select the configuration from the four different options available.
2. Select the desired ports to which E/O device and O/E device need to be connected. [One or two checks are allowed based on the configuration selected. The O/E ports are also selectable but the current E/O selection numbers will be grayed out and unavailable.]
3. Select the setup file (.chx).
4. Select a valid O/E characterization file (.s2p if the O/E device is single-ended, .s3p/.s4p if the O/E device is differential).
5. For case 4, a dominant path (in the case of asymmetric DUTs) is considered to run from the lower numbered E/O port to the O/E port (and another dominant path between the remaining ports). Reconnect the DUT if necessary.

6. In the case of a .s2p file, use the Swap Port check-box option if the S-parameters assignment present in the file need to be swapped. Applies to Cases 1 and 2.

7. In the case of a .s3p file, paths 1:2 and 3:2 are considered dominant. In the case of a .s4p file, paths 1:2 and 3:4 are considered dominant. Use the PORT REASSIGNMENT dialog by clicking on the Reassign Ports button if the dominant paths are different from this. Applies to Cases 3 and 4.

8. 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.

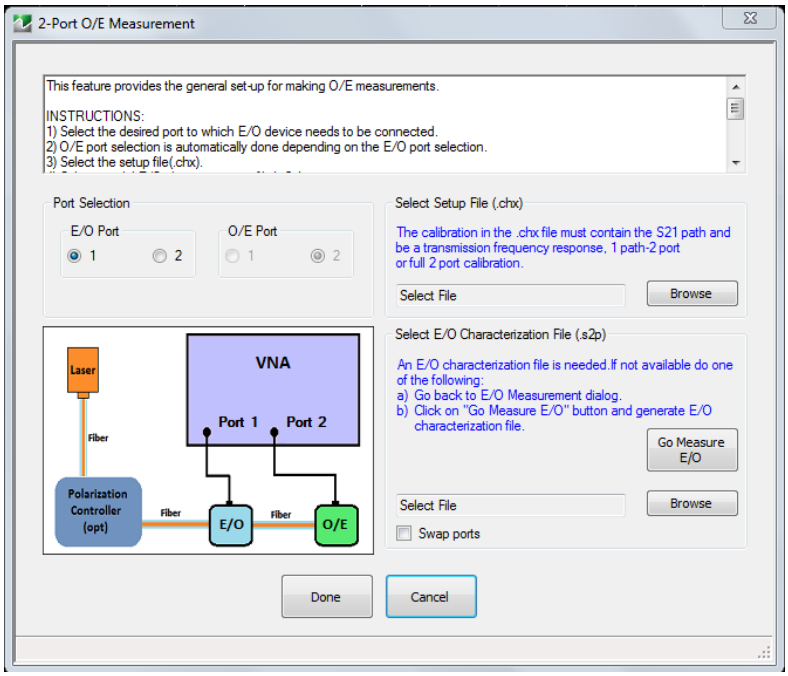


Figure 11-22. 2-PORT O/E MEASUREMENT Dialog

Port Selection Radio Buttons

- Select a valid port configuration.

Select Setup File (.chx)

- Choose a .chx setup file that satisfies the requirements for the particular configuration case selected.

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.

This feature provides the general set-up for making 4-port O/E measurements.

Instructions

1. Select the configuration from the four different options available.
2. Select the desired ports to which E/O device and O/E device need to be connected. [One or two checks are allowed based on the configuration selected. The O/E ports are also selectable but the current E/O selection numbers will be grayed out and unavailable.]
3. Select the setup file (.chx).
4. Select a valid E/O characterization file (.s2p if the E/O device is single-ended, .s3p/.s4p if the E/O device is differential).
5. For case 4, a dominant path (in the case of asymmetric DUTs) is considered to run from the lower numbered E/O port to the O/E port (and another dominant path between the remaining ports). Reconnect the DUT if necessary.

6. If E/O 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 .snp format.

b. Click on Go Measure E/O button and generate .snp file.

7. In the case of a .s2p file, use the "Swap Port" check-box option if the S-parameters assignment present in the file need to be swapped. Applies to Cases 1 and 3.

8. In the case of a .s3p file, paths 1:2 and 3:2 are considered dominant. In the case of a .s4p file, paths 1:2 and 3:4 are considered dominant. Use the PORT REASSIGNMENT dialog by clicking on the Reassign Ports button if the dominant paths are different from this. Applies to Cases 2 and 4.

9. Click Done to perform O/E measurement.

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 (Figure 11-24) 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.

2-PORT O/O MEASUREMENT Dialog Box

Upon clicking the O/O Measurements button, the 2-PORT O/O MEASUREMENT dialog appears.

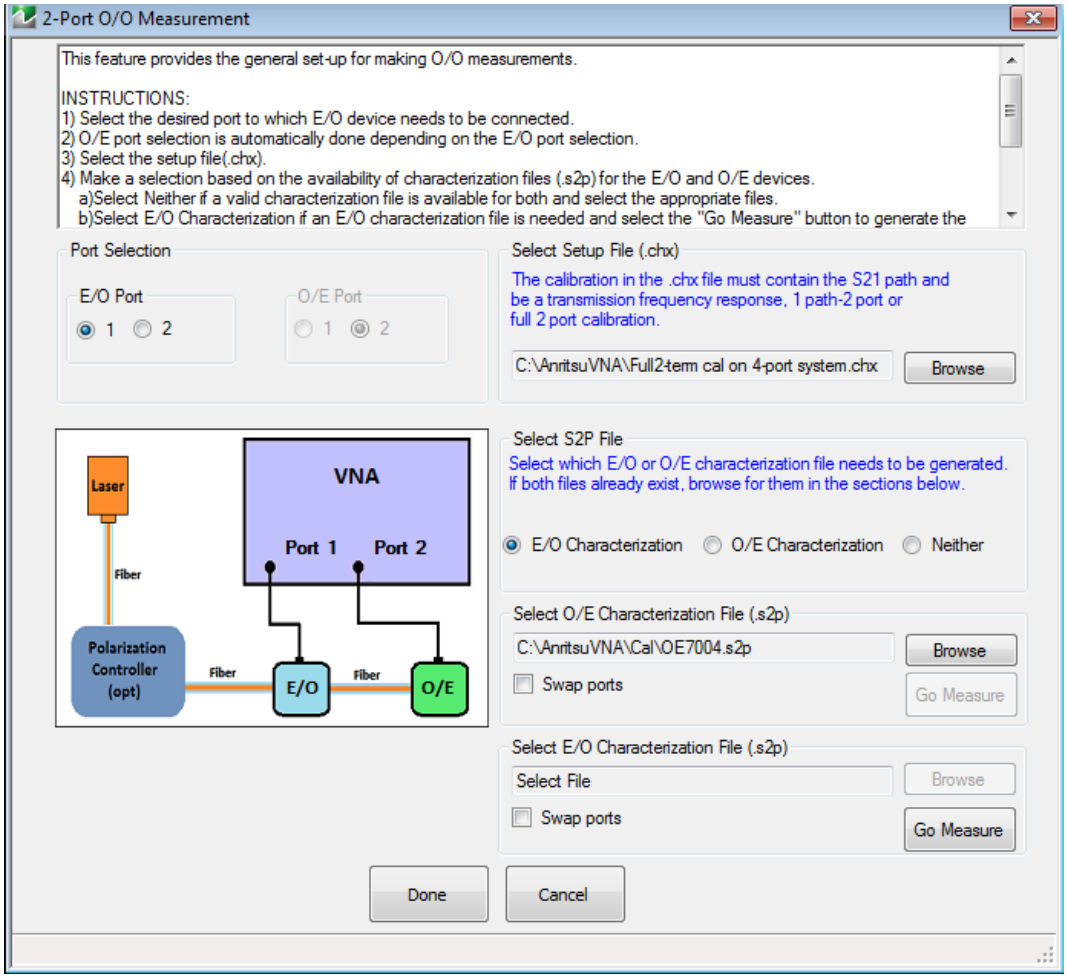


Figure 11-23. 2-Port O/O MEASUREMENT Dialog

Port Selection Radio Buttons

- Select a valid port configuration.

Select Setup File (.chx)

- Choose a .chx setup file that satisfies the requirements for the particular configuration case selected.

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 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.
    d. Click on Go Measure E/O button and generate .snp file.
6. In the case of a .s2p file, use the "Swap Port" check-box option if the S-parameters assignment present in the file need to be swapped. Applies to Cases 1, 2, and 3.
7. In the case of a .s3p file, paths 1:2 and 3:2 are considered dominant. In the case of a .s4p file, paths 1:2 and 3:4 are considered dominant. Use the PORT REASSIGNMENT dialog by clicking on the Reassign Ports button if the dominant paths are different from this. Applies to Cases 2, 3, and 4.
8. 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 11-24.

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..

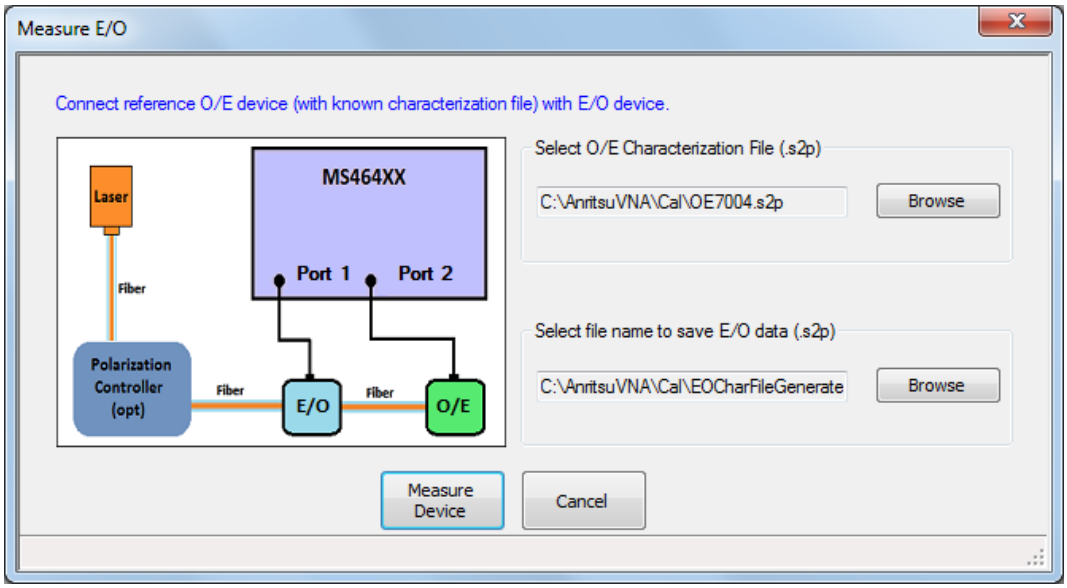


Figure 11-24. 2-Port MEASURE E/O or O/E Dialog

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.

4-Port E/O MEASUREMENT Dialog Box

Upon clicking E/O Measurements button, the 4-PORT E/O MEASUREMENT dialog appears.

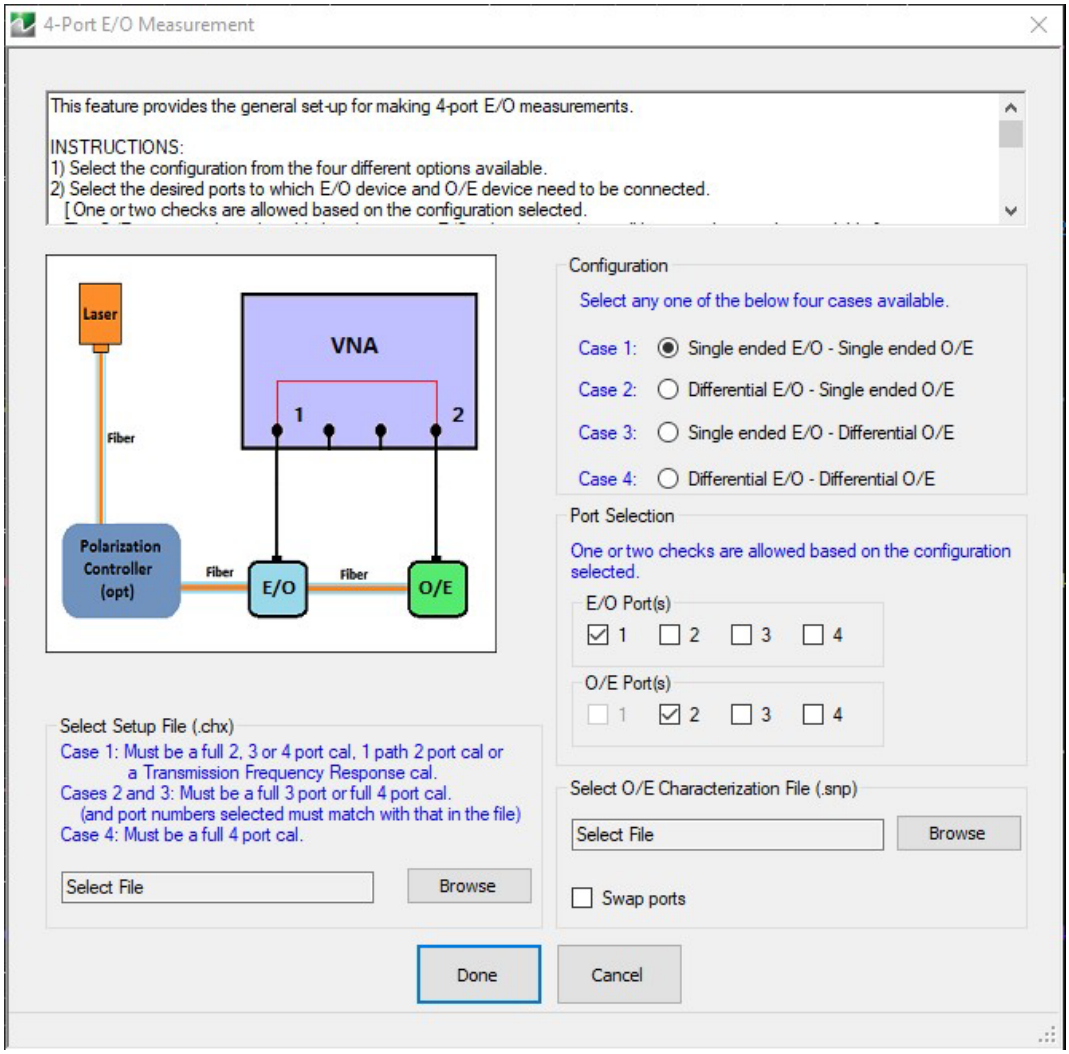


Figure 11-25. 4-Port E/O Measurement Dialog

Configuration

- Select any one of the four configuration cases available.

Port Selection

- Select a valid port configuration. One or two checks are allowed based on the configuration that was selected.

Select Setup File (.chx)

- Choose a .chx setup file that satisfies the requirements for the particular configuration case selected.

Select O/E Characterization File (.snp)

- File selected (.s2p/.s3p/.s4p) depends on the configuration selected.

Upon clicking the Done button, the calibration in the selected CHX file is loaded and the calibration error terms are modified using the O/E characterization file data.

4-Port O/E MEASUREMENT Dialog Box

Upon clicking O/E Measurements button, the 4-PORT O/E MEASUREMENT dialog appears.

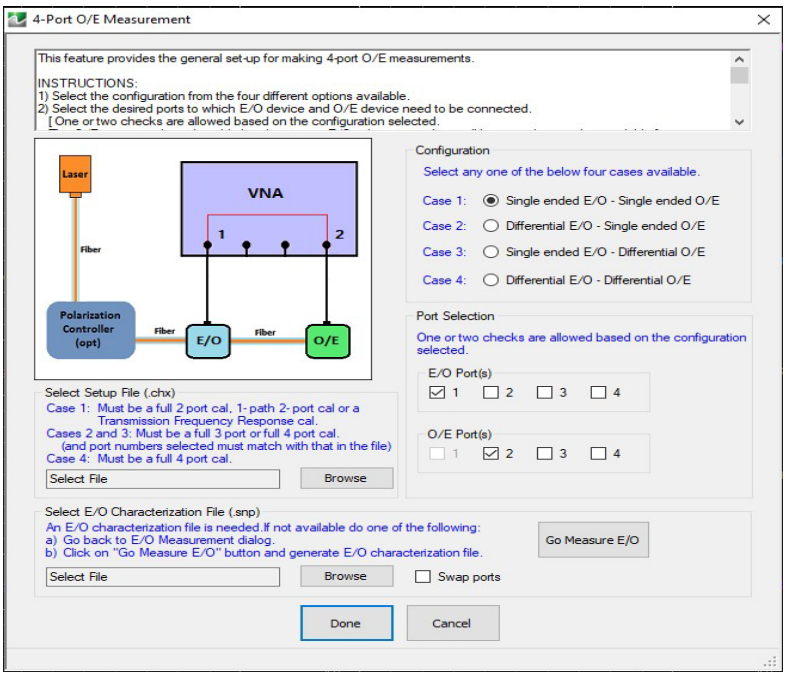


Figure 11-26. 4-PORT O/E MEASUREMENT Dialog

Configuration

- Select any one of the four configuration cases available.

Port Selection

- Select a valid port configuration. One or two checks are allowed based on the Configuration selected.

Select Setup File (.chx)

- Choose a .chx setup file that satisfies the requirements for the particular configuration case selected.

Select E/O Characterization File (.snp)

- File selected (.s2p/.s3p/.s4p) depends on the Configuration selected.

On clicking the Done button, the calibration in the selected CHX file is loaded and the calibration error terms are modified using the O/E characterization 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 (Figure 11-28) 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/.s3p/.s4p format – depending on the configuration selected). Now this saved E/O file is available for the O/E measurement in the parent dialog.

4-PORT O/O MEASUREMENT Dialog Box

Upon clicking O/O Measurements button, the 4-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 11-27, some 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 dialog, if both .sNp files exist, their file names can be entered directly and the de-embedding will proceed.

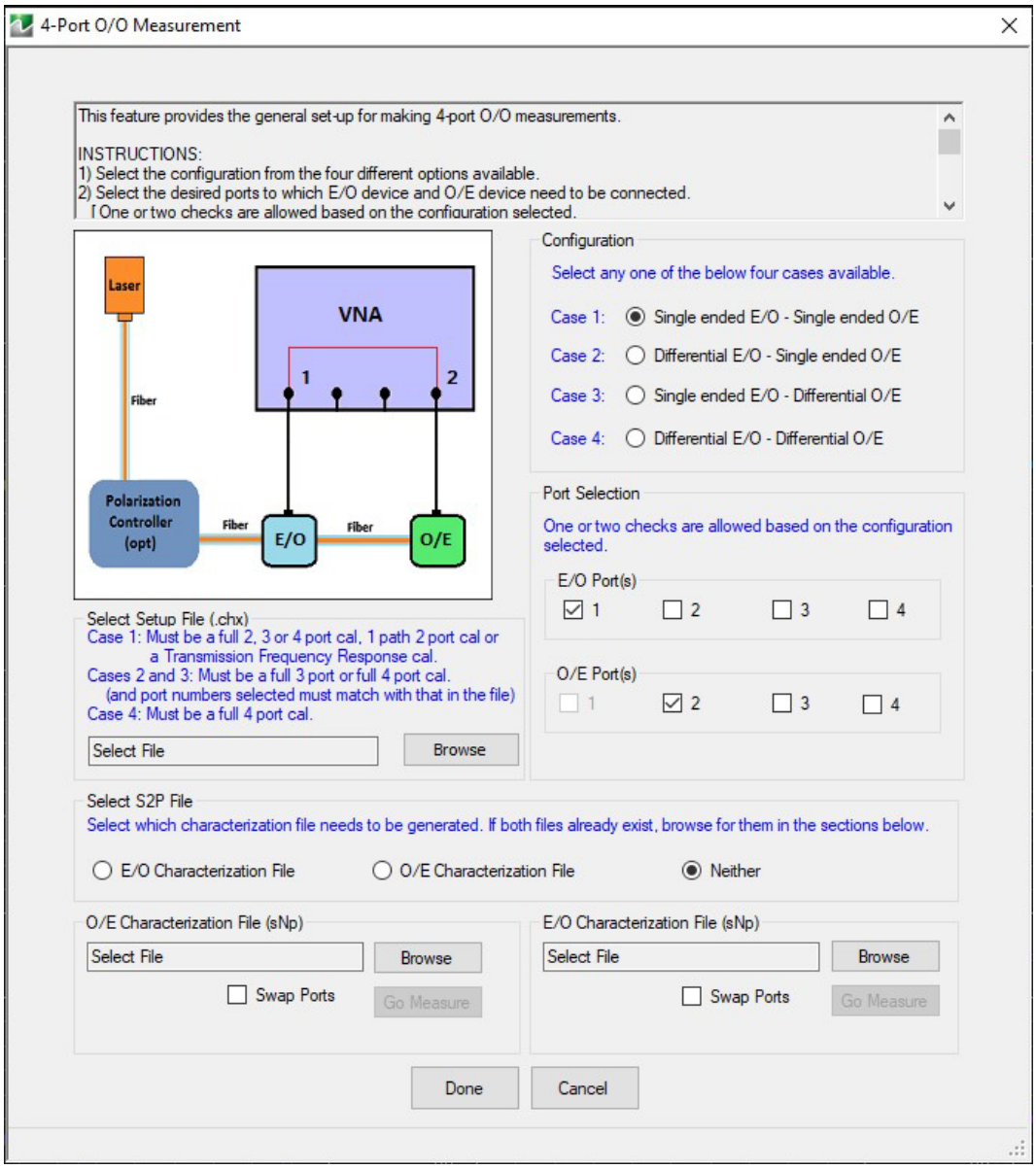


Figure 11-27. 4-Port O/O MEASUREMENT Dialog

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 MEASURE E/O dialog (or MEASURE O/E dialog) shown in Figure 11-28 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.

Configuration

- Select any one of the four configuration cases available.

Port Selection

- Select a valid port configuration. One or two checks are allowed based on the Configuration selected. The O/E ports are also selectable but the current E/O selection numbers will be greyed out and unavailable.

Select Setup

- Use current calibration setup, if valid, or browse to CHX file and select.

Select Characterization File (.sNp)

- Select which, if any, characterization file needs to be generated. Select at least 1 characterization file. The other file can be generated by clicking the associated Go Measure button.
- For Case 4 Configuration, a dominant path (in the case of asymmetric DUTs) is considered to run from the lower numbered E/O port to the O/E port (and another dominant path between the remaining ports).
- Reconnect the DUT if necessary.

Go Measure Button

- If the .sNp file does not exist, clicking this button opens the Measure E/O (or Measure O/E) dialog shown in Figure 11-28. Here, one can navigate and select the O/E file, then create a name for the E/O .sNp file to be created when Measure Device is clicked.

Swap Ports

- In the case of a .s2p file, use the Swap Ports checkbox option if the S-parameters assignment present in the file need to be swapped. Applies to Cases 1, 2, and 3.
- In the case of a .s3p file: 1:2 and 2:3 paths are dominant (S21>S12 and S23>S32).
- In the case of a .s4p file: 1:2 and 3:4 paths are dominant (S21>S12 and S43>S34).
- Use the PORT REASSIGNMENT dialog by clicking on the Reassign Ports button if the dominant paths are different from this. Applies to Cases 2, 3, and 4.

Done/Cancel

- On clicking the Done button, the calibration in the selected .CHX file is loaded and the calibration error terms are modified using the O/E characterization file data.

Instructions

This feature provides the general set-up for making 4-port O/O measurements.

1. Select the configuration from the four different options available.
2. Select the desired ports to which E/O device and O/E device need to be connected.

   (One or two checks are allowed based on the configuration selected. The O/E ports are also selectable but the current E/O selection numbers will be grayed out and unavailable.)
3. Select the setup file (.chx).
4. Select which, if any, characterization file need to be generated.
5. Select at least one characterization file. The other file can be generated by clicking the associated Go Measure button.
6. For case 4, a dominant path (in the case of asymmetric DUTs) is considered to run from the lower numbered E/O port to the O/E port (and another dominant path between the remaining ports).

Reconnect the DUT if necessary.

7. In the case of a .s2p file, use the Swap Port checkbox option if the S-parameters assignment present in the file need to be swapped.

8. In the case of a .s3p: 1:2 and 2:3 paths are dominant (S21>S12 and S23>S32).

In the case of a .s4p:,1:2 and 3:4 paths are dominant (S21>S12 and S43>S34).

9. Click Done to perform O/O measurement.

4-Port MEASURE E/O (or MEASURE O/E) Dialog Box

On the parent O/O MEASUREMENT dialog, clicking on the Go Measure button displays the MEASURE E/O (or MEASURE O/E) dialog shown in Figure 11-28.

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 .sNp file in the location designated for E/O data.

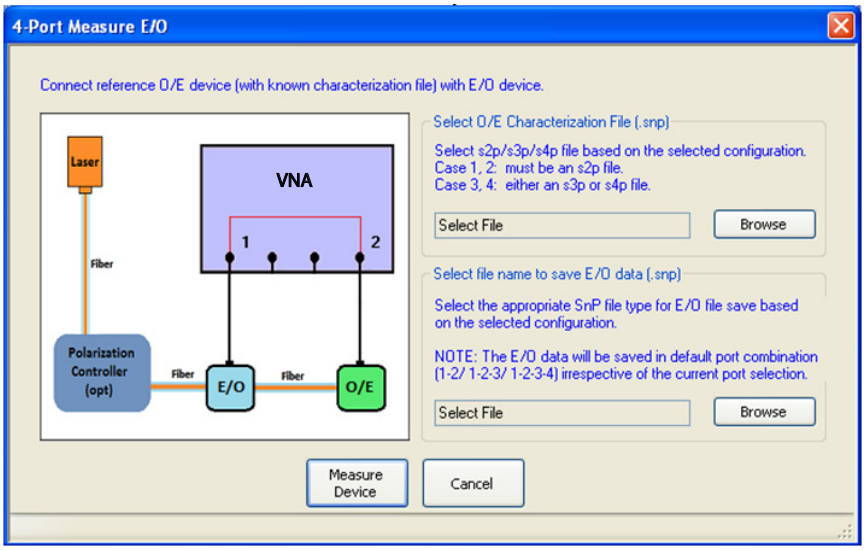


Figure 11-28. 4-PORT MEASURE E/O Dialog

Connect Reference O/E Device (that has a known characterization file) **With E/O Device**

- After connection select an OE file, then enter or select an EO file:

Select O/E Characterization File (.sNp)

- Browse to and select the reference O/E characterization file (.s2p/.s3p/.s4p – depending on the configuration selected).

Select file name to save E/O data (.sNp).

- Browse to the desired location, then enter or select an existing file name (.s2p/.s3p/.s4p – depending on the configuration selected) 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/O Measurement dialog to complete the O/O measurement.

Chapter 12 — Time Domain Menu

12-1 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 must be installed for the TDOMAIN menu to be available.

12-2 Overview of the Time Domain Menu

The TIME DOMAIN menu offers the following selection buttons:

- "LOW PASS TIME DOMAIN CAL Dialog" on page 12-3
- "TIME DOMAIN MEASUREMENT SETUP Dialog" on page 12-4

12-3 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.

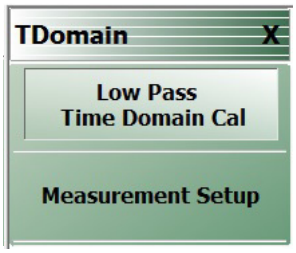
12-4 Time Domain Menu

Previous

- Main Menu on page 2-2

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" on page 12-3

Measurement Setup

Selection opens the dialog used to set up parameters for measurements supporting time domain results.

- "TIME DOMAIN MEASUREMENT SETUP Dialog" on page 12-4

Figure 12-1. TIME DOMAIN Menu

12-5 LOW PASS TIME DOMAIN CAL Dialog

Navigation

- MAIN | Time Domain | TDOMAIN | Low Pass Time Domain Cal | LOW PASS TIME DOMAIN CAL Dialog

LOW PASS TIME DOMAIN CAL Dialog

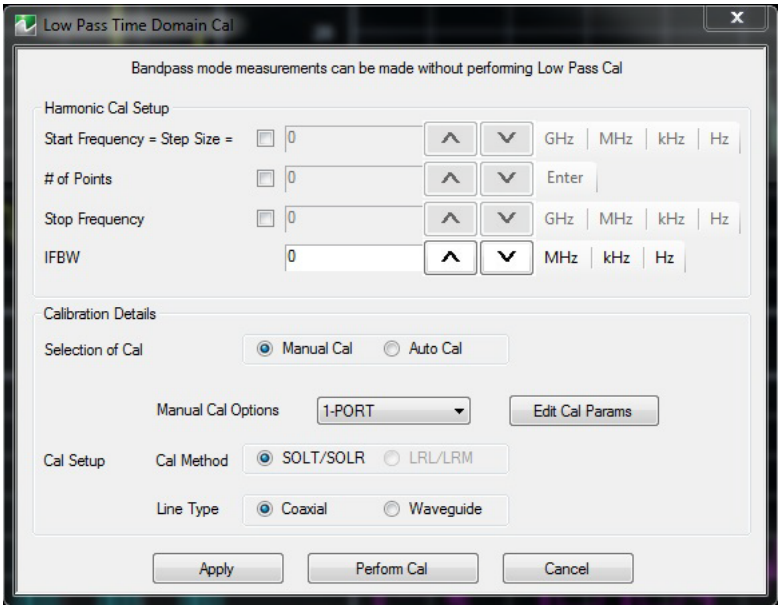


Figure 12-2. LOW PASS TIME DOMAIN CAL Dialog Box

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 path:

MAIN | Calibration | CALIBRATION | Calibrate | CALIBRATE| Manual Cal | X-PORT CAL (where X is the number of ports) | Modify Cal Setup | 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.

12-6 TIME DOMAIN MEASUREMENT SETUP Dialog

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 the Display chapter 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

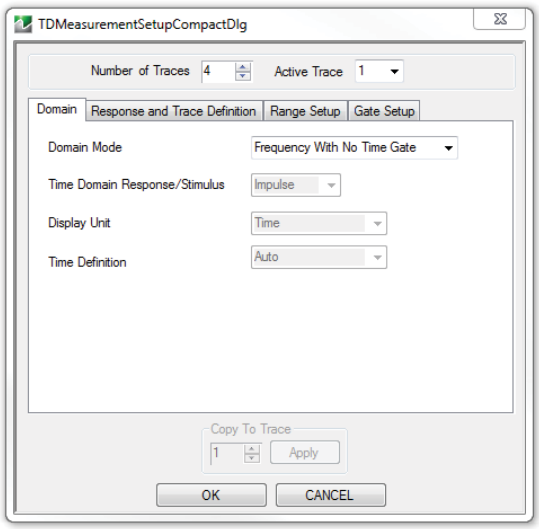


Figure 12-3. Time Domain Measurement Setup

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.

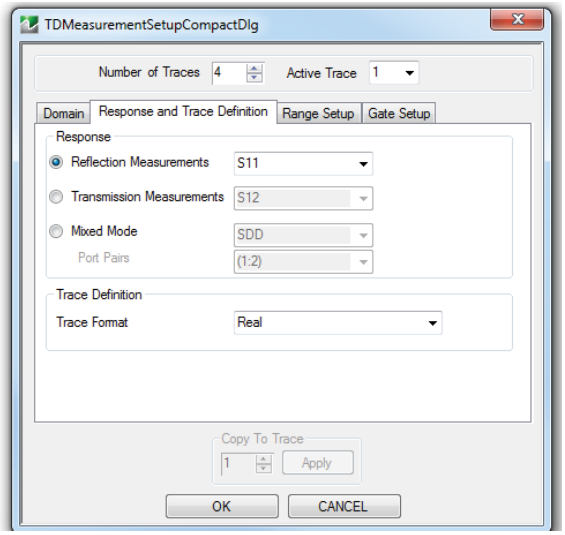


Figure 12-4. Response and Trace Definition Setup

Response and Trace Definition

The available choices here depend on the instrument model.

For 2-port models: MS46122A, MS46322A, and MS46522B parameters S11, S12, S21, and S22 are selectable.

For 4-port models: MS46524B, all parameters shown are selectable.

TRACE FORMAT controls the display format for a trace. For information on all formats listed here, see Chapter 18 — Display Menus.

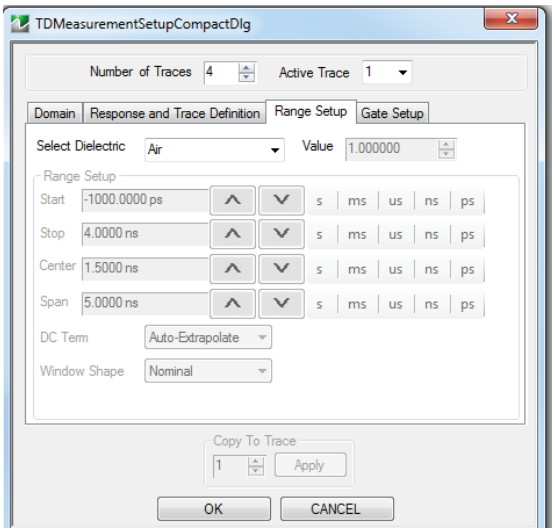


Figure 12-5. Range Setup

DUT Definition, Range Setup

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.

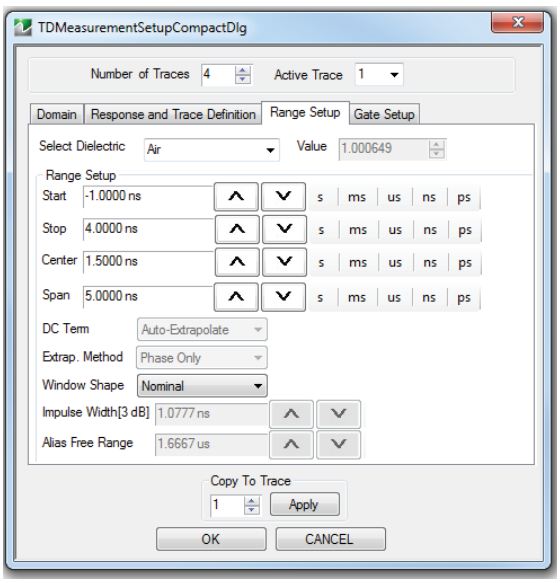


Figure 12-6. Gate Setup

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 13 — Advanced Time Domain Menu

13-1 Chapter Overview

The ADVANCED TIME DOMAIN menu provides a convenient way to access Eye Diagram setup and Signal Analysis (SI) setups.

Note	The Advanced Time Domain option must be installed for the TimeDomain ADK menu to be available.

13-2 Overview of the ADVANCED TIME DOMAIN Menu

The ADVANCED TIME DOMAIN menu offers the following selection buttons:

- "Eye Diagram Plot and Parameter Information Windows" on page 13-2
- "SI Analysis Dialog" on page 13-4

13-3 ADVANCED TIME DOMAIN Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Time Domain | TimeDomain ADK | Eye Diagram

Eye Diagram

Selection opens the Eye Diagram plot and Eye Diagram parameter information windows.

- "Eye Diagram" on page 13-1

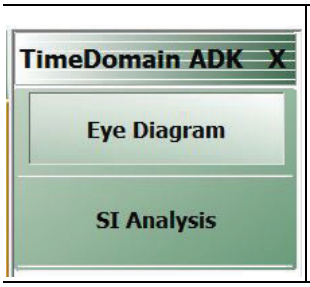
SI Analysis

Selection opens the dialog used to set up parameters for analyzing signal integrity

- "SI Analysis" on page 13-1

Navigation

- MAIN | Time Domain | TimeDomain ADK | SI Analysis



Eye Diagram

- Select opens the Eye Diagram plot and parameter information windows.

SI Analysis

- Select opens the dialog used to analyze VNA signal integrity measurements in the time domain.

Figure 13-1. ADVANCED TIME DOMAIN Menu

13-4 Eye Diagram Plot and Parameter Information Windows

The Eye Diagram button allows ShockLine software to create a .sNp that is used to generate an Eye Diagram. Each time the Eye Diagram button is used, a new .sNp file is created and a different eye is formed. The Eye Diagram plot comes from a configurable file located in the following directory: C:\AnritsuVNA\ADK. See Figure 13-2. The file is an .abt user-defined file and contains simple commands that configure the electrical parameters of the Eye Diagram measurement. Commands for the .abt file are located at the end of this chapter.

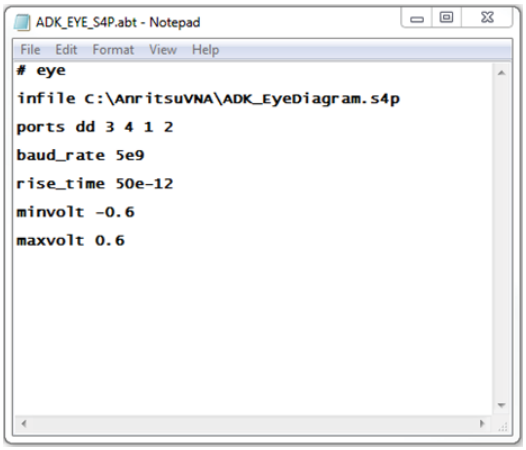


Figure 13-2. Sample .abt Eye Diagram Configuration File

When the Eye Diagram is generated, a parameter information window will appear as well as the configured Eye plot. This information window provides the user with information about the Eye such as jitter, height and width as well as threshold voltage and delay to the center of the eye.

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Time Domain | TimeDomain ADK | Eye Diagram.

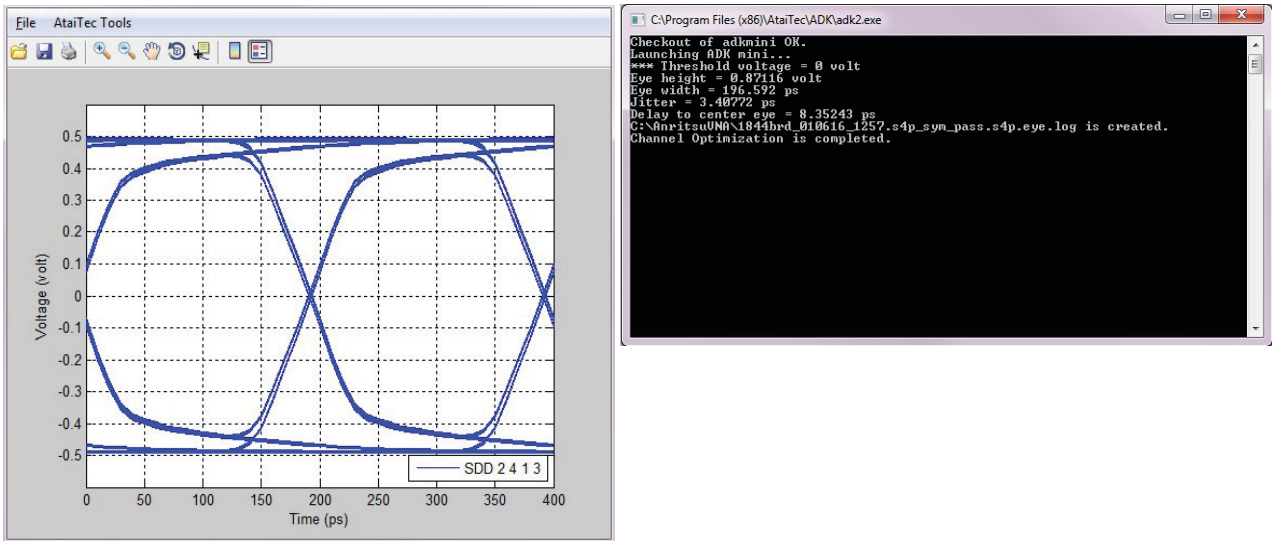


Figure 13-3. Eye Diagram and Eye Information Window

13-5 SI Analysis Dialog

This dialog contains design kits for time domain measurement analysis. These design kits can be used to analyze SnP files and provide signal integrity information. This software is referred to as ADK and the Advanced Time Domain option allows the user to access a subset of functions known as mini ADK.

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Time Domain | TimeDomain ADK | SI Analysis

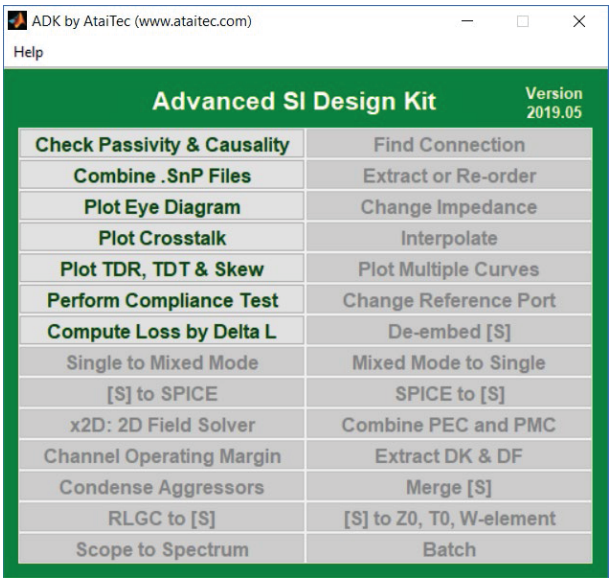


Figure 13-4. SI Analysis Design Kit options

There are seven main options in mini ADK:

- "Check Passivity and Causality" allows the user to correct a Touchstone file's reciprocity, passivity and/or causality.
- "Combine .sNp Files" allows the user to combine several Touchstone files and expand into a file with more ports.
- "Plot Eye Diagram" allows the user to plot waveforms, eye diagrams or spectra from measured Touchstone files.
- "Plot Crosstalk" allows the user to see near-end crosstalk (NEXT) and far-end crosstalk (FEXT).
- "Plot TDR, TDT and Skew" allows [S] to be converted into impedance showing TDR with open end TDR/TDT with matched terminations.
- "Perform Compliance Test" allows the user to choose among several IEEE and OIF specifications.
- "Compute Loss by Delta L" computes PCB trace loss by Delta-L 3.0 (i.e., eigenvalue solution).

13-6 Check Passivity and Causality

This utility is often used when trying to correlate simulated and measured data. It lets the user check a .sNp file for passivity, causality, and reciprocity and can add correction to reduce the likelihood of attempted correlation to non-physical data. Each .sNp file that is used in this menu system will have the plot shown by default and a .sNp file generated with the type of correction appended. For example, a .sNp file that is checked for passivity will have an additional .sNp file generated as a filename_causal.snp where n is the number of ports.

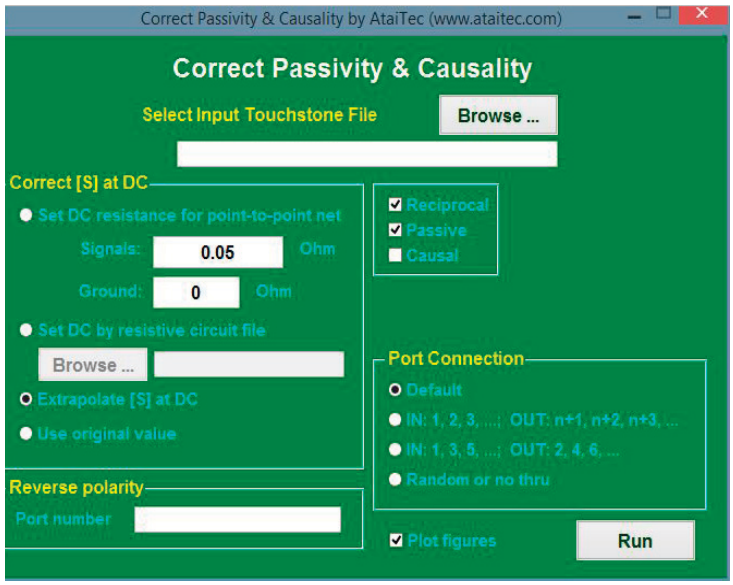


Figure 13-5. CHECK PASSIVITY & CAUSALITY Dialog Box

Select Input Touchstone File

Select the .sNp file that will have reciprocal, passive and causal parameters evaluated.

Correct [S] at DC

For point-to-point nets, DC resistance for both signals and ground can be entered to quickly fill in S parameters at DC. Multiple numbers can be used for different resistance in each signal. For multi-drop nets, the user can bring in a resistive circuit file to create the S parameters at DC.

- Reciprocity: The S-parameters of passive devices are reciprocal, for example S12 should be the same as S21 in both phase and magnitude. Bad reciprocity causes more issues when multiple measurement results are cascaded in simulation (for system simulation afterwards). The reciprocity errors cause mismatch to propagate incorrectly and the errors can build as the file count increases.
- Passivity: This metric is a gauge of how well a measurement represents a passive device. Having good passivity means that a passive device will not show gain anywhere in its measured S-Parameters.
- Causality: For a passive component, due to measurement noise or numeric error, the measured S-parameters may be slightly non-passive at certain frequencies. The causality violation of the impulse response, namely non-zero response at negative time, is due to the spectrum truncation in the S-parameter measurement.

Reverse polarity

At times the polarity of certain ports can be found reversed because of improper assignment of from- and to-nodes in simulation or signal and ground probes in measurement. This can be observed by examining either TDT or the phase angle of insertion loss. The phase angle of insertion loss should be 0 at DC instead of +/- 180 degrees. This utility lets the user easily correct the polarity error by entering those port numbers, separated by space, under Reverse polarity.

- Port Number: Enter the port numbers separated by a space

Port Connections

The user can specify the order of port connection:

- Ports (1,2,3, …) to (n+1, n+2, n+3,…),
- Ports (1,3,5,…) to (2,4,6, …),
- Random/no-thru connection.

13-7 Combine .sNp Files

With this utility, the user can combine several Touchstone files and expand it into a file with more ports. Zeros are inserted for unspecified [S]. One application is to combine many 4-port measurement files into a larger multi-port file. All Touchstone files will be synced automatically to the first file for the same frequencies and reference impedance.

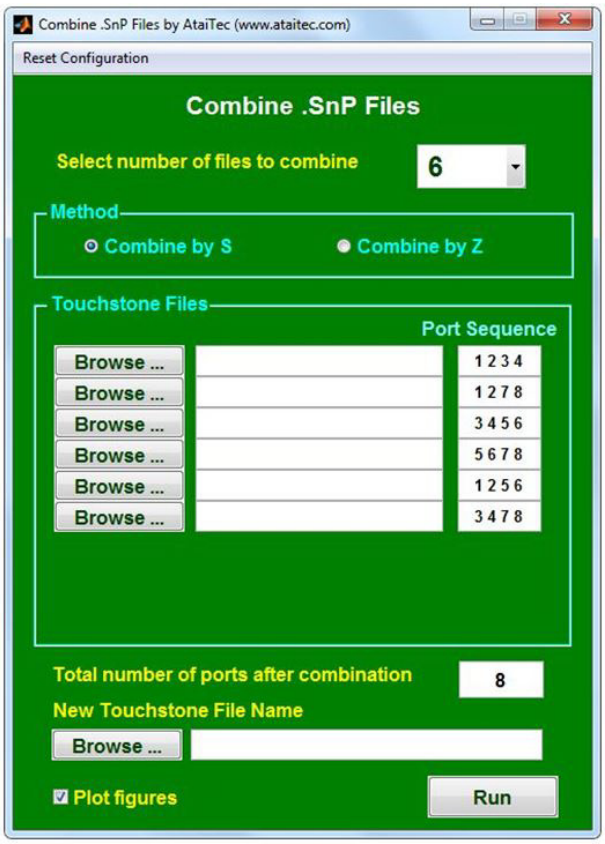


Figure 13-6. COMBINE .SNP FILES Dialog Box

Select number of files to combine

- Method: Select “Combine by [S]” or “Combine by [Z]”. The user should choose “Combine by [S]” if the unmeasured ports are terminated and “Combine by [Z]” if the unmeasured ports are open.
- Touchstone Files: Select the number of files that will be used to create larger .sNp files from different paths of smaller .sNp files. For example, an .S4P can be created using six .S2P files.

Total number of ports after combination

- Select the number of ports required to build the desired .sNp file.

New Touchstone File Name

- Select the location and file name for the newly created .sNp file.

Plot Figures

- Select enables ATD to plot the selected .sNp file. The file will be plotted as the combined .sNp contributions.

13-8 Plot Eye Diagram

With Plot Eye Diagram, the user can import S-parameter data and simulate the single-ended or mixed-mode bit-by-bit channel response to NRZ or 4-level pulse amplitude modulation (PAM-4) signals. This utility can plot bit waveforms, eye diagram or spectrum simulation data with a pseudo-random bit stream (PRBS) or a fixed data pattern. The user can also apply TX feed forward equalization (FFE), RX continuous time linear equalization (CTLE) and RX decision feedback equalizer (DFE) tap coefficients to the simulation. Signal baud rate, rise times, voltage swing, DC offset, and Random Jitter offset can also be controlled by this tool.

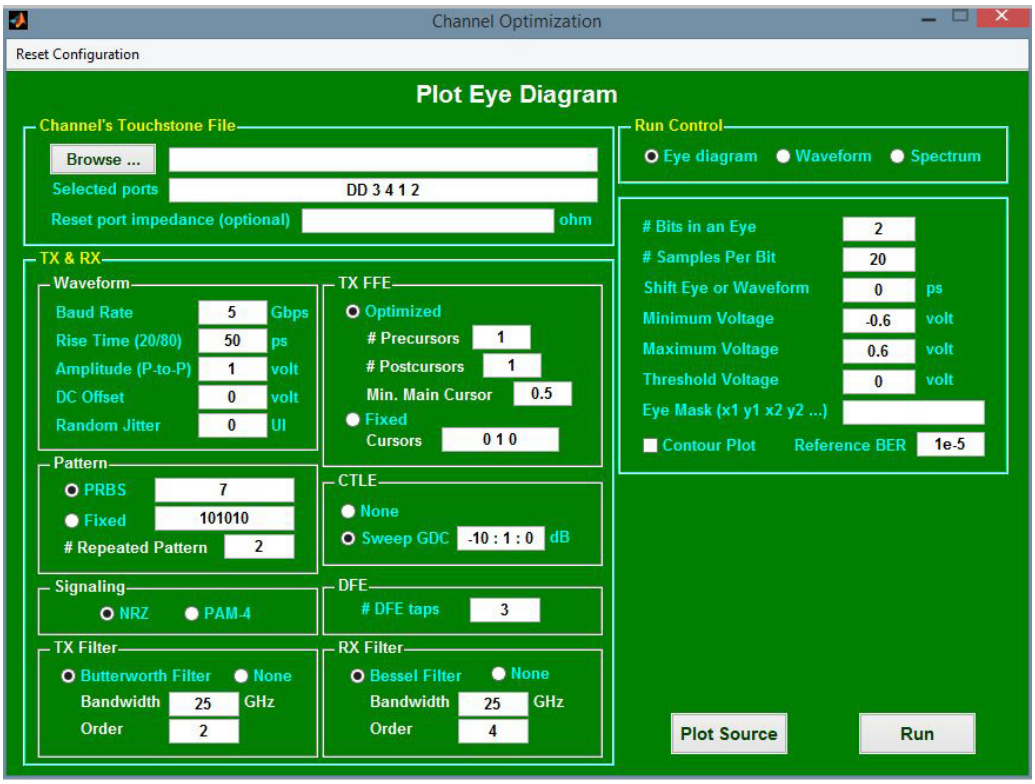


Figure 13-7. PLOT EYE DIAGRAM Dialog Menu

Channel's Touchstone File

- Select the .sNp file that will be used for plot eye diagram features.

TX & RX

- Waveform: Select electrical parameters that will be used in the generation of the eye diagram.
- Pattern: Select the bit sequence as either pseudo random or fixed for the eye diagram. Maximum PRBS is 20.
- Signaling: Select the signaling for the eye diagram plot. NRZ has high/low signaling between two states, 0 and 1. PAM-4 will plot an eye diagram between 4 logic states 00, 01, 10, 11.
- TX Filter: Select parameters for transmit properties using a Butterworth Filter
- TX FFE: (Feed Forward Equalization) is used to help the receiver recognize the resulting waveform by improving signal quality through a lossy channel. The channel distorts the signal and TX FFE allows the user to pre-distort the signal so that it the channel cancels both distortions. Select optimized or fixed settings.
- CTLE: CTLE (Continuous Time Linear Equalization) is an equalization scheme on the receiver side. CTLE attenuates low frequency signals components, amplifies components around the Nyquist frequency and filters of higher frequencies. Select parameters for CTLE.

- DFE: DF (Decision Feedback Equalization) is an equalization scheme on the receiver side. DFE is a control system that feeds a sum of logic or symbol decision back to the symbol decoder. Select parameters for DFE.
- RX Filter: Select parameters for transmit properties using a Bessel Filter.

Run Control

- Select between Eye Diagram, Waveform or Spectrum.

Note	Dialog may change depending on the choice for plot between eye diagram, waveform, and spectrum. Waveform plots only the first 10,000 sampling points.

- # of bits in eye: Select the number of eyes in the present in the eye diagram. For example, to see four NRZ eye diagrams in the plot, the number of bits selected should be 4.
- # of Samples per Bit: Select the number of samples per bit.
- Threshold Voltage: Threshold voltage is used as the reference voltage to measure eye height and width. Multiple threshold voltages can be entered in a vector such as "-0.2 0 0.2."
- Minimum and Maximum Voltage: Select the minimum and maximum voltage values for the eye diagram, waveform or spectrum.
- Eye Mask: An eye mask can be specified by a vector of "x1 y1 x2 y2 …" with x in ps and y in volt. Multiple eye masks can be specified by several vectors separated by semicolon (;). To turn off the eye mask, this entry can be simply left blank.
- Contour Plot: Select to see 3-D contour plot.
- Plot Source: Select to see a plot of the bit source.

Note	Values for optimization parameters will be displayed in a presentation field on the lower right-hand side of the PLOT EYE DIAGRAM dialog menu.

13-9 Plot Crosstalk

Cross talk is the coupling of energy from one line to another by mutual capacitance or mutual inductance. The mutual inductance will induce current on the victim line and mutual capacitance will pass current that flows in both directions of the victim line. The measurements that quantify the effects of crosstalk are near end crosstalk (NEXT) and far end crosstalk (FEXT).

NEXT is a measure of the ability of channel to reject crosstalk. Interference between two channels is measured at the same end of the channel as the interfering transmitter. FEXT is the interference between two channels measured at the other end of the channel with respect to the interfering transmitter.

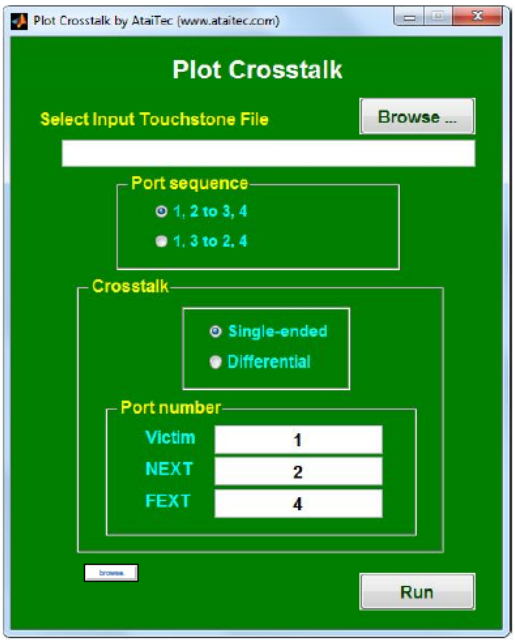


Figure 13-8. PLOT CROSSTALK Dialog

Select Input Touchstone File

- Select the .sNp file that will have crosstalk parameters evaluated.

Port Sequence

- Select the appropriate port sequence that accurately describes the connections between ports.

Crosstalk

- Select between single-ended and differential. The Crosstalk field will automatically select Single-ended if an .s4p file is selected.

Port Number

- Select the correct orientation that describes the Victim, NEXT, and FEXT parameters.

13-10 Plot TDR, TDT and Skew

This utility converts S-parameter data into an impedance profile, a time domain reflection (TDR) with an open end, or a TDR/time domain transmission (TDT) with matched terminations. The user can select step, single-bit, or impulse responses. Resulting TDR, TDT, and skew can be plotted.

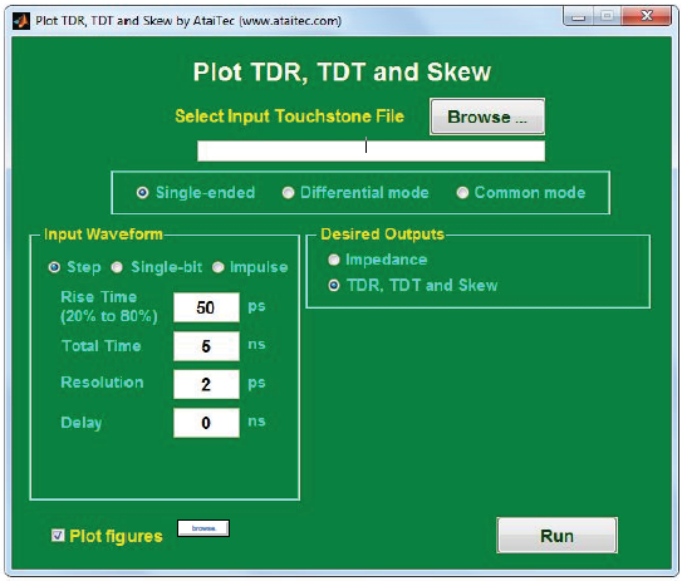


Figure 13-9. PLOT TDR, TDT and SKEW Dialog

Select Input Touchstone File

- Select the .sNp file that will have TDR, TDT and Skew parameters evaluated.

Input Waveform

- Select the electrical parameters that will be used to generate an impedance or other time domain output.

Desired Outputs

- Impedance: Select impedance for looking at impedance mismatch or DUT Impedance characterization
  TDR, TDT and Skew: Select to see stimulus plot, NEXT and FEXT, and Skew parameters.

Note	Values for TDR, TDT and Skew parameters will be displayed in a presentation field on the lower right-hand side of the dialog menu.

13-11 Perform Compliance Test

With this utility, the user can choose among several IEEE and OIF specs, and compare the power sum of coupled noises, insertion loss crosstalk ratio (ICR), insertion loss, insertion loss deviation (ILD), and integrated crosstalk noise (ICN).

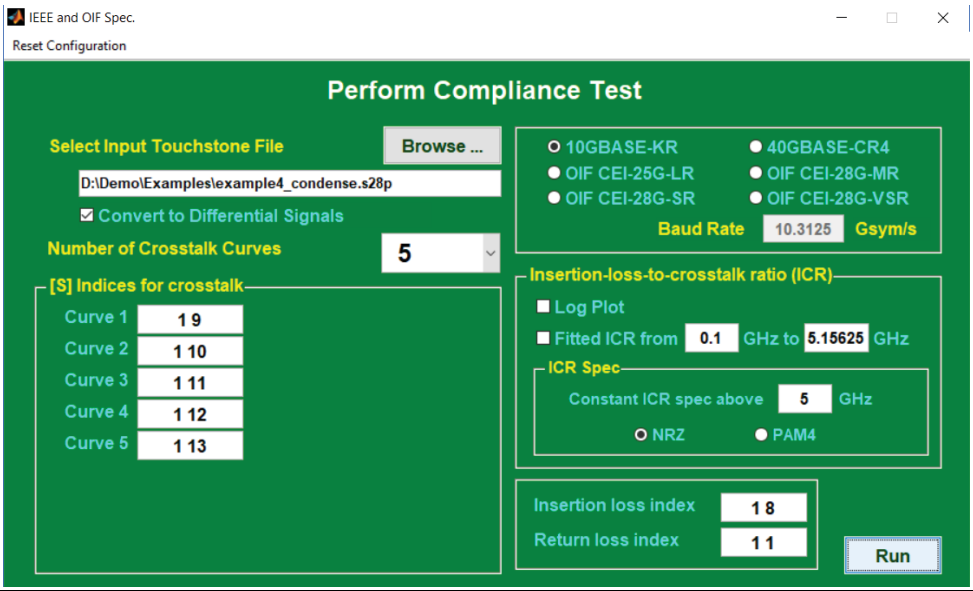


Figure 13-10. Perform Compliance Test Dialog

Select Input Touchstone File

- Select the .sNp file that will have compliance parameters evaluated.

Number of Crosstalk Curves

- Select the number of crosstalk curves that will be evaluated with chosen compliance standard.

[S] Indices for crosstalk

- Select the port orientation and compliance standard for the .sNp file that will be used for compliance evaluation.

Insertion-loss-to-crosstalk ratio (ICR)

- Select parameters for ICR evaluation.

13-12 Compute Loss by Delta L

This utility computes PCB trace loss by Delta-L 3.0 (i.e., eigenvalue solution). The program calculates the trace-only (= long trace – short trace) attenuation in dB/in between every two files by eigenvalue solution, plots them in the same graph, curvefits their average values, and outputs a summary in …ADK_DeltaL.log. When only one file is entered, the short trace is equated to a perfect short (of zero length) and the eigenvalue of that input file's corresponding T parameter is computed.

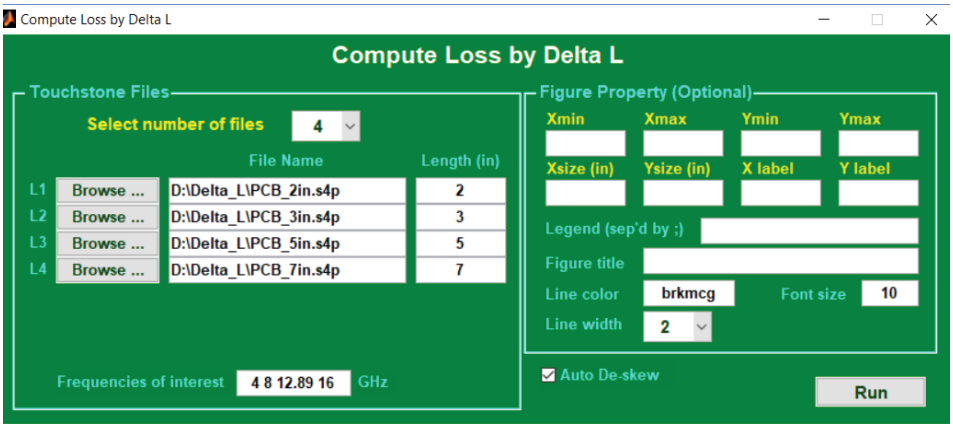


Figure 13-11. Compute Loss by Delta L Dialog

Select Input Touchstone File

- Up to seven Touchstone files (in either .s2p or .s4p) of different length + launch can be entered.

Frequencies of Interest

- Frequencies of interest, separated by spaces, can be entered (in GHz) to place markers on the fitted curve. Those fitted numbers are shown in …ADK_DeltaL.log.

Figure Property (Optional)

- By default, the figure properties are left as blank and the program automatically plots the entire x and y ranges. The user has the option to enter a specific x, y range to plot and override the default label, legend, line color, line width and font size, etc.
- Valid line colors are in b (blue), r (red), k (black), m (magenta), c (cyan), g (green), y (yellow).
- Valid font size is between 6 and 60.
- The default of "brkmcg" corresponds to that the 1st curve is in blue and the 2nd curve is in red, etc. Certain publications (such as patent, journal, …) require that all graphs be in black and white. The user can just enter "k" in this case and the program will plot all curves in black with solid line, dashed line, …, etc.

Auto De-skew

- De-skew .s4p files before computing the loss. De-skewing is crucial for getting unbiased reading of differential loss. When enabled (the default is on), each file will be de-skewed and a new file generated in <file name>_noskew.s4p.

Chapter 14 — Application Menu

14-1 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.

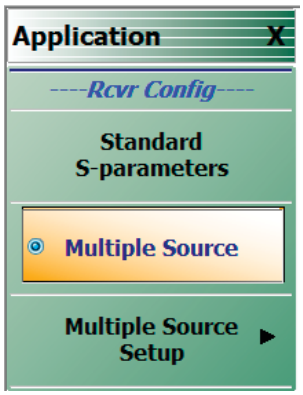
APPLICATION Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Application | APPLICATION



The controls on this menu are for Receiver Configuration (Rcvr Config).

Standard S-parameters

Uses Standard S-Parameters receiver configuration. (This is the default setting).

Multiple Source

Select sets the Multiple Source receiver configuration and de-selects all other receiver configurations and their respective selection buttons. If selected, use the Multiple Source Setup button described below to configure the multiple sources. Multiple source mode is not available if power sweep is enabled.

- Section 14-3 “Multiple and External Source Control” on page 14-3

Multiple Source Setup

Select displays the MULTIPLE SOURCE SETUP menu. Use this button if the Multiple Source receiver configuration was selected above.

Figure 14-1. APPLICATION Menu for Receiver Configuration

\14-2 Application Menus for Multiple Source

The APPLICATION menu set for configuration and control of multiple source contains the following menus:

- MULTIPLE SOURCE Menu on page 14-3
- INT. SRC CONTROL Menu on page 14-6

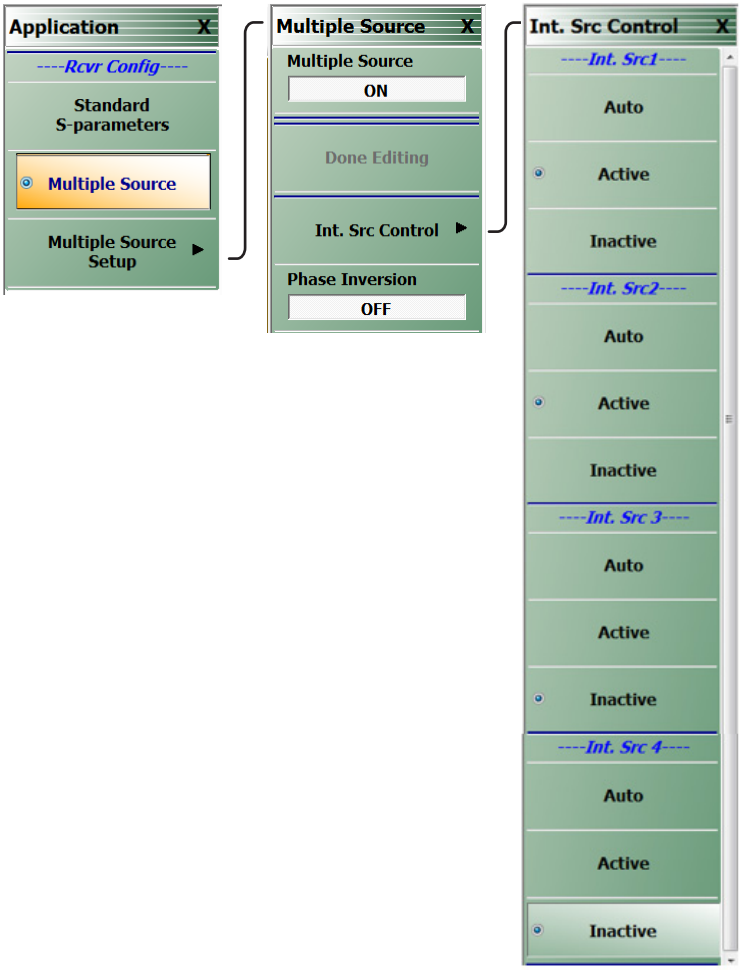


Figure 14-2. Multiple Source Menus

14-3 Multiple and External Source Control

MULTIPLE SOURCE Menu

Previous

- APPLICATION Menu on page 14-1

Navigation

- MAIN | Application | APPLICATION | Multiple Source | MULTIPLE SOURCE

Figure 14-3. MULTIPLE SOURCE Menu

MULTIPLE SOURCE Menu Source Table

When the MULTIPLE SOURCE menu is selected, the MULTIPLE SOURCE Table appears at the bottom of the main display area.

Multiple Source (OFF/ON)

Select toggles multiple source capability to OFF or ON, and sets the Receiver Config to Multiple Source.

Note	For multiple source to take effect, the Done Editing button should be selected. If you are in the middle of defining the bands and have not selected Done Editing, the band in effect will be the previous band and not the one currently being defined.

Add Band

Select adds a frequency band to the multiple source table at the bottom of the display.

- "MULTIPLE SOURCE Table" on page 14-4

Delete Band

Select a row in the frequency band table at the bottom of the display. Click the Delete Band button to permanently delete it.

- "MULTIPLE SOURCE Table" on page 14-4

Clear All Bands

Select deletes all band entries in the table. One default band remains even after Clear All Bands is executed.

- "MULTIPLE SOURCE Table" on page 14-4

Done Editing

If no changes have been made to the frequency band settings, this button is unavailable.

Once changes are made, the button becomes available.

When all changes are complete, select the Done Editing button to apply the frequency band changes (additions, edits, and deletions) to the current running measurement and its attached test sets and modules.

After the change have been applied, the button again becomes unavailable.

If the button is not selected, the changes are not applied to the instrument.

Phase Inversion (OFF/ON)

Select toggles the phase inversion function OFF and ON.

MULTIPLE SOURCE Table

The multiple source table is available at the bottom of the screen when the MULTIPLE SOURCE menu is selected. A typical example is shown below.

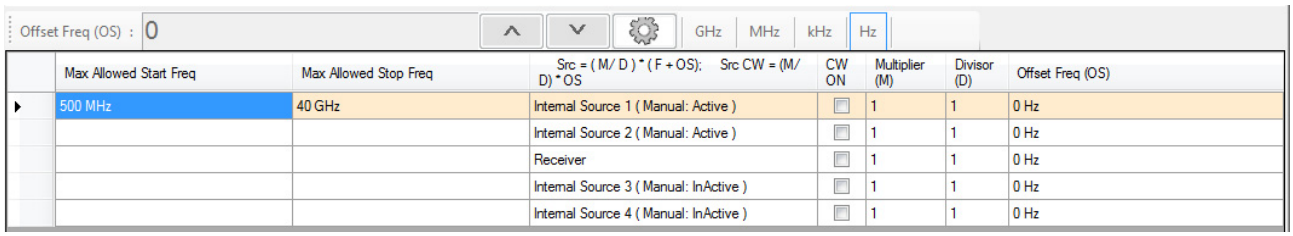


Figure 14-4. MULTIPLE SOURCE Table – Sample

Band Table Controls

Bands are added by selecting the Add Band button on the MULTIPLE SOURCE menu. Up to 50 Bands can be added. Each band can be defined for any combination of the following sources:

- Internal Source 1
- Internal Source 2
- Receiver
- Receiver Source

General Operation

The following general operation notes and requirements apply:

- Tabular field data can be entered in any sequence.
- If invalid data is entered, a warning icon appears in the left margin of the table. Selecting the Done Editing button with invalid data results in a WARNING dialog.
- Read-only tabular elements are distinguished from editable contents.
- Table focus remains on the last added/ deleted band.
- Data is not applied to the instrument and its attached equipment until the Done Editing button is selected. When successful, the button again becomes unavailable.

CW OFF

Each source is defaulted as CW OFF. A check box can be selected to enable CW for each source. If CW is not selected, the source equation is:

$$\text{Source (Src)} = \left(\frac{M}{D}\right) \times (F + OS)$$

Where:

- M = Multiplier
- D = Divisor
- F = Frequency in user-defined units of Hz, kHz, MHz, or GHz. This is the current instrument frequency within the band being defined.
- OS = Offset frequency in Hertz

CW ON

If CW is selected, the source equation is:

$$\text{Source (Src)} = \left(\frac{M}{D}\right) \times (OS)$$

Where:

- M = Multiplier
- D = Divisor
- OS = Offset frequency in Hertz

Band Management

Band management is done by using the Add Band, Delete Band, and Clear All Bands button. After all bands are configured, select Done Editing button to apply the setting to the instrument and its attached equipment.

Saving/Recalling Band Configurations

A multiple source band configuration can be saved by using MENU BAR | File | Save Setup. On the SAVE SETUP dialog box, the setup can be saved as a:

- Active Channel Setup and Calibration CHX file
- Active Channel Setup STX file
- All Channel Setup and Calibration CHA file
- All Channel Setup STA file

Recall previously saved setups by using MENU BAR | File | Recall Setup. File operations are duplicated on the FILE menu at MAIN | File | FILE.

INT. SRC CONTROL Menu

Full Name

- Internal Source Control Menu

Previous

- MULTIPLE SOURCE Menu on page 14-3

Navigation

- MAIN | Application | APPLICATION | Multiple Source Setup | MULTIPLE SOURCE | Int. Src Control | INT. SRC CONTROL

Figure 14-5. INT. SRC CONTROL (INTERNAL SOURCE CONTROL) Menu

INT. SRC CONTROL Menu Note

Initiates the dual source drive at both ports. As shown, the setup includes identification of two internal sources that can be set to “Auto” or “Manual” mode. In “Manual” mode, they are either “Active” (always ON) or “Inactive” (always OFF). The setting of the internal sources is controlled via the “MULTIPLE SOURCE Table” on page 14-4.

Int. Src1 State [Auto/Active/Inactive]

For Internal Source 1, toggles the state from auto, active, or inactive.

Chapter 15 — Trace Menus

15-1 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 Menus” on page 18-1).

15-2 Overview of Trace Menus

There are two (2) trace menus:

- TRACE Menu on page 15-2
- TRACE LAYOUT Menu on page 15-4

15-3 Trace Configuration

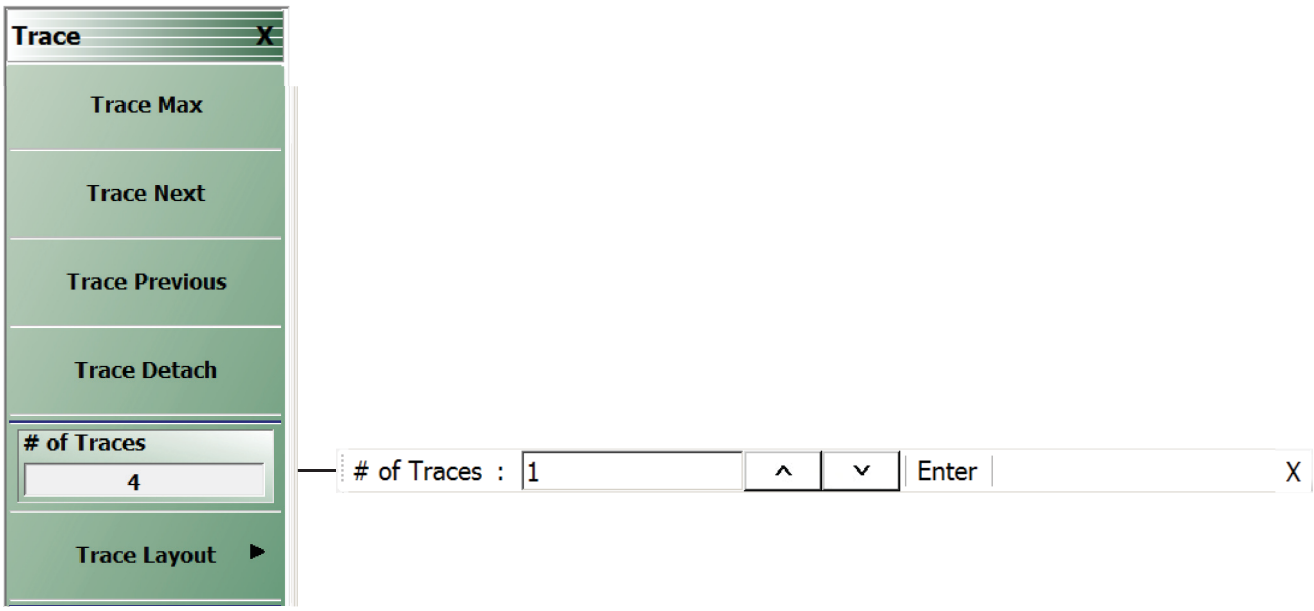
TRACE Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Trace | TRACE



1. TRACE Menu	2. # of Traces (Number of Traces) Field Toolbar

Figure 15-1. 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 activates additional traces of current channel and can be manipulated to highlight all traces or a single enlarged trace. Traces that are detached cannot have separate settings from the primary instance of the active Channel and traces.

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 15-4

15-4 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 15-2

Navigation

- MAIN | Trace | TRACE | Trace Layout | TRACE LAYOUT

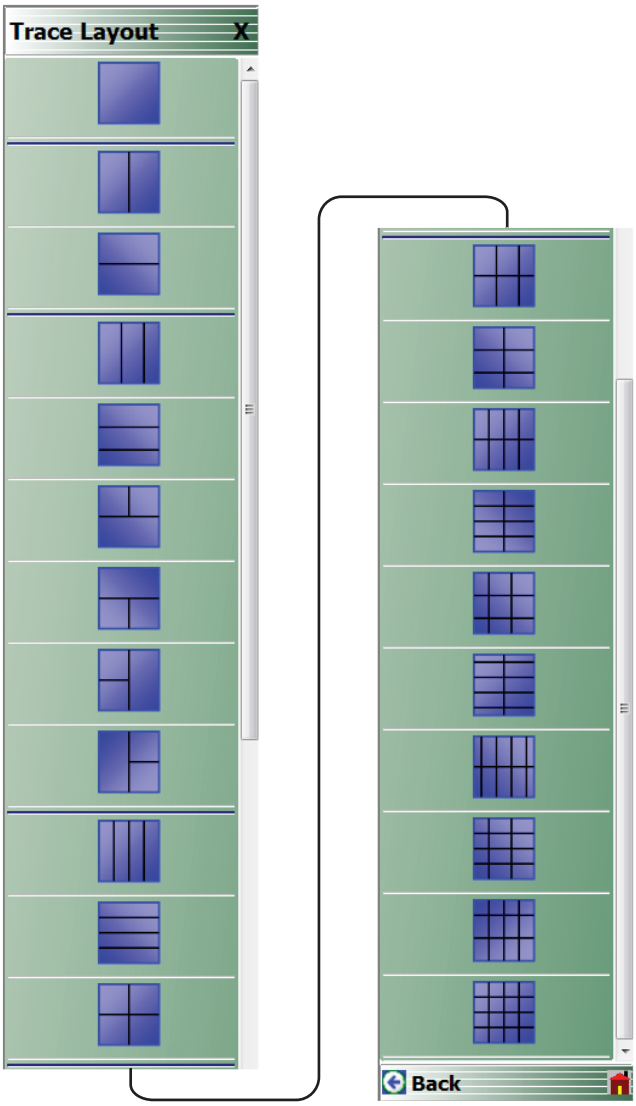


Figure 15-2. TRACE LAYOUT Menu (1 of 3)

	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 15-2. 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 15-2. TRACE LAYOUT Menu (3 of 3)

Chapter 16 — Response Menus: 2-Port VNAs

16-1 Chapter Overview

This chapter provides information on the 2-port VNA RESPONSE menus used to configure S-Parameters using standard options, or to configure user-defined parameters.

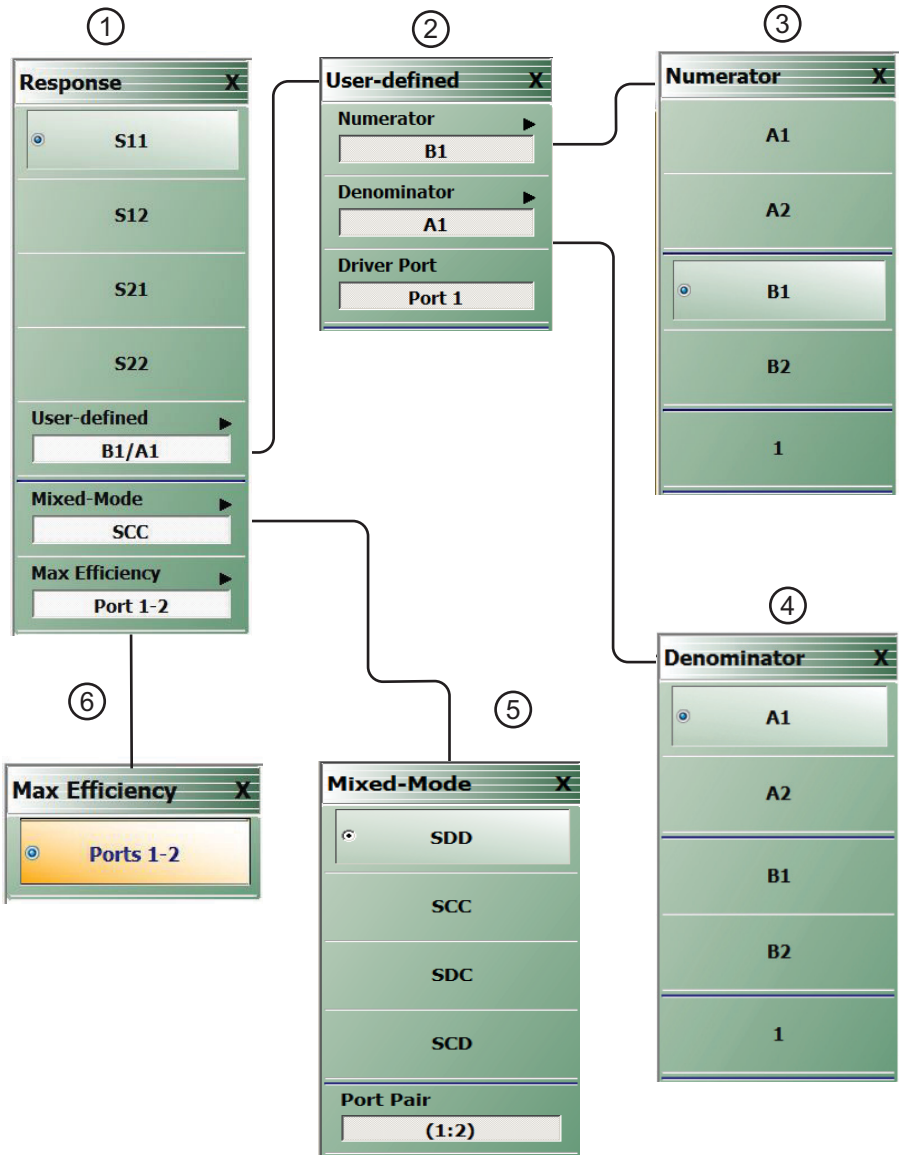
16-2 Overview of Response Menus – 1-Port and 2-Port VNAs

The available 2-port Response menus are:

- RESPONSE Menu on page 16-3
- USER-DEFINED Menu on page 16-5
  - NUMERATOR Menu on page 16-7
  - DENOMINATOR Menu on page 16-8
- MIXED-MODE Menu on page 16-9

16-3 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 EFFICIENCY Menu

Figure 16-1. RESPONSE and USER-Defined Menu Set

16-4 RESPONSE Menu

RESPONSE Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Response | RESPONSE

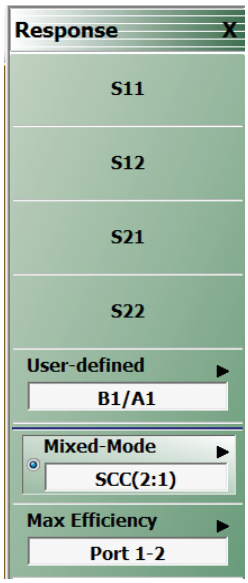


Figure 16-2. RESPONSE Menu

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 16-5

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,

- MIXED-MODE Menu on page 16-9

Max Efficiency

Select displays the kQ product measurement or maximum power efficiency for wireless power transfer.

16-5 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 16-1, "User-Defined Numerator/Denominator Combinations" for all possible combinations and definitions of common 2-port parameters.

Previous

- RESPONSE Menu on page 16-3

Navigation

- MAIN | Response | RESPONSE | User-Defined | USER-DEFINED

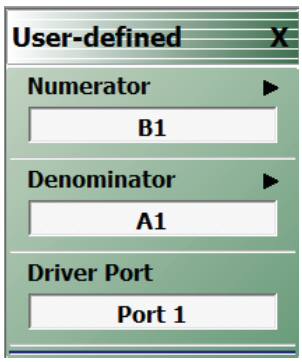


Figure 16-3. USER DEFINED Menu

Numerator

Select displays the NUMERATOR menu.

- NUMERATOR Menu on page 16-7

Denominator

Select displays the DENOMINATOR menu.

- DENOMINATOR Menu on page 16-8

Driver Port (Port 1/Port 2)

Select toggles the driver port setting between Port 1 and Port 2.

Table 16-1. User-Defined Numerator/Denominator Combinations

	Numerator				
Denominator	**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 16-5

Navigation

- MAIN | Response | RESPONSE | User-Defined | USER-DEFINED | Numerator | NUMERATOR

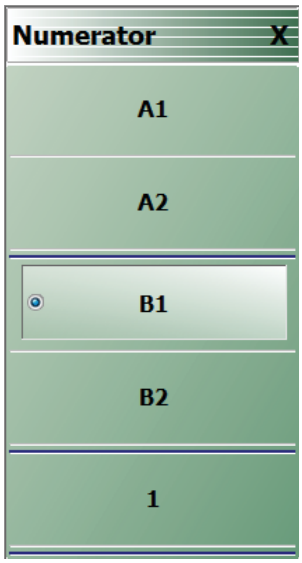


Figure 16-4. NUMERATOR Menu – 2-Port VNAs

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.

DENOMINATOR Menu

Previous

- USER-DEFINED Menu on page 16-5

Navigation

- MAIN | Response | RESPONSE | User-Defined | USER DEFINED | Denominator | DENOMINATOR

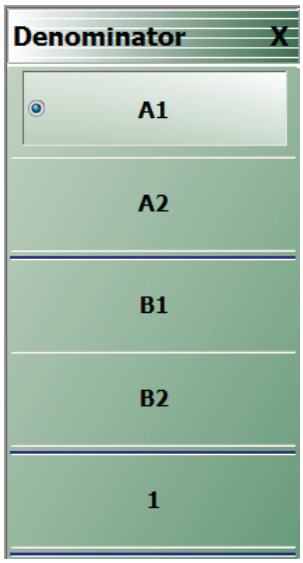


Figure 16-5. DENOMINATOR Menu

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.

MIXED-MODE Menu

Previous

- RESPONSE Menu on page 16-3

Navigation

- MAIN | Response | RESPONSE |Mixed-Mode | MIXED-MODE

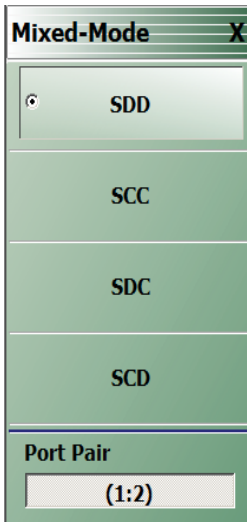


Figure 16-6. MIXED-MODE

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.

Max Efficiency

Previous

- RESPONSE Menu on page 16-3

Navigation

MAIN | Response | RESPONSE | Max Efficiency | Max Efficiency

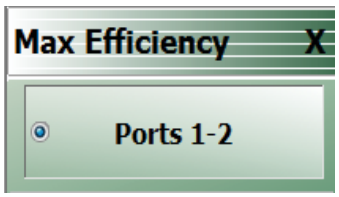


Figure 16-7. Max Efficiency

Port 1-2

Select measures the maximum power efficiency or kQ product using a wireless power transfer system between ports 1 and 2.

Chapter 17 — Response Menus: 4-Port VNAs

17-1 Chapter Overview

This chapter provides information about the 4-Port VNA RESPONSE menus for configuration of standard S-Parameters or user-definition of a unique parameter. The MIXED MODE dialog box variants provide mixed-mode response setup on a trace-by-trace basis with multiple response options for each trace.

For information on response menus for 2-Port VNAs, consult Chapter 16, "Response Menus: 2-Port VNAs"

17-2 Overview of 4-Port Response Menus and Dialog Boxes

The available 4-port Response menus and dialog boxes are:

- RESPONSE Menu – 4-Port VNAs on page 17-2
- SINGLE-MODE Menu – 4-Port VNAs on page 17-8
- "USER-DEFINED Menu Set- 4-Port VNAs" on page 17-9
  - NUMERATOR Menu – 4-Port VNAs on page 17-11
  - DENOMINATOR Menu – 4-Port VNAs on page 17-12
- "MIXED MODE Dialog Box Variants- 4-Port VNAs" on page 17-13
  - "MIXED MODE Dialog Box – Two Differential Pairs – 4-Port VNAs" on page 17-13
  - "MIXED MODE Dialog Box – One Differential Pair – One Singleton – 4-Port VNAs" on page 17-15
  - "MIXED MODE Dialog Box – One Differential Pair – Two Singletons – 4-Port VNAs" on page 17-17
  - "SELECT TRACE Dialog Box – 4-Port VNAs" on page 17-19

17-3 RESPONSE Menu Set – 4-Port VNAs

RESPONSE Menu – 4-Port VNAs

Prerequisites

- The VNA must be in 4-Port Mode

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Response | RESPONSE

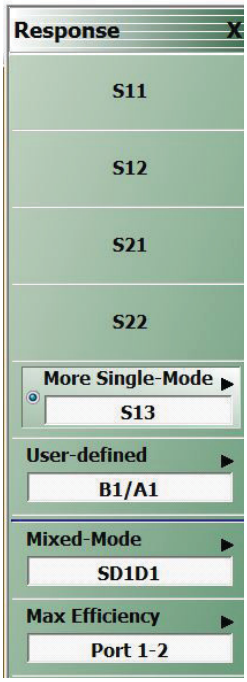


Figure 17-1. RESPONSE Menu – 4-Port VNAs

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).

More Single-Mode

Select displays the SINGLE-MODE menu where 4-Port S-Parameters are selected from the following selections: S13, S14, S23, S24, S31, S32, S33, S34, S41, S42, S43, S44.

- "RESPONSE and SINGLE-MODE Menus" on page 17-4
- "SINGLE-MODE Menu – 4-Port VNAs" on page 17-8

User-Defined

Select sets the response to a user-defined mathematical fraction, and displays 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.

- "RESPONSE and USER-DEFINED Menus" on page 17-5
- "USER-DEFINED Menu Set- 4-Port VNAs" on page 17-9

Mixed-Mode

Select de-selects all other menu buttons and displays the MIXED MODE dialog box for three general mixed-mode configurations of:

- Two differential pairs
- One differential pair and one singleton
- One differential pair and two singletons

The button field displays the currently selected mixed-mode settings where SXX is the selected response type and numbers are the assigned port number.

- "RESPONSE Menu and MIXED MODE Dialog Box Variants" on page 17-6
- "MIXED MODE Dialog Box Variants- 4-Port VNAs" on page 17-13

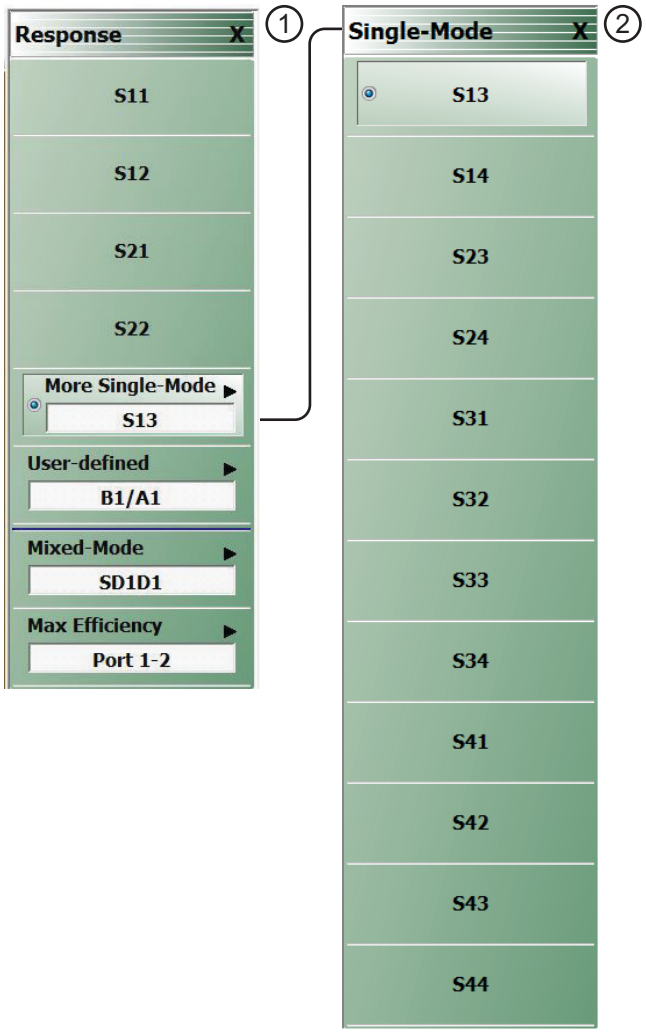
Max Efficiency

The MAX EFFICIENCY menu provides a choice for selecting a variation of setups using two ports at a time.

RESPONSE and SINGLE-MODE Menus

The RESPONSE menu provides direct access to the standard S-Parameters S11, S12, S21, and S22, and also access to additional S-parameters through the SINGLE-MODE menu.

- SINGLE-MODE Menu – 4-Port VNAs on page 17-8



1. RESPONSE Menu – 4-Port VNAs	2. SINGLE-MODE Menu – 4-Port VNAs

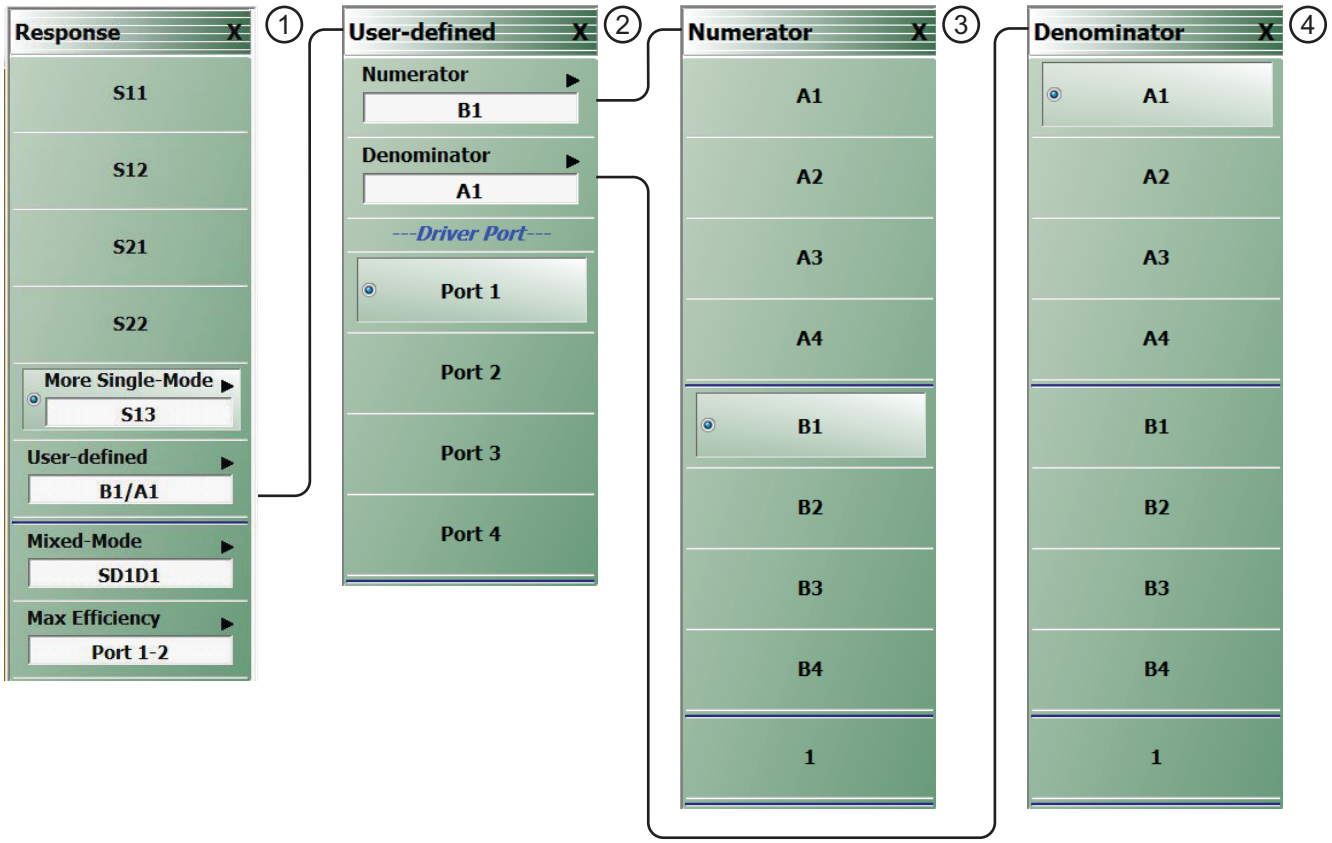
Figure 17-2. RESPONSE and SINGLE-MODE Menus – 4-Port VNAs

The SINGLE-MODE menu provides access for setting S13 through S44 parameters to the active trace.

RESPONSE and USER-DEFINED Menus

The RESPONSE menu provides access to create user-defined parameters as shown in Figure 17-3.

Note that all parameters listed on the NUMERATOR and DENOMINATOR menus are available regardless of the calibration in place. Some parameters selected for a user-defined parameter could be uncorrected if they were not included in the original calibration.



1. RESPONSE Menu – 4-Port VNAs	3. NUMERATOR Menu – 4-Port VNAs
2. USER-DEFINED Menu – 4-Port VNAs	4. DENOMINATOR Menu – 4-Port VNAs

Figure 17-3. Response Menu Set – 4-Port VNAs

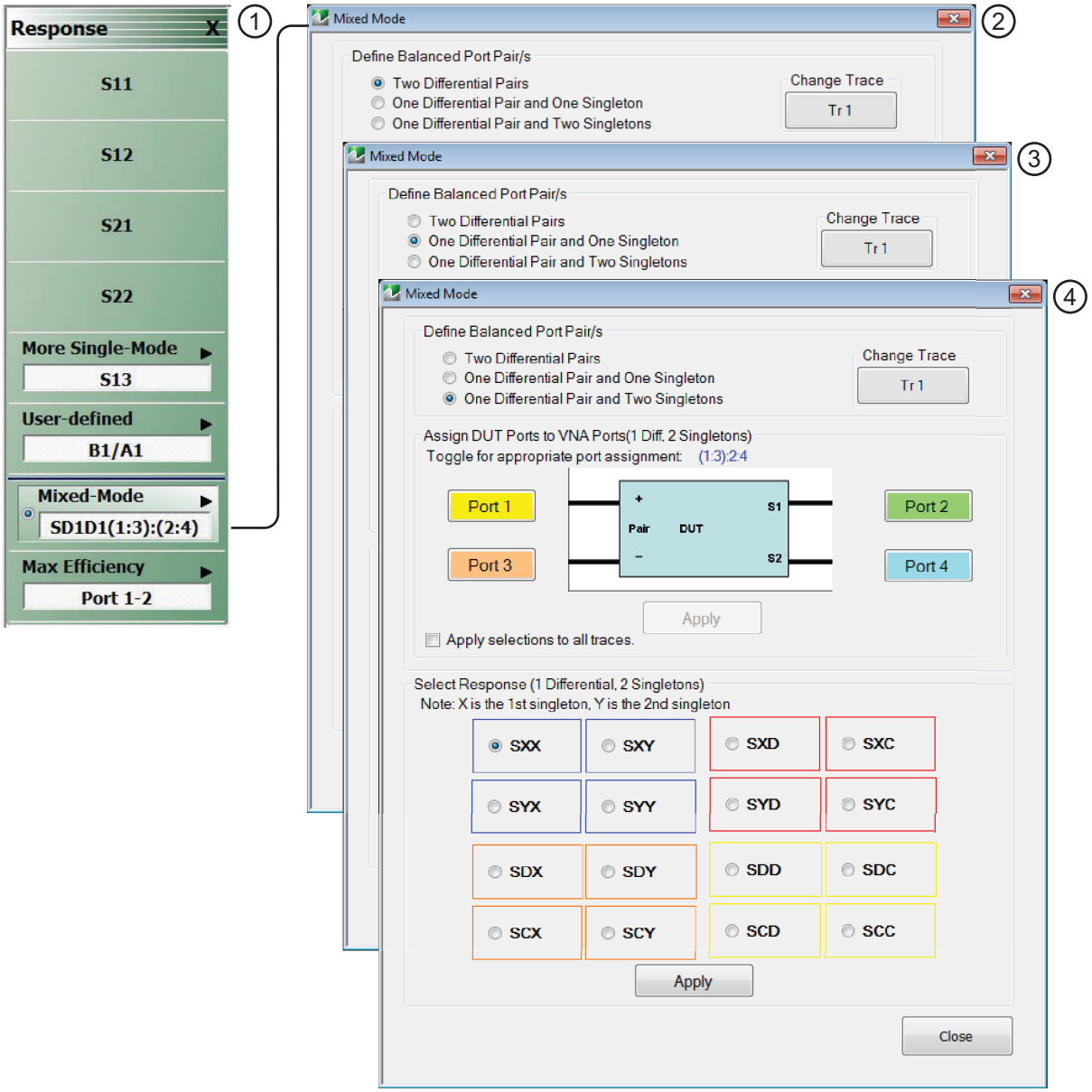
The USER-DEFINED menu provides access to the NUMERATOR and DENOMINATOR menus to assign numerator and denominator values of a user-defined parameter, and also provides a control for specifying the driver port.

RESPONSE Menu and MIXED MODE Dialog Box Variants

The MIXED MODE dialog box provides setup for using any of three mixed-mode configurations:

- Two differential pairs
- One differential pair and one singleton
- One differential pair and two singletons

Each mixed-mode configuration dialog box provides control of all response measurement parameters.

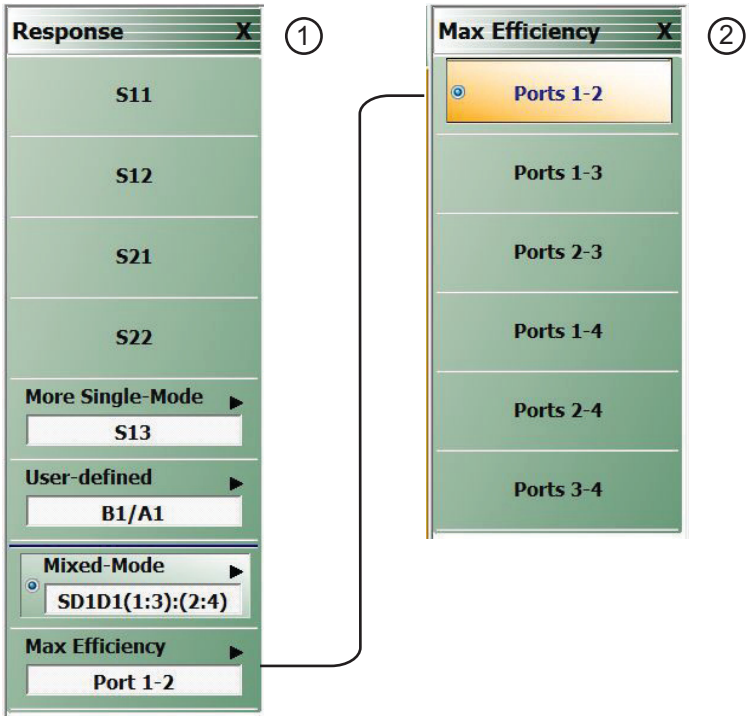


1. RESPONSE Menu and Mixed Mode button.
2. MIXED MODE Dialog Box for Two Differential Pairs.
3. MIXED MODE Dialog Box for One Differential Pair and One Singleton.
4. MIXED MODE Dialog Box for One Differential Pair and Two Singletons.

Figure 17-4. RESPONSE Menu and MIXED MODE Dialog Box Variants – 4-Port VNA

RESPONSE Menu and MAX EFFICIENCY Menu

The MAX EFFICIENCY menu provides a choice for selecting a variation of setups using two ports at a time.



1. RESPONSE Menu	2. MAX EFFICIENCY Menu

Figure 17-5. RESPONSE and MAX EFFICIENCY Menu

17-4 SINGLE-MODE Menu – 4-Port VNAs

Prerequisites

- The VNA must be in 4-Port Mode

Previous

- RESPONSE Menu – 4-Port VNAs on page 17-2

Navigation

- MAIN | Response | RESPONSE | More Single-Mode | SINGLE-MODE

S13

Select sets S-Parameter to S13.

S14

Select sets S-Parameter to S14.

S23

Select sets S-Parameter to S23.

S24

Select sets S-Parameter to S24.

S31

Select sets S-Parameter to S31.

S32

Select sets S-Parameter to S32.

S33

Select sets S-Parameter to S33.

S34

Select sets S-Parameter to S34.

S41

Select sets S-Parameter to S41.

S42

Select sets S-Parameter to S42.

S43

Select sets S-Parameter to S43.

S44

Select sets S-Parameter to S44.

Figure 17-6. SINGLE-MODE Menu – 4-Port VNAs

17-5 USER-DEFINED Menu Set- 4-Port VNAs

USER-DEFINED Menu – 4-Port VNAs

The USER-DEFINED menu is used to establish various mathematical combinations of incident and reflected power values. See Table 17-1, "User-Defined 4-Port Mathematical Combinations" on page 17-10 below for a listing of all possible parameter combinations.

Prerequisites

- The VNA must be in 4-Port Mode

Previous

- RESPONSE Menu – 4-Port VNAs on page 17-2

Navigation

- MAIN | Response | RESPONSE | User-Defined | USER-DEFINED

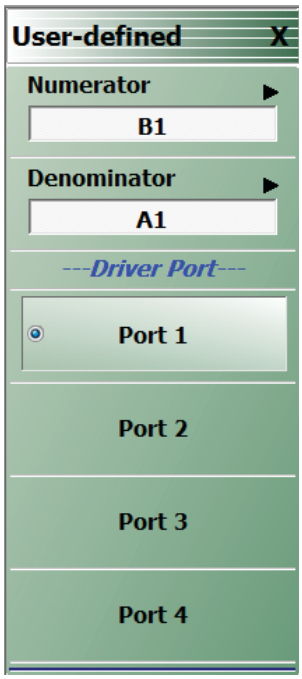


Figure 17-7. USER-DEFINED Menu – 4-Port VNAs

Numerator

Select displays the NUMERATOR menu.

- NUMERATOR Menu – 4-Port VNAs on page 17-11

Denominator

Select displays the DENOMINATOR menu.

- DENOMINATOR Menu – 4-Port VNAs on page 17-12

----Driver Port----

Select Port 1, Port 2, Port 3, or Port 4 to set the driving port.

Table 17-1. User-Defined 4-Port Mathematical Combinations

	Numerator								
Denominator	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**	**1**
A1	$\frac{A1}{A1} = 1$ Unity	$\frac{A2}{A1}$	$\frac{A3}{A1}$	$\frac{A4}{A1}$	$\frac{B1}{A1}$ S11	$\frac{B2}{A1}$ S21	$\frac{B3}{A1}$ S31	$\frac{B4}{A1}$ S41	$\frac{1}{A1}$
A2	$\frac{A1}{A2}$	$\frac{A2}{A2} = 1$ Unity	$\frac{A3}{A2}$	$\frac{A4}{A2}$	$\frac{B1}{A2}$ S12	$\frac{B2}{A2}$ S22	$\frac{B3}{A2}$ S32	$\frac{B4}{A2}$ S42	$\frac{1}{A2}$
A3	$\frac{A1}{A3}$	$\frac{A2}{A3}$	$\frac{A3}{A3} = 1$ Unity	$\frac{A4}{A3}$	$\frac{B1}{A3}$ S13	$\frac{B2}{A3}$ S23	$\frac{B3}{A3}$ S33	$\frac{B4}{A3}$ S43	$\frac{1}{A3}$
A4	$\frac{A1}{A4}$	$\frac{A2}{A4}$	$\frac{A3}{A4}$	$\frac{A4}{A4} = 1$ Unity	$\frac{B1}{A4}$ S14	$\frac{B2}{A4}$ S24	$\frac{B3}{A4}$ S34	$\frac{B4}{A4}$ S44	$\frac{1}{A4}$
B1	$\frac{A1}{B1}$	$\frac{A2}{B1}$	$\frac{A3}{B1}$	$\frac{A4}{B1}$	$\frac{B1}{B1} = 1$ Unity	$\frac{B2}{B1}$	$\frac{B3}{B1}$	$\frac{B4}{B1}$	$\frac{1}{B1}$
B2	$\frac{A1}{B2}$	$\frac{A2}{B2}$	$\frac{A3}{B2}$	$\frac{A4}{B2}$	$\frac{B1}{B2}$	$\frac{B2}{B2} = 1$ Unity	$\frac{B3}{B2}$	$\frac{B4}{B2}$	$\frac{1}{B2}$
B3	$\frac{A1}{B3}$	$\frac{A2}{B3}$	$\frac{A3}{B3}$	$\frac{A4}{B3}$	$\frac{B1}{B3}$	$\frac{B1}{B3}$	$\frac{B3}{B3} = 1$ Unity	$\frac{B4}{B3}$	$\frac{1}{B3}$
B4	$\frac{A1}{B4}$	$\frac{A2}{B4}$	$\frac{A3}{B4}$	$\frac{A4}{B4}$	$\frac{B1}{B4}$	$\frac{B2}{B4}$	$\frac{B3}{B4}$	$\frac{B4}{B4} = 1$ Unity	$\frac{1}{B4}$
1	$\frac{A1}{1} = A1$ A1	$\frac{A2}{1} = A2$ A2	$\frac{A3}{1} = A3$ A3	$\frac{A4}{1} = A4$ A4	$\frac{B1}{1} = B1$ B1	$\frac{B2}{1} = B2$ B2	$\frac{B3}{1} = B3$ B3	$\frac{B4}{1} = B4$ B4	$\frac{1}{1} = 1$ Unity

NUMERATOR Menu – 4-Port VNAs

Possible combinations of the NUMERATOR and DENOMINATOR menu functions are summarized above in Table 17-1, “User-Defined 4-Port Mathematical Combinations” on page 17-10.

Prerequisites

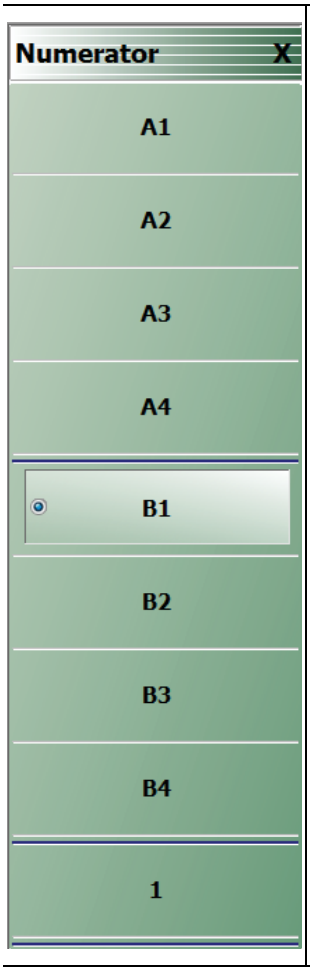
- The VNA must be in 4-Port Mode

Previous

- USER-DEFINED Menu Set- 4-Port VNAs on page 17-9

Navigation

- MAIN | Response | RESPONSE | User-Defined | USER DEFINED | Numerator | NUMERATOR



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.

A3

Select sets A3 incident power on port 3 as the numerator value.

A4

Select sets A4 incident power on port 4 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.

B3

Select sets B3 received power on port 3 as the numerator value.

B4

Select sets B4 received power on port 4 as the numerator value.

1

Select specifies that 1 (one) will be the numerator value.

Figure 17-8. NUMERATOR Menu – 4-Port VNAs

DENOMINATOR Menu – 4-Port VNAs

Possible combinations of the NUMERATOR and DENOMINATOR functions are summarized above in Table 17-1, "User-Defined 4-Port Mathematical Combinations" on page 17-10.

Prerequisites

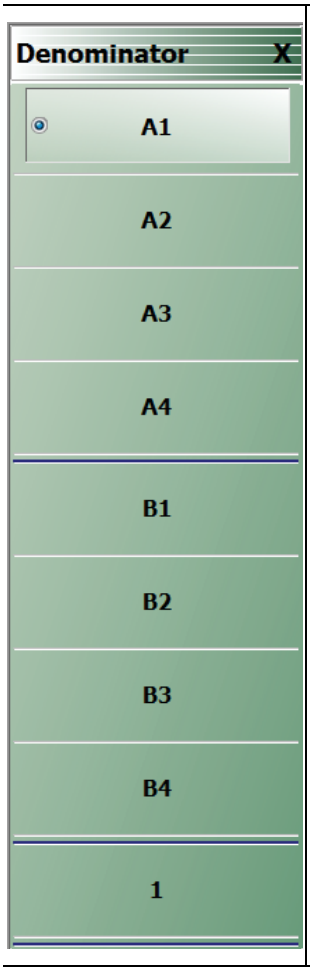
- The VNA must be in 4-Port Mode

Previous

- USER-DEFINED Menu Set- 4-Port VNAs on page 17-9

Navigation

- MAIN | Response | RESPONSE | User-Defined | USER DEFINED | Denominator | DENOMINATOR



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.

A3

Select sets A3 incident power on port 3 as the denominator value.

A4

Select sets A4 incident power on port 4 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.

B3

Select sets B3 received power on port 3 as the denominator value.

B4

Select sets B4 received power on port 4 as the denominator value.

1

Select sets 1 (one) as the denominator value.

Figure 17-9. DENOMINATOR Menu – 4-Port VNAs

17-6 MIXED MODE Dialog Box Variants- 4-Port VNAs

MIXED MODE Dialog Box – Two Differential Pairs – 4-Port VNAs

Prerequisites

- Balanced Port Pair Setting = Two Differential Pairs

Previous

- RESPONSE Menu – 4-Port VNAs on page 17-2

Navigation

- MAIN | Response | RESPONSE | Mixed Mode | MIXED MODE Dialog Box | Two Differential Pairs

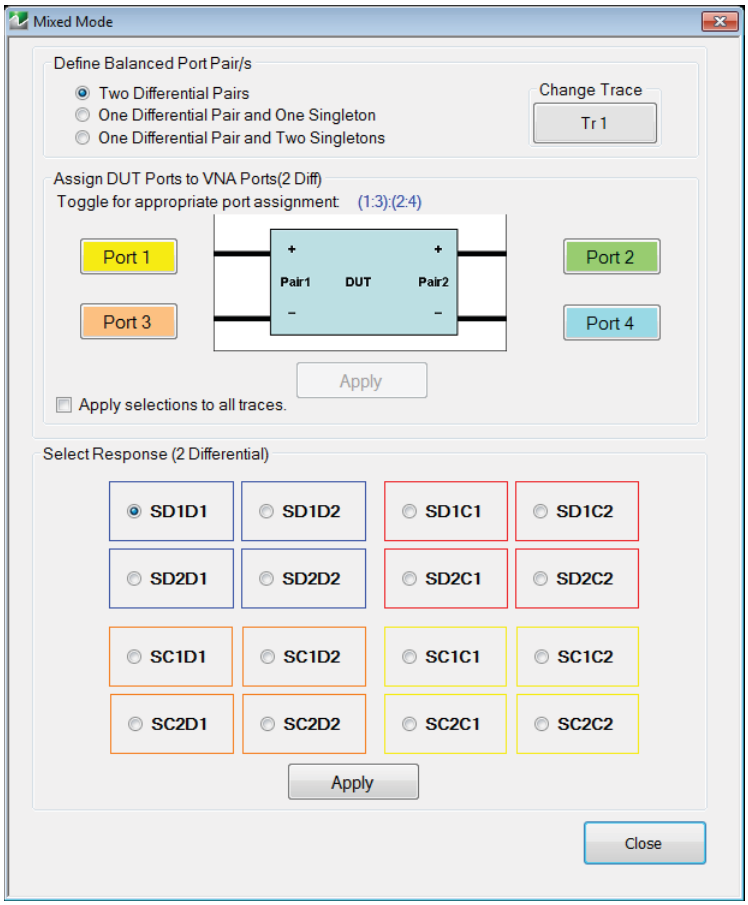


Figure 17-10. MIXED MODE Dialog Box – Two Differential Pairs

Define Balanced Port Pair(s)

Option selected:

- Two Differential Pairs

Change Trace

Change Trace button displays currently active trace number. Select opens the SELECT TRACE dialog box with options for trace selection.

- "SELECT TRACE Dialog Box – 4-Port VNAs" on page 17-19

Assign DUT Ports to VNA Ports (2 Diff)

For each DUT connection, click the Port button to select the appropriate VNA Port Number. Each port assignment must be unique.

- DUT Port Pair 1
  - Pair 1 (+): Select positive polarity port from VNA Ports 1, 2, 3, or 4
  - Pair 1 (–): Select negative polarity port from VNA Ports 1, 2, 3, or 4
- DUT Port Pair 2:
  - Pair 2 (+): Select positive polarity port from VNA Ports 1, 2, 3, or 4
  - Pair 2 (–): Select negative polarity port from VNA Ports 1, 2, 3, or 4

Apply

Select applies the port assignments, displayed above the DUT Ports/VNA Ports diagram. For example:

- (1:2):(3:4) = First port pair measured from ports 1 to 2: second port pair measured from ports 3 to 4

Apply selections to all traces

Select check box to apply the port pair selections to all traces.

Select Response

Select the required 2-differential response characteristic from the available 16 combinations of pure differential (D) and common-mode (C) parameters. Only one response may be selected:

- Differential Reception with Differential Drive S-Parameters
  - SD1D1 – S-parameter for differential reception at Pair 1 and differential drive at Pair 1.
  - SD1D2 – S-parameter for differential reception at Pair 1 and differential drive at Pair 2
  - SD2D1 – S-parameter for differential reception at Pair 2 and differential drive at Pair 1
  - SD2D2 – S-parameter for differential reception at Pair 2 and differential drive at Pair 2
- Common-Mode Reception with Differential Drive S-Parameters
  - SC1D1 – S-parameter for common-mode reception at Pair 1 and differential drive at Pair 1
  - SC1D2 – S-parameter for common-mode reception at Pair 1 and differential drive at Pair 2
  - SC2D1 – S-parameter for common-mode reception at Pair 2 and differential drive at Pair 1
  - SC2D2 – S-parameter for common-mode reception at Pair 2 and differential drive at Pair 2
- Differential Reception with Common-Mode Drive S-Parameters
  - SD1C1 – S-parameter for differential reception at Pair 1 and common-mode drive at Pair 2
  - SD1C2 – S-parameter for differential reception at Pair 1 and common-mode drive at Pair 2
  - SD2C1 – S-parameter for differential reception at Pair 2 and common-mode drive at Pair 1
  - SD2C2 – S-parameter for differential reception at Pair 2 and common-mode drive at Pair 2
- Common-Mode Reception with Common-Mode Drive S-Parameters
  - SC1C1 – S-parameter for common-mode reception at Pair 1 and common-mode drive at Pair 1
  - SC1C2 – S-parameter for common-mode reception at Pair 1 and common-mode drive at Pair 2
  - SC2C1 – S-parameter for common-mode reception at Pair 2 and common-mode drive at Pair 1
  - SC2C2 – S-parameter for common-mode reception at Pair 2 and common-mode drive at Pair 2

Apply

Select applies the designated response characteristic.

Close

Select closes the dialog box.

MIXED MODE Dialog Box – One Differential Pair – One Singleton – 4-Port VNAs

Prerequisites

- Balanced Port Pair Setting = One Differential Pair and One Singleton

Previous

- RESPONSE Menu – 4-Port VNAs on page 17-2

Navigation

- MAIN | Response | RESPONSE | Mixed Mode | MIXED MODE Dialog Box | One Differential Pair and One Singleton

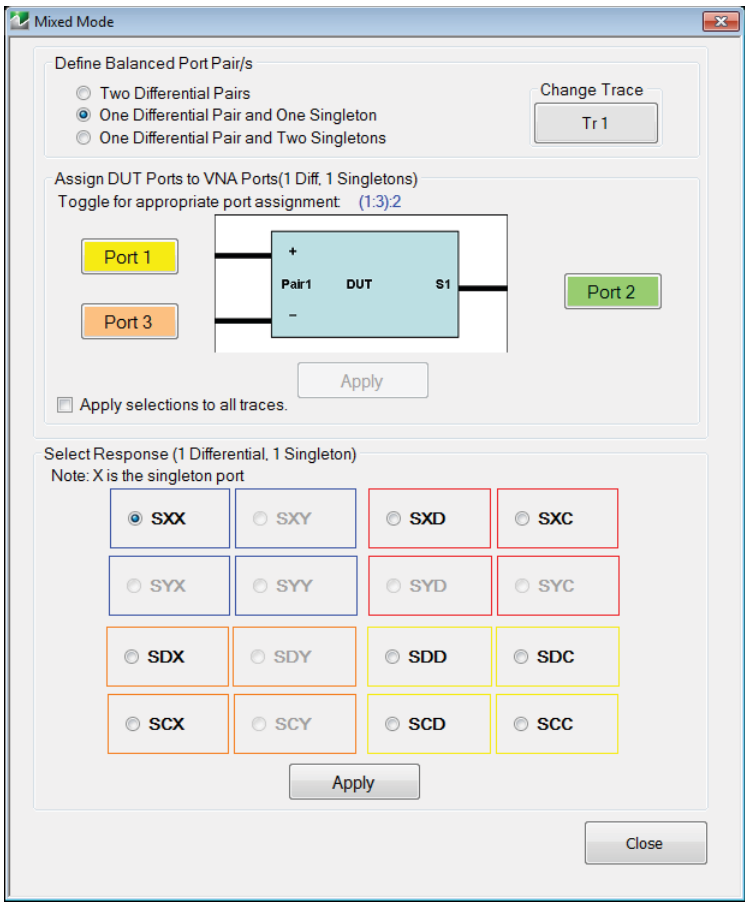


Figure 17-11. MIXED MODE Dialog Box – One Differential Pair and One Singleton – 4-Port VNAs

Define Balanced Port Pair(s)

Option selected:

- One Differential Pair and One Singleton

Change Trace

Change Trace button displays currently active trace number. Select opens the SELECT TRACE dialog box with options for trace selection.

- "SELECT TRACE Dialog Box – 4-Port VNAs" on page 17-19

Assign DUT Ports to VNA Ports (1 Diff, 1 Singleton)

For each DUT connection, click the Port button to select the appropriate VNA Port Number. Each port assignment must be unique.

- DUT Port Pair 1
  - Pair 1 (+): Select positive polarity port from VNA Ports 1, 2, 3, or 4
  - Pair 1 (–): Select negative polarity port from VNA Ports 1, 2, 3, or 4
- DUT S1 Singleton:
  - S1: Select from VNA Ports 1, 2, 3, or 4

Apply

Select applies the port assignments, displayed above the DUT Ports/VNA Ports diagram. For example:

- (1:2):3 = DUT port differential measured from ports 1 to 2: port 3 is the singleton

Apply selections to all traces

Select check box to apply the port pair selections to all traces.

Select Response

Select the required differential or common-mode response characteristic from the available 9 combinations of pure differential (D), common-mode (C), or singleton (X) parameters. Only one response may be selected:

- Reception at Singleton and Drive at Singleton
  - SXX – S-Parameter for singleton reception and singleton drive
- Reception at Singleton and Drive at Pair 1
  - SXD – S-Parameter for singleton reception and differential drive at Pair 1
  - SXC – S-Parameter for singleton reception and common-mode drive at Pair 1
- Reception at Pair 1 and Drive at Singleton
  - SDX – S-Parameter for differential reception at Pair 1 and singleton drive
  - SCX – S-Parameter for common-mode reception at Pair 1 and singleton drive
- Reception at Pair 1 and Drive at Pair 1
  - SDD – S-Parameter for differential reception at the Pair 1 and differential drive at the port pair
  - SDC – S-Parameter for differential reception at Pair 1 and common-mode drive at the port pair
  - SCD – S-Parameter for common-mode reception at Pair 1 and differential drive at the port pair
  - SCC – S-Parameter for common-mode reception at Pair 1 and common-mode drive at the port pair

Apply

Select applies the designated response characteristic.

Close

Select closes the dialog box.

MIXED MODE Dialog Box – One Differential Pair – Two Singletons – 4-Port VNAs

Prerequisites

- Balanced Port Pair Setting = One Differential Pair and Two Singletons

Previous

- RESPONSE Menu – 4-Port VNAs on page 17-2

Navigation

- MAIN | Response | RESPONSE | Mixed Mode | MIXED MODE Dialog Box | One Differential Pair and Two Singletons

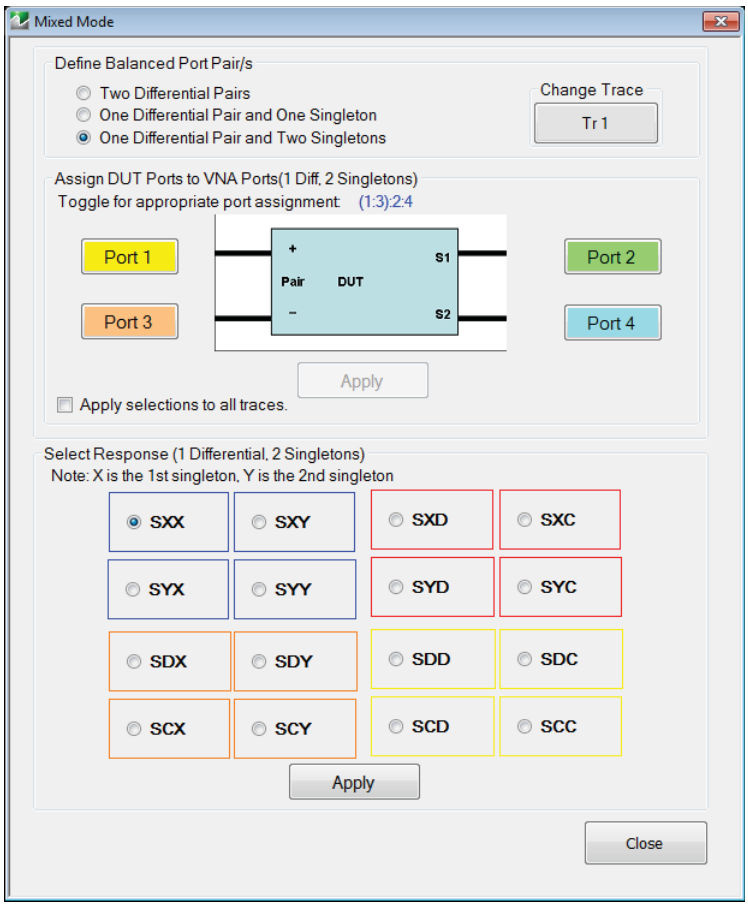


Figure 17-12. MIXED MODE Dialog Box – One Differential Pair and Two Singletons – 4-Port VNAs

Define Balanced Port Pair(s)

Option selected:

- One Differential Pair and Two Singletons

Change Trace

Change Trace button displays currently active trace number. Select opens the SELECT TRACE dialog box with options for trace selection.

- "SELECT TRACE Dialog Box – 4-Port VNAs" on page 17-19

Assign DUT Ports to VNA Ports (1 Diff, 1 Singleton)

For each DUT connection, click the Port button to assign a unique VNA port number.

- DUT Port Pair 1
  - Pair 1 (+): Select positive polarity port from VNA Ports 1, 2, 3, or 4
  - Pair 1 (–): Select negative polarity port from VNA Ports 1, 2, 3, or 4
- DUT S1 Singleton:
  - S1: Select from VNA Port 1, Port 2, Port 3, or Port 4
- DUT S2 Singleton:
  - S2: Select from VNA Port 1, Port 2, Port 3, or Port 4

Apply

Select applies the port assignments, displayed above the DUT Ports/VNA Ports diagram. For example:

- (1:2):3:4 = DUT port differential measured from ports 1 to 2: ports 3 and 4 are the singletons

Apply selections to all traces

Select check box to apply the port pair selections to all traces.

Select Response

Select the required differential or common-mode response characteristic from the available 16 combinations of pure differential (D), common-mode (C), first singleton (X), or second singleton (Y) parameters. Only one response may be selected:

- Reception at Singleton and Drive at Singleton
  - SXX – S-Parameter for first singleton reception and first singleton drive
  - SXY – S-Parameter for first singleton reception and second singleton drive
  - SYX – S-Parameter for second singleton reception and first singleton drive
  - SYY – S-Parameter for second singleton reception and second singleton drive
- Reception at Singleton and Drive at Pair 1
  - SXD – S-Parameter for first singleton reception and differential drive at Pair 1
  - SXC – S-Parameter for first singleton reception and common-mode drive at Pair 1
  - SYD – S-Parameter for second singleton reception and differential drive at Pair 1
  - SYC – S-Parameter for second singleton reception and common-mode drive at Pair 1
- Reception at Pair 1 and Drive at Singleton
  - SDX – S-Parameter for differential reception at Pair 1 and first singleton drive
  - SDY – S-Parameter for differential reception at Pair 1 and second singleton drive
  - SCX – S-Parameter for common-mode reception at Pair 1 and first singleton drive
  - SCY – S-Parameter for common-mode reception at Pair 1 and second singleton drive
- Reception at Pair 1 and Drive at Pair 1
  - SDD – S-Parameter for differential reception at Pair 1 and differential drive at the port pair.
  - SDC – S-Parameter for differential reception at Pair 1 and common-mode drive at the port pair.
  - SCD – S-Parameter for common-mode reception at Pair 1 and differential drive at the port pair.
  - SCC – S-Parameter for common-mode reception at Pair 1 and common-mode drive at the port pair.

Apply

Select applies the designated response characteristic.

Close

Select closes the dialog box.

SELECT TRACE Dialog Box – 4-Port VNAs

Prerequisites

- One of the three MIXED MODE dialog box configurations must be selected.

Previous

- "MIXED MODE Dialog Box – Two Differential Pairs – 4-Port VNAs" on page 17-13
  - Figure 17-10, "MIXED MODE Dialog Box – Two Differential Pairs" on page 17-13
- "MIXED MODE Dialog Box – One Differential Pair – One Singleton – 4-Port VNAs" on page 17-15
  - Figure 17-11, "MIXED MODE Dialog Box – One Differential Pair and One Singleton – 4-Port VNAs" on page 17-15
- "MIXED MODE Dialog Box – One Differential Pair – Two Singletons – 4-Port VNAs" on page 17-17
  - Figure 17-12, "MIXED MODE Dialog Box – One Differential Pair and Two Singletons – 4-Port VNAs" on page 17-17

Navigation

- MAIN | Response | RESPONSE | Mixed Mode | MIXED MODE Dialog Box | Change Trace | SELECT TRACE Dialog Box

Figure 17-13. SELECT TRACE Dialog Box – For Mixed-Mode Trace Assignment

Choose a trace to update

Select applies current mixed-mode settings to the designated trace, and closes the dialog box.

Chapter 18 — Display Menus

18-1 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.

18-2 Overview of Display Menus and Dialog Boxes

The available display menus and dialog boxes are:

- DISPLAY Menu on page 18-3
- DISPLAY Menu (When Using Max Efficiency Response) on page 18-5
- TRACE FORMAT (Using Max Efficiency in Response) Menu on page 18-7
- TRACE FORMAT Menu on page 18-8
    - IMPEDANCE Menu on page 18-11
    - SMITH IMPEDANCE Menu on page 18-13
- VIEW TRACE Menu on page 18-15
    - DATA MEM. OP. Menu on page 18-17
- LIMIT Menu on page 18-21
    - EDIT LIMIT LINE Menu on page 18-22
        - “Limit Line Type Setup Tableau Dialog” on page 18-24
        - “SAVE AS (LIMIT LINE LMT FILE) Dialog Box” on page 18-30
        - “OPEN (LIMIT LINE LMT FILE) Dialog Box” on page 18-31
- RIPPLE LIMIT Menu on page 18-32
- RIPPLE VALUE Menu on page 18-33
    - “Edit Ripple Limit Tableau Dialog” on page 18-36
    - “SAVE AS (RIPPLE LIMIT FILE) Dialog Box” on page 18-39
    - “OPEN (RIPPLE LIMIT FILE) Dialog Box” on page 18-40
- EDIT RIPPLE L Menu on page 18-34
- LIMIT/RIPPLE (Display Location) Menu on page 18-41
- DOMAIN (Frequency With No Time Gate) Menu on page 18-45
- DOMAIN (Frequency With Time Gate) Menu on page 18-46
- DOMAIN (Time Low Pass) Menu on page 18-47
- DOMAIN TIME (Band Pass) Menu on page 18-49
- TIME DEFINITION Menu on page 18-51
- RANGE SETUP (Frequency With Time Gate) Menu on page 18-54
- RANGE SETUP (Time Band Pass) Menu on page 18-56
- RANGE SETUP (Time Low Pass) Menu on page 18-58
- DC TERM Menu on page 18-60
- EXTRAPOLATION Menu on page 18-62

- WINDOW SHAPE Menu on page 18-63
  - "ADVANCED WINDOW SHAPE SETUP Dialog Box" on page 18-64
- GATE SETUP Menu on page 18-66
- GATE FUNCTION Menu on page 18-68
  - "ADVANCED GATE SHAPE SETUP Dialog Box" on page 18-70
- INTER-TRACE MATH Menu on page 18-72
  - "EQUATION EDITOR Dialog Box" on page 18-75
  - "INTRA TRACE OP. Menu" on page 18-74
- CONVERSION Menu on page 18-81
- DISPLAY AREA SETUP Menu on page 18-82

18-3 Display Main Menu

DISPLAY Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Display | DISPLAY

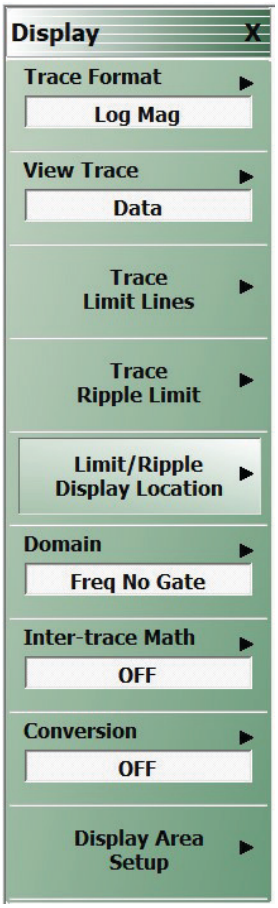


Figure 18-1. DISPLAY Menu

Trace Format

Displays the current trace format setting. Select displays the TRACE FORMAT menu.

- TRACE FORMAT Menu on page 18-8

Displays the TRACE FORMAT kQ Product menu when Max Efficiency is selected in the RESPONSE Menu

- TRACE FORMAT (Using Max Efficiency in Response) Menu on page 18-7

View Trace

Select displays the VIEW TRACE menu.

- VIEW TRACE Menu on page 18-15

Trace Limit Lines

Select displays the LIMIT menu.

- LIMIT Menu on page 18-21
- "DOMAIN Menu Appearance and Button Availability" on page 18-42

Trace Ripple Limit

Select displays the RIPPLE LIIMIT menu.

- LIMIT Menu on page 18-21

Limit /Ripple Display Location

Select displays the LIMIT/RIPPLE menu.

- LIMIT/RIPPLE (Display Location) Menu on page 18-41

Domain

Option 002 must be installed for Domain to be available. Once installed, select displays the DOMAIN menu.

- "DOMAIN Menu Appearance and Button Availability" on page 18-42
- DOMAIN (Frequency With No Time Gate) Menu on page 18-45
- DOMAIN (Frequency With Time Gate) Menu on page 18-46
- DOMAIN (Time Low Pass) Menu on page 18-47
- DOMAIN TIME (Band Pass) Menu on page 18-49

Inter-Trace Math

Select displays the INTER-TRACE MATH menu.

- INTER-TRACE MATH Menu on page 18-72

Conversion

Select displays the CONVERSION menu

- CONVERSION Menu on page 18-81

Display Area Setup

Select displays the DISPLAY SETUP menu.

- DISPLAY AREA SETUP Menu on page 18-82

DISPLAY Menu (When Using Max Efficiency Response)

Previous

- Main Menu on page 2-2

Prerequisite

- MAIN | Response | RESPONSE | Max Efficiency

Navigation

- MAIN | Display | DISPLAY

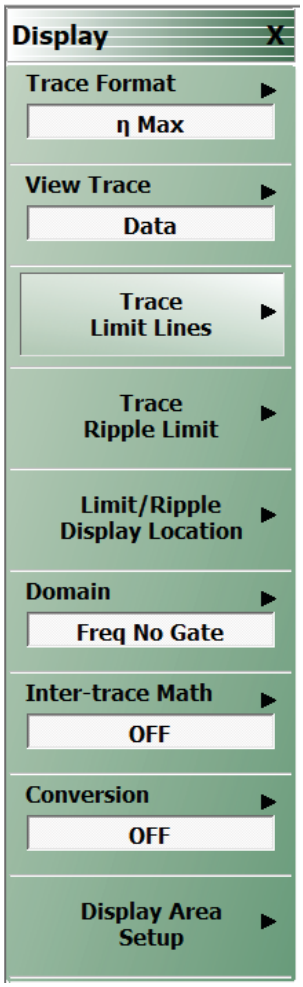


Figure 18-2. Display Menu Using Max Efficiency Response

Trace Format

Select displays the current trace format setting. Select displays the TRACE FORMAT menu.

- TRACE FORMAT Menu on page 18-8

View Trace

Select displays the VIEW TRACE menu.

- VIEW TRACE Menu on page 18-15

Trace Limit Lines

Select displays the LIMIT menu.

- LIMIT Menu on page 18-21
- "DOMAIN Menu Appearance and Button Availability" on page 18-42

Limit /Ripple Display Location

Select displays the LIMIT/RIPPLE menu.

- LIMIT/RIPPLE (Display Location) Menu on page 18-41

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.

- "DOMAIN Menu Appearance and Button Availability" on page 18-42
- DOMAIN (Frequency With No Time Gate) Menu on page 18-45
- DOMAIN (Frequency With Time Gate) Menu on page 18-46
- DOMAIN (Time Low Pass) Menu on page 18-47
- DOMAIN TIME (Band Pass) Menu on page 18-49

Inter-Trace Math

Select displays the INTER-TRACE MATH menu.

- INTER-TRACE MATH Menu on page 18-72

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 18-82

TRACE FORMAT (Using Max Efficiency in Response) Menu

Previous

- Main Menu on page 2-2

Prerequisite

- MAIN | Response | RESPONSE | Max Efficiency

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT

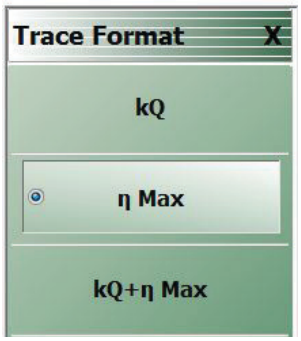


Figure 18-3. TRACE FORMAT (Using Maximum Efficiency in Response) Menu

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.

18-4 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 2-2

Navigation

- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT

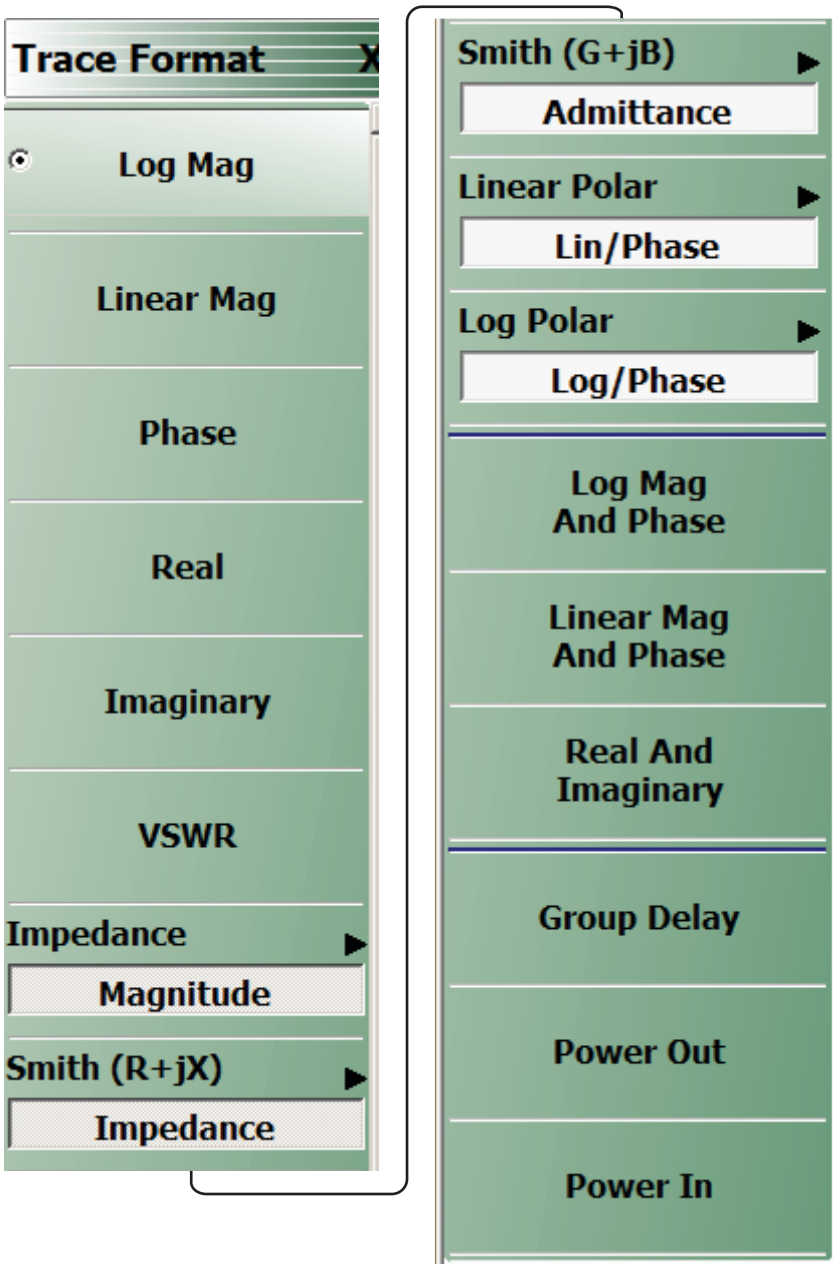


Figure 18-4. TRACE FORMAT Menu

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 18-11

Smith (R+jX)

Select displays the SMITH (with Impedance) submenu to configure the display of Smith Impedance charts.

- SMITH IMPEDANCE Menu on page 18-13

Smith (G+jB)

Select displays the SMITH (with Admittance) submenu to configure the display of Smith Impedance charts.

- SMITH IMPEDANCE Menu on page 18-13

Linear Polar

Select sets a linear polar display.

Log Polar

Select sets a logarithmic polar display.

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.

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

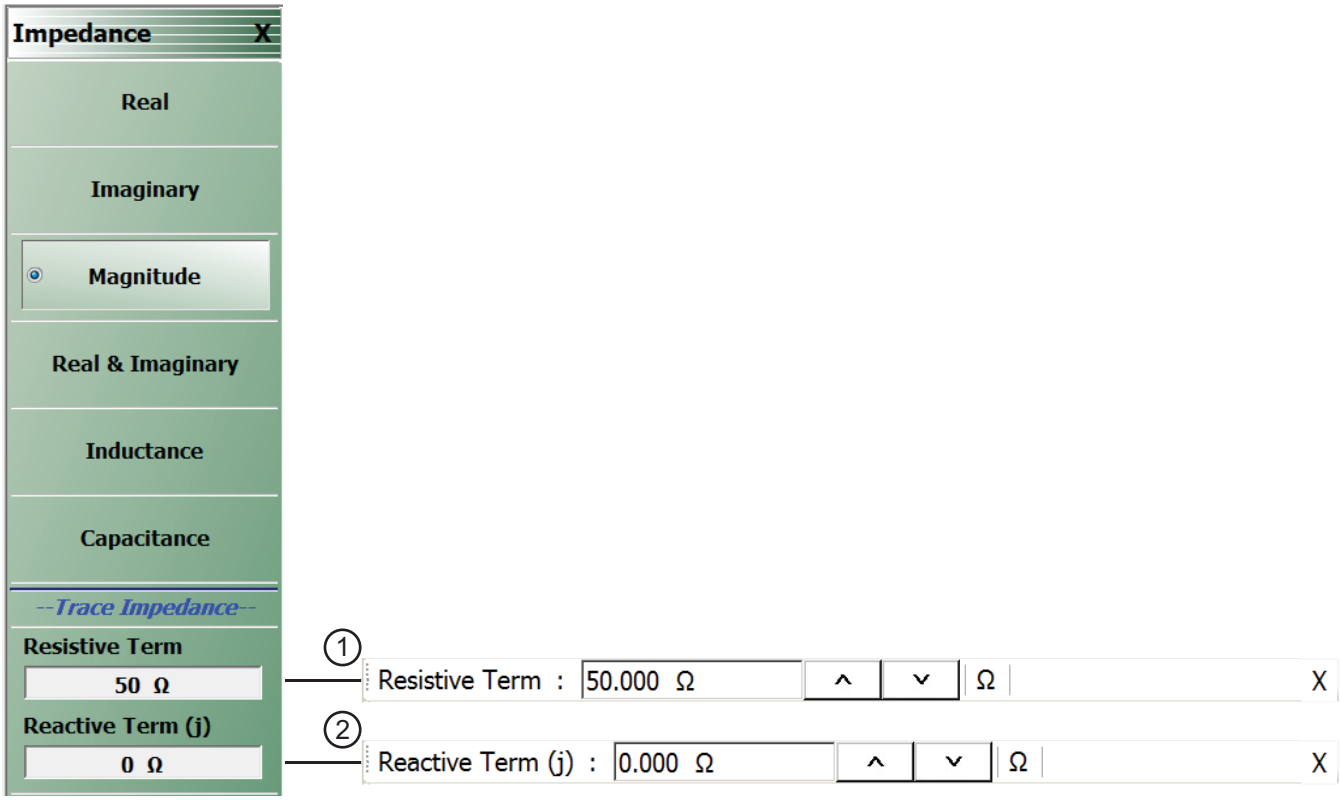
- TRACE FORMAT Menu on page 18-8

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 18-5. 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/Capacitance

Select enables marker Inductance or 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 18-8

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 19-13
- MAIN | Scale | SCALE | Scale Selection | SMITH SCALING

Figure 18-6. 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.

Inductance/Capacitance

Select enables marker Inductance or Capacitance measurement readout

SMITH ADMITTANCE Menu

Previous

- TRACE FORMAT Menu on page 18-8

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 19-13
- MAIN | Scale | SCALE | Scale Selection | SMITH SCALING

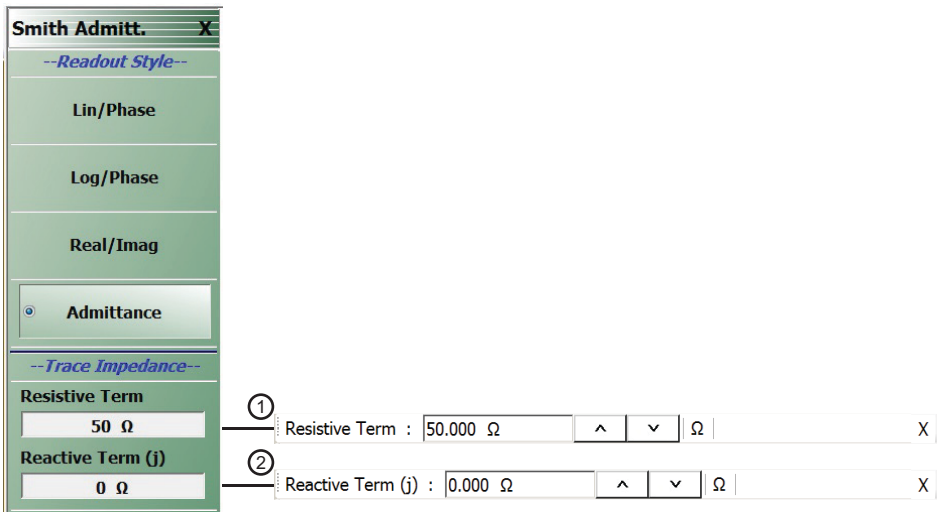


Figure 18-7. SMITH (ADMITTANCE) Menu

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.

VIEW TRACE Menu

Previous

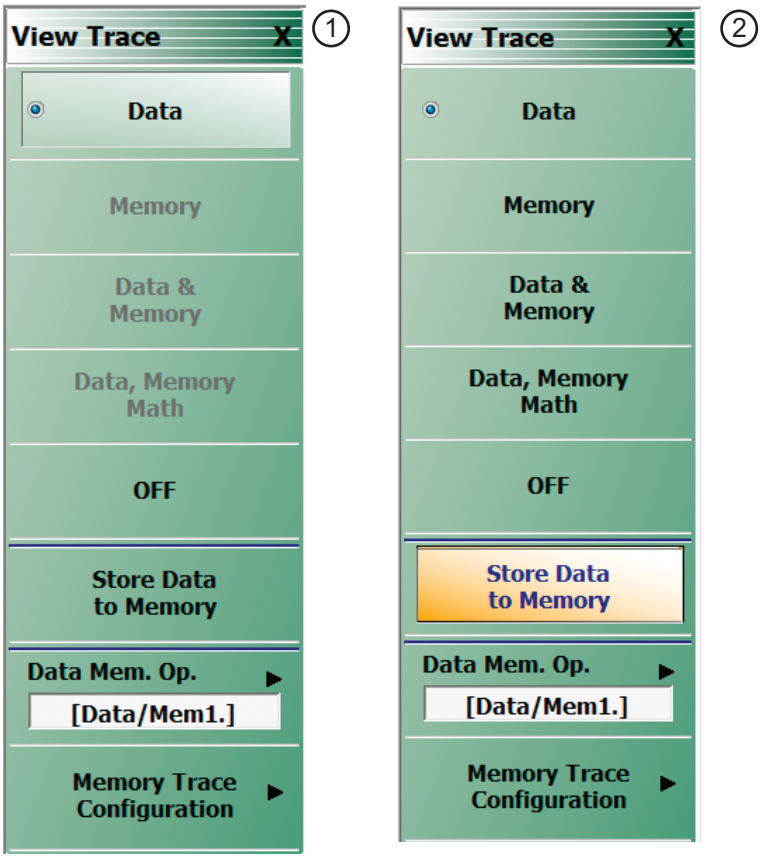
- TRACE FORMAT Menu on page 18-8

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 18-8.
- 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 18-8. 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 18-17

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 enables the Store Data MemMath to Memory button (below) and 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 will store displayed data to memory.

Data Mem. Op.

Select displays the DATA MEM OP menu.

- DATA MEM. OP. Menu on page 18-17

Memory Trace Configuration

Select displays the MEMORY TRACE CONFIGURATION(Trx) menu.

- MEMORY TRACE CONFIGURATION(Trx) Menu on page 18-18

DATA MEM. OP. Menu

Full Name

- Data Memory Operations Setup Menu

Previous

- VIEW TRACE Menu on page 18-15

Navigation

- MAIN | Display | DISPLAY | View Trace | VIEW TRACE | Data Mem Op | DATA MEM OP

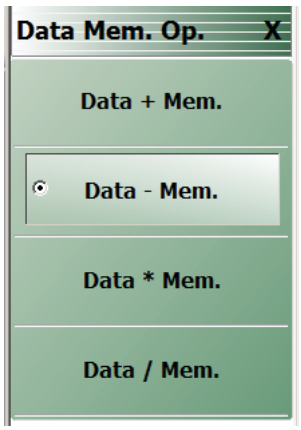


Figure 18-9. DATA-MEM. OP. (DATA-MEMORY OPERATIONS) Menu

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 18-15

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 18-10.

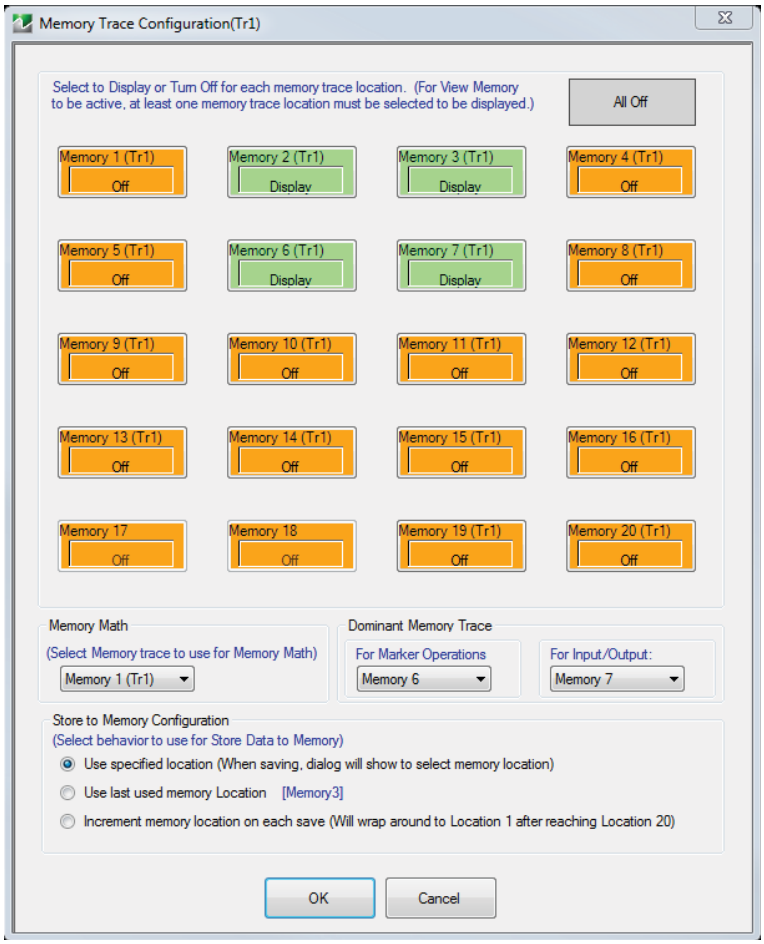


Figure 18-10. MEMORY TRACE CONFIGURATION Dialog

Memory Math

Select Memory Trace to use for Memory Math

Dominant Memory Trace

For Marker Operations – Drop-down provides memory trace selections. Select a memory trace from the drop-down menu for an active marker to follow.

For Input/Output – Select the trace memory location from the drop-down 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 21-6

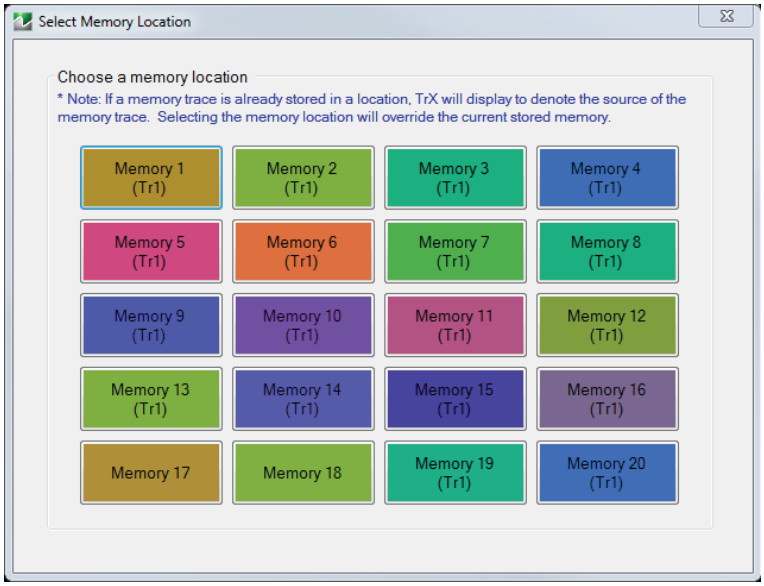


Figure 18-11. Select Memory Location

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 18-12 indicates the memory location displayed.

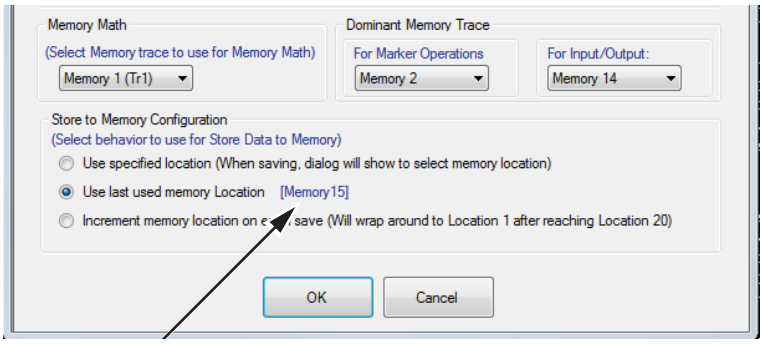


Figure 18-12. Last Memory Location

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 18-13.

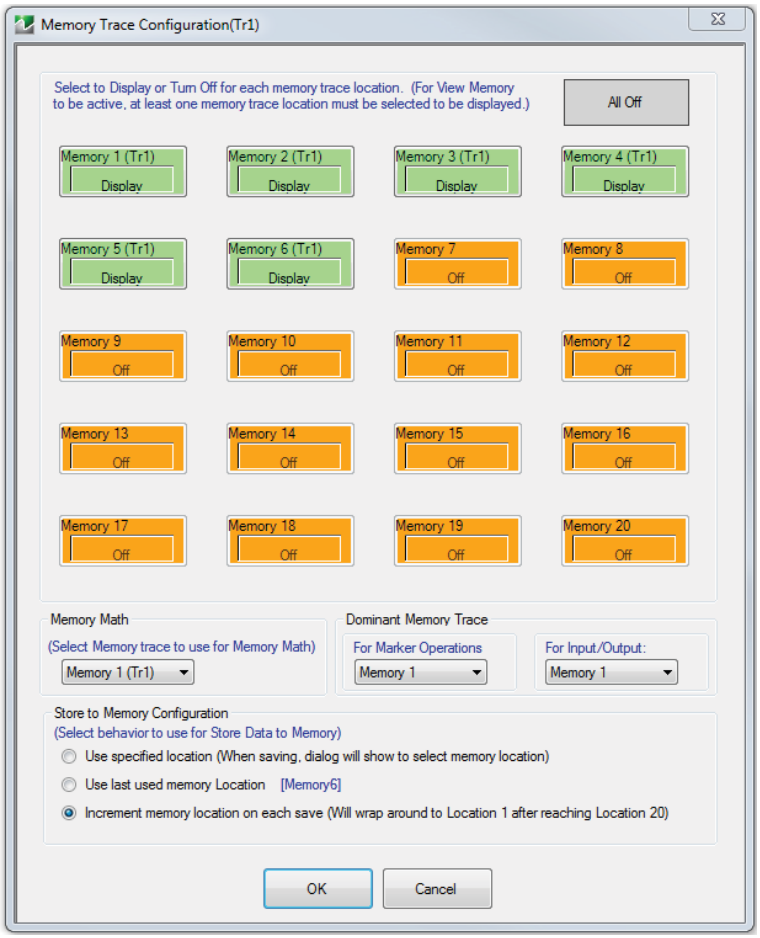


Figure 18-13. Six Stored Traces

Note that after memory location 20 is filled, each subsequent Store Data to Memory selections will wrap and replace the memory locations starting from 1.

18-5 Trace Limit Line Control Menus and Dialog Boxes

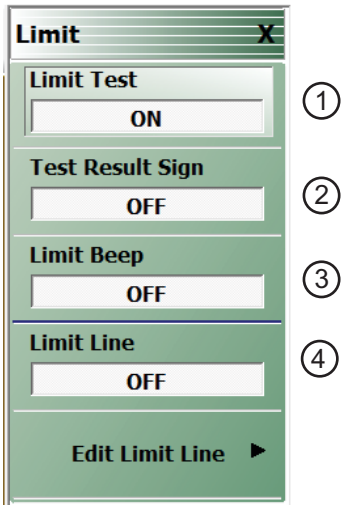
LIMIT Menu

Previous

- DISPLAY Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT



1. Limit Test Toggle Button – Toggles limit tests ON or OFF.
2. Limit Test Results Sign Button – Toggles limit test results as screen message as shown in #5 ON and OFF.
3. Limit Beep
4. Limit Line Toggle Button – Toggles existing limit lines ON or OFF.

Figure 18-14. LIMIT Menu

Limit Test

On a per-system basis, select toggles Limit Test OFF and ON.

Test Result Sign

On a per-system basis, toggles the Test Result Sign OFF and ON. If Test Result Sign is enabled, a failed test icon appears. If Test Result Sign is enabled, a passed test icon appears.

Limit Beep

Select allows audible beep

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 18-22

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 18-21

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE

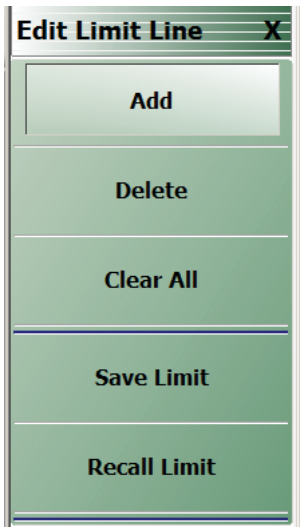


Figure 18-15. EDIT LIMIT LINE Menu

EDIT LIMIT LINE Menu Button Availability

The EDIT LIMIT LINE menu buttons are available to all rectangular displays.

Rectangular displays can have up to 100 limit line segments per trace.

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 18-24

Delete

After selecting a limit line row in the Edit Limit Line table, selecting the Delete button removes the limit line.

- "Limit Line Type Setup Tableau Dialog" on page 18-24

Clear All

Select deletes all recorded limit lint rows in the Edit Limit Line table.

- "Limit Line Type Setup Tableau Dialog" on page 18-24

Save Limit

Select displays the SAVE AS (LIMIT LINE LMT FILE) dialog box.

- "SAVE AS (LIMIT LINE LMT FILE) Dialog Box" on page 18-30

Recall Limit

Select displays the OPEN (LIMIT LINE LMT FILE) dialog box.

- "OPEN (LIMIT LINE LMT FILE) Dialog Box" on page 18-31

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 table.

Previous

- EDIT LIMIT LINE Menu on page 18-22

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE

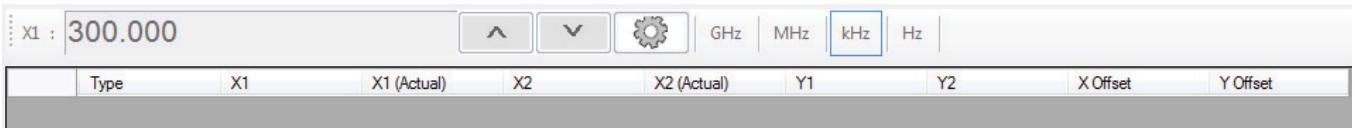
Limit Line Parameters

The following eight parameters are used to define each 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.

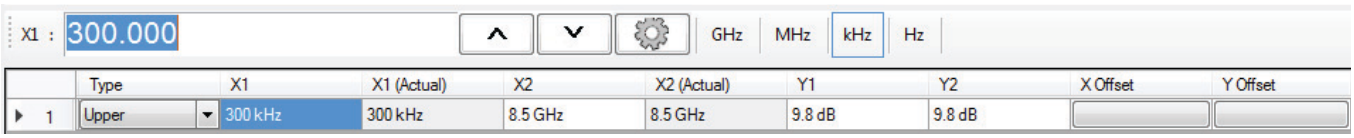
Adding the First Limit Line

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.



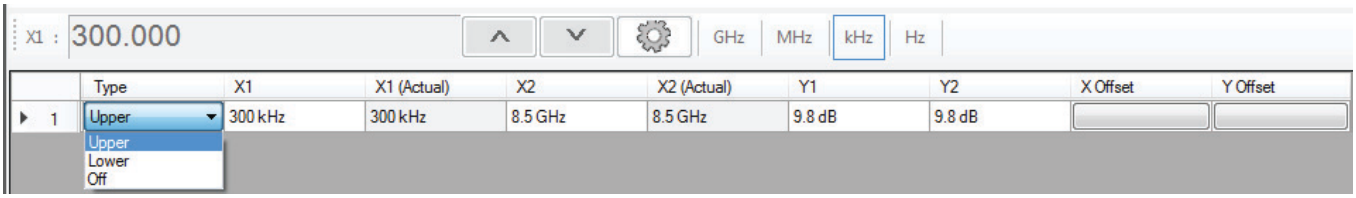
Adding a Limit Line Row

On the EDIT LIMIT LINE menu, click Add. A default limit line appears in the table at row 1.



Type Selection Field

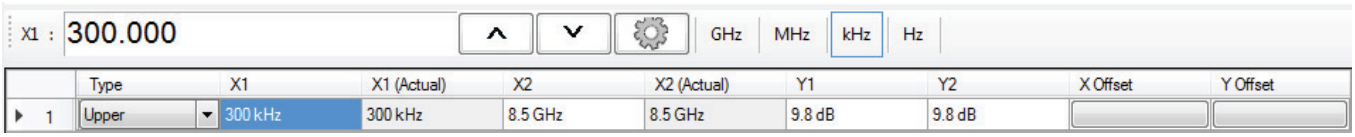
In the Type field, click the down button icon to select whether the limit will be an Upper or Lower limit line or if it will be OFF.



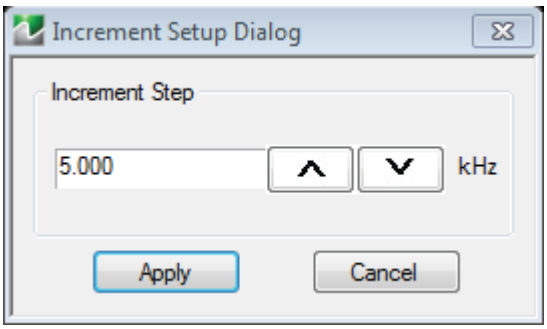
The OFF function is useful if you use a saved limit line file and want to temporarily disable some limits.

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.

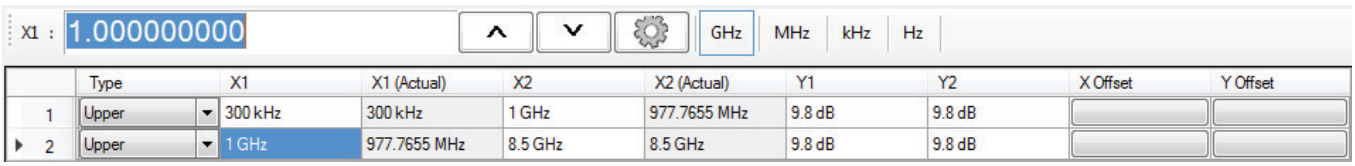


X1 Field Toolbar

As shown above, the X1 field toolbar appears immediately above the table 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.

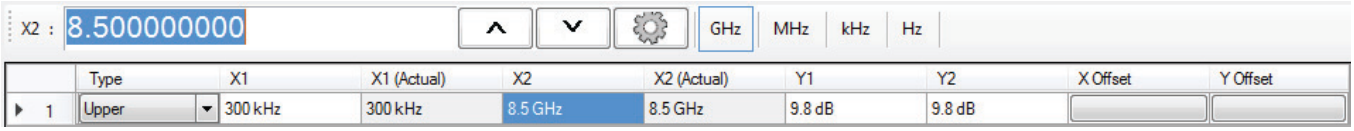
X1 (Actual) Field (Read-only)

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 table header row with units of frequency, time, or power.



X2 Field Toolbar

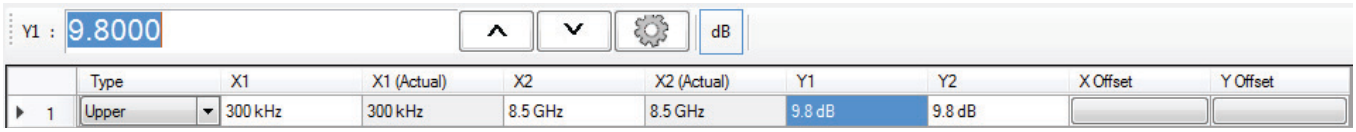
As shown above, use the toolbar to enter the required X2 value and units.

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.

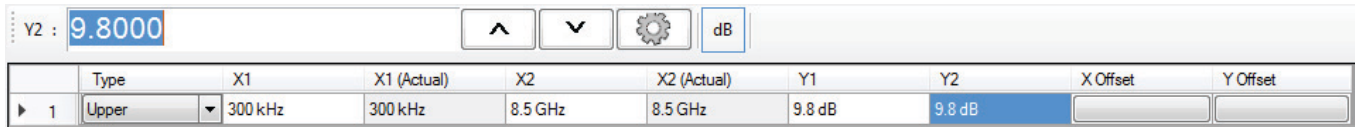


Y1 Field Toolbar

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.

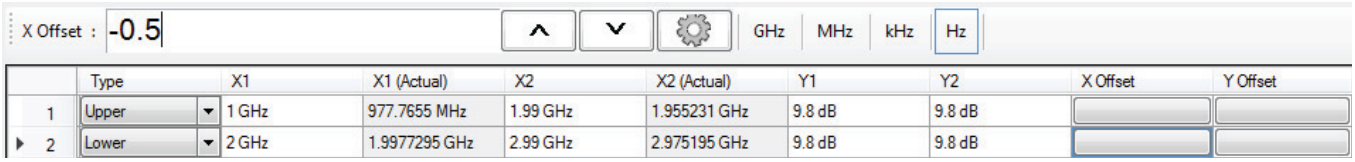


Y2 Field Toolbar

As shown above, use the field toolbar to enter the required Y2 value and units.

X Offset Button

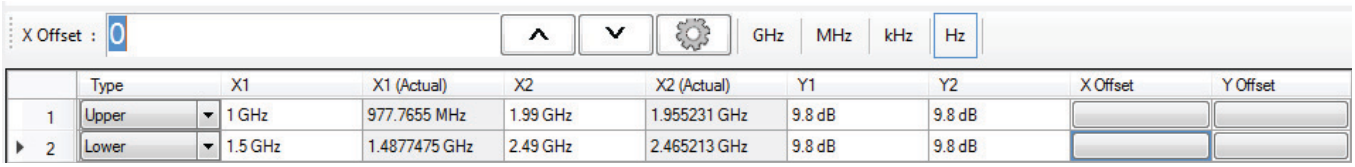
On a per-row basis, the X Offset and Y Offset buttons allow the user to offset indices by a constant amount. This is useful for copying multiple rows and incrementing by a fixed frequency offset. In the X Offset column, click the X Offset button for the appropriate row. The X Offset field toolbar appears immediately above the table 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. Click the X Offset button in row 2 and the X Offset field toolbar appears. Enter the required value and units.



	Type	X1	X1 (Actual)	X2	X2 (Actual)	Y1	Y2	X Offset	Y Offset
1	Upper	1 GHz	977.7655 MHz	1.99 GHz	1.955231 GHz	9.8 dB	9.8 dB		
2	Lower	2 GHz	1.9977295 GHz	2.99 GHz	2.975195 GHz	9.8 dB	9.8 dB		

X Offset Field Toolbar

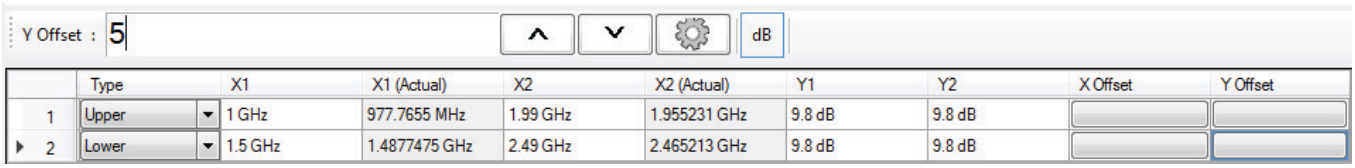
As shown above, use the field toolbar to enter the required X Offset value and units. Once the toolbar units button has been selected, the new X values in row 2 are X1 = 1.5 GHz and X2 = 2.49 GHz, as shown below.



	Type	X1	X1 (Actual)	X2	X2 (Actual)	Y1	Y2	X Offset	Y Offset
1	Upper	1 GHz	977.7655 MHz	1.99 GHz	1.955231 GHz	9.8 dB	9.8 dB		
2	Lower	1.5 GHz	1.4877475 GHz	2.49 GHz	2.465213 GHz	9.8 dB	9.8 dB		

Y Offset Button

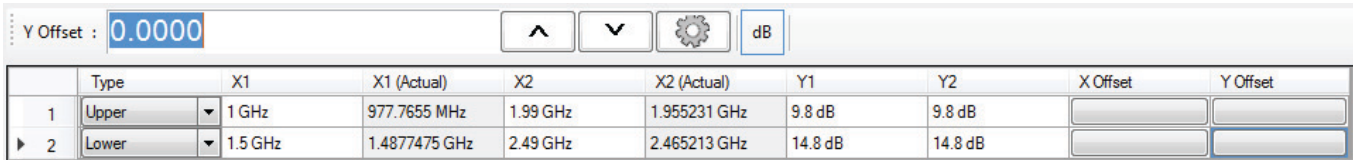
The Y Offset button and field toolbar function the same as the X Offset button described above. Under the Y Offset column heading, click the Y Offset button. The Y Offset field toolbar appears immediately above the table header row.



	Type	X1	X1 (Actual)	X2	X2 (Actual)	Y1	Y2	X Offset	Y Offset
1	Upper	1 GHz	977.7655 MHz	1.99 GHz	1.955231 GHz	9.8 dB	9.8 dB		
2	Lower	1.5 GHz	1.4877475 GHz	2.49 GHz	2.465213 GHz	9.8 dB	9.8 dB		

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.



	Type	X1	X1 (Actual)	X2	X2 (Actual)	Y1	Y2	X Offset	Y Offset
1	Upper	1 GHz	977.7655 MHz	1.99 GHz	1.955231 GHz	9.8 dB	9.8 dB		
2	Lower	1.5 GHz	1.4877475 GHz	2.49 GHz	2.465213 GHz	14.8 dB	14.8 dB		

Adding a Limit Line Row

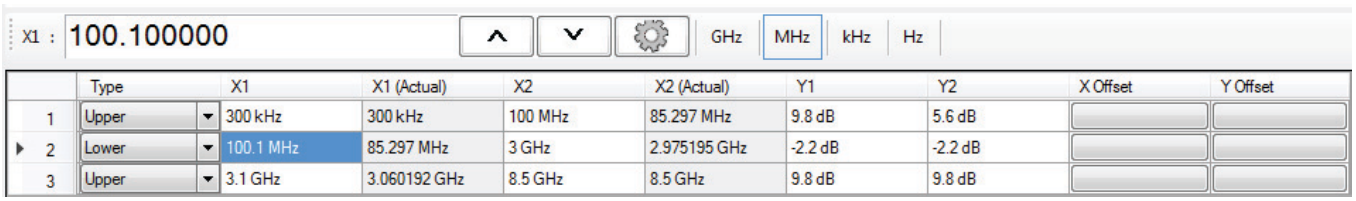
To add more rows to the bottom of the Limit Line Type Setup table area, use the Add button on the EDIT LIMIT LINE menu and then complete the X1, X2, Y1, Y2, and offset parameters as described above.

If no rows are present, Add creates a new row 1 at the top of the table using the trace settings for X1 start and X2 stop values.

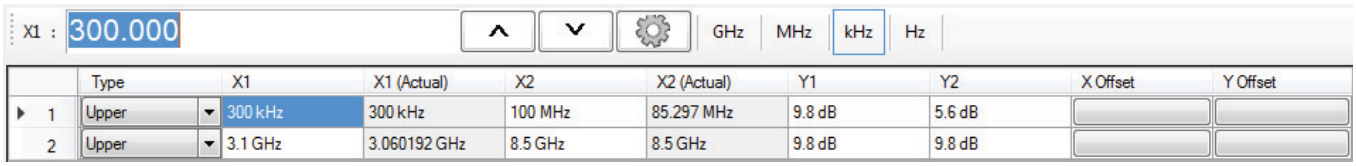
- If one or more rows are present, the Add button places each new row at the bottom of the table.
- If no rows are present or the field of an existing row is selected, the Insert does not function.
- If one or more rows are present and the entire row is selected by selecting the row number, Insert adds 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 2 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.

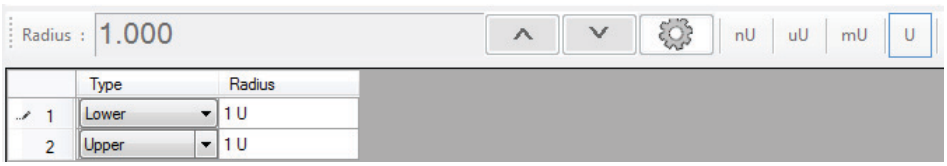


Figure 18-16. Smith Chart and Polar Edit Lines

On the EDIT LIMIT LINE menu, click Add. A default limit line appears in the table 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.

Radius Field Toolbar

The Radius field toolbar appears immediately above the table 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.

Figure 18-17. Smith Chart and Polar Radius Toolbar

SAVE AS (LIMIT LINE LMT FILE) Dialog Box

Previous

- EDIT LIMIT LINE Menu on page 18-22

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE | Save Limit | SAVE AS (LIMIT LINE LMT FILE) Dialog Box

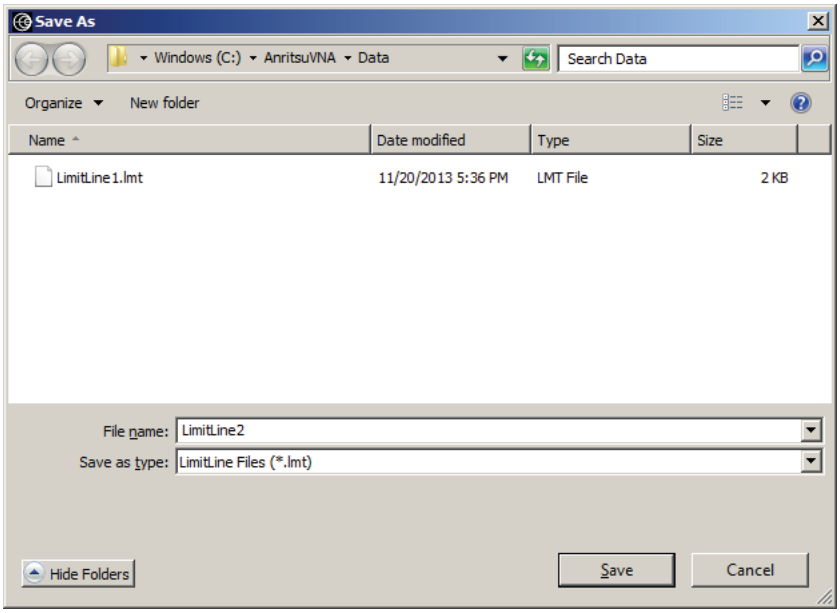


Figure 18-18. SAVE AS (LIMIT LINE LMT FILE) Dialog Box

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 18-22

Navigation

- MAIN | Display | DISPLAY | Trace Limit Lines | LIMIT | Edit Limit Line | EDIT LIMIT LINE | Recall Limit | OPEN (LIMIT LINE LMT FILE) Dialog Box

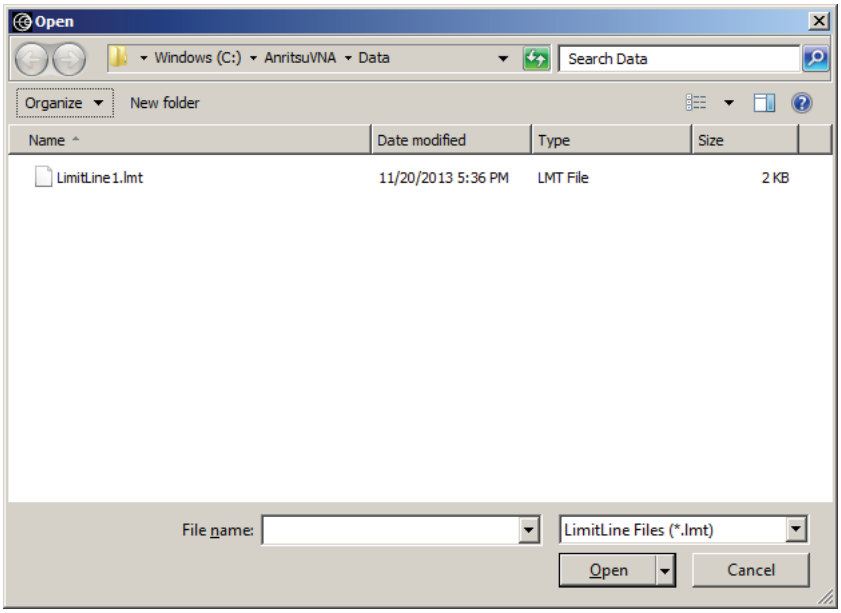


Figure 18-19. OPEN (LIMIT LINE LMT FILE) Dialog Box

Instructions

Select the required LMT file and then click Open.

18-6 Trace Ripple Limit Menus

RIPPLE LIMIT Menu

Previous

- DISPLAY Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT

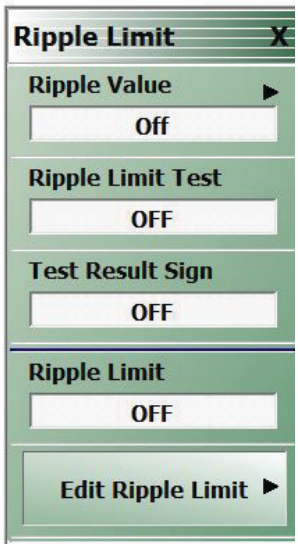


Figure 18-20. RIPPLE LIMIT Menu

Ripple Value

Displays RIPPLE VALUE Menu on page 18-33.

Ripple 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 L Menu on page 18-34.

RIPPLE VALUE Menu

Previous

- RIPPLE LIMIT Menu on page 18-32

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Ripple Value | RIPPLE VALUE

Figure 18-21. 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 L Menu

When this menu is selected, the bottom of the display moves up and the "Edit Ripple Limit Tableau Dialog" on page 18-36 is displayed.

Previous

- RIPPLE LIMIT Menu on page 18-32

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit | EDIT RIPPLE L

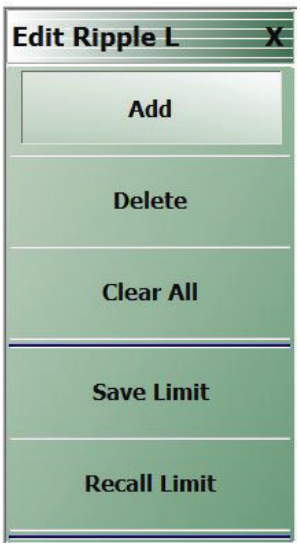


Figure 18-22. EDIT RIPPLE L Menu

EDIT LIMIT LINE Menu Button Availability

The five (5) buttons of the EDIT LIMIT LINE 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 18-36 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 table dialog.

Save Limit

Select displays the SAVE AS (Limit Line LMT File) dialog box.

- "SAVE AS (RIPPLE LIMIT FILE) Dialog Box" on page 18-39

Recall Limit

Select displays the OPEN (Limit Line LMT File) dialog box.

- “OPEN (RIPPLE LIMIT FILE) Dialog Box” on page 18-40

Edit Ripple Limit Tableau Dialog

When Edit Ripple Limit is selected, the Edit Ripple Limit tableau dialog 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 EDIT RIPPLE menu and the segment controls in the table.

Previous

- EDIT RIPPLE L Menu on page 18-34

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LINE | Edit Ripple Limit|

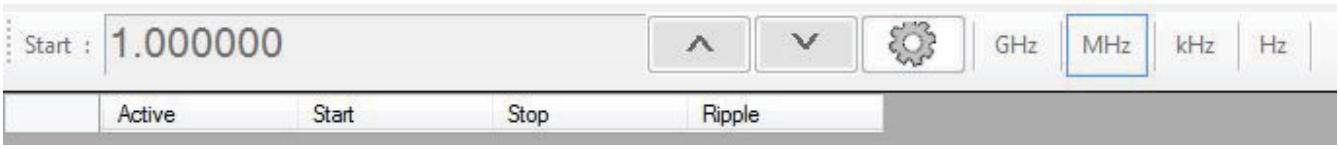
Limit Line Rectangular Parameters

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

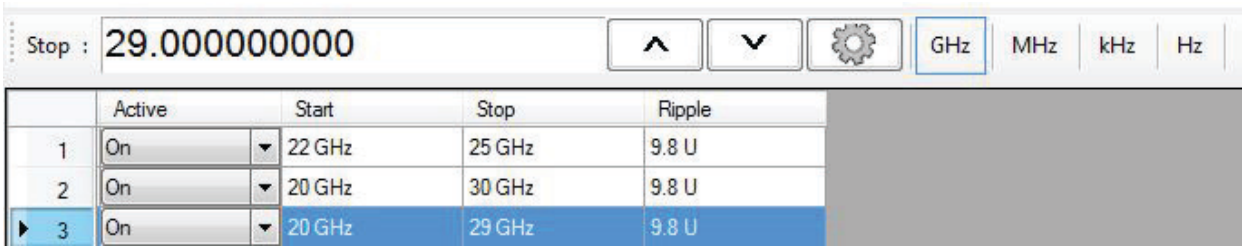
Adding the First Limit Line

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.



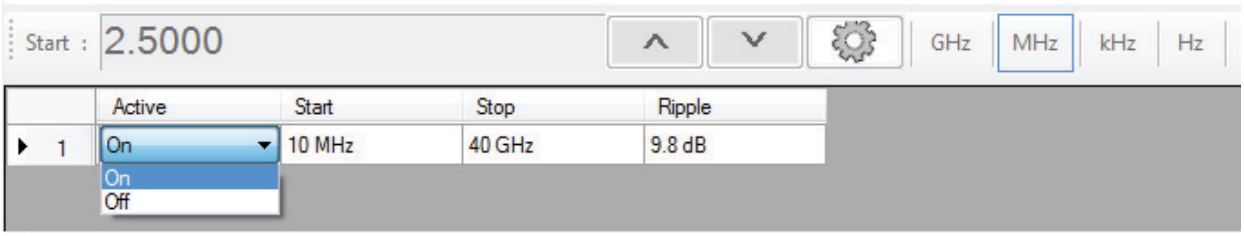
Adding a Limit Line Row

On the EDIT RIPPLE LIMIT menu, click Add. Up to 50 lines can be added.



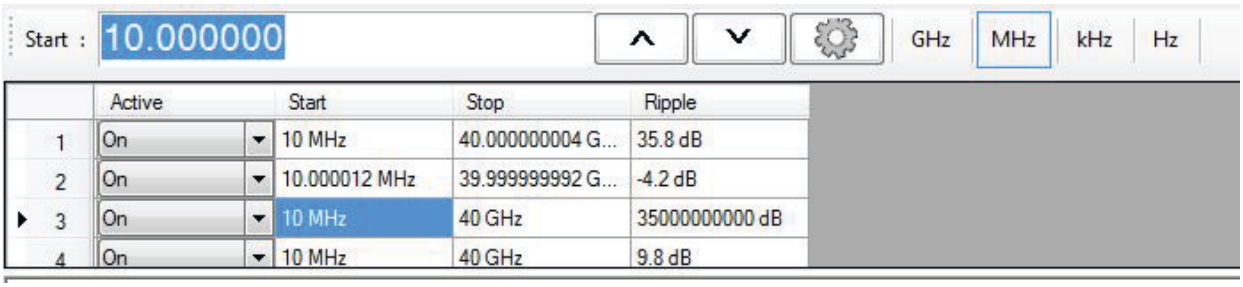
Active Selection Field

In the Active field, click the down button icon to set the ripple limit ON or OFF.



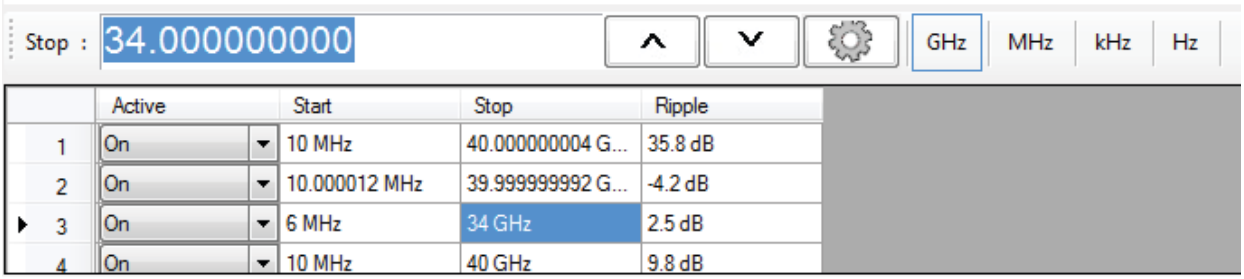
Start Selection Field

In the Start column, select and click the Start cell 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.



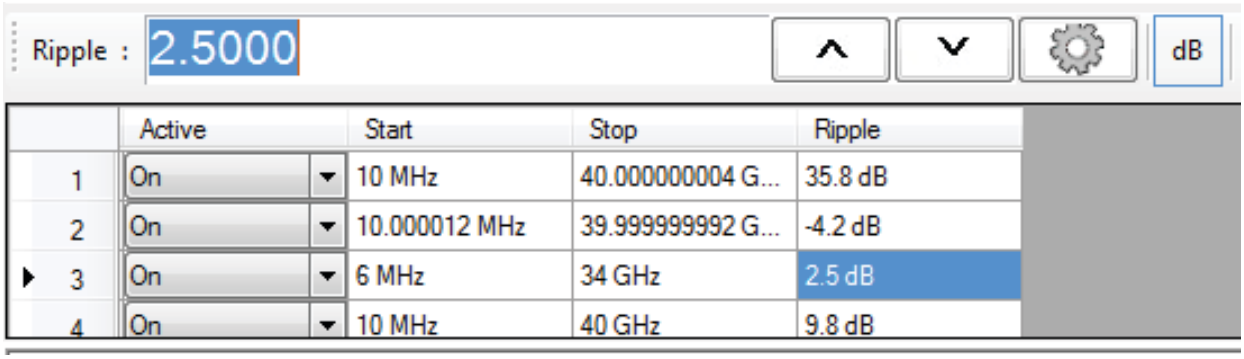
Stop Selection Field

In the Stop column, select and click the Stop cell 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 cell to activate the ripple limit range Type in the ripple limit.



SAVE AS (RIPPLE LIMIT FILE) Dialog Box

Previous

- EDIT RIPPLE L Menu on page 18-34

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit | SAVE LIMIT | SAVE AS (RIPPLE LIMIT LMT FILE) Dialog Box

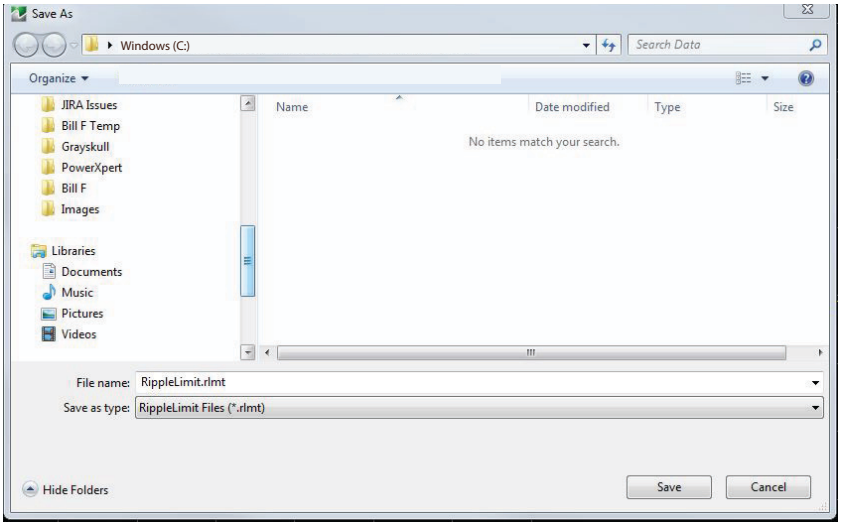


Figure 18-23. SAVE AS (RIPPLE LIMIT FILE) Dialog Box

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 L Menu on page 18-34

Navigation

- MAIN | Display | DISPLAY | Trace Ripple Limit | RIPPLE LIMIT | Edit Ripple Limit | Recall Limit | OPEN (LIMIT LINE LMT FILE) Dialog Box

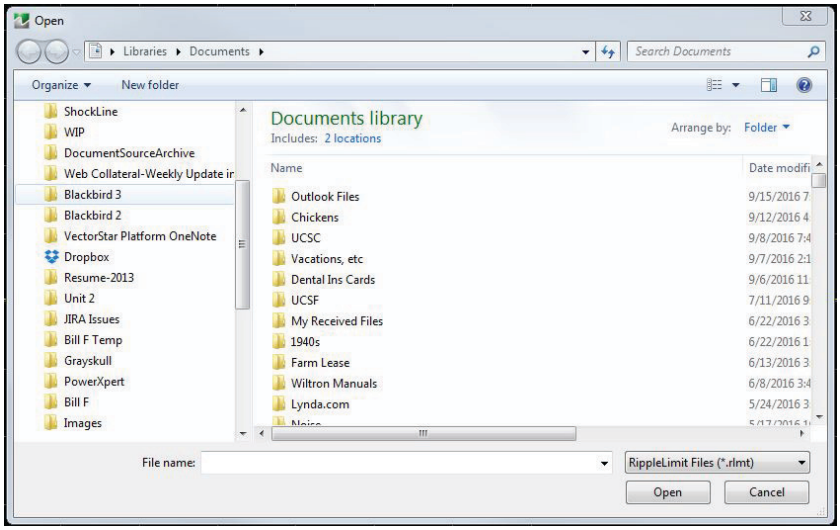


Figure 18-24. OPEN (RIPPLE LIMIT FILE) Dialog Box

Instructions

Select the required RLMT file and then click Open.

18-7 Limit/Ripple Display Location Menu

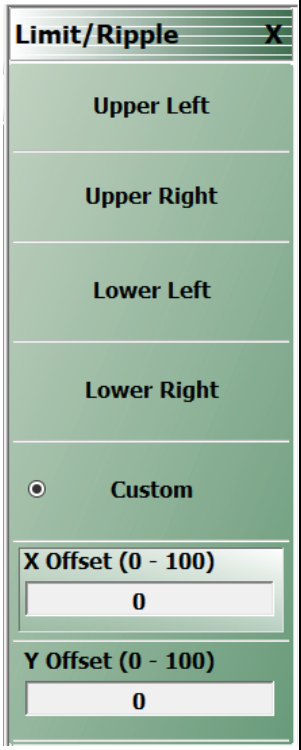
LIMIT/RIPPLE (Display Location) Menu

Previous

- DISPLAY Menu on page 18-3

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 18-25. 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.

18-8 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. 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 18-45

Prerequisites

- SWEEP TYPES = Power (CW Freq).
- SWEEP TYPES Menu on page 7-5
- MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES | Power (CW Freq)

DOMAIN (Frequency With Time Gate Menu)

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 18-46

Prerequisites

- SWEEP TYPES = Freq Sweep (Linear) or Segmented Sweep (Freq-based)
- SWEEP TYPES Menu on page 7-5
- 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 are 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 18-47

Prerequisites

- SWEEP TYPES Menu = Freq Sweep (Linear) or Segmented Sweep (Freq-based)
  - SWEEP TYPES Menu on page 7-5
  - 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 18-49

Prerequisites

- SWEEP TYPES Menu = Freq Sweep (Linear), or Segmented Sweep (Freq-based)
  - SWEEP TYPES Menu on page 7-5
  - MAIN | Sweep Setup | SWEEP SETUP | Sweep Types | SWEEP TYPES

DOMAIN (Frequency With No Time Gate) Menu

Menu Identification and Variants

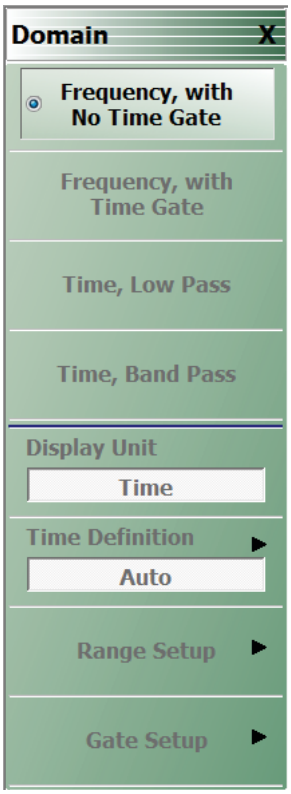
- The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP menu.
- Consult the section above for menu identification and prerequisites.
- "DOMAIN Menu Appearance and Button Availability" on page 18-42

Previous

- DISPLAY Menu on page 18-3

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 18-26. DOMAIN (Frequency With No Time Gate) Menu

DOMAIN (Frequency With Time Gate) Menu

Menu Identification and Variants

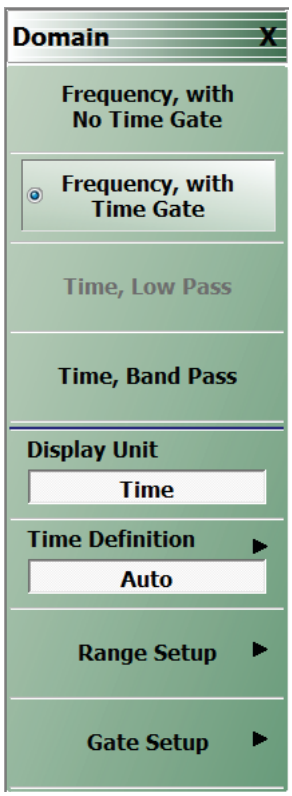
- The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP menu.
- Consult the section above for menu identification and prerequisites.
- "DOMAIN Menu Appearance and Button Availability" on page 18-42

Previous

- DISPLAY Menu on page 18-3

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 below:
  - 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 18-51

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 18-54

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 18-66

Figure 18-27. 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 18-42 for menu identification and prerequisites.

Prerequisites

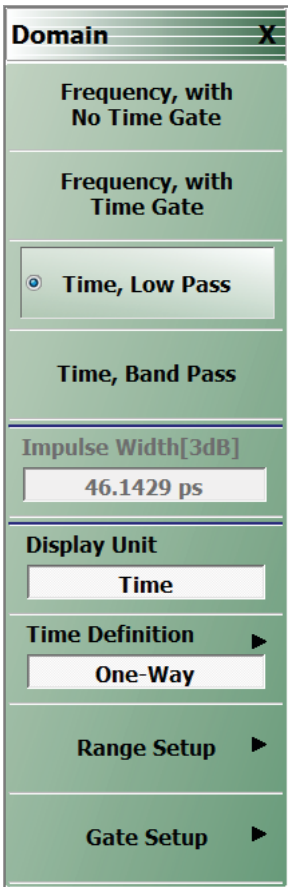
- The Time, Low Pass button is only available as a selection under certain conditions when a harmonic sweep condition is established.
- For example, at the FREQUENCY menu, a Start point of 1 GHz, a Stop point of 10 GHz, and the # of Points set to 10 makes the Time, Low Pass button available.
  - FREQUENCY Menu for Frequency-Based Segmented Sweep Mode on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- DISPLAY Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN (Time Low Pass)



Time, Low Pass

If the Time, Low Pass button is selected:

- The following time domain buttons 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 [3 dB] 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 18-51

Figure 18-28. 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 18-58 **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 18-66

Figure 18-28. DOMAIN (Time Low Pass) Menu (2 of 2)

DOMAIN TIME (Band Pass) Menu

Menu Identification and Variants

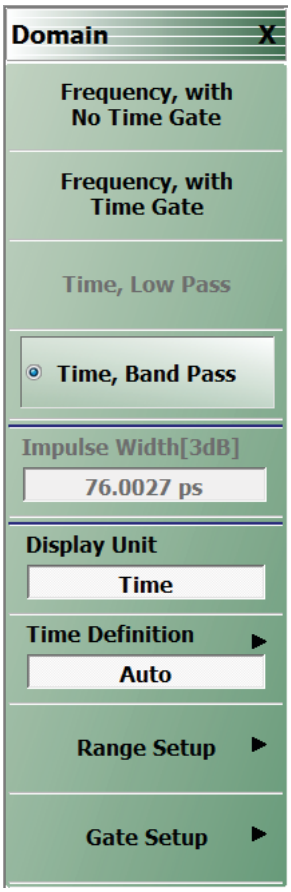
- The appearance and button availability of the DOMAIN menu depends on settings on the SWEEP menu.
- Consult the section above for menu identification and prerequisites.
- "DOMAIN Menu Appearance and Button Availability" on page 18-42

Previous

- DISPLAY Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Domain | DOMAIN Time Band Pass



Time, Band Pass

If the Time, Band Pass button is selected:

- The following time domain buttons are deselected and unavailable:
  - Frequency, with No Time Gate
  - Frequency, with Time Gate
  - Time, Low Pass
- These buttons 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 18-51

Figure 18-29. DOMAIN (Time Band Pass) Menu (1 of 2)

	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 18-54 **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 18-66

Figure 18-29. DOMAIN (Time Band Pass) Menu (2 of 2)

18-9 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 18-46
- DOMAIN (Time Low Pass) Menu on page 18-47
- DOMAIN TIME (Band Pass) Menu on page 18-49

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

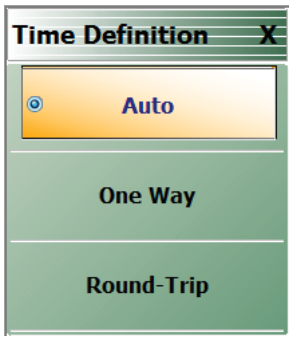


Figure 18-30. TIME DEFINITION Menu

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.

18-10 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 18-45
- 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 18-54

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 18-56

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 18-58

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 on page 18-66, 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 18-52

Prerequisites

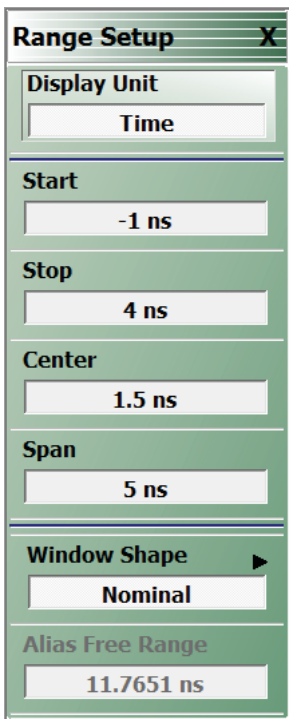
- On the DOMAIN menu, Domain Type is set to Frequency, with Time Gate

Previous

- DOMAIN (Frequency With Time Gate) Menu on page 18-46

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 18-31. 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 18-63

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 18-31. 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 18-52

Prerequisites

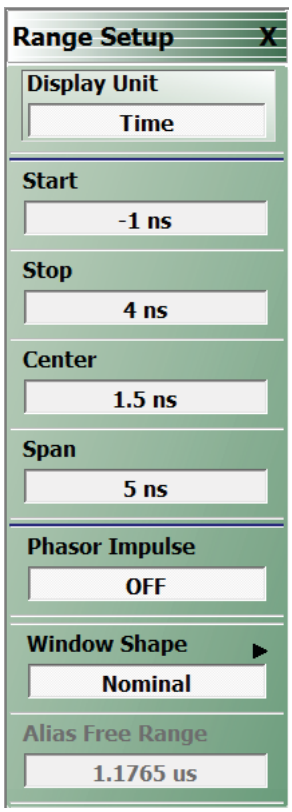
- On the DOMAIN menu, Domain Type is set to Time, Band Pass

Previous

- DOMAIN TIME (Band Pass) Menu on page 18-49

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 18-32. RANGE SETUP (Time Band Pass) Menu – 8 Buttons (1 of 2)

Stop

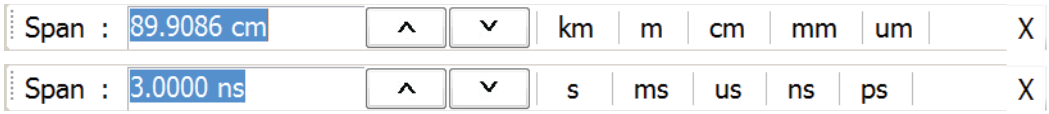
Select either displays the Stop (Distance) or Stop (Time) toolbar.

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 18-63

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 18-32. 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 18-52

Prerequisites

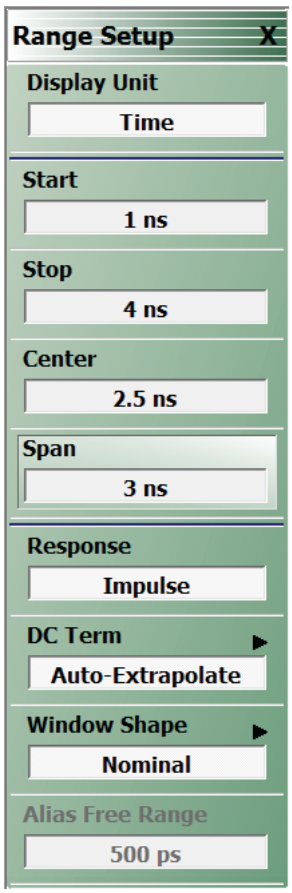
- On the FREQUENCY menu, a harmonic sweep must be set such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - FREQUENCY Menu for Frequency-Based Segmented Sweep Mode on page 4-5
  - MAIN | Frequency | FREQUENCY
- On the DOMAIN menu, Domain Type is set to Time, Low Pass

Previous

- DOMAIN (Time Low Pass) Menu on page 18-47

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.

Figure 18-33. RANGE SETUP (Time Gate Low Pass) Menu – Nine Buttons (1 of 2)

Stop

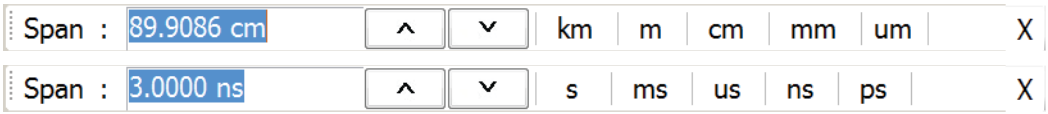
Select either displays the Stop (Distance) or Stop (Time) toolbar.

Center

Select either displays the Center (Distance) or Center (Time) toolbar.

Span

Select either displays the Span (Distance) or Span (Time) toolbar.



Response

Select toggles response between Impulse and Step.

DC Term

Select displays the DC TERM menu where Auto-Extrapolate or other extrapolation methods can be selected.

- DC TERM Menu on page 18-60

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 18-63

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 18-33. 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

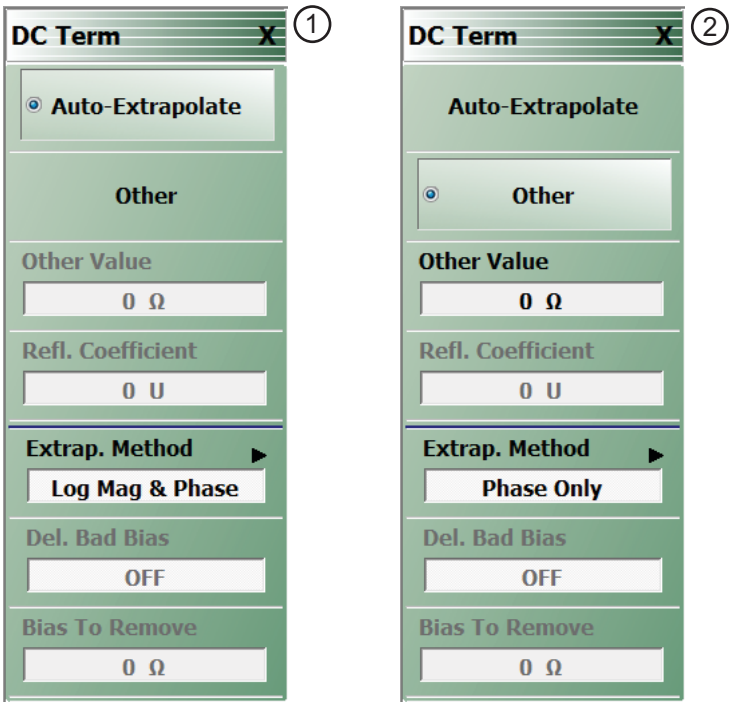
- RANGE SETUP (Time Low Pass) Menu on page 18-58

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.



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 18-34. DC TERM Menu

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 18-62

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 18-60

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 18-35. EXTRAPOLATION Menu

18-11 Time Domain Window Shape and Gate Setup Menus

WINDOW SHAPE Menu

Prerequisites

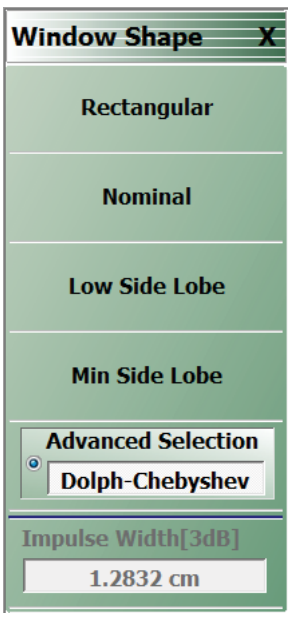
- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass.
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep such as: Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - FREQUENCY Menu for Frequency-Based Segmented Sweep Mode on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- RANGE SETUP (Frequency With Time Gate) Menu on page 18-54
- RANGE SETUP (Time Band Pass) Menu on page 18-56
- RANGE SETUP (Time Low Pass) Menu on page 18-58

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 18-64

Impulse Width [3dB]

Read-only display. Shows the calculated width of the window at **3 dB**.

Figure 18-36. WINDOW SHAPE Menu

ADVANCED WINDOW SHAPE SETUP Dialog Box

Prerequisites

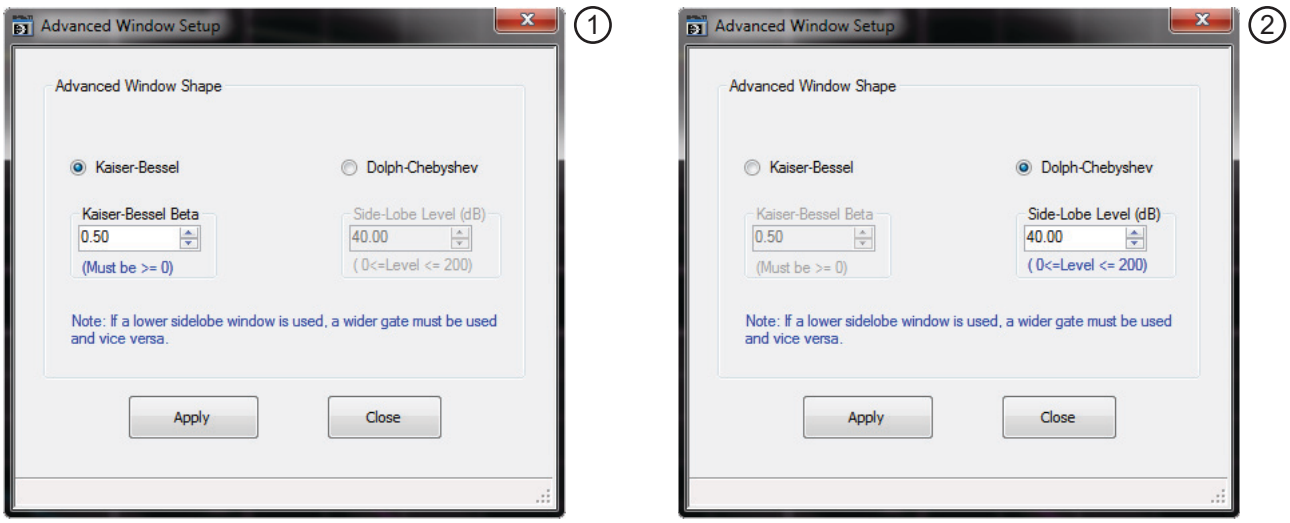
- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep set such as:
  Start Frequency = 10 MHz; Stop Frequency = 50 MHz; # of Points = 5 points
  - FREQUENCY Menu for Frequency-Based Segmented Sweep Mode on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- WINDOW SHAPE Menu on page 18-63

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 18-37. 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 18-64

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 18-46
- DOMAIN (Time Low Pass) Menu on page 18-47
- DOMAIN TIME (Band Pass) Menu on page 18-49

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

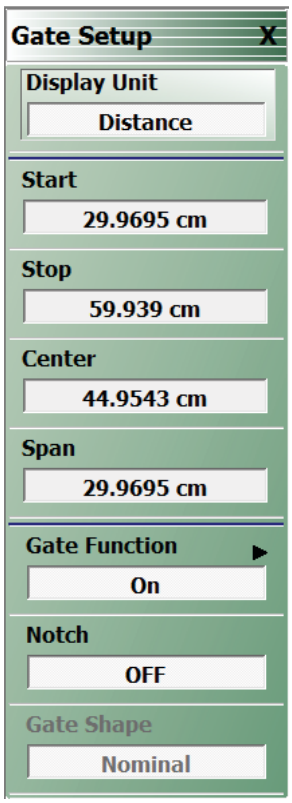


Figure 18-38. GATE SETUP Menu

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 18-54

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 18-68

Notch (OFF/ON)

Select toggles notch between OFF and ON.

Gate Slope

Read-only display of the Gate Slope setting.

GATE FUNCTION Menu

Prerequisites

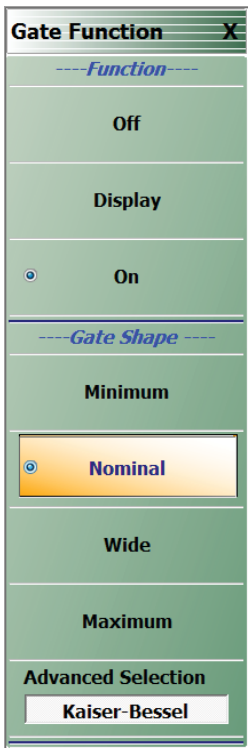
- On the DOMAIN menu, Domain Type is set to one of the following: Frequency, with Time Gate; Time, Band Pass; Time, Low Pass.
- Time Low Pass requires on the FREQUENCY menu, a harmonic sweep set such as:
  - Start Frequency = 10 MHz
  - Stop Frequency = 50 MHz
  - # of Points = 5 points
- FREQUENCY Menus
  - FREQUENCY Menu for Frequency-Based Segmented Sweep Mode on page 4-5
  - MAIN | Frequency | FREQUENCY

Previous

- GATE SETUP Menu on page 18-66

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 18-39. 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 18-70

Figure 18-39. GATE FUNCTION Menu (2 of 2)

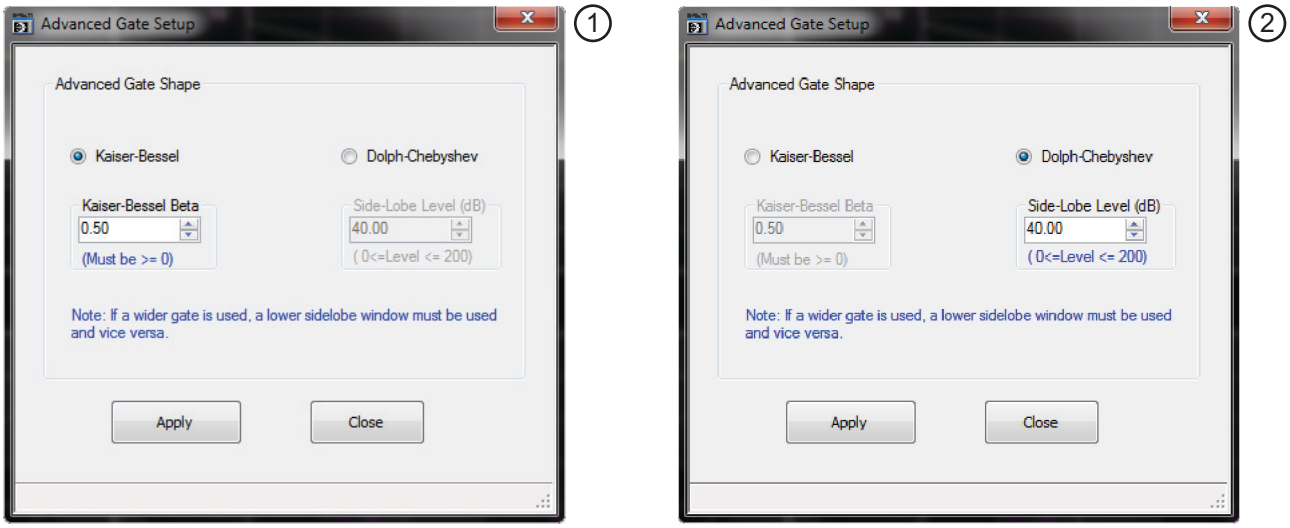
ADVANCED GATE SHAPE SETUP Dialog Box

Previous

- GATE FUNCTION Menu on page 18-68

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 18-40. 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 18-40 above.
   - Dolph-Chebyshev, shown at right at #2 in Figure 18-40 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.

18-12 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.

Previous

- DISPLAY Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Inter-Trace Math | INTER-TRACE MATH

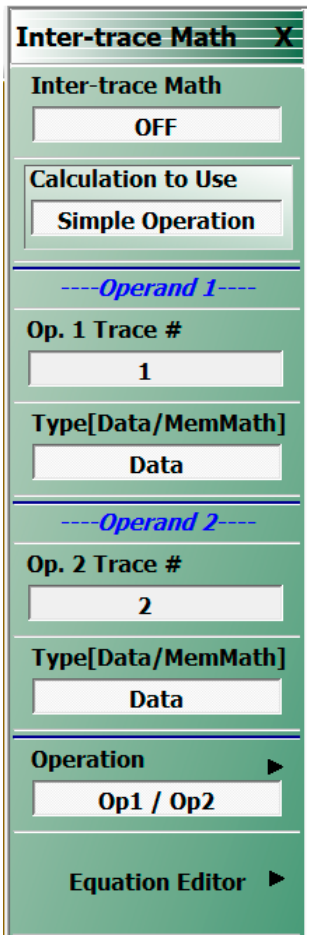


Figure 18-41. INTER-TRACE MATH Menu

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 One 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 Two 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 18-74

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 18-72

Navigation

- MAIN | Display | DISPLAY | Inter-trace Math | INTER-TRACE MATH | Operation | INTRA-TRACE OP

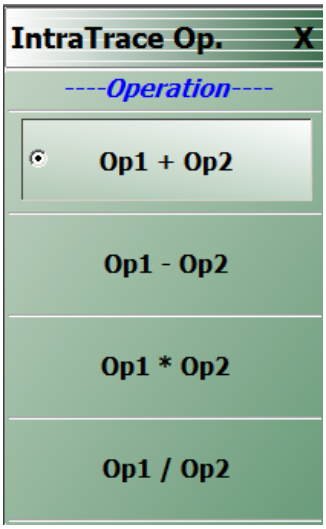


Figure 18-42. INTRA-TRACE OP. (INTRA TRACE OPERAND) Menu

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 18-43 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 18-72

Navigation

- MAIN | Display | DISPLAY | Inter-Trace Math | INTER-TRACE MATH | Equation Editor | EQUATION EDITOR FOR TRx Dialog Box

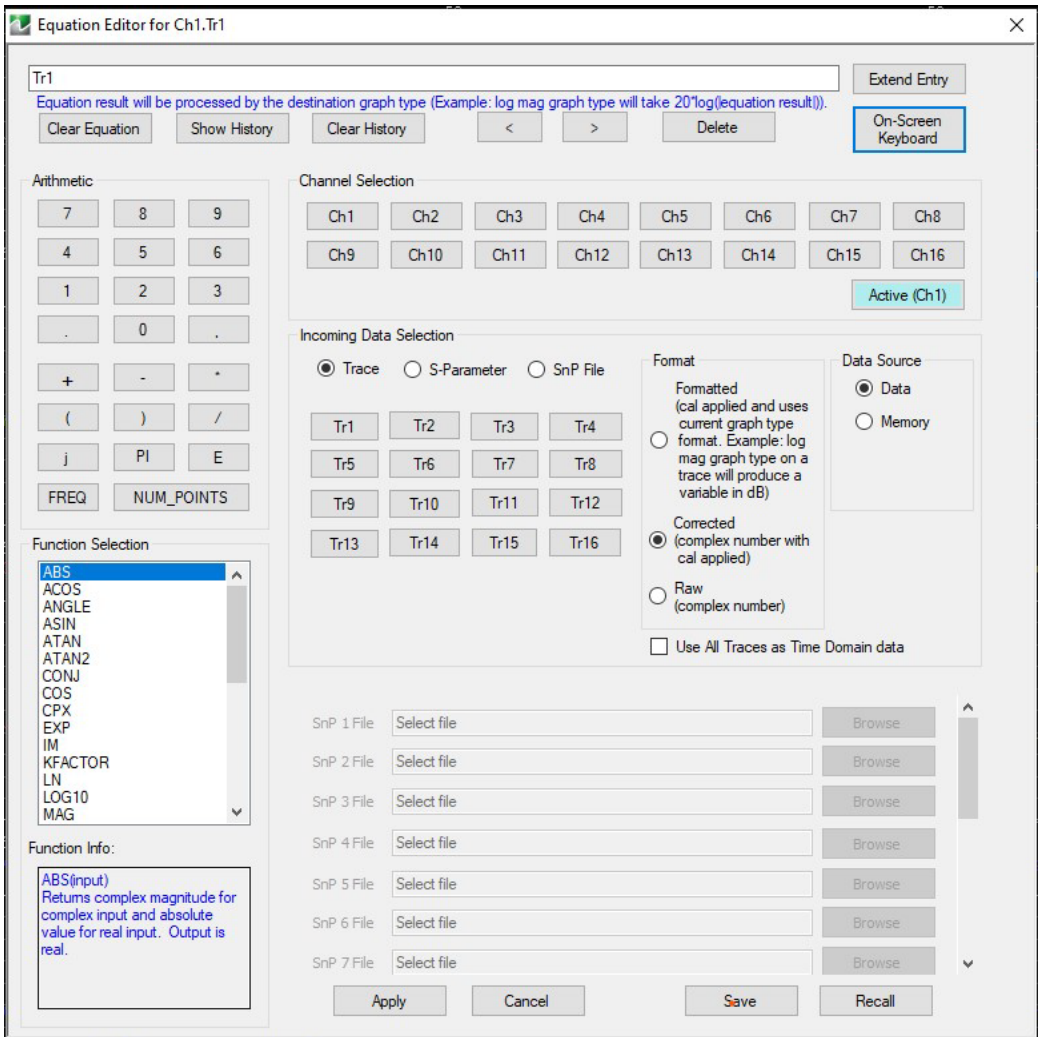


Figure 18-43. Inter-Trace Math Equation Editor

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 2 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 4 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 18-1.

- 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 four 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 18-2.

- 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 18-3.

- 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

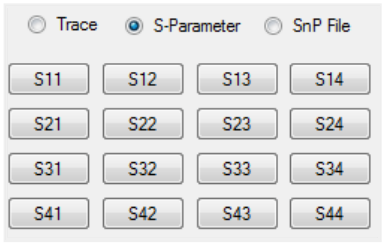
- Select enables buttons for selection of traces Tr1 through Tr16:

S-Parameter Radio Button (MS46522 only)

- Select enables buttons for selection of S-parameters:

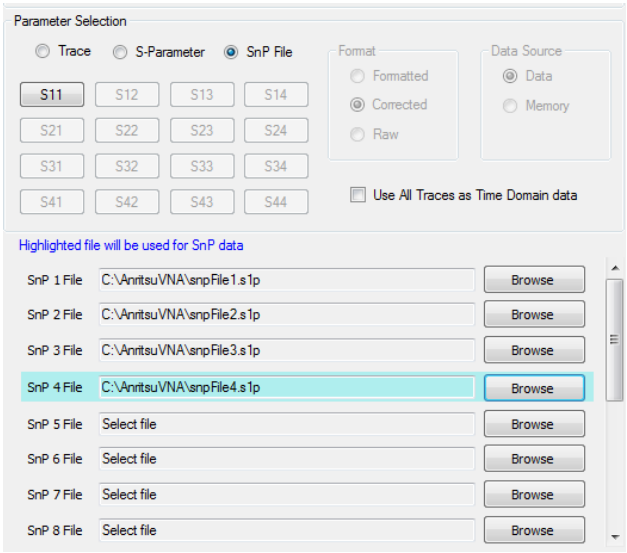
S-Parameter Radio Button (MS46524 only)

- Select enables buttons for selection of S-parameters:



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 18-8

Navigation

- MAIN | Display | DISPLAY | Conversion | CONVERSION |

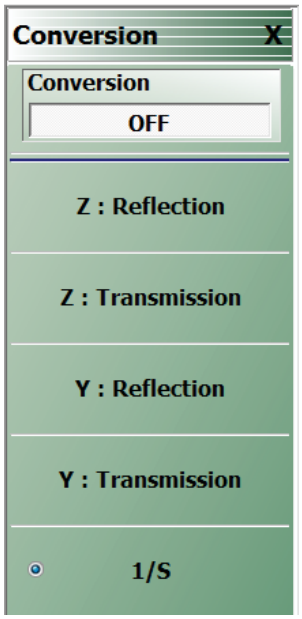


Figure 18-44. CONVERSION Menu

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.

18-13 Display Area Setup Menu

DISPLAY AREA SETUP Menu

This menu allows the display area to be customized.

Previous

- DISPLAY Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Display Area Setup | DISPLAY SETUP

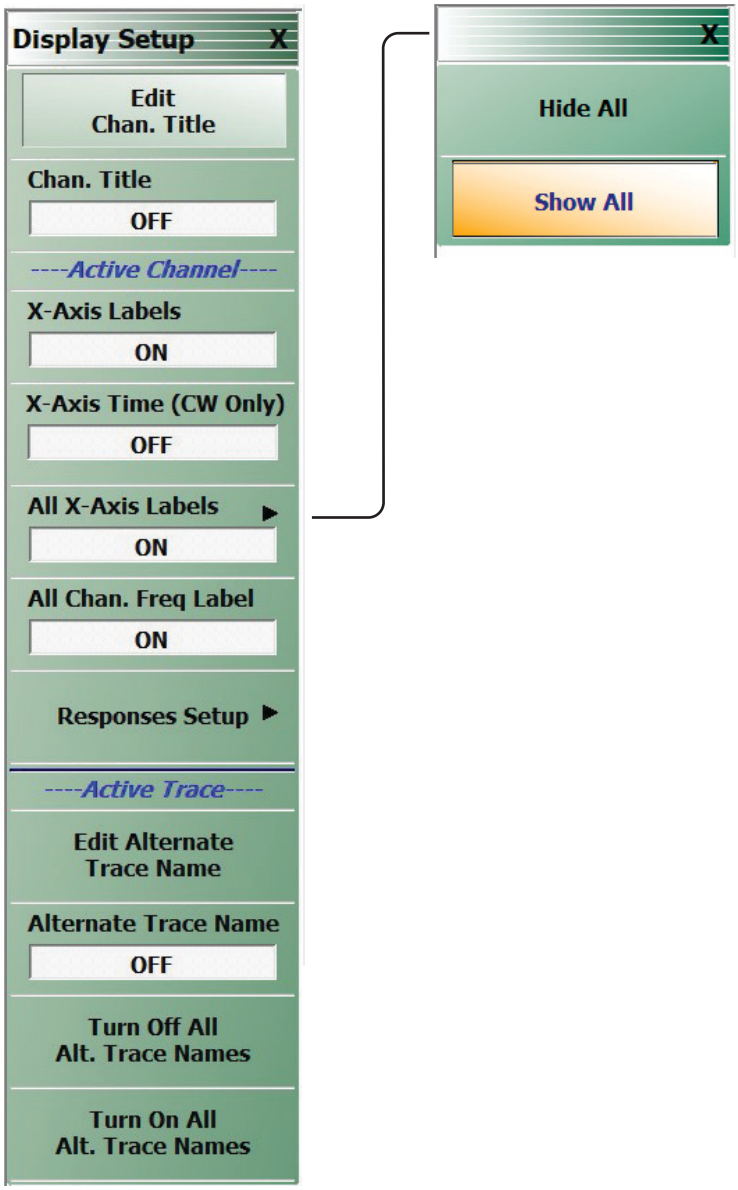


Figure 18-45. DISPLAY SETUP Menu

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. 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

Toggles the channel frequency labels ON or OFF.

Edit Alternate Trace Name

Select displays the alternate trace name field toolbar, which allows entry of a custom trace name.

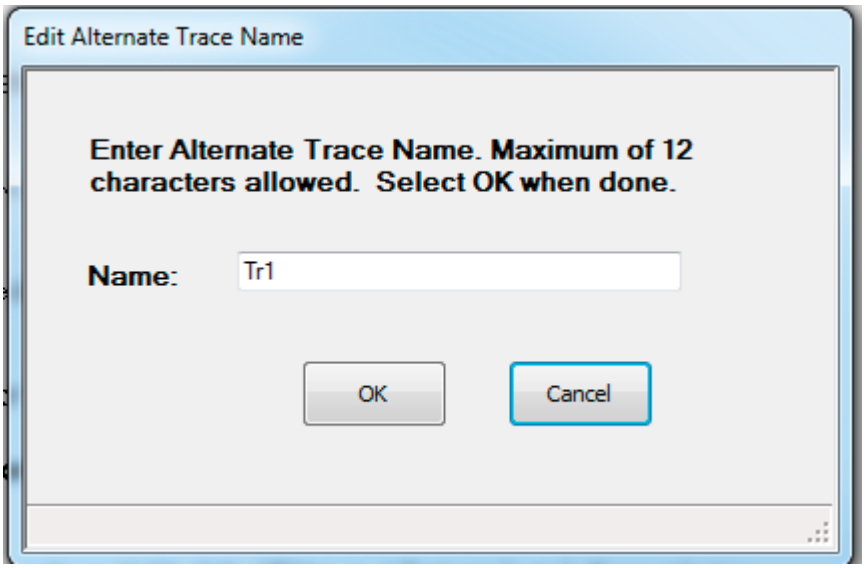


Figure 18-46. EDIT TRACE NAME Dialog

Alternate Trace Name

Toggles the alternate trace name display ON or OFF.

RESPONSES SETUP Menu – 4-Port VNAs

Prerequisites

- The RESPONSES SETUP menu is only available if the VNA is in 4-Port mode and allows selection between four different modes.

Alternate Mixed Mode Control

- The RESPONSES SETUP menu duplicates the functions available in the menu and dialog boxes below available in the RESPONSE 4-Port VNA menus:
  - RESPONSE Menu – 4-Port VNAs on page 17-2
  - "MIXED MODE Dialog Box – Two Differential Pairs – 4-Port VNAs" on page 17-13
  - "MIXED MODE Dialog Box – One Differential Pair – One Singleton – 4-Port VNAs" on page 17-15
  - "MIXED MODE Dialog Box – One Differential Pair – Two Singletons – 4-Port VNAs" on page 17-17

Previous

- Display Main Menu on page 18-3

Navigation

- MAIN | Display | DISPLAY | Display Area Setup | DISPLAY SETUP | Responses Setup | RESPONSES SETUP

Figure 18-47. RESPONSES SETUP Menu

Single-Ended

Select sets the response mode to single-ended mode where any S-Parameter can be selected in the RESPONSE menu group.

- S11, S12, S21, and S22 can be selected on the RESPONSE menu.
  - RESPONSE Menu – 4-Port VNAs on page 17-2
  - MAIN | Response | RESPONSE
- S13, S23, S32, S33, S14, S24, S34, S41, S42, S43, S44 can be selected on the SINGLE-MODE menu
  - SINGLE-MODE Menu – 4-Port VNAs on page 17-8
  - MAIN | Response | RESPONSE | More Single-Mode | SINGLE-MODE

2 Diff. Pair

Two Differential Pairs button. Select sets all traces on the 4-Port VNA to mixed-mode with two differential pairs. When the WARNING dialog appears, select OK to continue. This is the same mixed-mode as set by the MIXED-MODE dialog box.

- "MIXED MODE Dialog Box – Two Differential Pairs – 4-Port VNAs" on page 17-13
- MAIN | Response | RESPONSE | Mixed-Mode | MIXED-MODE Dialog Box – Two Differential Pairs

1 Pair, 2 Singletons

Select sets all traces on the 4-Port VNA to mixed-mode with one differential pair and two singletons. When the WARNING dialog appears, select OK to continue. This is the same mixed-mode as set by the MIXED-MODE dialog box.

- "MIXED MODE Dialog Box – One Differential Pair – Two Singletons – 4-Port VNAs" on page 17-17
- MAIN | Response | RESPONSE | Mixed-Mode | MIXED-MODE Dialog Box – One Differential Pair and Two Singletons

1 Pair, 1 Singletons

Select sets all traces on the 4-Port VNA to mixed-mode with one differential pair and one singleton. When the WARNING dialog appears, select OK to continue. This is the same mixed-mode as set by the MIXED-MODE dialog box.

- "MIXED MODE Dialog Box – One Differential Pair – One Singleton – 4-Port VNAs" on page 17-15
- MAIN | Response

Chapter 19 — Scale Menus

19-1 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.

19-2 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 15-4
- 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 common buttons are:

- Auto Scale Active Trace
- Auto Scale All Traces
- # of Vert. Divisions

A description of these buttons is found at:

- Section 19-11 "SCALE Menu Common Buttons" on page 19-33

SCALE Menu Units

The table below summarizes the displayed fields and units available in the SCALE menu variants.

Table 19-1. 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 19-1. 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	#

19-3 Overview of SCALE Menu Variants

All SCALE menu variants are shown in the sections and links below:

- "SCALE (Magnitude) Menus" on page 19-5
  - SCALE (Log Magnitude) Menu on page 19-5
  - SCALE (Linear Magnitude) Menu on page 19-6
- SCALE (Phase) Menu on page 19-8
- "SCALE (Real or Imaginary) Menus" on page 19-10
  - SCALE (Real Magnitude) Menu on page 19-10
  - SCALE (Imaginary) Menu on page 19-11
- SCALE Standing Wave Ratio Menu on page 19-12
- SCALE (Smith Chart Impedance) Menu on page 19-13
- SCALE (Smith Chart Impedance) Menu on page 19-13
- "SCALE Menu Common Buttons" on page 19-33

19-4 SCALE (Magnitude) Menus

SCALE (Log Magnitude) Menu

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

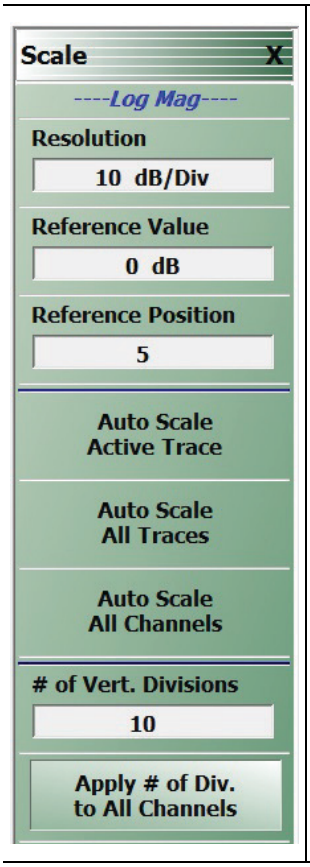
- TRACE FORMAT is set to Log Mag
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Log Mag

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



SCALE (Log Magnitude) Menu

----Log Magnitude----

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 19-33

Figure 19-1. SCALE (Log Magnitude) Menu

SCALE (Linear Magnitude) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

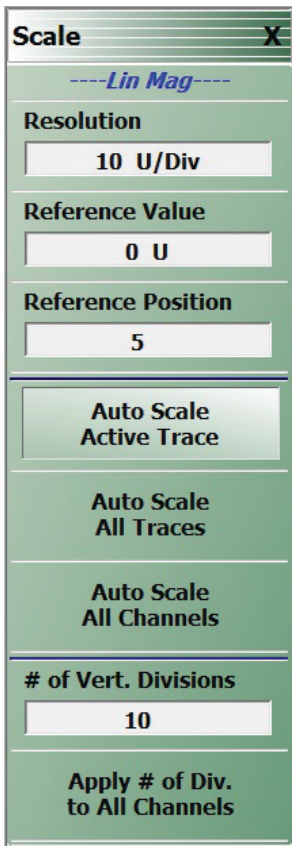
- TRACE FORMAT is set to Lin Mag
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Lin Mag

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



SCALE Menu

----Linear Magnitude----

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 19-33

Figure 19-2. SCALE (Linear Magnitude) Menu

SCALE (kQ) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

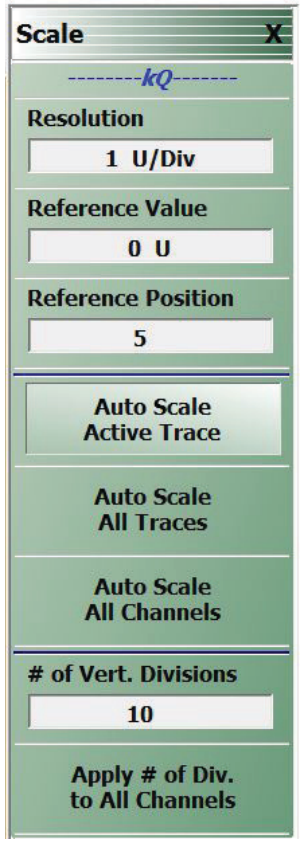
- TRACE FORMAT is set to kQ
- MAIN | Response | RESPONCE | Max Efficiency
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | kQ

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



----Linear Magnitude----

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 19-33

Figure 19-3. SCALE (kQ) Menu

19-5 SCALE (Phase) Menu

SCALE Phase Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

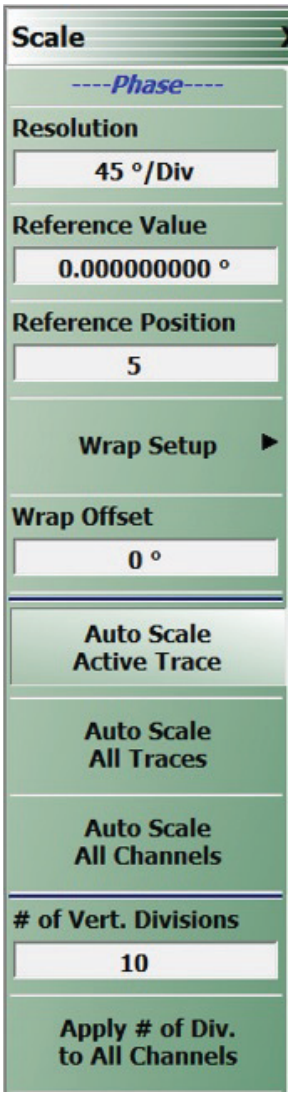
- TRACE FORMAT is set to Phase
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Phase

Previous

- Main Menu on page 2-2

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: º (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 19-21

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- “SCALE Menu Common Buttons” on page 19-33

Figure 19-4. SCALE (Phase) Menu

19-6 SCALE (Real or Imaginary) Menus

SCALE (Real Magnitude) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

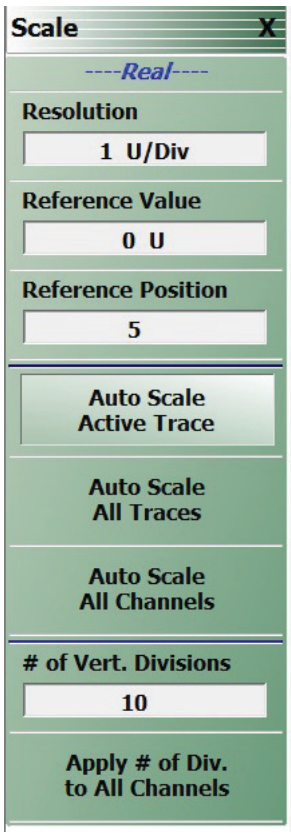
- TRACE FORMAT is set to Real
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Real

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



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 19-33

Figure 19-5. SCALE (Real) Menu

SCALE (Imaginary) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

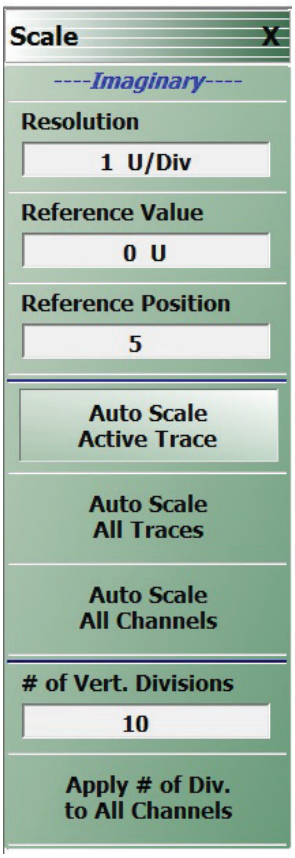
- TRACE FORMAT is set to Imaginary
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Imaginary

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



Scale (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 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 19-33

Figure 19-6. SCALE (Imaginary) Menu

19-7 SCALE (SWR) Menu

SCALE Standing Wave Ratio Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

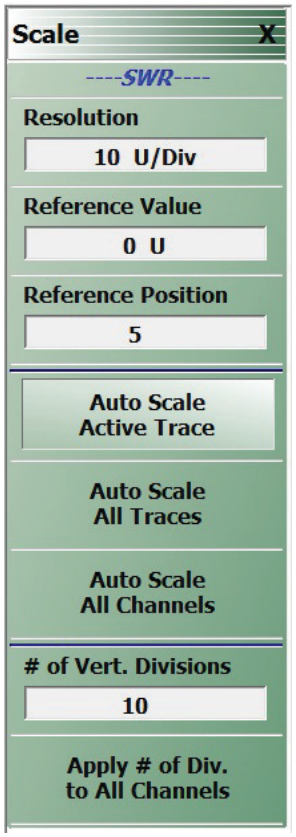
- TRACE FORMAT is set to VSWR
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | VSWR

Previous

- Main Menu on page 2-2

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 19-33

Figure 19-7. SCALE SWR (Standing Wave Ratio) Menu

19-8 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 depend 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 19-1

Prerequisites

- TRACE FORMAT is set to Smith (R+jX Impedance)
  - Display Main Menu on page 18-3
  - 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 18-13
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX) | SMITH IMPED.

Previous

- Main Menu on page 2-2

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

Opens the SMITH SCALING Menu on page 19-17 .

Wrap Setup

Select opens the WRAP SETUP menu.

- WRAP SETUP Menu on page 19-21

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "SCALE Menu Common Buttons" on page 19-33

Figure 19-8. SCALE (Smith Impedance) Menu

SCALE (Smith Chart Admittance) Menu

Menu Appearance

- The appearance and button availability of the SCALE menu depend on the settings on the DISPLAY menu.
- "Scale Menus Appearance, Common Buttons, and Units" on page 19-1

Prerequisites

- TRACE FORMAT is set to Smith (G+jB Admittance)
  - Display Main Menu on page 18-3
  - 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 18-13
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB) | SMITH ADMITT.

Previous

- Main Menu on page 2-2

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 19-17 .

Wrap Setup

Select displays the WRAP SETUP menu which allows the user to define if wrapping is ON or OFF, and if ON, the wrap offset in degrees.

Additional Common Buttons

- "WRAP SETUP Menu" on page 19-21

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "SCALE Menu Common Buttons" on page 19-33

Figure 19-9. SCALE (Smith Admittance) Menu

SMITH SCALING Menu

Menu Appearance

- The appearance and button availability of the SCALE menu depend on the settings on the DISPLAY menu.
- "Scale Menus Appearance, Common Buttons, and Units" on page 19-1

Prerequisites

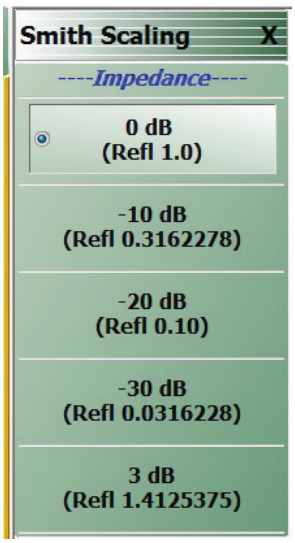
- TRACE FORMAT is set to Smith (R+jX Impedance) or Smith (G+jB Admittance)
  - Display Main Menu on page 18-3
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (R+jX)
  - MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Smith (G+jB)
- SMITH readout style is set to Linear/Phase, Log/Phase, Real/Imaginary, Impedance or Admittance
  - SMITH IMPEDANCE Menu on page 18-13
  - 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 19-13
- SCALE (Smith Chart Admittance) Menu on page 19-15

Navigation

- MAIN | Scale | SCALE



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)

–10 dB (Refl 0.3162278)

–20 dB (Refl 0.10)

–30 dB (Refl 0.0316228)

3 dB (Refl 1.4125375)

Figure 19-10. SMITH SCALING Menu

19-9 SCALE (Polar Chart) Menus

SCALE (Linear Polar Chart) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend on the settings on the DISPLAY menu.
- "Scale Menus Appearance, Common Buttons, and Units" on page 19-1

Prerequisites

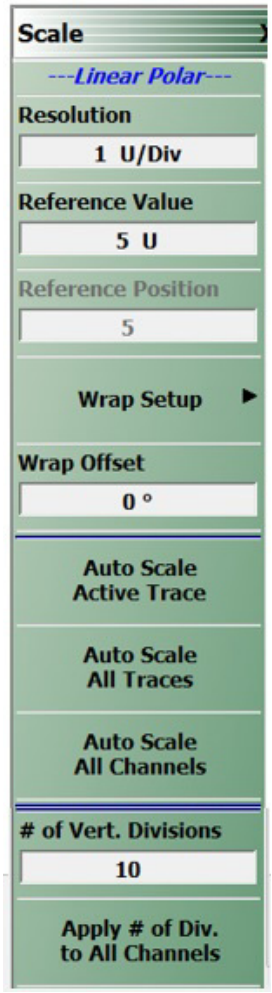
- The SCALE (Linear Polar) menu is available when TRACE FORMAT on the Display menu is set to either Linear Polar (Linear/Phase) or Linear Polar (Real/Imaginary).
- Button Units: U (Units)
- Button Units: ° (Degrees)
- The Reference Position button is unavailable.

Previous

- Main Menu on page 2-2

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 19-33

Figure 19-11. SCALE (Linear Polar) Menu

SCALE (Log Polar Chart) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisites

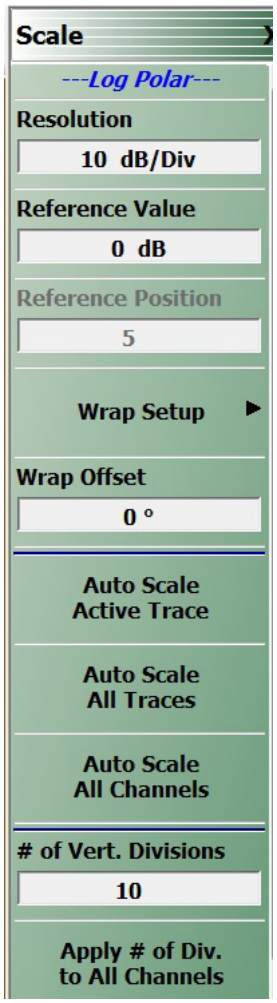
- The SCALE (Log Polar) menu is available when Trace Format is set to either Log Polar (Linear/Phase) or Log Polar (Real/Imaginary).
- Button Units: dB
- Button Units: ° (Degrees)

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



Resolution (dB/Div)

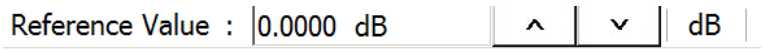
Select displays the Resolution (dB) toolbar with units in dB per division.

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 opens the WRAP SETUP menu.

- WRAP SETUP Menu on page 19-21

Additional Common Buttons

- "SCALE Menu Common Buttons" on page 19-33

Figure 19-12. SCALE (Log Polar) Menu

WRAP SETUP Menu

Prerequisites

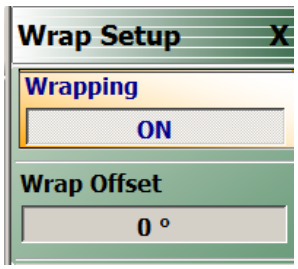
- The WRAP SETUP submenu is linked to the SCALE Smith Impedance or the SCALE Smith Admittance menus and is only available if the DISPLAY menu is set to a Smith Impedance (R+jX) or Smith Admittance (G+jB) trace display.
- DISPLAY Menu on page 18-3

Previous

- SCALE (Smith Chart Impedance) Menu on page 19-13
- SCALE (Smith Chart Admittance) Menu on page 19-15

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 19-13. WRAP SETUP Menu

19-10 SCALE (Dual-Trace Display) Menus

SCALE (Impedance Real and Imaginary) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

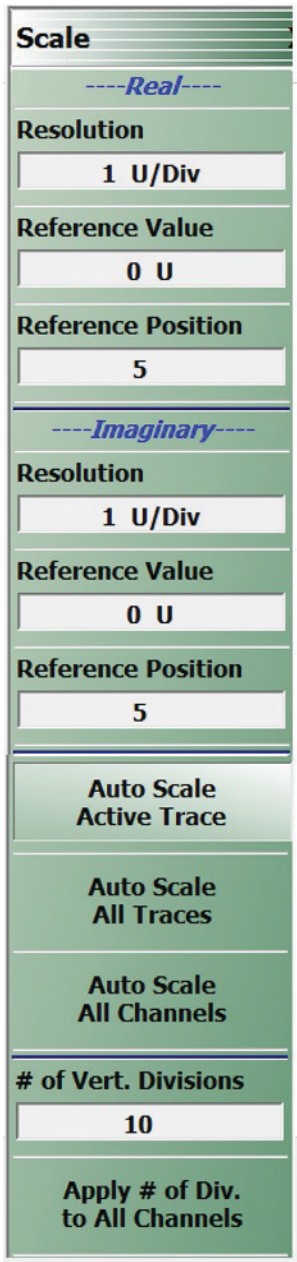
- TRACE FORMAT is set to Real & Imaginary
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Impedance | IMPEDANCE | Real&Imaginary

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



SCALE (Impedance Real & 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).

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 19-33

Figure 19-14. SCALE (Impedance Real and Impedance Imaginary) Menu

SCALE (Log Magnitude and Phase) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

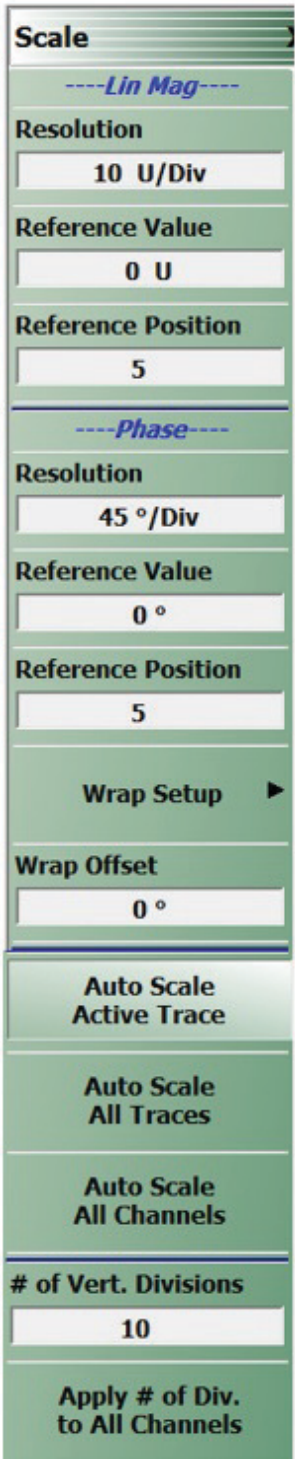
- TRACE FORMAT is set to Log Mag And Phase
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Log Mag And Phase

Previous

- Main Menu on page 2-2

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 19-15. SCALE (Log Magnitude and Phase) Menu (1 of 2)

Wrap Setup

Select opens the WRAP SETUP menu.

- WRAP SETUP Menu on page 19-21

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "SCALE Menu Common Buttons" on page 19-33

Figure 19-15. 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 depend 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 19-1

Prerequisite

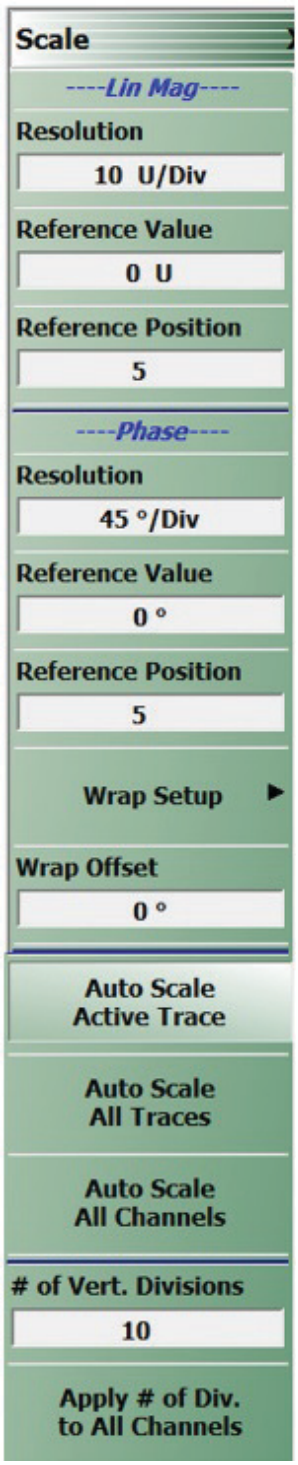
- TRACE FORMAT is set to Lin Mag And Phase
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Lin Mag And Phase

Previous

- Main Menu on page 2-2

Navigation

- MAIN | Scale | SCALE



SCALE (Linear Magnitude and Phase) 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 19-16. SCALE (Linear Magnitude and Phase) Menu (1 of 2)

Wrap Setup

Select opens the WRAP SETUP menu.

- WRAP SETUP Menu on page 19-21

Wrap Offset

Select displays the Wrap Offset field toolbar with units in degrees.

Additional Common Buttons

- "SCALE Menu Common Buttons" on page 19-33

Figure 19-16. 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 depend 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 19-1

Prerequisite

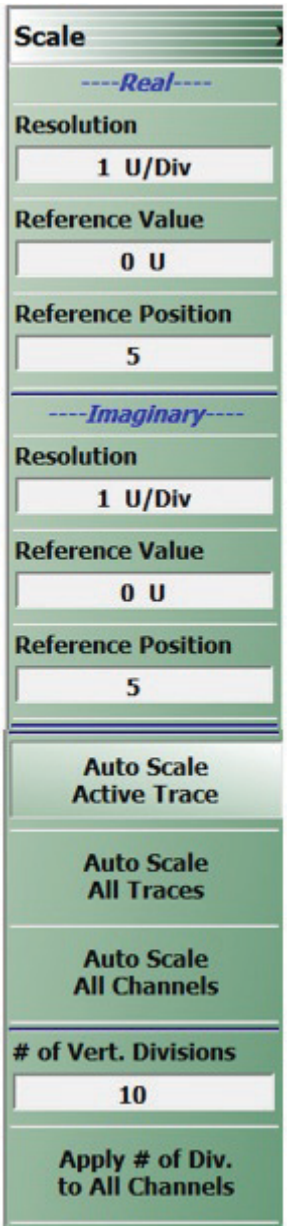
- TRACE FORMAT is set to Real And Imaginary
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Real And Imaginary

Previous

- Main Menu on page 2-2

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 19-33

Figure 19-17. SCALE (Real and Imaginary) Menu

SCALE (Group Delay) Menu

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

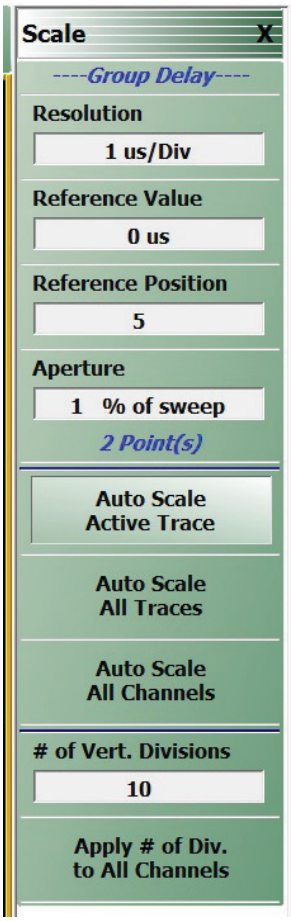
- TRACE FORMAT is set to Group Delay
- MAIN | Display | DISPLAY | Trace Format | TRACE FORMAT | Group Delay

Previous

- Main Menu on page 2-2

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.

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 19-33

Figure 19-18. SCALE (Group Delay) Menu (1 of 2)

19-11 SCALE Menu Common Buttons

The button descriptions below apply to all SCALE menus.

Menu Identification

- The appearance and button availability of the SCALE menu depend 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 19-1

Prerequisite

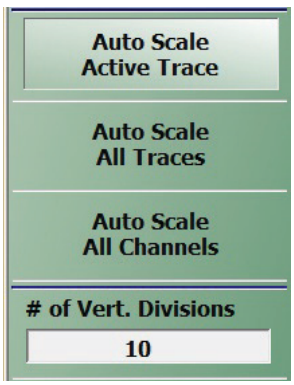
- MAIN | Scale | SCALE

Previous

- Main Menu on page 2-2

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.

Auto Scale All Traces

Select applies the auto scale function to all traces.

Auto Scale All Channels

Select applies the auto scale function to all channels.

of Vert. Divisions (Number)

Select displays the Number of Vertical Divisions field toolbar.

Figure 19-19. SCALE Menu – Common Buttons

Chapter 20 — Marker Menus

20-1 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.

20-2 Overview of Marker Menus, Dialog Boxes, and Toolbars

The available menus and dialog boxes are:

- MARKERS [1] Menu on page 20-4
- MARKERS [2] Menu on page 20-7
- MARKER SETUP Menu on page 20-9
    - "Marker Table Display" on page 20-12
- MARKER SEARCH Menu on page 20-13
- PEAK (Marker) Menu on page 20-14
- TARGET (Marker) Menu on page 20-15
- ADVANCED SEARCH (Markers) Menu on page 20-16
- MULTI PEAK (Marker Search) Menu on page 20-17
- MULTI TARGET (Marker Search) Menu on page 20-18
- SEARCH RANGE (Marker) Menu on page 20-19
- "BANDED SEARCH RANGE CONFIGURATION Dialog Box" on page 20-20
- BANDWIDTH (Marker Search) Menu on page 20-24
- NOTCH (Marker Search) Menu on page 20-26
- MKR FUNCTIONS Menu on page 20-28
- "Marker Value/Math Functions" on page 20-28

20-3 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].

Toggle 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.

Toggle 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 location 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

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.

20-4 Primary Marker Menus

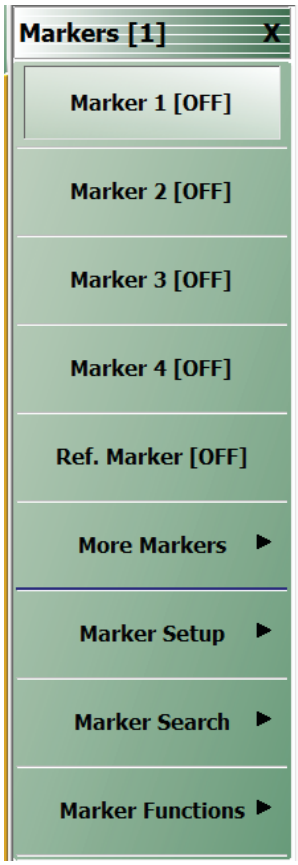
MARKERS [1] Menu

Previous

- Main Menu on page 2-2

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 20-5

Mkr 3 [Ref] [OFF/ON]

Used to control Marker 3.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 4 [Ref] [OFF/ON]

Used to control Marker 4.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

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.

Figure 20-1. MARKERS [1] Menu (1 of 2)

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 20-7

Markers Setup

Select displays the MARKER SETUP menu.

- MARKER SETUP Menu on page 20-9

Markers Search

Select displays the MARKER SEARCH button.

- MARKER SEARCH Menu on page 20-13

Marker Functions

Select displays the MKR FUNCTIONS menu.

- MKR FUNCTIONS Menu on page 20-28

Figure 20-1. MARKERS [1] Menu (2 of 2)

MARKERS [2] Menu

Previous

- MARKERS [1] Menu on page 20-4

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 20-5

Mkr 6 [Ref] [OFF/ON]

Used to control Marker 6.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 7 [Ref] [OFF/ON]

Used to control Marker 7.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 8 [Ref] [OFF/ON]

Used to control Marker 8.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 9 [Ref] [OFF/ON]

Used to control Marker 9.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 10 [Ref] [OFF/ON]

Used to control Marker 10.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 11 [Ref] [OFF/ON]

Used to control Marker 11.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Mkr 12 [Ref] [OFF/ON]

Used to control Marker 12.

- "Mkr 1 [Ref] [OFF/ON]" on page 20-5

Figure 20-2. MARKERS [2] Menu

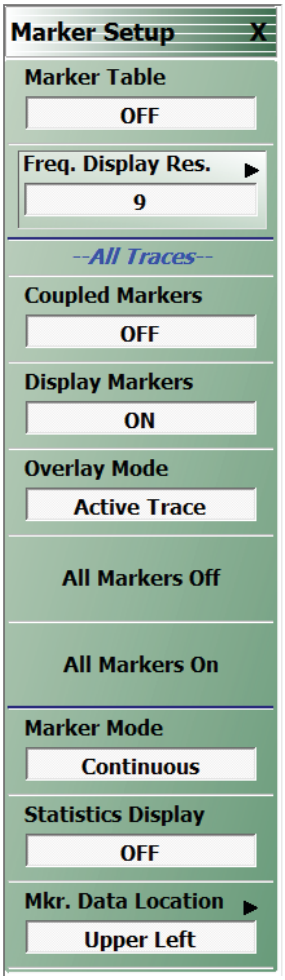
MARKER SETUP Menu

Previous

- MARKERS [1] Menu on page 20-4

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 visible. When ON is selected, the main display area is shortened, and the Marker Table appears below the main display.

- "Marker Table Display" on page 20-12

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 visible markers between All traces or the Active trace.

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 20-3. 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 20-11 .

Figure 20-3. MARKER SETUP Menu (2 of 2)

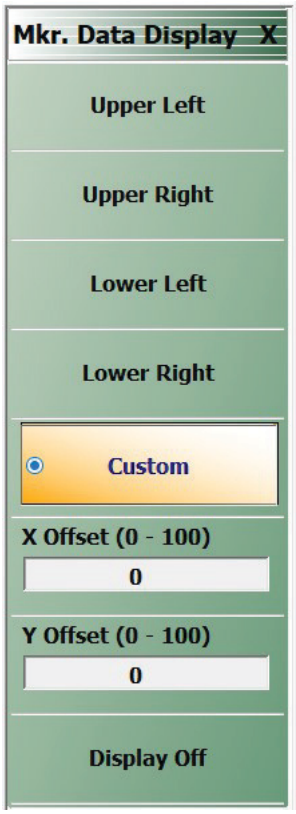
MKR. DATA DISPLAY Menu

Previous

- MARKER SETUP Menu on page 20-9

Navigation

- MAIN | Marker | MARKERS [1] | Marker Setup | MARKER SETUP | Mrk Data Location | MRK. POSITION



Marker Data Display

Selections position the marker 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 marker(s) within the display.

  As the Ripple Limit 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 Marker data display.

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).

Figure 20-4. MARKER SETUP Menu

Marker Table Display

Previous

- MARKER SETUP Menu on page 20-9

Navigation

- MAIN | Marker | MARKERS [1] | Marker Setup | MARKER SETUP | Marker Table Display

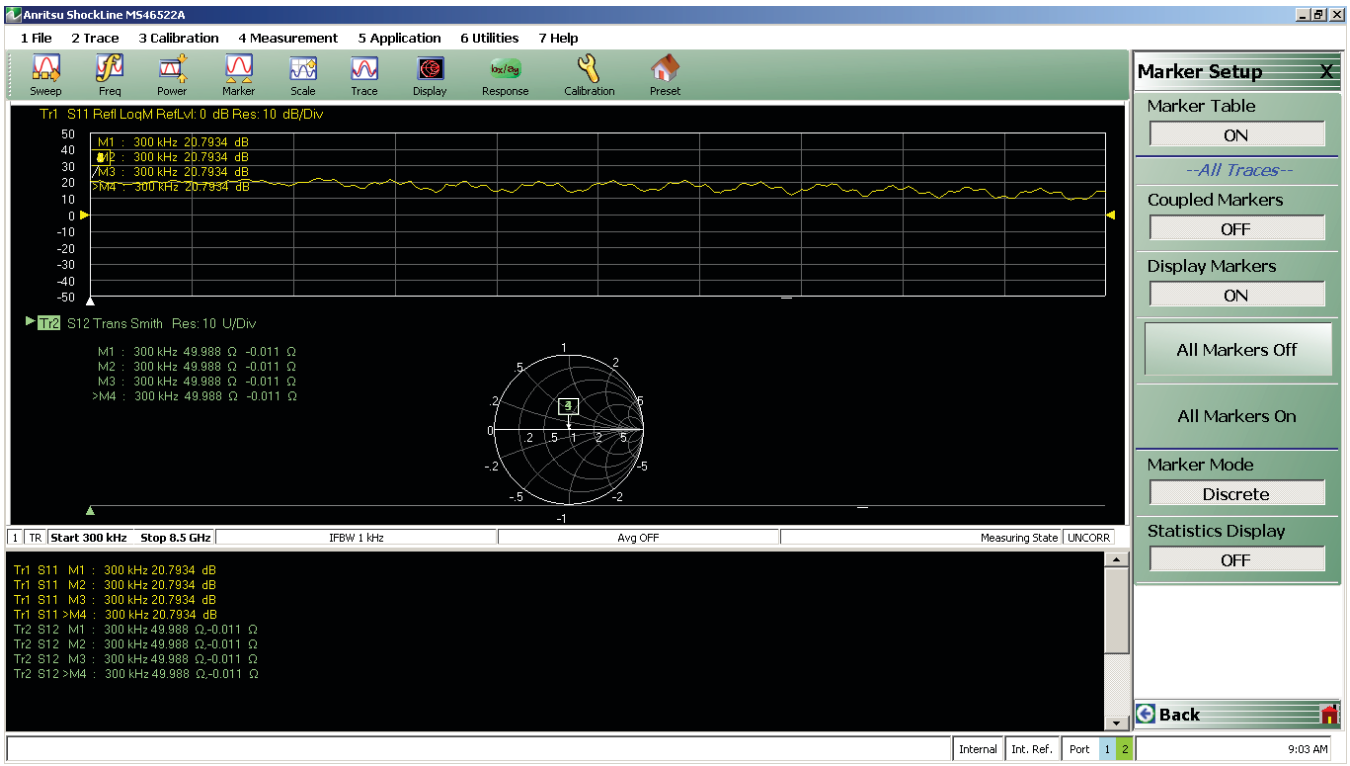


Figure 20-5. MARKER Table Display

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.

20-5 Marker Search Menus

MARKER SEARCH Menu

Previous

- MARKERS [1] Menu on page 20-4

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 20-14

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 20-15

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 20-16

Figure 20-6. MARKER SEARCH Menu

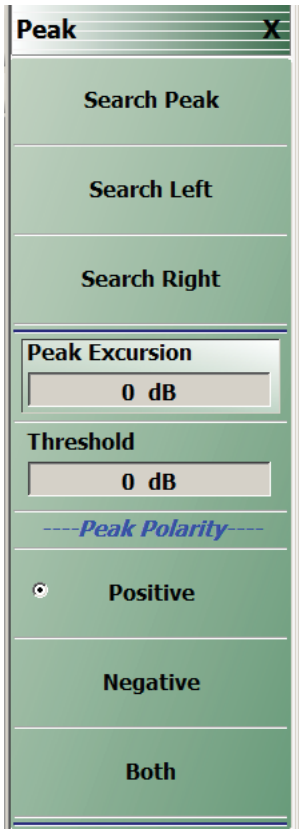
PEAK (Marker) Menu

Previous

- MARKER SEARCH Menu on page 20-13

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 20-7. PEAK (Marker) Menu

TARGET (Marker) Menu

Previous

- MARKER SEARCH Menu on page 20-13

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 20-8. TARGET (Marker) Menu

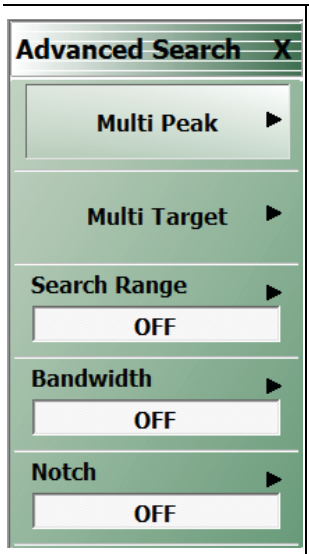
ADVANCED SEARCH (Markers) Menu

Previous

- MARKER SEARCH Menu on page 20-13

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 20-17

Multi Target

Select displays the MULTI TARGET menu.

- MULTI TARGET (Marker Search) Menu on page 20-18

Search Range

Select displays the SEARCH RANGE menu.

- SEARCH RANGE (Marker) Menu on page 20-19

Bandwidth

Select displays the BANDWIDTH menu.

- BANDWIDTH (Marker Search) Menu on page 20-24

Notch

Select displays the NOTCH menu.

- NOTCH (Marker Search) Menu on page 20-26

Figure 20-9. ADVANCED SEARCH (Markers) Menu

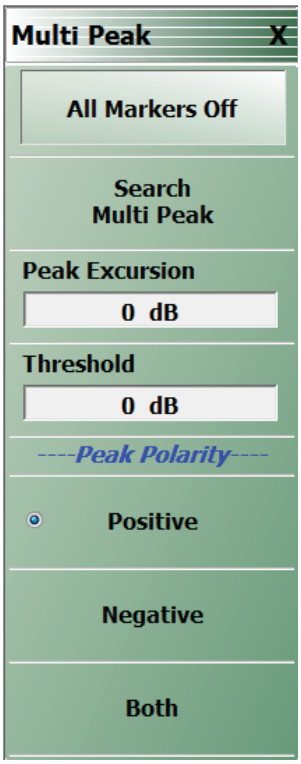
MULTI PEAK (Marker Search) Menu

Previous

- ADVANCED SEARCH (Markers) Menu on page 20-16

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 20-10. MULTI PEAK (Marker Search) Menu

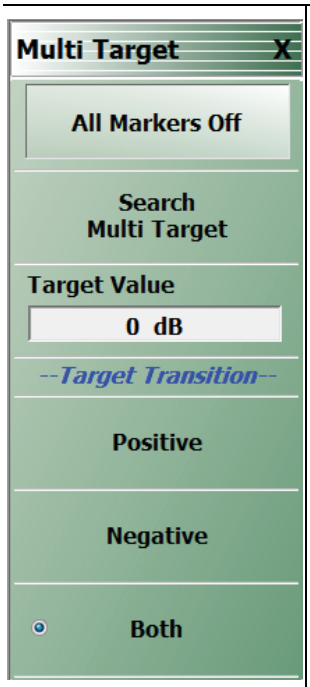
MULTI TARGET (Marker Search) Menu

Previous

- ADVANCED SEARCH (Markers) Menu on page 20-16

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 20-11. MULTI TARGET (Marker Search) Menu

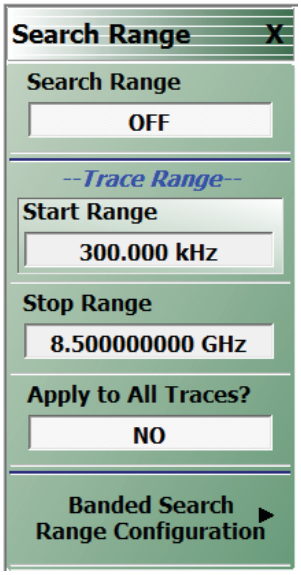
SEARCH RANGE (Marker) Menu

Previous

- ADVANCED SEARCH (Markers) Menu on page 20-16

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.

Figure 20-12. SEARCH RANGE (Marker) Menu

BANDED SEARCH RANGE CONFIGURATION Dialog Box

Previous

- SEARCH RANGE (Marker) Menu on page 20-19

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

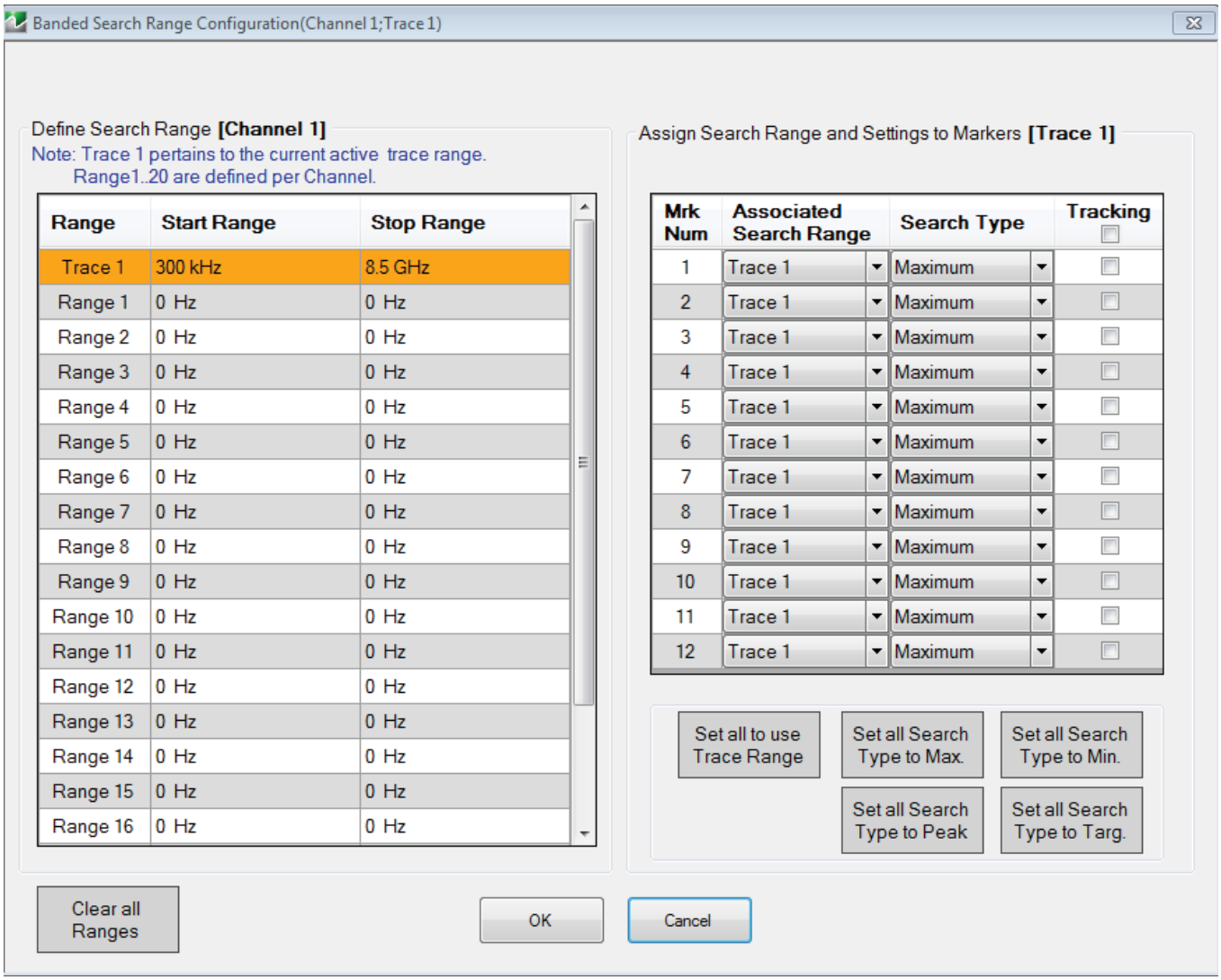


Figure 20-13. Banded Search Range Configuration Dialog Box – Frequency Sweep Example (1 of 2)

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 20-14). 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 20-14).

Search Type – Allows selection of Maximum, Minimum, Peak, and Target (see Figure 20-14).

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.

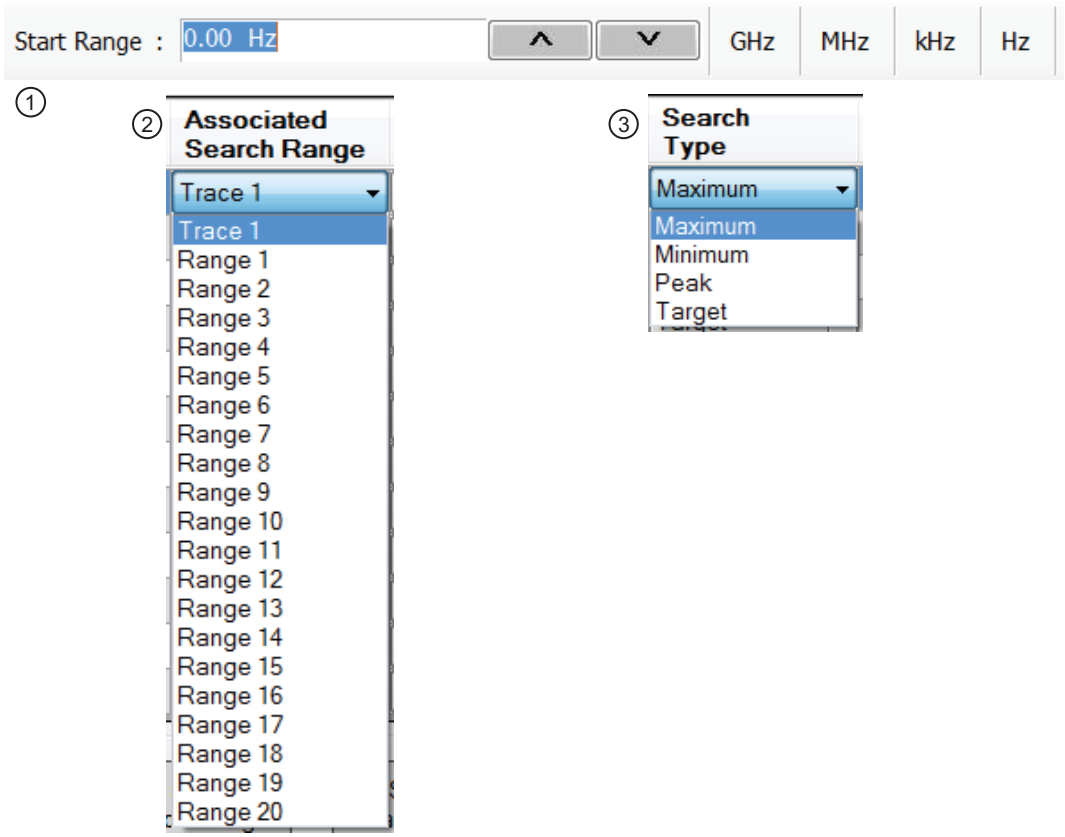
Set all Search Type to Max. – Sets the search type for all markers to be 'maximum' (i.e., maximum trace value in the specified range).

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 20-13. Banded Search Range Configuration Dialog Box – Frequency Sweep Example (2 of 2)

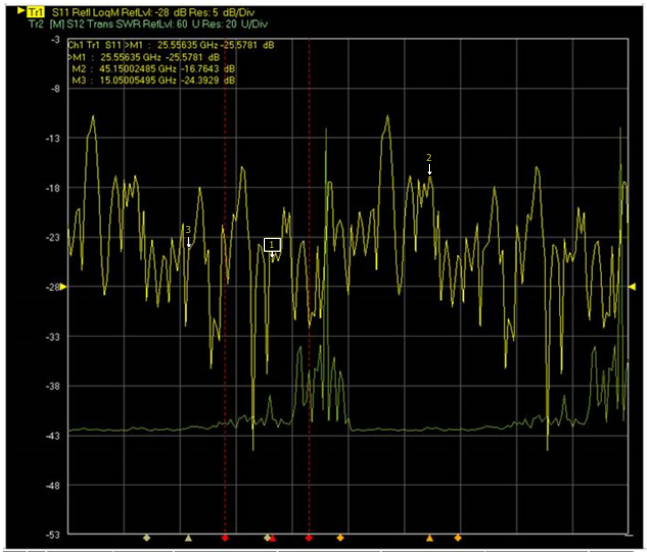


1. Start Range Toolbar: Frequency Domain example. Stop Range Toolbar is similar.	2. ASSOCIATED SEARCH RANGE Drop-down Menu 3. SEARCH TYPE Drop-down Menu

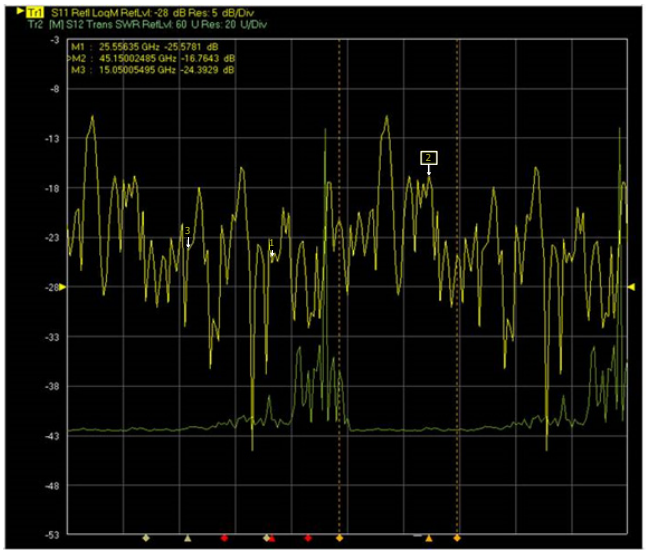
Figure 20-14. Banded Search Range Configuration Dialog Box Toolbar and Drop-Down Menus

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.

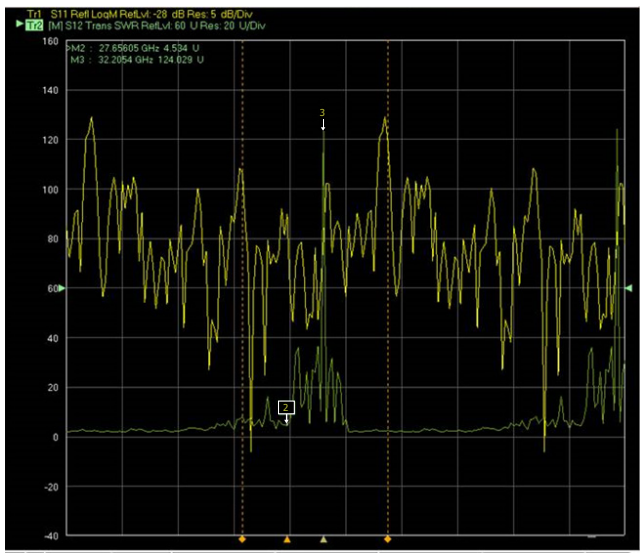


Trace 1, Marker 1 Active



Trace 1, Marker 2 Active

Figure 20-15. Banded Marker Search Range – Examples 1 and 2



Trace 2, Marker 3 Active

Marker 2 and Marker 3 share the same search range.

Figure 20-16. 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.

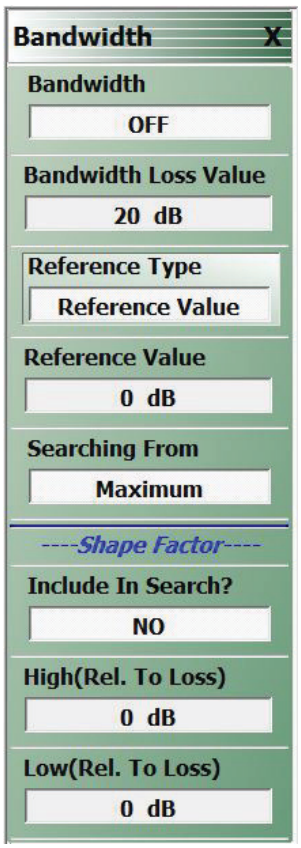
BANDWIDTH (Marker Search) Menu

Previous

- ADVANCED SEARCH (Markers) Menu on page 20-16

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 20-17. BANDWIDTH (Marker Search) 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 20-17. BANDWIDTH (Marker Search) Menu (2 of 2)

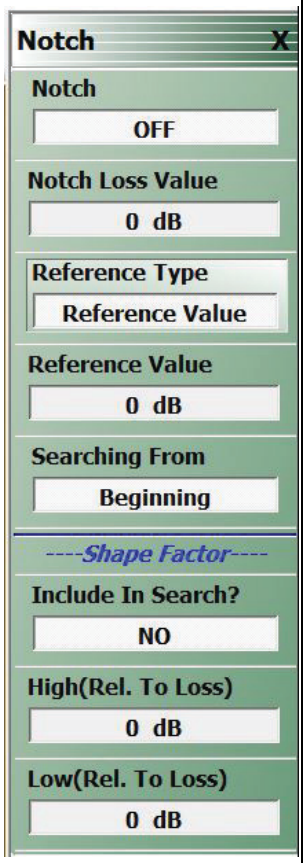
NOTCH (Marker Search) Menu

Previous

- ADVANCED SEARCH (Markers) Menu on page 20-16

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 20-18. NOTCH (Marker Search) 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 20-18. NOTCH (Marker Search) Menu (2 of 2)

20-6 Marker Value/Math Functions

MKR FUNCTIONS Menu

Full Name

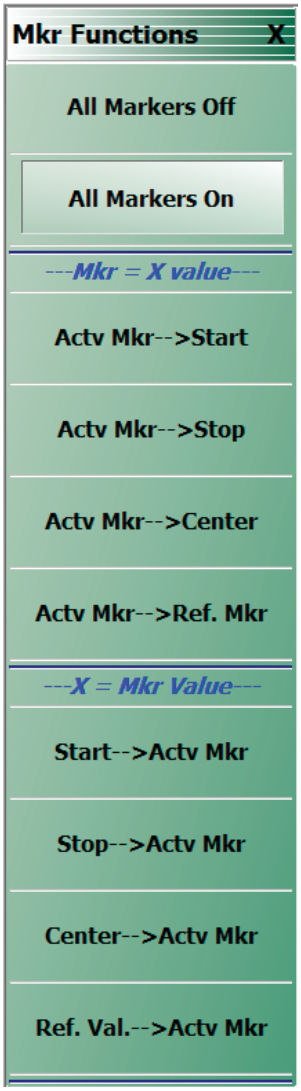
- Marker Functions Menu

Previous

- MARKERS [1] Menu on page 20-4

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

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.

Figure 20-19. MKR FUNCTIONS (MARKER FUNCTIONS) Menu (1 of 2)

	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 20-19. MKR FUNCTIONS (MARKER FUNCTIONS) Menu (2 of 2)

Chapter 21 — System Menus

21-1 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.

21-2 System Menus, Buttons, and Dialog Boxes

- SYSTEM Menu on page 21-2
- SETUP Menu on page 21-3
  - "Clock Setup" on page 21-3
  - "COLOR SETUP Dialog Box" on page 21-6
  - "FONT DIALOG Box" on page 21-9
  - "TRACE THICKNESS SETUP Dialog Box" on page 21-10
  - MISC SETUP Menu in 4-Port VNAs on page 21-11
    - "SNP SETUP Dialog Box – 2-Port VNAs" on page 21-13
    - "SNP SETUP Dialog Box – 4-Port VNAs" on page 21-16
    - "MnP SETUP Dialog Box – 4-Port VNAs" on page 21-19
  - AUTOCAL UTILITY Menu on page 21-22
- UTILITY Menu on page 21-21
- NETWORK INTERFACE Menu on page 21-24
  - "NETWORK CONNECTIONS Dialog Box" on page 21-25
- "SELF TEST Dialog Box" on page 21-26
- "EVENT VIEWER Dialog Box" on page 21-27
- "DIAGNOSTICS ACCESS Dialog Box" on page 21-29

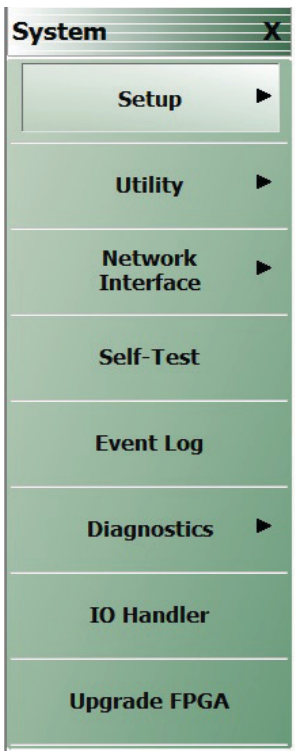
21-3 SYSTEM Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | System | SYSTEM



Setup

Select displays the SETUP menu.

- SETUP Menu on page 21-3

Utility

Select displays the UTILITY menu.

- UTILITY Menu on page 21-21

Network Interface

Select displays the NETWORK INTERFACE menu.

- NETWORK INTERFACE Menu on page 21-24

Self-Test

Select displays the SELF TEST dialog box.

- "SELF TEST Dialog Box" on page 21-26

Event Log

Select displays the EVENT VIEWER dialog box.

- "EVENT VIEWER Dialog Box" on page 21-27

Diagnostics

Select displays the DIAGNOSTICS ACCESS dialog box.

- "DIAGNOSTICS ACCESS Dialog Box" on page 21-29

Upgrade FPGA

Select initiates a firmware update. **FOR FACTORY SERVICE USE ONLY**.

Figure 21-1. SYSTEM Menu

SETUP Menu

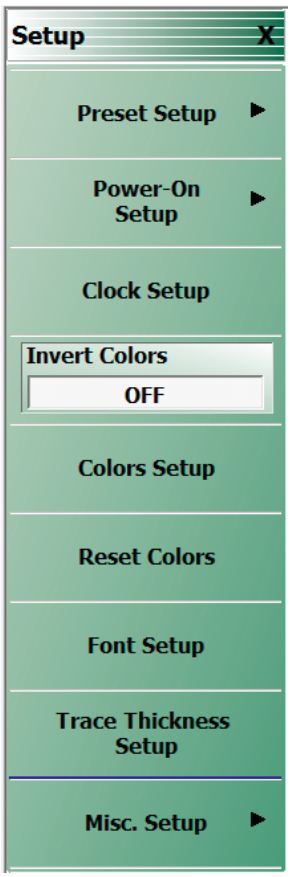
Provides a variety of setup functions.

Previous

- SYSTEM Menu on page 21-2

Navigation

- MAIN | System | SYSTEM | Setup | SETUP



Preset Setup

Opens the PRESET SETUP Menu on page 21-4 .

Power-On Setup

Opens the POWER-ON SETUP Menu on page 21-5 .

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 21-6

Reset Colors

Opens RESET COLORS dialog box for option to reset color changes made in the COLOR SETUP dialog box.

Font Setup

Opens FONT SETUP dialog box for option to change font style.

- "FONT DIALOG Box" on page 21-9

Trace Thickness Setup

Opens TRACE THICKNESS SETUP dialog box for option to change the thickness of the GUI trace display.

- "TRACE THICKNESS SETUP Dialog Box" on page 21-10

Misc. Setup

Opens MISC SETUP dialog box for options for SnP, MnP, and data file setup options.

- "TRACE THICKNESS SETUP Dialog Box" on page 21-10

Figure 21-2. SETUP Menu

PRESET SETUP Menu

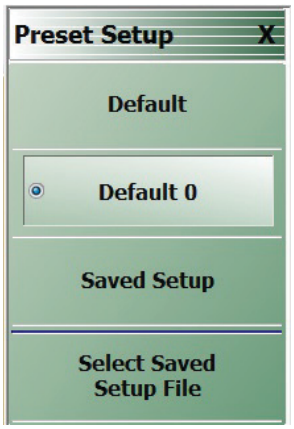
Provides a variety of setup functions.

Previous

- SETUP Menu on page 21-3

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Preset Setup | PRESET SETUP



Default

If selected, the 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 21-3. PRESET SETUP Menu

POWER-ON SETUP Menu

Provides a variety of setup functions.

Previous

- SETUP Menu on page 21-3

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 21-4. POWER-ON SETUP Menu

COLOR SETUP Dialog Box

Previous

- SETUP Menu on page 21-3

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Colors Setup | COLOR SETUP

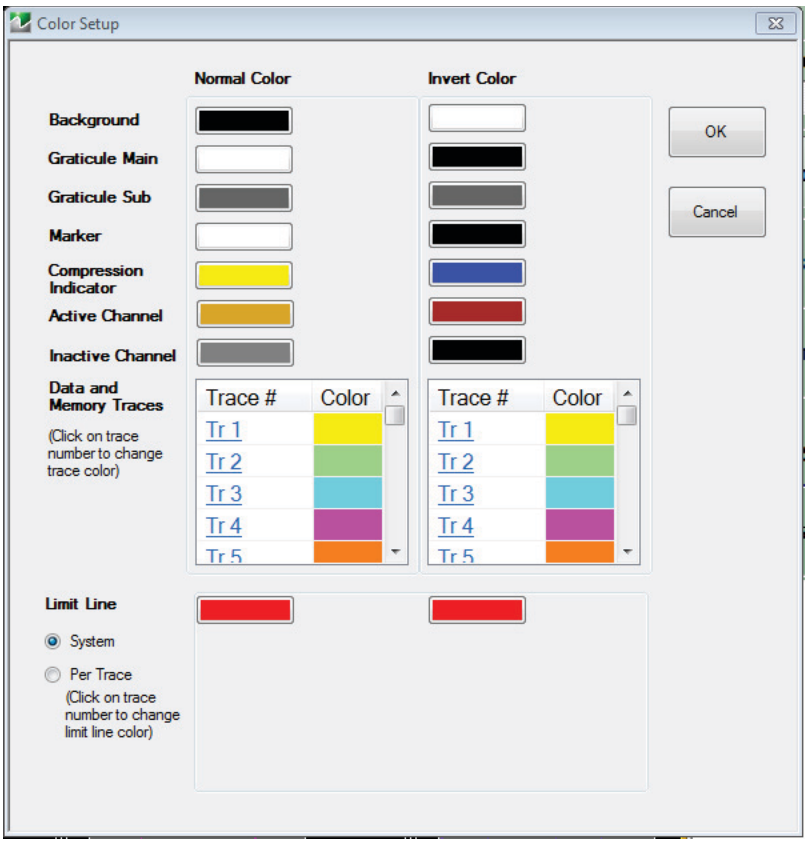


Figure 21-5. COLOR SETUP Dialog – Limit Line Color Per System

Modifying Default Colors

Use the COLOR SETUP dialog box to assign colors in:

- Normal Mode for Background, Graticule Main, Graticule Sub, Limit Lines, and each trace. The scroll bar provides twenty trace memory selections.
- Invert Color Mode for the same elements. The scroll bar provides twenty trace memory selections.

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 21-5).
- Per Trace – The limit line colors for each trace (Normal and Invert) can be selected individually (see Figure 21-6).

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 Trx.

To save a color assignment, click OK, or click Cancel to exit.

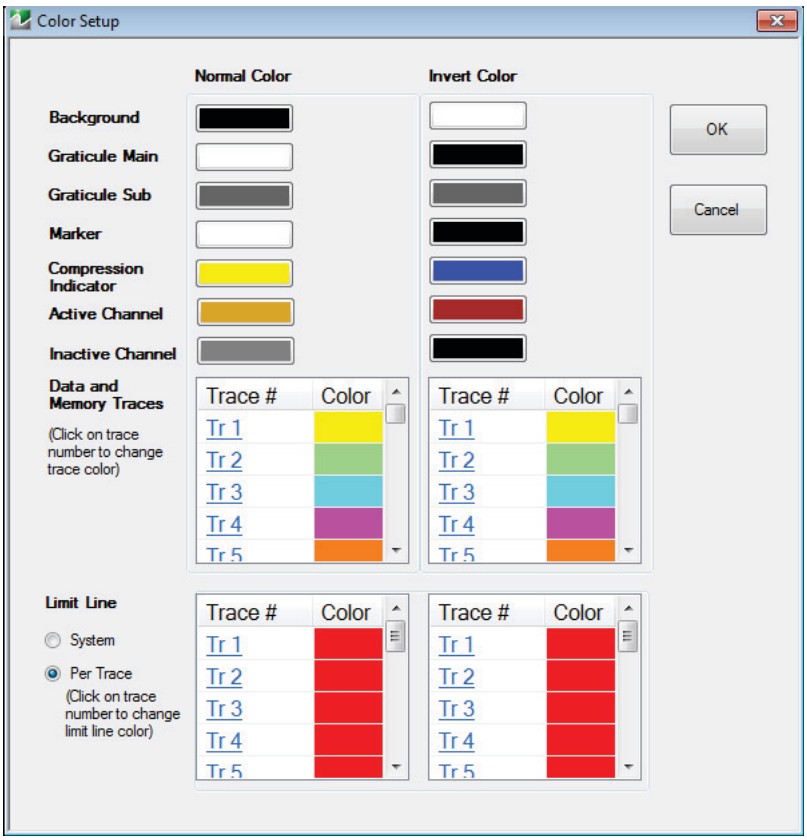


Figure 21-6. COLOR SETUP Dialog – Limit Line Color Per Trace

COLOR Palette Dialog Box

Previous

- “COLOR SETUP Dialog Box” on page 21-6

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Color Setup | COLOR SETUP Dialog Box | Color Block | COLOR Picker Dialog Box

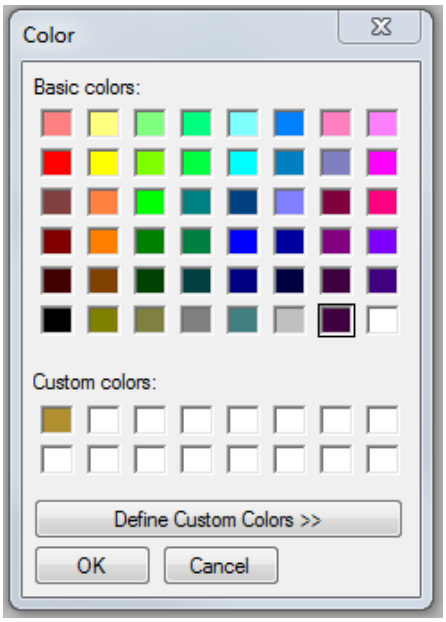


Figure 21-7. COLOR PALLET Dialog Box

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 21-24

Navigation

- MAIN | System | SYSTEM | System | Font Setup | FONT Dialog Box

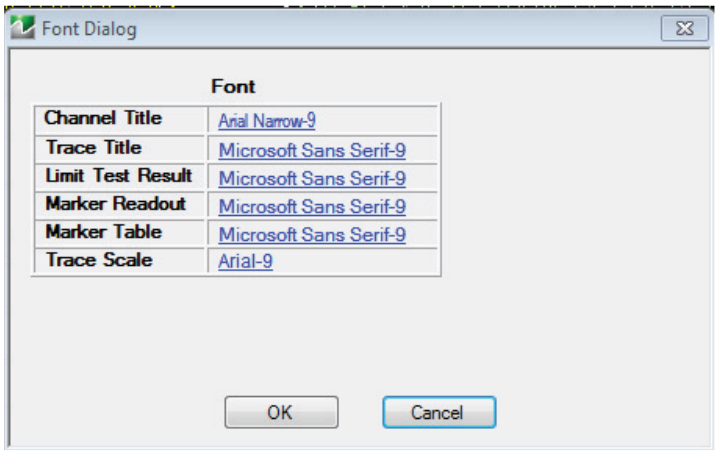


Figure 21-8. FONT CONNECTIONS Dialog Box

Instructions

1. Select the GUI display link to change the font setting. The FONT dialog appears.
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 21-24

Navigation

- MAIN | System | SYSTEM | System | SETUP | Setup | Trace Thickness Setup | TRACE THICKNESS SETUP Dialog Box

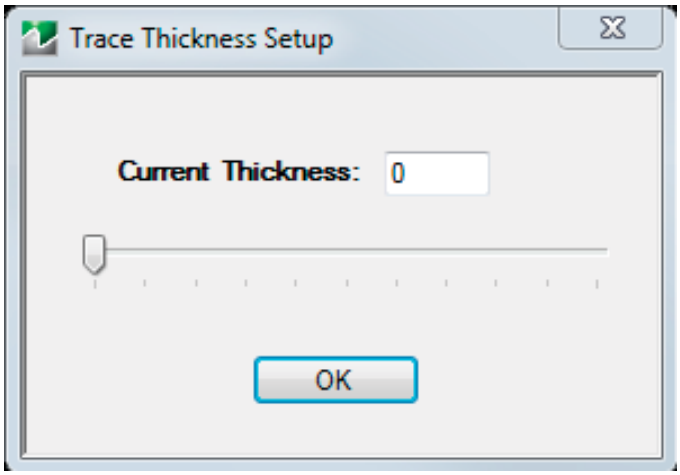


Figure 21-9. TRACE THICKNESS SETUP Dialog Box

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

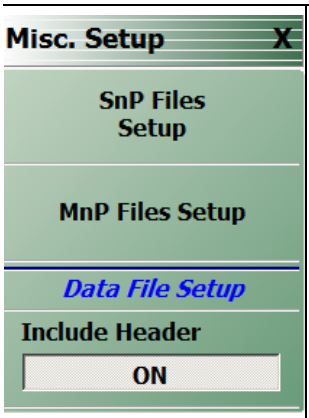
Previous

- Main Menu on page 2-2

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Misc. Setup | MISC. SETUP

MISC SETUP Menu in 4-Port VNAs



SnP Files Setup

Select displays the SNP FILES SETUP dialog box where the frequency units and output format of the SnP files is set.

- "SNP SETUP Dialog Box – 4-Port VNAs" on page 21-16

MnP Files Setup

Select displays the MnP SETUP dialog box. The dialog box allows mixed-mode DUT configuration as:

- M4P DUT with two differential pairs and no singletons
- M4P DUT with one differential pair and two singletons
- M3P DUT with one differential pair and one singleton
- M2P DUT with one differential pair and no singletons

Each configuration allows any VNA port to be assigned to any DUT port.

- "MnP SETUP Dialog Box – 4-Port VNAs" on page 21-19

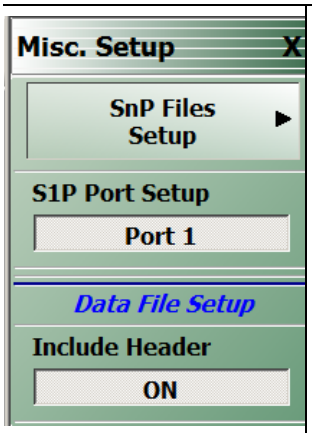
--- Data File Setup ---

Include Header

Toggle ON to include header information in the data file.

Figure 21-10. MISC SETUP Menu in 4-Port VNAs

MISC SETUP Menu in 2-Port VNAs



SnP Files Setup

Select displays the SNP FILES SETUP Menu where the frequency units and output format of the SnP files is set.

- "SNP SETUP Dialog Box – 2-Port VNAs" on page 21-13

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 21-11. MISC SETUP Menu in 2-Port VNAs

SNP Setup

The SnP files setup configuration user interface varies depending on the VNA model's maximum number of ports. The following presents information for the model series covered by this manual.

SNP SETUP Dialog Box – 2-Port VNAs

Prerequisites

- The VNA is in 2-Port Mode

Previous

- MISC SETUP Menu in 2-Port VNAs on page 21-12

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Misc. Setup | MISC. SETUP | SnP Files Setup | SNP SETUP Dialog Box

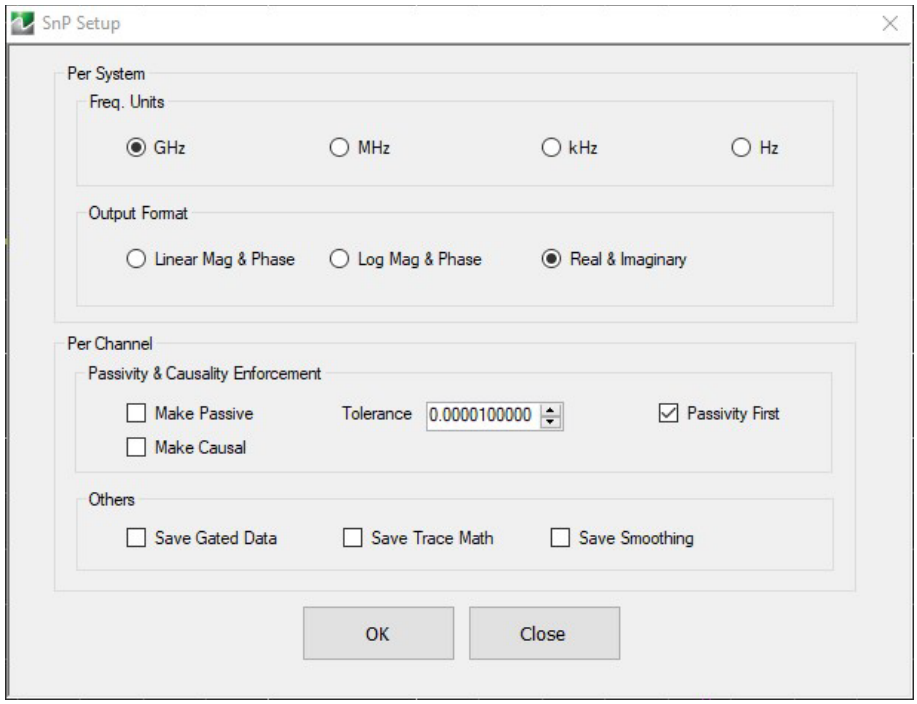


Figure 21-12. SNP FILES SETUP Dialog Box – 2-Port VNAs

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

Per Channel Area

The Per Channel area contains the Passivity and Causality Enforcement and Others areas.

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.

Others Area

In the Others area, the two options can be selected independently of each other.

Others – 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.

Others – 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.

Others – Save Smoothing: When an .snp file is saved with " Save Smoothing enabled, a comment line ("`! Smoothing applied for: Sxy;`") will be added to the generated .snp file, indicating smoothing is applied.

SNP SETUP Dialog Box – 4-Port VNAs

Prerequisites

- The VNA is in 4-Port Mode

Previous

- MISC SETUP Menu in 4-Port VNAs on page 21-11

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Misc. Setup | MISC. SETUP | SnP Setup | SNP SETUP Dialog Box

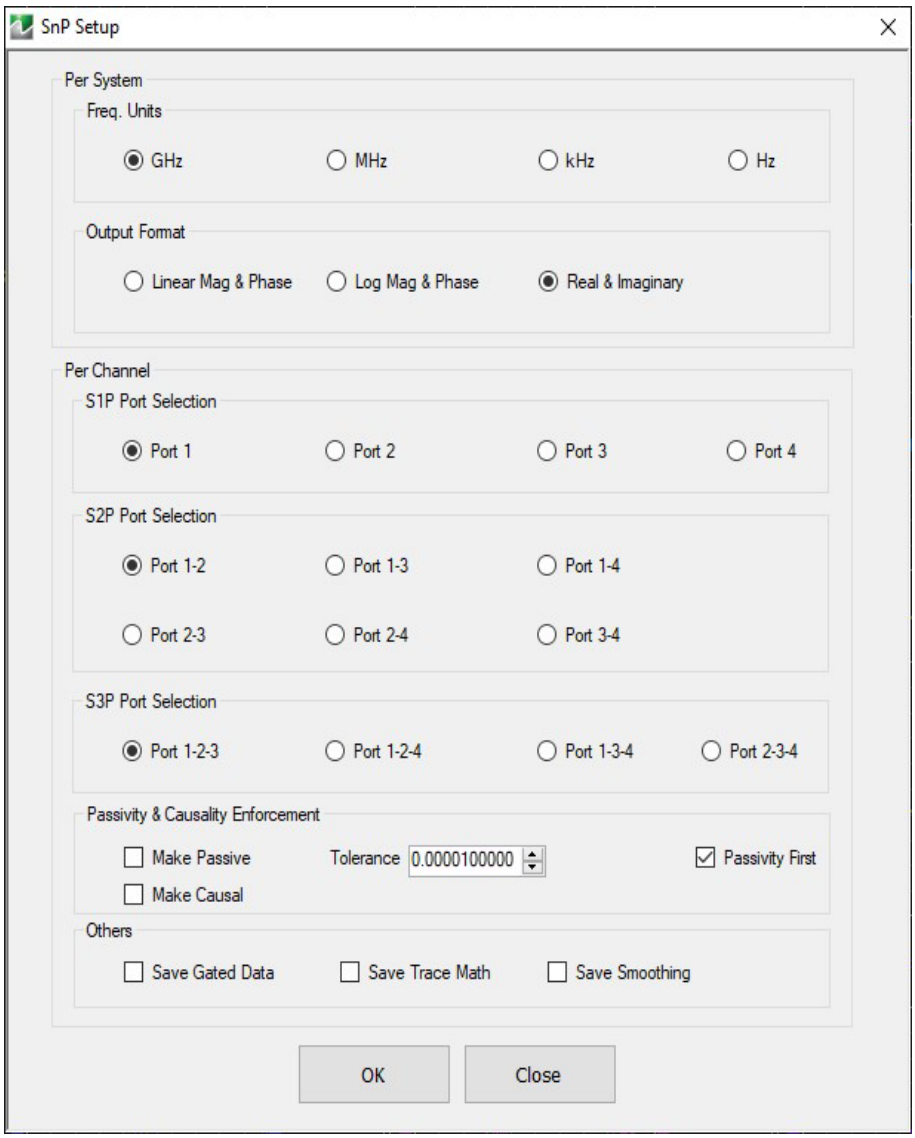


Figure 21-13. SNP SETUP Dialog Box – 4-Port VNAs

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

Per Channel Area

The Per Channel area has four sub-areas: S1P Port Selection radio buttons, S2P Port Selection radio buttons, S3P Port Selection radio buttons, and Others checkboxes.

Per Channel – S1P Port Selection: On a per-channel basis, allows the S1P single port to be selected as:

- Port 1
- Port 2
- Port 3
- Port 4

Per Channel – S2P Port Selection: On a per-channel basis, allows the S2P port pair to be selected as:

- Port 1-2
- Port 1-3
- Port 1-4
- Port 2-3
- Port 2-4
- Port 3-4

Per Channel – S3P Port Selection: On a per-channel basis, allows the S2P port triad to be selected as:

- Port 1-2-3
- Port 1-2-4
- Port 1-3-4
- Port 2-3-4

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.

Others Area

In the Others area, the two options can be selected independently of each other.

Others – 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 02) is present. The Save Gated Data option is NOT available in CW power sweep mode.

Others – 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.

Others – 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.

MnP SETUP Dialog Box – 4-Port VNAs

Full Name

- Mixed-mode DUT Setup Dialog Box – 4-Port VNAs

Prerequisites

- VNA is in 4-Port Mode

Previous

- "TRACE THICKNESS SETUP Dialog Box" on page 21-10

Navigation

- MAIN | System | SYSTEM | Setup | SETUP | Misc. Setup | MISC. SETUP | MnP Files Setup | MXP SETUP Dialog Box

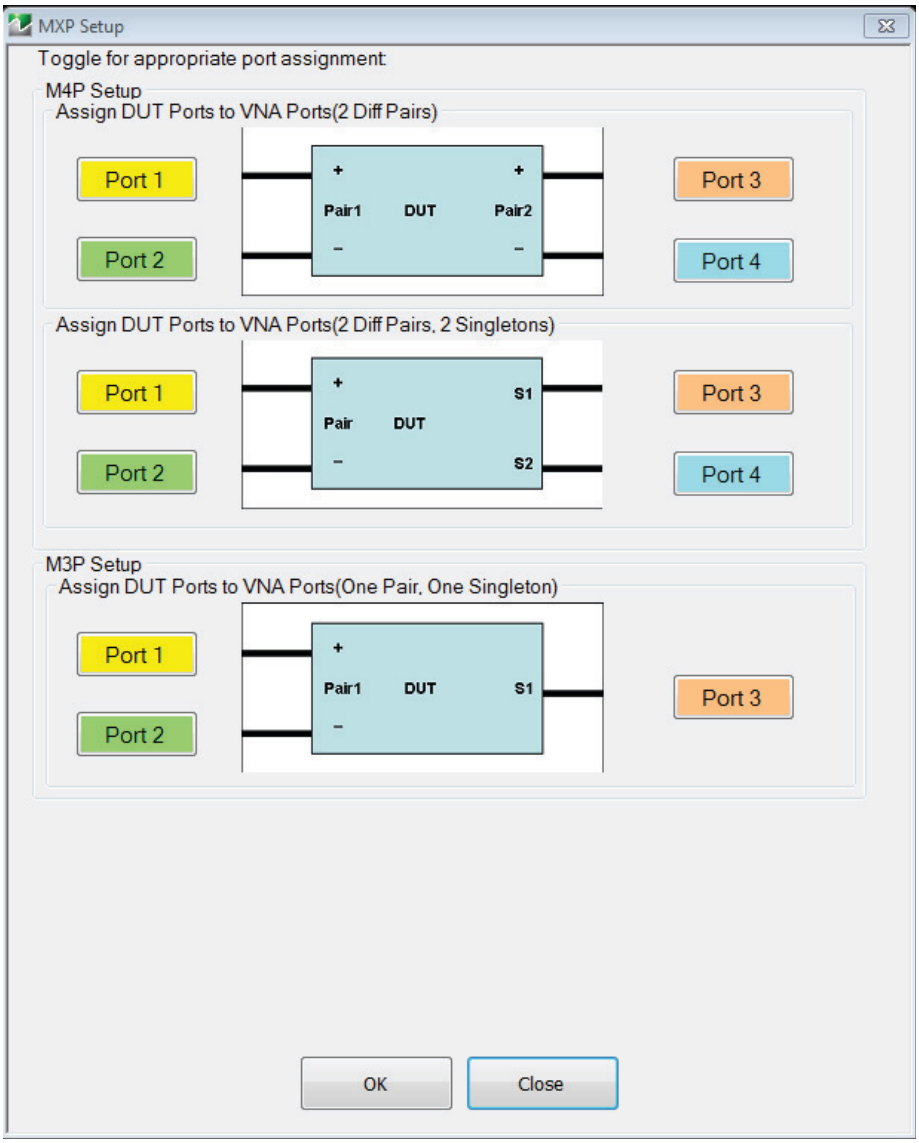


Figure 21-14. MXP (MIXED-MODE DUT) SETUP Dialog Box

Instructions

Select displays the MXP SETUP dialog box. The dialog box provides VNA-port to DUT-port configuration for output files for four mixed-mode DUT types:

- M4P Setup – Assign DUT ports with two differential pairs. For remote GPIB control, this is defined as D2S0.
- M4P Setup – Assign DUT ports with one differential pair and two singletons. For remote GPIB control, this is defined as D1S2
- M3P Setup – Assign DUT ports with one differential pair and one singleton. For remote GPIB control, this is defined as D2S1.
- M2P Setup – Assign DUT ports with one differential pair and no singletons. For remote GPIB control, this is defined as D1S0.

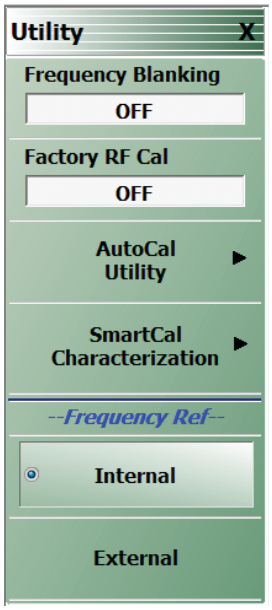
UTILITY Menu

Previous

- SYSTEM Menu on page 21-2

Navigation

- MAIN | System | SYSTEM | Utility | UTILITY



Frequency Blanking (OFF/ON)

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.

AutoCal Utility

Select displays the AUTOCAL UTILITY menu.

- AUTOCAL UTILITY Menu on page 21-22

SmartCal Characterization

Select displays the SMARTCAL menu.

- SMARTCAL Menu on page 21-23

Internal and External Buttons

Internal and External frequency reference buttons select internal or external 10 MHz reference source for the unit.

Figure 21-15. UTILITY Menu

AUTOCAL UTILITY Menu

The best practice recommendation is to return the AutoCal module to Anritsu annually for an in-factory characterization. For more information, contact Anritsu Customer Service. This menu allows saving and loading the characterization file.

Full Name

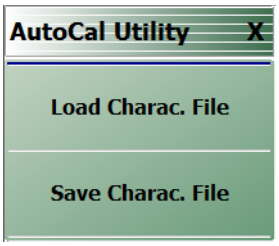
- Automatic Calibrator (AutoCal) Utility Menu

Previous

- UTILITY Menu on page 21-21

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 21-16. AUTOCAL CHARAC. (AUTOCAL CHARACTERIZATION) Menu

SMARTCAL Menu

The best practice recommendation is to return the SmartCal 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.

Full Name

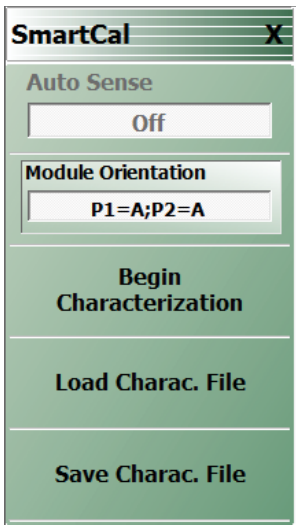
- SmartCal Characterization Menu

Previous

- UTILITY Menu on page 21-21

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 (or Ports 1/2/3/4 for SmartCal 4-port calibration modules).

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 21-17. SMARTCAL Menu

Network Interface Menu and Dialog Boxes

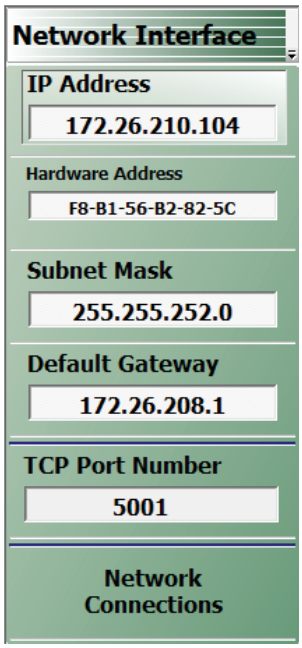
NETWORK INTERFACE Menu

Previous

- SYSTEM Menu on page 21-2

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 21-25

Figure 21-18. NETWORK INTERFACE Menu

NETWORK CONNECTIONS Dialog Box

Previous

- NETWORK INTERFACE Menu on page 21-24

Navigation

- MAIN | System | SYSTEM | Network Interface | NETWORK INTERF. | Network Connections | NETWORK CONNECTIONS Dialog Box

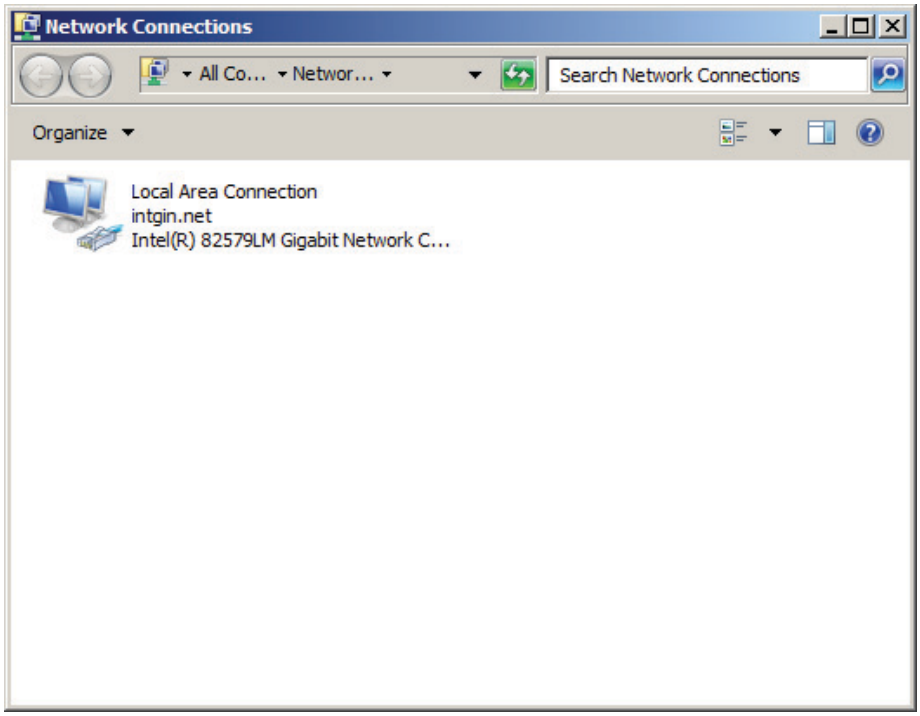


Figure 21-19. NETWORK CONNECTIONS Dialog Box

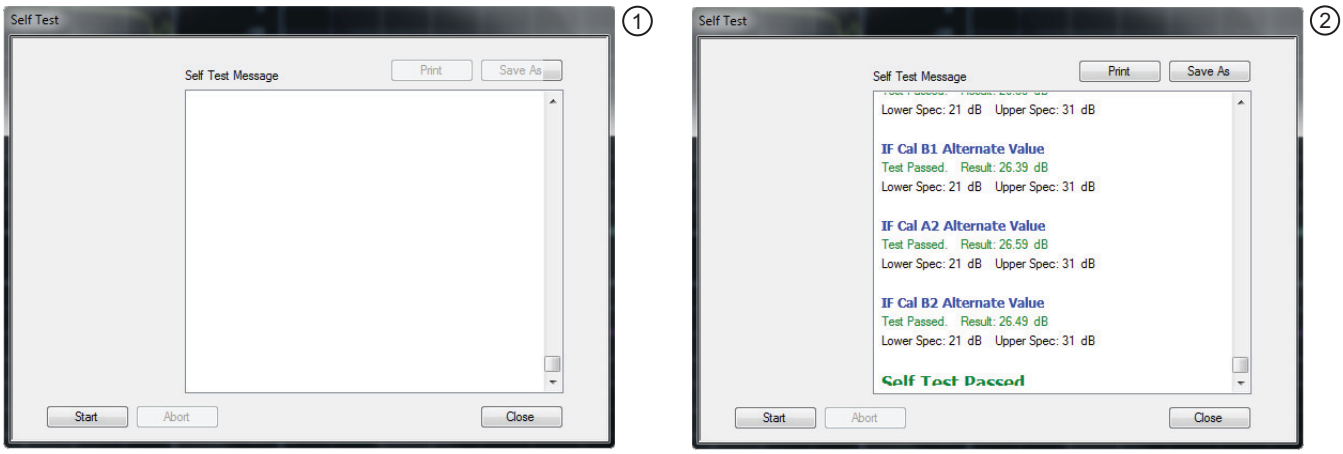
SELF TEST Dialog Box

Previous

- SYSTEM Menu on page 21-2

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 21-20. 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 Menu on page 21-2

Navigation

- MAIN | System | SYSTEM | Event Log | EVENT VIEWER Dialog Box

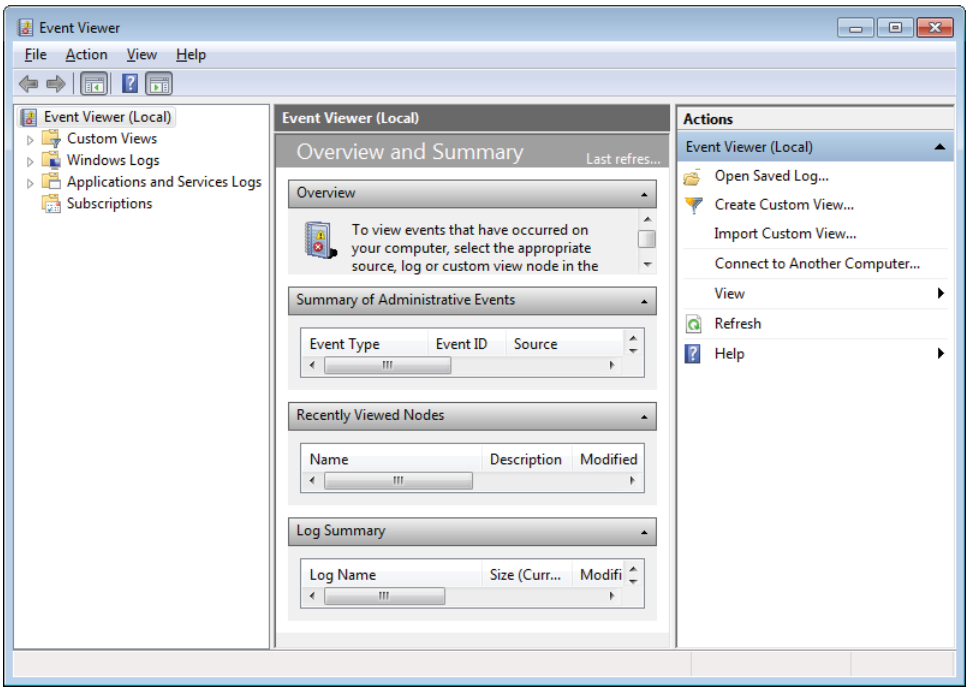


Figure 21-21. EVENT VIEWER Dialog Box

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 Menu on page 21-2

Navigation

- MAIN | System | SYSTEM | Diagnostics | DIAGNOSTICS ACCESS Dialog Box

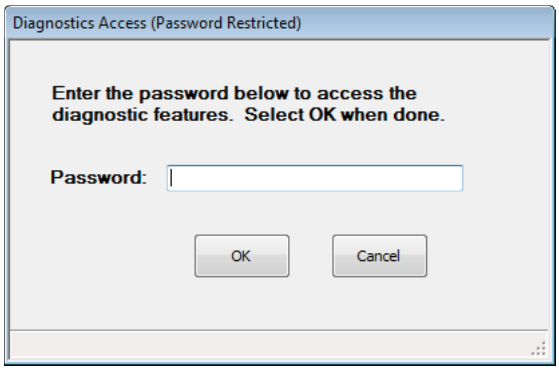


Figure 21-22. DIAGNOSTICS ACCESS Dialog Box

Instructions

An instrument-specific password is required to enter the DIAGNOSTICS ACCESS dialog box.

Chapter 22 — File Management Menus

22-1 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).

22-2 Overview of File Management Menus and Dialog Boxes

There is one available menu with multiple related dialog boxes:

- FILE Menu on page 22-2
  - "RECALL SETUP Dialog Box" on page 22-4
  - "RECALL DATA Dialog Box" on page 22-5
  - "SAVE SETUP Dialog Box" on page 22-6
  - "SAVE DATA Dialog Box" on page 22-7

22-3 File Menus and Dialog Boxes

FILE Menu

Previous

- Main Menu on page 2-2

Navigation

- MAIN | File | FILE

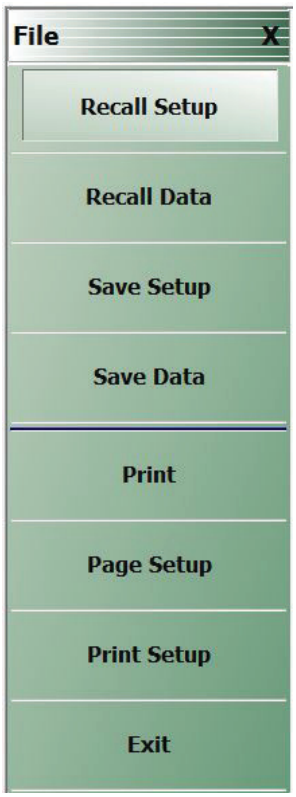


Figure 22-1. FILE Menu – Data Save/Recall Functions – Print Functions

Recall Setup

Select displays the RECALL SETUP dialog box which allows recalling of previously saved setup files.

- "RECALL SETUP Dialog Box" on page 22-4

Recall Data

Select displays the RECALL DATA dialog box.

- "RECALL DATA Dialog Box" on page 22-5

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 22-6

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 22-7

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 Dialog Box" on page 22-9

Print Setup

Select displays the PRINT SETUP dialog box where various print output parameters can be configured and set.

- "Print Setup Dialog Box" on page 22-10

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 22-2

Navigation

- MAIN | File | FILE | Recall Setup | RECALL SETUP Dialog Box

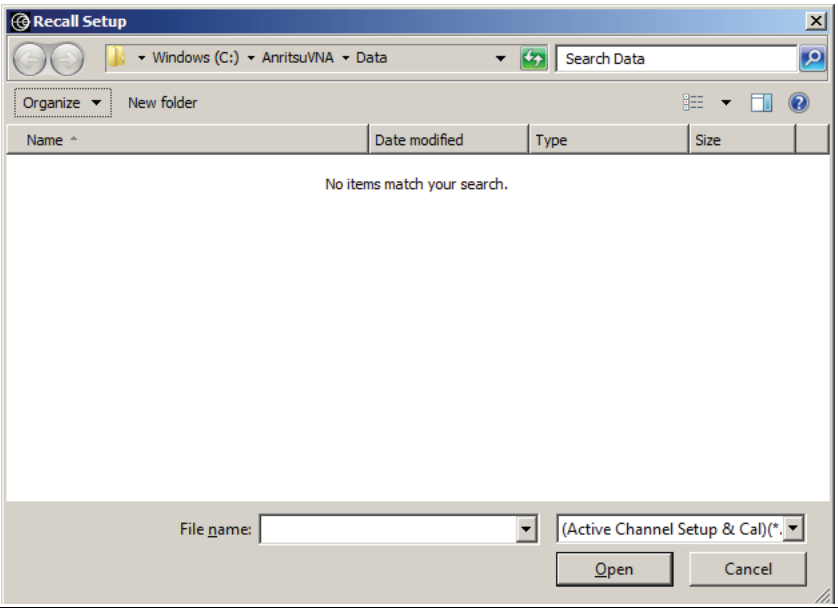


Figure 22-2. Recall Setup Dialog Box

Instructions

Use this dialog to select a previously stored setup configuration file.

1. Navigate to the File menu and the POWER-ON 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 22-2

Navigation

- MAIN | File | FILE | Recall Data | RECALL DATA Dialog Box

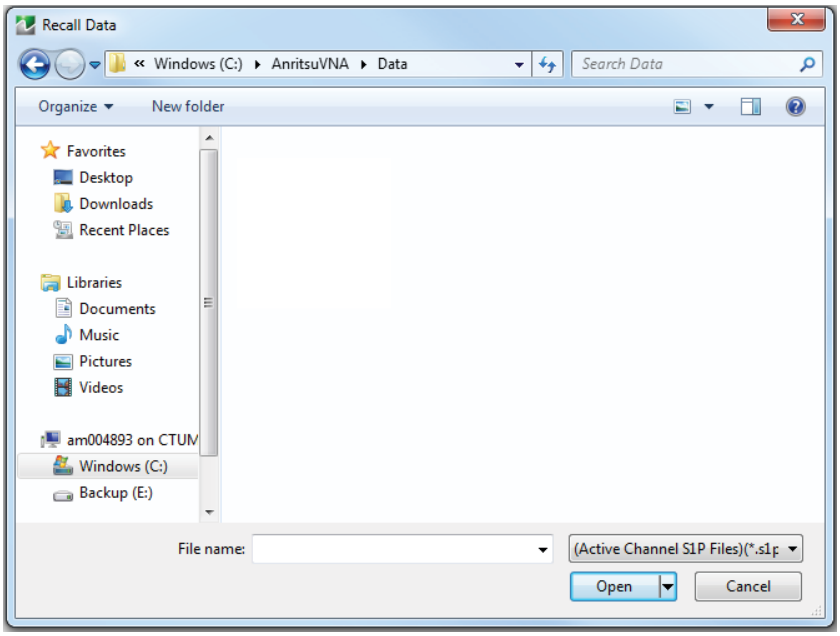


Figure 22-3. RECALL DATA Dialog Box

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 22-2

Navigation

- MAIN | File | FILE | Save Setup | SAVE SETUP Dialog Box

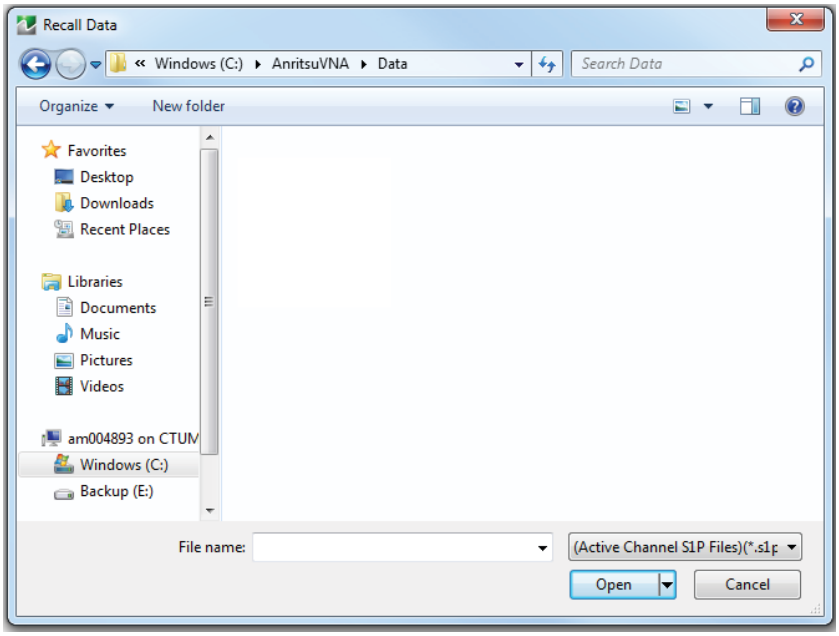


Figure 22-4. SAVE SETUP Dialog Box

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 22-2

Navigation

- MAIN | File | FILE | Save Data | SAVE DATA Dialog Box

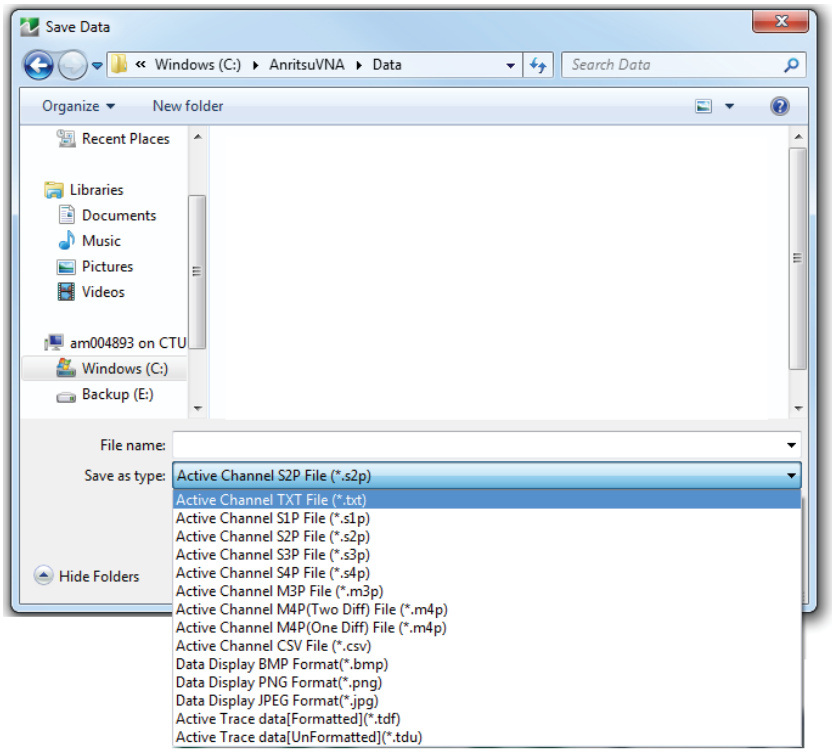


Figure 22-5. SAVE DATA Dialog Box

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 22-2

Navigation

- MAIN | File | FILE | Print | Page Setup Dialog Box

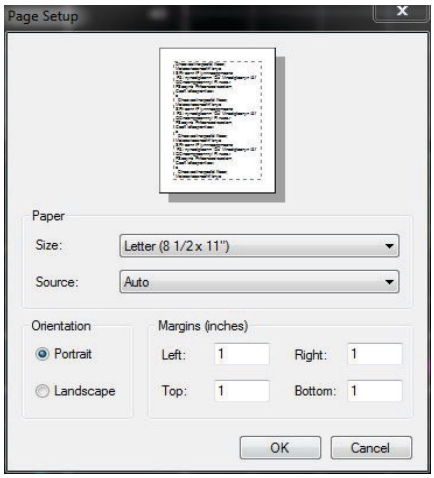


Figure 22-6. Page Setup Dialog Box

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.

PRINT Dialog Boxes

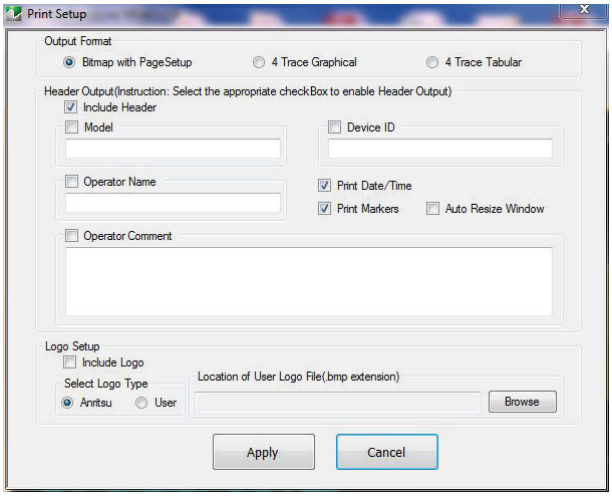


Figure 22-7. Print Setup Dialog Box

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. The graphics header setup outputs data when the Remote Interface Language is set to Lightning AND the Graphics Header is set to ON.
- If the header is set to OFF, no header is printed, and the standard PAGE SETUP and then the PRINT dialogs are displayed.
- Print Setup Dialog Box

Menu Bar

- MENU BAR | File | Print Setup

Previous

- FILE Menu on page 22-2

Navigation

- MAIN | File | FILE | Print Setup | Print Setup Dialog Box

PRINT SETUP Dialog Box

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.

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.**
.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 37000D 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.
.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.
KIT_INFO.xyz	Calibration kit file for an Anritsu Lightning 37xxxD/37xxxE Series VNA.	The .xyz file extension varies with the connector geometry and gender. A ShockLine Series VNA can read Lightning calibration kit files and convert them to a .ccf format.

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. Any error messages that require action by a qualified 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. In many cases, the remedial action for the error message is described with applicable cross-references to documented procedures.

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 1 Loop 1 Unlocked	Status Bar
Lock Error "B"	Source 1 Loop 2 Unlocked	Status Bar
Lock Error "C"	Source 1 Automatic Level Control (ALC) Unleveled	Status Bar
Lock Error "D"	Source 2 Loop 1 Unlocked	Status Bar
Lock Error "E"	Source 2 Loop 2 Unlocked	Status Bar
Lock Error "F"	Source 2 ALC Unlocked	Status Bar
Lock Error "G"	LO Loop 1 Unlocked	Status Bar
Lock Error "H"	LO Loop 2 Unlocked	Status Bar
Lock Error "I"	External Reference PLL Unlocked	Status Bar
RF Power Unlevel	Automatic Level Control Loop Failed	Status Bar
Auto IF Cal Failed	Intermediate Frequency Power Level Failed	Status Bar
Trigger IF Cal Failed	Intermediate Frequency Power Level Failed	Dialog Box
Power Up Self Test Failed	Self Test Failed	Status Bar
Trigger Self Test Failed	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 MS46522B and MS46524B model VNAs. The easyTest Tools application is used to create easyTest .ett files having step sequences that can be run (displayed) on the instrument.

Note	easyTest test sequences (.ett files) generated specifically for the MS4652xB VNA cannot be run on a MS4652xA VNA and vice versa.

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 by 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" on page C-2), and Figure C-2 shows the resulting material displayed on the VNA ("Resulting easyTest Sequence Step Displayed on a ShockLine VNA" on page C-3).

Refer to the easyTest Tools Help menu for additional information.

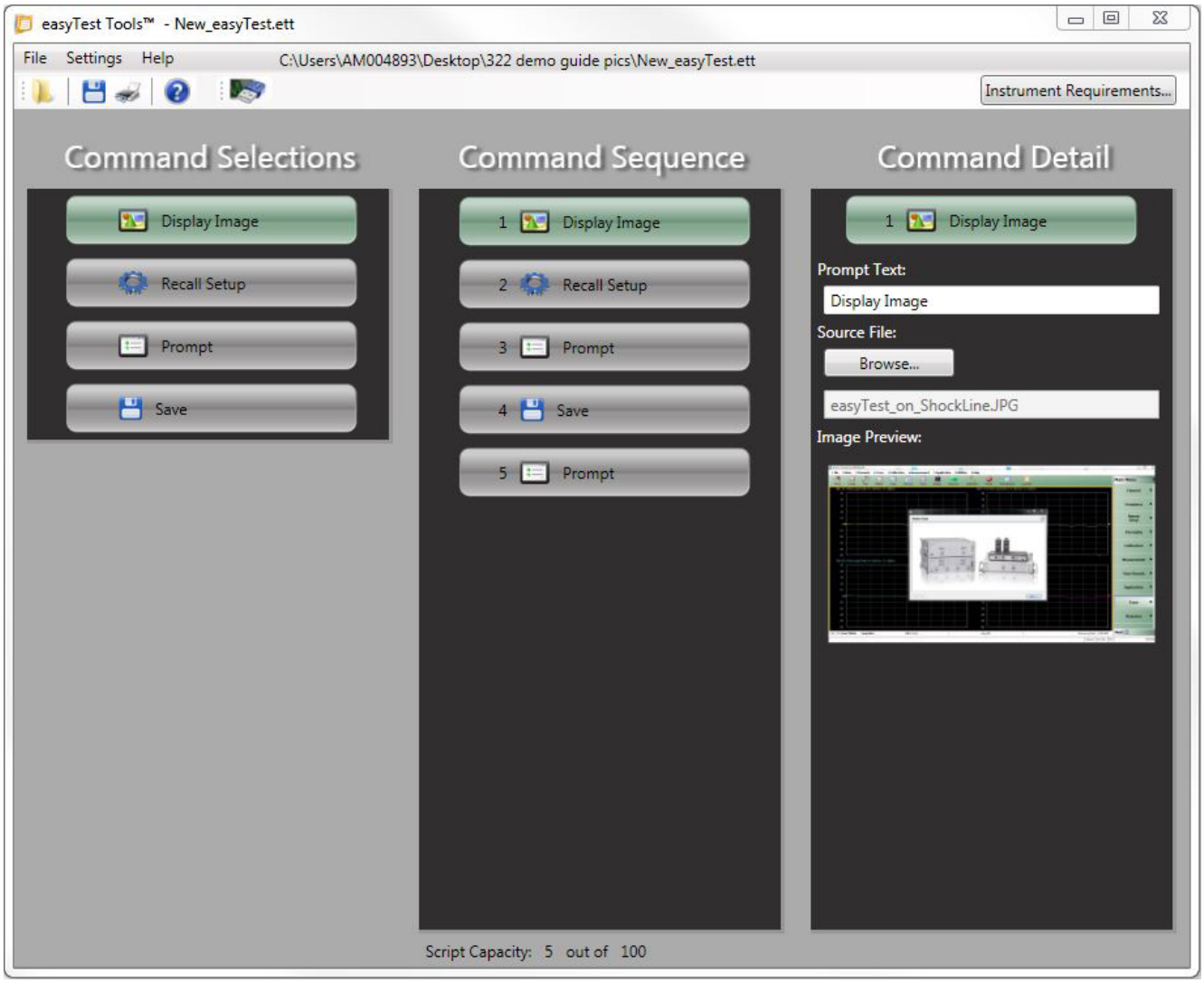


Figure C-1. Example of setup in easyTest Tools on the PC

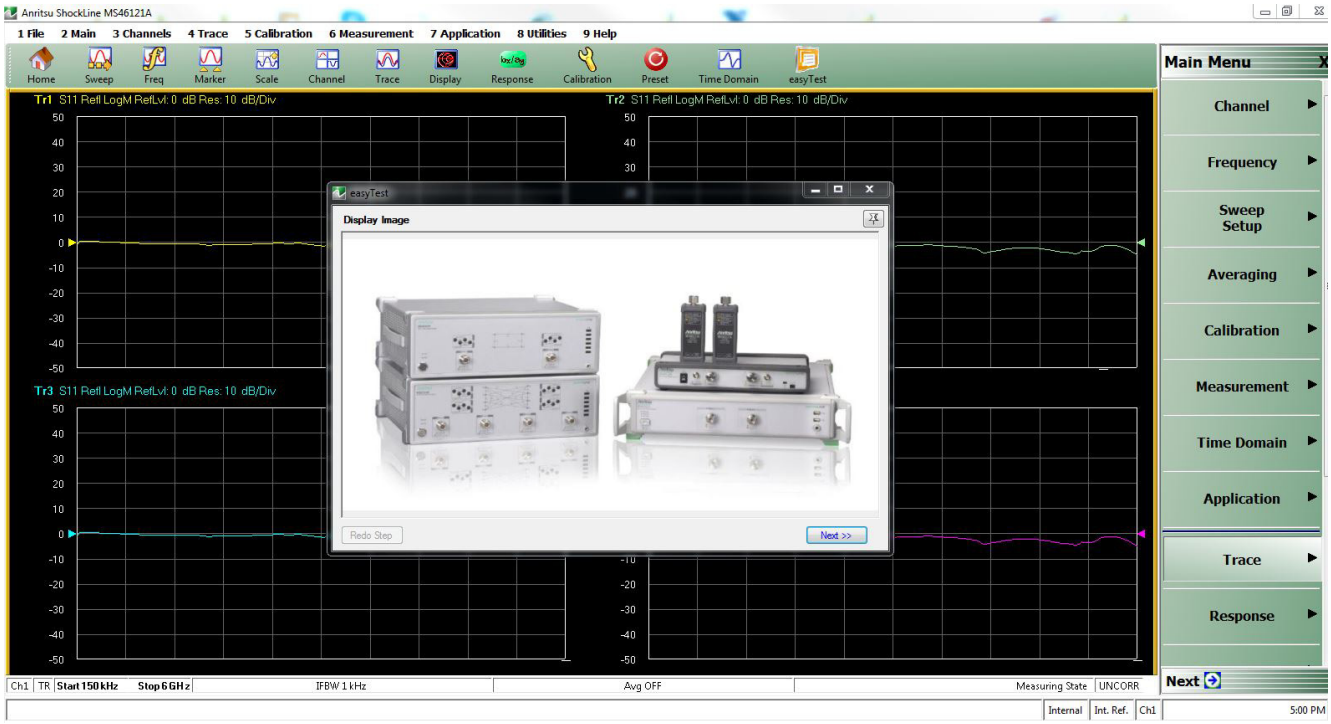


Figure C-2. Resulting easyTest Sequence Step Displayed on a ShockLine VNA

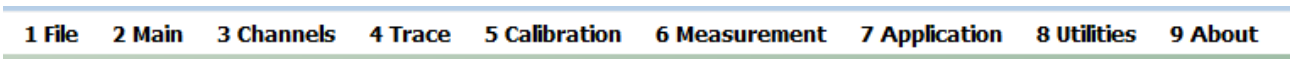
C-4 easyTest Tools on a ShockLine VNA

After an easyTest 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 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.

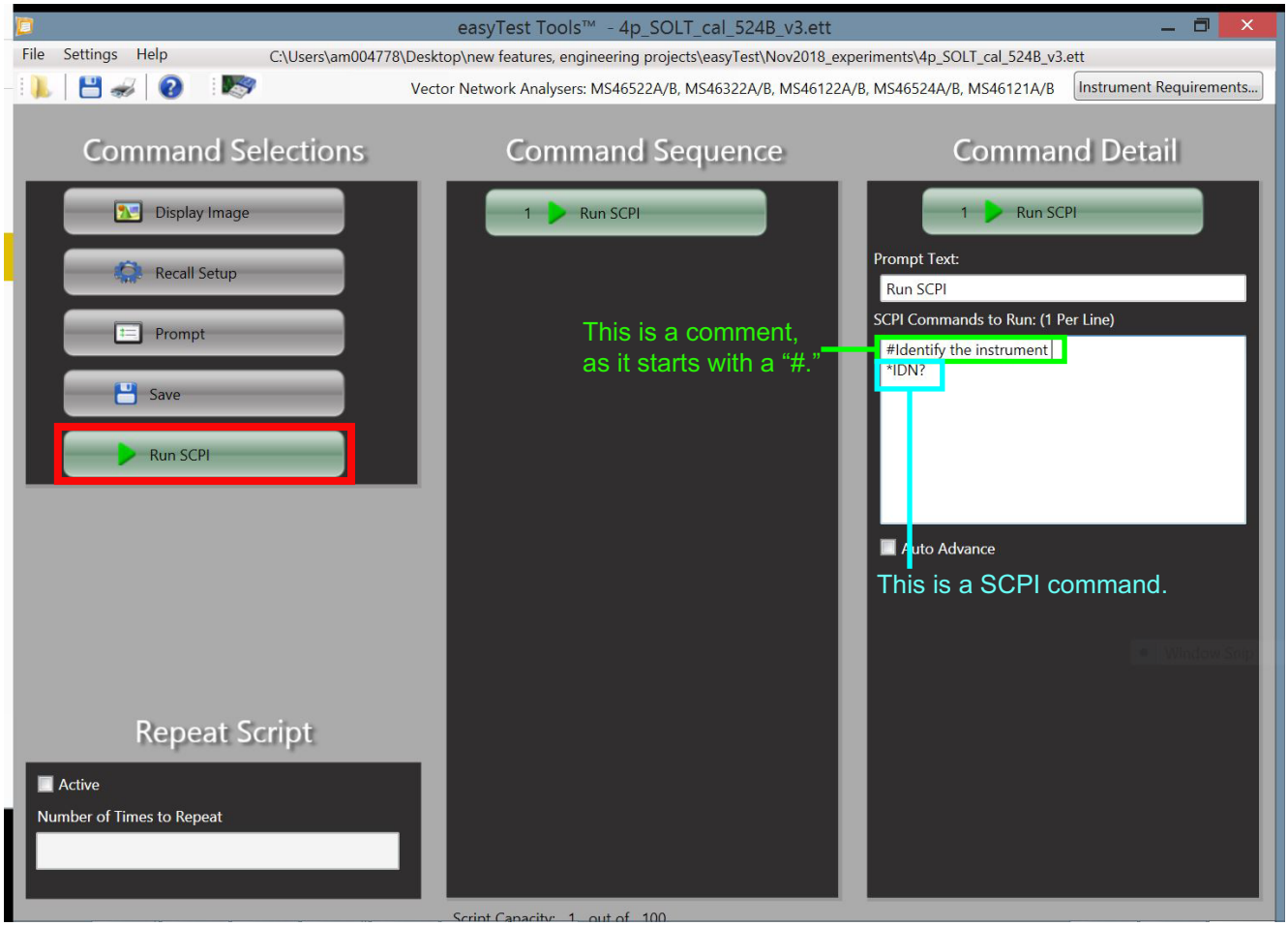


Figure C-3. Executing SCPI Commands via easyTest

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.

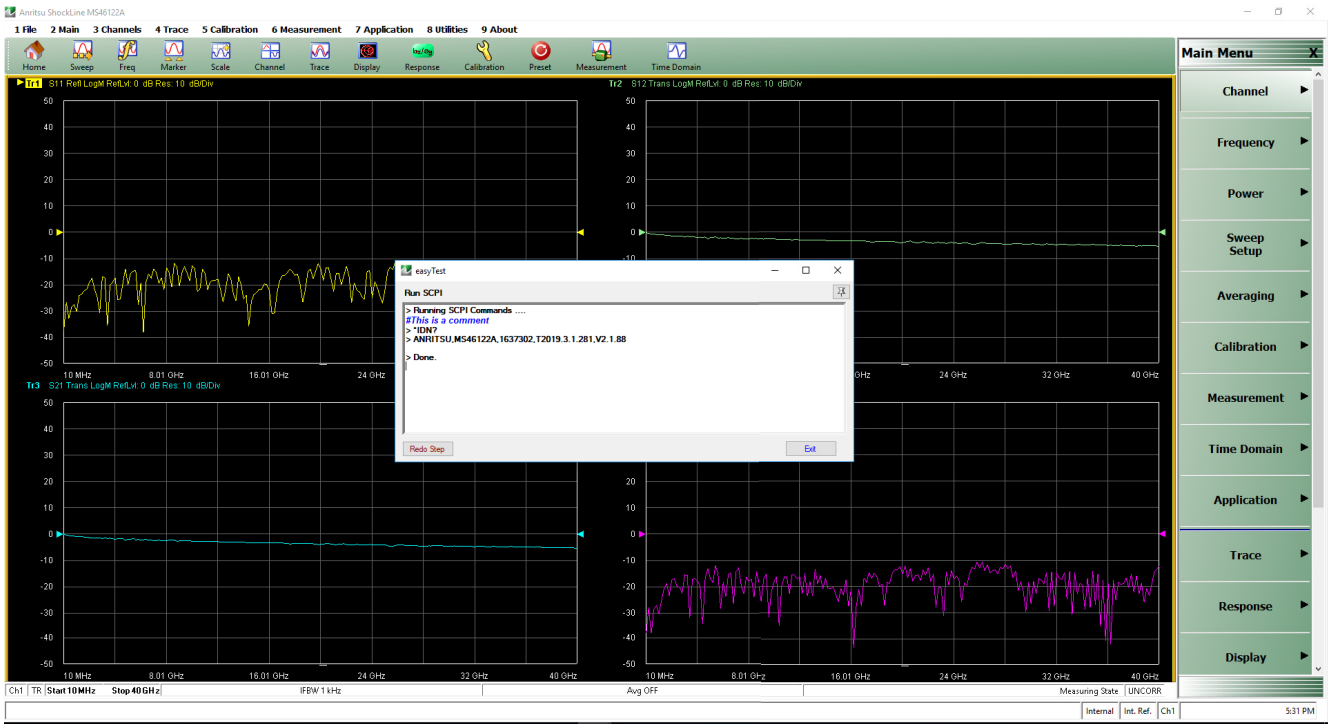


Figure C-4. Using an .ett file for Executing SCPI Commands via easyTest Tools in ShockLine

Appendix D — Glossary of Terms

D-1 Appendix Overview

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.

Spectral Resolution : The capability of an optical system to distinguish different frequencies.

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.

Time Domain : In the VNA, Time Domain refers to Time Domain anaysis of the S-Parameter data.

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)

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