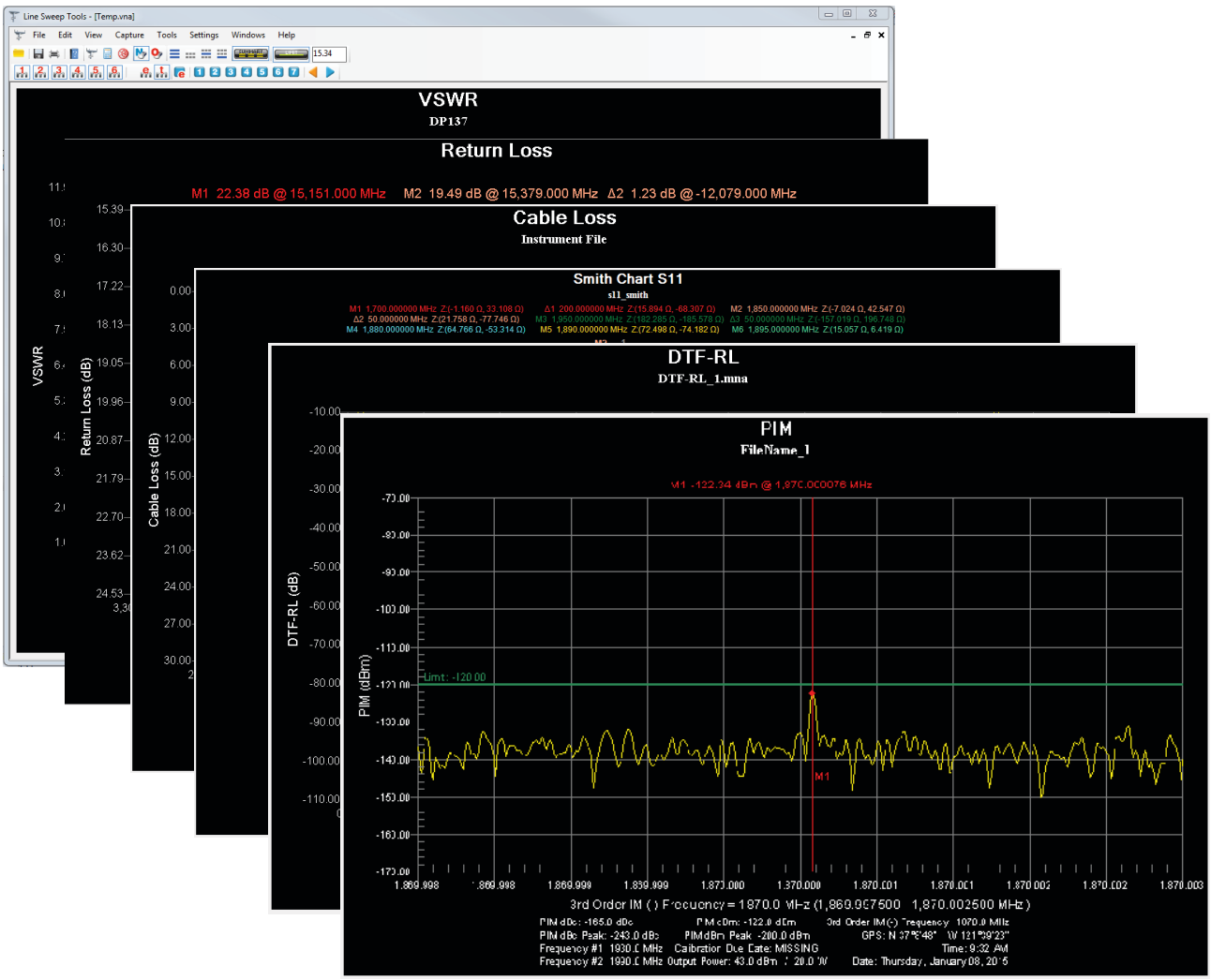
User Guide

Line Sweep Tools™



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Chapter 1 — General Information

1-1 Introduction

The Line Sweep Tools application provides the means for capturing and transferring measurement plot data from an Anritsu instrument to a personal computer. Once the data has been transferred, the following operations can be performed:

- Add or adjust markers, set a limit line, and adjust scale
- Set markers and limit lines quickly to preset values
- Quick renaming of trace file names, titles, and subtitles
- Distance to Fault analysis
- Compare two traces in a measurement plot using Plot Overlay
- Zoom into a specific region of a plot for closer viewing
- Generate reports
- Output measurement plots to a printer
- Export plot data to text (CSV), image (BMP, JPG, PNG), VNA, PIM, MNA, and TM files
- Save plots to a database

PC Requirements

- Microsoft Windows 11 or higher
- 1 GB of RAM
- 100 MB of available hard-disk space
- Microsoft .Net Framework 4.8.1 or later
- National Instruments VISA 5.3 or later

Instruments Supported by Line Sweep Tools (LST)

To identify the instruments supported by Line Sweep Tools, visit the Anritsu product page for Line Sweep Tools at: https://www.anritsu.com/en-us/test-measurement/products/lst

Note	LST file formats compatible with some older firmware versions. It is recommended that you update your instrument's firmware. Firmware can be found at the Anritsu website.

1-2 Installation

Line Sweep Tools is a software component of the Anritsu Tool Box download. Go to the Anritsu download library to install the latest Anritsu Tool Box software:
https://www.anritsu.com/en-US/test-measurement/support/downloads

- If you select the Full Installer, internet access is not required while running.
- If you select the Web Installer, internet access is required while running.

Select the installation program to start the download process and follow through the on-screen instructions. The installation process will include several installation screens as shown in Figure 1-1.

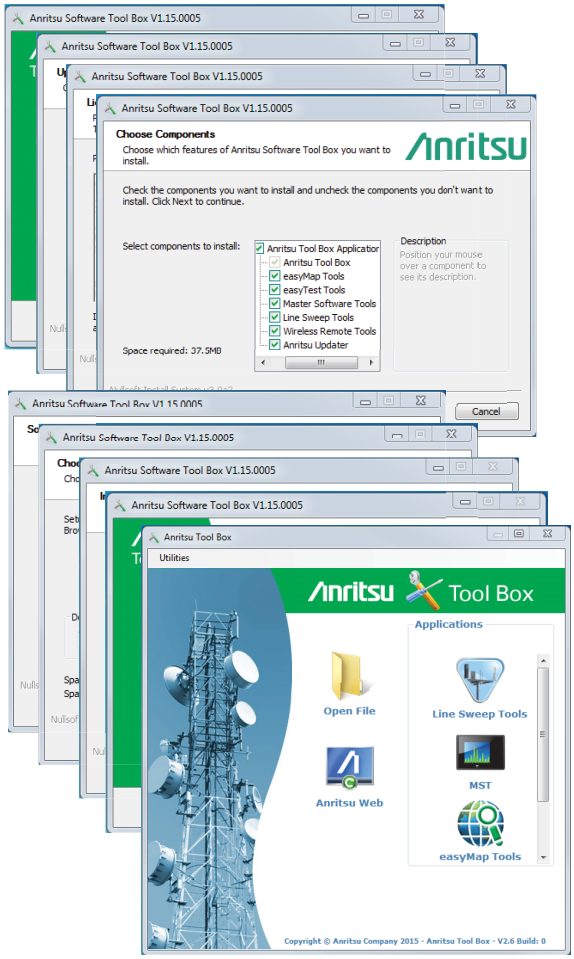


Figure 1-1. Anritsu Tool Box Installation Process

During the installation process, an instruction screen will prompt you to choose the program to download. See Figure 1-2. Select Line Sweep Tools. Note that you may download more programs from the Anritsu Tool Box suite. The selected program(s) will be loaded to your system tray and show as shortcut icons on your desktop

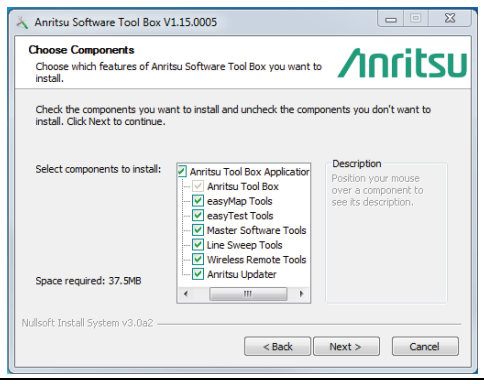


Figure 1-2. Anritsu Toolbox Program Selection Screen

1-3 LST Graphical User Interface

The LST graphical User Interface (GUI) provides a measurement workspace where a single measurement plot or multiple measurement plots are placed for analysis. Measurement plots can be arranged cascading, tiled horizontally, or tiled vertically. A single measurement plot is displayed in Figure 1-3.

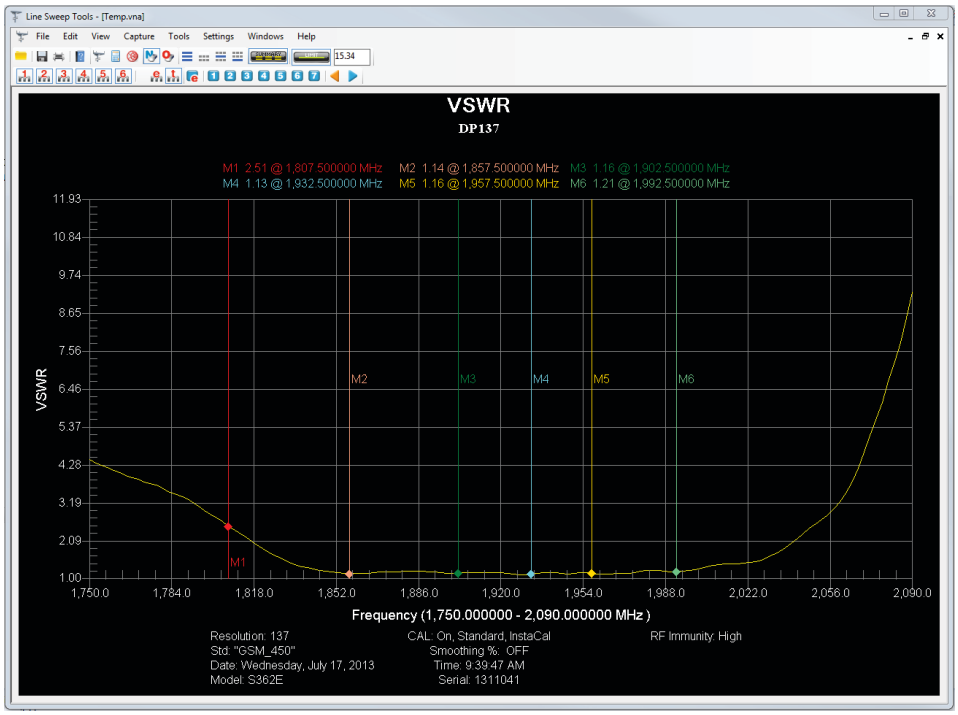


Figure 1-3. Line Sweep Tools Window

Menu Bar

The menu bar extends across the top of the application window and includes eight menu categories: File, Edit, View, Capture, Tools, Settings, Windows, and Help. This topic describes the basic set of menu items.

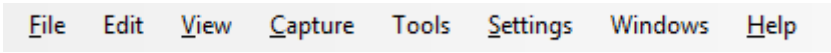


Figure 1-4. Menu Bar

File

Open: Opens the Open Line Sweep Tools File dialog to load a measurement plot into the Line Sweep Tools measurement workspace. To load a file from the instrument in use, under Desktop, click Anritsu Devices. Then in the file window, click the connection type associated with the instrument – USB, Serial, or Ethernet.

Save: Saves the active measurement plot.

Save As: Allows you to rename a measurement plot before saving it.

Save All: Saves all the measurements in the workspace.

Export: Exports the active file in the workspace as text (.csv), image, VNA, PIM, TM or MNA. Image files can be stored as BMP, JPG, or PNG files.

Export All: Exports all of the files in the workspace as text (.csv), text (Unicode .csv), image, VNA, PIM, TM or MNA. Image files can be stored as BMP, JPG, or PNG files.

Database: Lists the commands for creating, opening, and storing measurement plots to a database.

Reporting: Lists a subset of report functions Line Sweep Report Setup, Line Sweep Report Generator, PIM Report Generator and Trace Reporting Order.

- **Line Sweep Report Setup** – Opens the Save a PDF File dialog to save the measurement plot/s as a PDF file in the desired directory. Note: To view the PDF file, you need a PDF file viewer.
- **Line Sweep Generate Report** – Opens the Save a PDF File dialog to save the measurement plot/s as a PDF file in the desired directory. Note: To view the PDF file, you need a PDF file viewer.
- **PIM Report Generator** – Opens the PIM Report Generator dialog to enter Site Details and to set the power units to be displayed in the Test Results. This function only generates a report for PIM vs. Time measurements. Note: To view the PDF file, you need a PDF file viewer.
- **Trace Reporting Order** – Opens the Trace Order dialog that allows you to rearrange the order of the trace files in Report Generator.Print… – Opens the Print dialog for printing. Select the desired settings before printing.

Print: Opens the Print Dialog

Close: Closes the active measurement plot in the Line Sweep Tools workspace.

Close All: Closes all of the measurement plots in the Line Sweep Tools workspace.

Exit: Closes the Line Sweep Tools application.

Edit

These commands are not enabled until a trace has been placed in the Line Sweep Tools workspace. Only the active measurement plot is affected by this setting change.

Plot Properties: Opens the Plot Properties dialog to setup the graph titles, display mode, scale/limit, markers, and line thickness.

Copy (Ctrl+C): Copies the measurement plot information to the clipboard. The information can be either text or graphics which is set in the Program Preferences dialog under the Clipboard Format tab.

Undo Overlay (Alt+O): Removes all of the traces that were dragged onto the original measurement plot for comparison.

Undo Zoom (Alt+Z): Returns the view of the measurement plot from zoom to the original view.

View

Plot Information: Opens the Plot Information dialog with the following information listed in the figure below. A scroll bar will appear on the right side of the Plot Information window providing scrolling access to more parameter data.

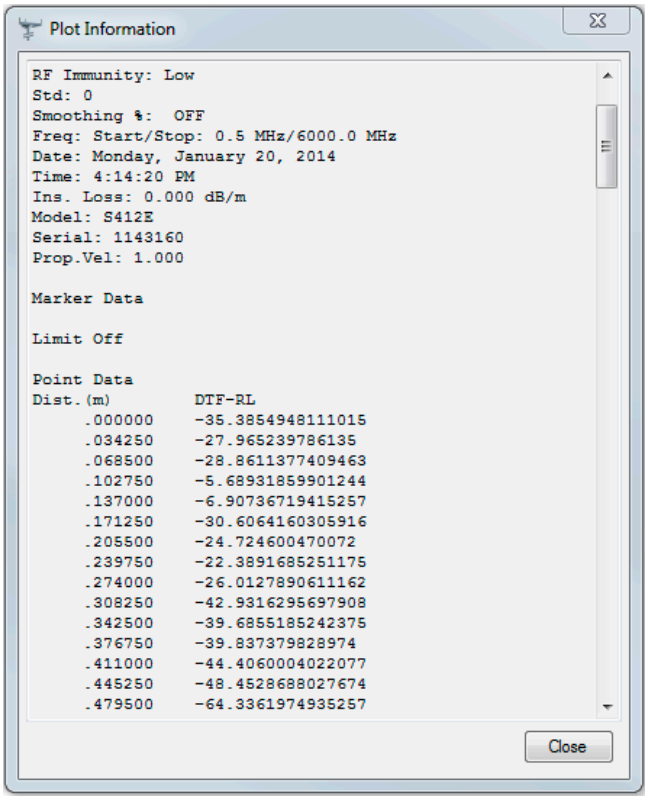


Figure 1-5. Plot Information

Capture

Capture Plots to Screen: Opens previously saved measurements in the Line Sweep workspace.

Capture Plots to .dat files: Transfers previously saved measurement plots from the instrument to the PC.

Capture Plots to Database: Transfers previously saved measurement plots a database in the PC.

Capture Current Plot to Screen: (F2) Captures the current measurement on the instrument and reproduces the plot in the Line Sweep workspace.

Capture Current Plot to JPEG: (F4) Saves previously saved measurement files in the instrument to the PC as JPEG files.

Upload to Instrument: (F3) Uploads the active measurement plot in from the Line Sweep workspace to the instrument. to be used in similar type measurement plots.

Tools

Cable Editor: Allows you to edit a cable's parameters currently in the cable list or enter a new cable to the list.

Waveguide Editor: allows you to edit or add to a waveguide file which contains definitions of multiple waveguides and waveguide parameters.

Signal Standard Editor: Allows you to edit or add to a signal standard file which contains definitions of multiple signal standards.

Distance To Fault: Opens the DTF Parameters dialog Converts a previously saved Return Loss (frequency domain) plot or an SWR (frequency domain) plot into a Distance to Fault (DTF) plot.

Measurement Calculator: Opens the Measurement Calculator.

Naming Grid: Opens the Naming Grid dialog to simply create Filenames, Titles, and Subtitles for multiple measurement plots.

Marker Presets: Opens the Marker Presets dialog to add New, Delete, Import, Export or Load markers.

Settings

Graph Colors: Allows you to change the marker, trace, limit line and background colors.

Instrument: Opens the Program Preference dialog with the Instrument tab active allowing you to select/set the instrument's connection.

Default Plot Settings: Opens the Program Preference dialog with the Default Plot Settings tab active allowing you to select/set the Plot Scaling, Plot/Limit Lind Width, Measurement Unit, and Plot Footer.

Clipboard Format: Opens the Program Preference dialog with the Clipboard Format tab active allowing you to select/set the Graphical Format, Black & White, and Tabular Format.

Properties: Opens the Program Preference dialog with the Properties tab active allowing you to enter an operator's name and tower information.

Line Sweep Report Setup: Opens the Program Preference dialog with the Report Setup tab active allowing you to select/set Report Header, Signature Line, Output Format, and Traces Per Page.

Color Options: Opens the Program Preference dialog with the Color Options tab active allowing you to select/set Print/Report Output Color options.

Language: Opens the Program Preference dialog with the Language tab active allowing you to select/set the desired Language Options.

Misc.: Opens the Program Preference dialog with the Misc. tab active allowing you to select/set the Unsaved Plot Warning options and Splash Screen Options.

User Preferences: Opens the Program Preference dialog with the Instrument tab active allowing you to select/set the instrument's connection.

Windows

Arrange the workspace measurement plots by pressing Cascade, Tile Vertical, or Tile Horizontal.

Cascade: Arranges the measurement plots one on top the other diagonally in the measurement workspace.

Tile Vertical: Places the measurement plots next to each other in the portrait view.

Tile Horizontal: Places the measurement plots next to each other in the landscape view.

Help

Contents: Displays the Help File.

Check for updates: Checks to verify if any updates are available.

About: Displays the Line Sweep Tools Version currently installed.

Main Toolbar

Figure 1-6. Main Toolbar

Toolbars arrange tools, displayed as buttons, into task-related groups. For example the Marker toolbar includes buttons to activate six markers, open the Plot Properties dialog to edit marker parameters, and toggle on and off the marker table.

Toolbars float as independent panels so you can move them anywhere within the toolbar area. Toolbars may be turned On/Off in the View menu.

Table 1-1. Toolbar Buttons Definitions

Icon	Name	Description
	Open File	Load a Line Sweep Tool file.
	Save File	Saves the Line Sweep Tools file to the PC.
	Print	Opens the Print Preview dialog with the commands and command sequence displayed in table form for printing.
	Help	Opens easyTest Tools Help.

Table 1-1. Toolbar Buttons Definitions

Icon	Name	Description
	Distance To Fault	Converts a previously saved Return Loss (frequency domain) plot or an SWR (frequency domain) plot into a Distance to Fault (DTF) plot.
	Measurement Calculator	Provides conversion between different modes of operation. For example, entering a Return Loss value will give you equivalent VSWR, Reflective Coefficient, and Transmitted Power values.
	Smith Chart	The Smith Chart is a tool that converts a Return Loss (frequency domain) plot or VSWR (frequency domain) plot into a Smith Chart. This chart is a commonly used graph format for the analysis of the impedance of transmission lines. It is also useful for fine tuning an antenna system.
	Normal Mouse Operations	The mouse function expands a selected section of the measurement plot for closer analysis.
	Overlay Mouse Operations	Overlay Mouse allows you to compare two measurement plots.
	Naming Grid	Naming Grid: Opens the Naming Grid dialog to create Filenames, Titles, and Subtitles. Use Filename from Naming Grid: When activated, highlighted in orange, applies the filename set in NG into the File name: entry window of the Save an unsaved trace as a DAT file. Title from Naming Grid:Transfers the title created in the Naming Grid dialog onto the active measurement plot. Subtitle from Naming Grid: Transfers the subtitle created in the Naming Grid dialog onto the active measurement plot.
	Summary Table Toggle	Toggles the display of the following data for the measurement plot – Resolution, Std, Date, Model, Cal, Channel, Time, Serial, and CW

Table 1-1. Toolbar Buttons Definitions

Icon	Name	Description
	Limit Toggle	Limit lines can be used for visual reference or for pass/fail criteria. Activate the Limit Line: Press the button on the toolbar. The green limit line will be displayed on the measurement plot. Edit the Limit Line Value: The Limit Toggle button must be active for editing (highlighted in orange). Type in the desired value into the display/entry box and press Enter. The limit line moves to the entered value. Manually Move the Limit Line: Place the cursor on the anywhere on the limit line and drag it to the desired amplitude. The amplitude value also changes in the display/entry box.
	Marker Toolbar	The Marker toolbar allows you to activate markers within the measurement plot, open the Plot Properties dialog to edit marker properties manually, and toggle the marker table for viewing in the measurement plot.
	Marker Edit	Press the Marker Edit button in the Marker toolbar to open the Plot Properties dialog with Markers tab active.
	Marker Table Toggle	Press the Marker Table Toggle button to toggle on the db/freq values for the active markers.
	Edit Preset Mode	When activated, it turns preset buttons 1 through 7 red. Buttons are in learning mode.
	Marker Preset Buttons 1-7	Contain limit line and maker information to be used in similar type measurement plots.
	Previous / Next	Use to scroll through multiple measurement plots before applying preset limit lines and markers.

Chapter 2 — Measurement Tools

2-1 Capture Functions

Capture functions require the PC be connected to an Anritsu supported instrument.

Note	For any of the capture functions below, ONLY the active trace(s) or current measurement(s) will be captured.

Capture Plots to Screen

1. Click **Capture Plots to Screen** in the Capture menu. The Plots Download dialog opens displaying a list of measurement plots in the instrument to download.

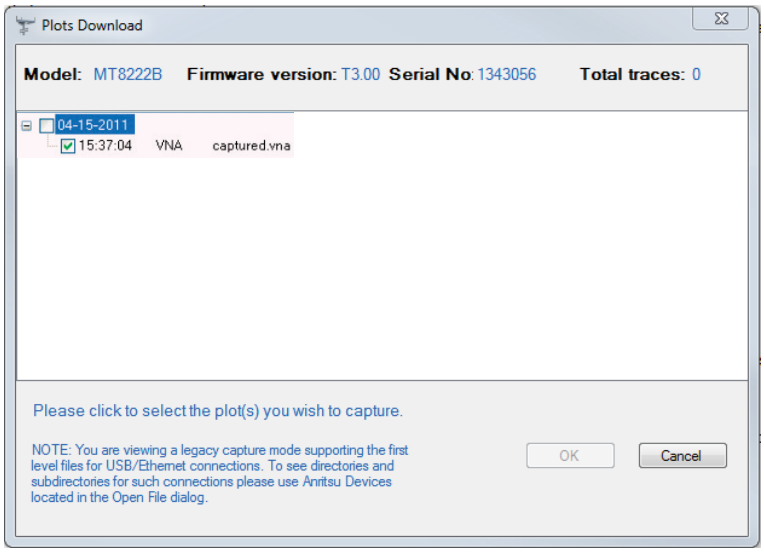


Figure 2-1. Plots Download Dialog

2. Click the **+** sign to expand the file tree if necessary.
3. Check the desired date folders or measurement plots and press **OK**. Selected measurement plots are displayed in the Line Sweep Tools workspace.

Capture Plots to .dat Files

1. Click **Capture Plots to .dat Files** in the Capture menu. The Browse for Folder dialog opens.
2. Select the directory where the measurement plots are to be saved.
3. Press the **OK** button. The Plots download dialog opens.
4. Check the desired date folders or measurement plots to transfer from the instrument to the PC.
5. Press the **OK** button. The selected measurements will be stored as a .dat file/s to the selected folder. A message window will pop open that states “Trace(s) successfully captured to DAT file(s)”.

Capture Plots to Database

Before executing the procedure below, a database must be created.

1. Click **Capture Plots to Database** in the Capture menu. The Select database dialog opens.
2. Highlight the desired database and press the **Open** button. The Plots download dialog opens.
3. Check the desired date folders or measurement plots to add to the database.
4. Press the **OK** button. The selected measurement plots are added to the database. A message window will pop open that states that "Trace successfully captured to the database".

Capture Current Plot to Screen (F2)

Click **Capture Current Plot to Screen** in the Capture menu or press **F2** on the PC keyboard. The measurement on the instrument in use will be transferred to the PC and placed in the Line Sweep Tools workspace.

Capture Current Plot to JPEG (F4)

1. Click **Capture Plot to JPEG** in the Capture menu or press **F4** on the PC keyboard. The Save As dialog opens.
2. Enter a name for the JPEG file.
3. Press the **Save** button. The display screen of the instrument in use is saved to the selected folder and is displayed in the Line Sweep Tools workspace.

Upload to Instrument (F3)

Click **Upload to Instrument** in the Capture menu or press **F3** on the PC keyboard. The active measurement plot in the Line Sweep Tools workspace is uploaded to the instrument in use.

2-2 Limit Line Toolbar & Functions

Limit lines can be used for visual reference or for pass/fail criteria.

Figure 2-2. Limit Line Toolbar

Activate the Limit Line

Press the **Limit Toggle** button on the toolbar. The limit line will be displayed on the measurement plot.

Edit the Limit Line Value (Single Value Limit Line)

The Limit Toggle button must be active for editing. Type in the desired value into the display/entry box and press Enter. The limit line moves to the entered value.

Manually Move the Limit Line (Single Value Limit Line)

Place the cursor anywhere on the limit line and drag it to the desired amplitude. The amplitude value also changes in the display/entry box.

2-3 Marker Toolbar & Functions

If your are using a S331L or S331P, go to Section 2-4 “Marker Toolbar & Functions (S331L, S331P)” on page 2-6.

The Marker toolbar allows you to activate markers within the measurement plot, open the Plot Properties dialog to edit marker properties manually, and toggle the marker table for viewing in the measurement plot

Figure 2-3. Marker Toolbar

Activate a Marker

Press the desired marker button to display the marker lines in the measurement display. The marker is a vertical line with a diamond that resides on the trace.

Move a Marker

Place the cursor on the desired marker, press the left mouse button, and drag it to the desired frequency.

See following: Edit Markers using the Plot Properties Dialog

Note	When capturing a Swept PIM trace, its marker cannot be “dragged” to a different position. But it can be moved by editing the FREQ window.

Edit Markers using the Plot Properties Dialog

Use the Plot Properties dialog to move a marker to the highest peak, to the lowest valley, edit its frequency manually, or activate the associated delta marker. Delta Makers are useful in calculating the bandwidth of a signal or finding the dB/VSWR difference between two data points. The difference between the reference marker and delta marker is displayed when the marker table is enabled. Because of the different types of handheld instruments, the Plot Properties dialog will best reflect the marker setup of that instrument.

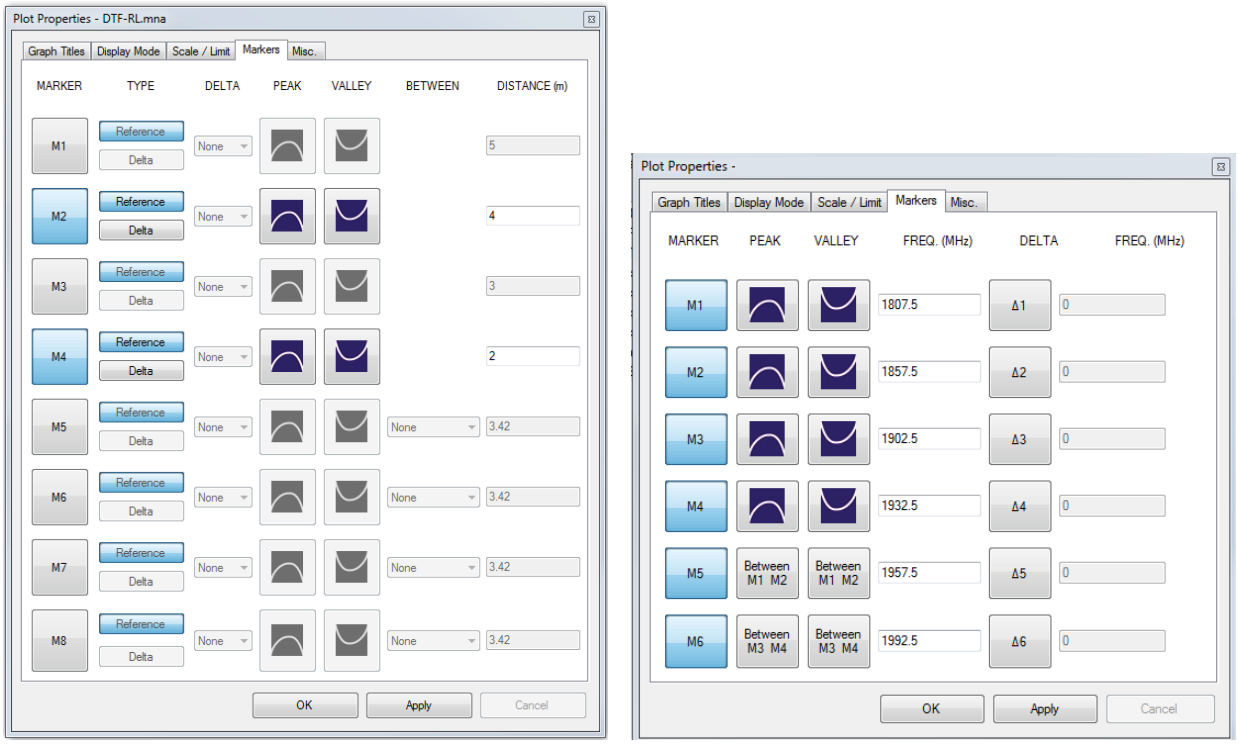


Figure 2-4. Plot Properties Marker Dialogs

Instructions

1. Press the **Marker Edit** button in the Marker toolbar.
2. Click **Plot Properties** in the Edit menu, or click **Markers** in the pop up menu to open the Plot Properties dialog with Markers tab active.

Activate a Marker

1. Press the desired marker button/s to activate a marker,
   - The pressed button color changes color and the PEAK, VALLEY, delta MARKER buttons, and FREQ window become active.

Set a Marker as Reference or Delta

1. Set the selected marker as either a reference marker or a delta marker.
   - If delta is selected, the delta symbol replaces the letter M in the button label and marker label in the graph. The Reference Marker list window under the Delta column activates.
2. Select a reference maker to associate with the set delta marker.

Move Marker to PEAK

1. Press the **PEAK** button associated with the desired active marker and the frequency of the highest peak value of the measurement plot will be entered into the FREQ window.
2. Press **Apply** and the marker will move to that peak position on the active measurement plot.

Move Marker to VALLEY

1. Press the **VALLEY** button associated with the desired active marker and the lowest valley value of the measurement plot will be entered into the FREQ window.
2. Press **Apply** and the marker will move to that valley position.

Set a Marker between a Peak or a Valley

The Between column is used to set a marker to peak or to valley in between two set markers.

1. Select a marker pair that is listed.
2. Press either the **Peak** or **Valley** buttons
    - The marker will move between that position.

Move a Marker

1. Press the desired marker button,
2. Type a value into the FREQ. (MHz) entry window.
    - The marker value updates immediately on the graph.

Activate Delta Markers

1. Press the associated delta marker button. The button changes color.
2. Enter a frequency in the delta frequency entry window.
3. Press **Apply**
    - The delta marker will move to that delta frequency position.

Display Marker Table

1. Press the **Marker Table Toggle** button to toggle on the db/freq values for the active markers.

2-4 Marker Toolbar & Functions (S331L, S331P)

The Marker toolbar allows you to activate markers within the measurement plot, open the Plot Properties dialog to edit marker properties manually, and toggle the marker table for viewing in the measurement plot. The S331L and S331P has two Marker Style windows to setup markers – Default and Advanced. The select button is located at the bottom of the window titled Marker Style. If Advanced is selected the setup features replicate those of the Advance Marker setups in a VNA Master instrument.

Note	Any markers added to the measurement using the Advance Marker feature in LST cannot be loaded back up to the instrument. Advanced Marker settings can be changed to Default. Reference markers will retain their settings while Delta makers are converted into Reference markers. Any peak or valley information will be removed. And the current location of the former delta marker is placed in the Distance window.

Click **Plot Properties in the Edit** menu or the **Marker Edit** button on the Marker Toolbar to open the Plot Properties dialog with the Markers tab selected.

Activate a Marker

Press the desired marker button, **Marker 1-8**, to display the markers in the measurement display. The marker is a vertical line with a diamond that resides on the trace.

Move a Marker

Place the cursor on the desired marker, press the left mouse button, and drag it to the desired frequency.

Display the Marker Table

Press the **Marker Table Toggle** button to toggle on the db/freq values for the active markers.

Edit Markers using the Plot Properties Dialog

Use the Plot Properties dialog to move a marker to the highest peak, to the lowest valley, edit its frequency manually, or activate the associated delta marker. Delta Makers are useful in calculating the bandwidth of a signal or finding the dB/VSWR difference between two data points. The difference between the reference marker and delta marker is displayed when the marker table is enabled.

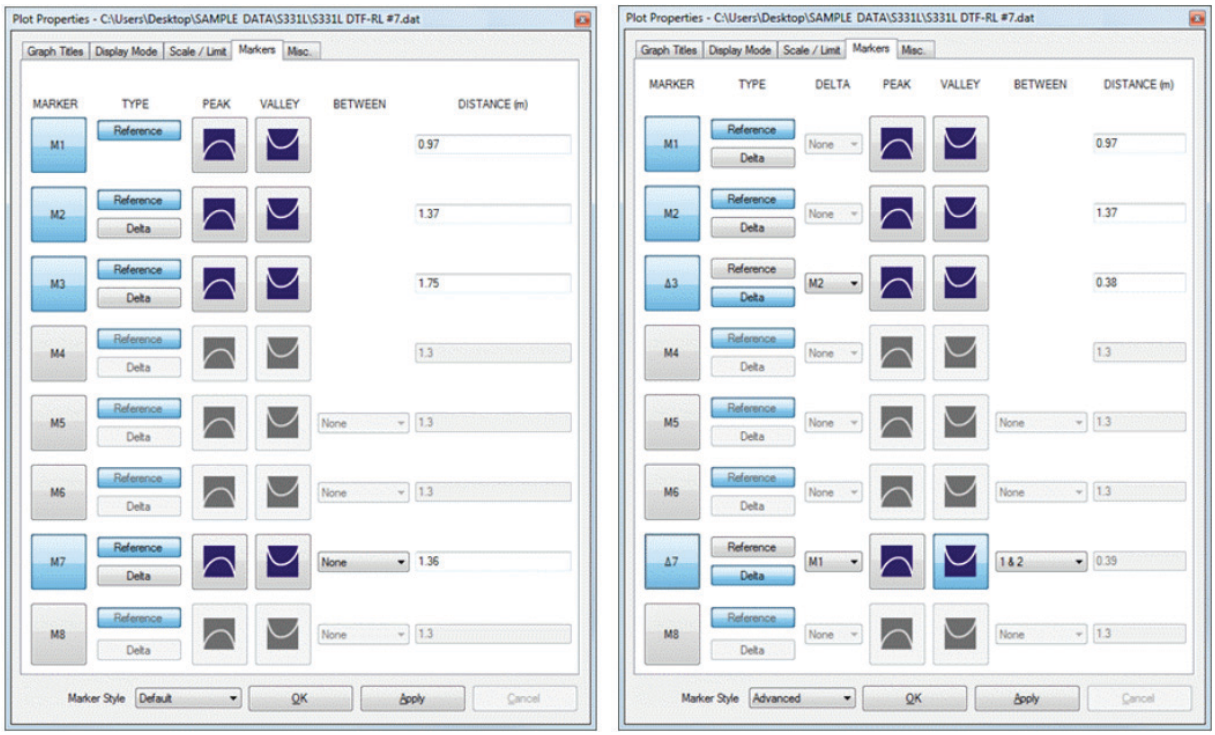


Figure 2-5. Plot Properties VNA Marker Dialog

Instructions

1. Click on a window to enlarge.
2. Press the **Marker Edit** button in the Marker toolbar to open the Plot Properties dialog with the Markers tab active. Or, place the cursor over the graph and click the right mouse button.
3. Click on **Markers**… in the menu.

Activate a Marker

1. Press the desired marker buttons, **M1-M8**, to activate a marker.
   - The pressed button's color changes and the TYPE, PEAK, VALLEY, BETWEEN, and FREQ window become active.

Activate and Set Reference Markers

1. Press the desired marker button.
   - The button changes color.
2. Enter a frequency in the associated entry window of the FREQ column.
3. Press **Apply** and the Reference marker will move to that frequency in the display.

Activate and Set Delta Markers

Markers 2-8 can be set as delta markers to reference Marker 1.

1. Press the associated delta marker button.
    - The button changes color.
2. Enter a frequency in the delta frequency entry window.
3. Press **Apply**
    - The delta marker will move to that delta frequency position relative to Marker 1.

Marker Type

- Reference markers display absolute frequency.
- Delta markers display frequency relative to Marker 1.
- Marker 2- Marker 8 can be set as a reference marker or a delta marker. If set as a delta marker, Marker 1 will be the reference marker.

Move Marker to Peak

Using the default BETWEEN setting, Marker 5 and 7 can be used to find either the peak or valley between Markers 1 and 2. Marker 6 and 8 can be used to find either the peak or valley between Markers 3 and 4.

1. Press the **PEAK** button associated with the desired active marker and the frequency of the highest peak value of the measurement plot will be entered into the FREQ window.
2. Press **Apply** and the marker will move to that peak position on the active measurement plot.

Move Marker to Valley

Using the default BETWEEN setting, Marker 5 and 7 can be used to find either the peak or valley between Markers 1 and 2. Marker 6 and 8 can be used to find either the peak or valley between Markers 3 and 4.

1. Press the **VALLEY** button associated with the desired active marker and the lowest valley value of the measurement plot will be entered into the FREQ window.
2. Press **Apply** and the marker will move to that valley position.

2-5 Marker Functions (PIM MW82119B)

A Distance-to-PIM (DTP) measurement with Trace Overlay and Markers can be captured from a PIM Master into LST.

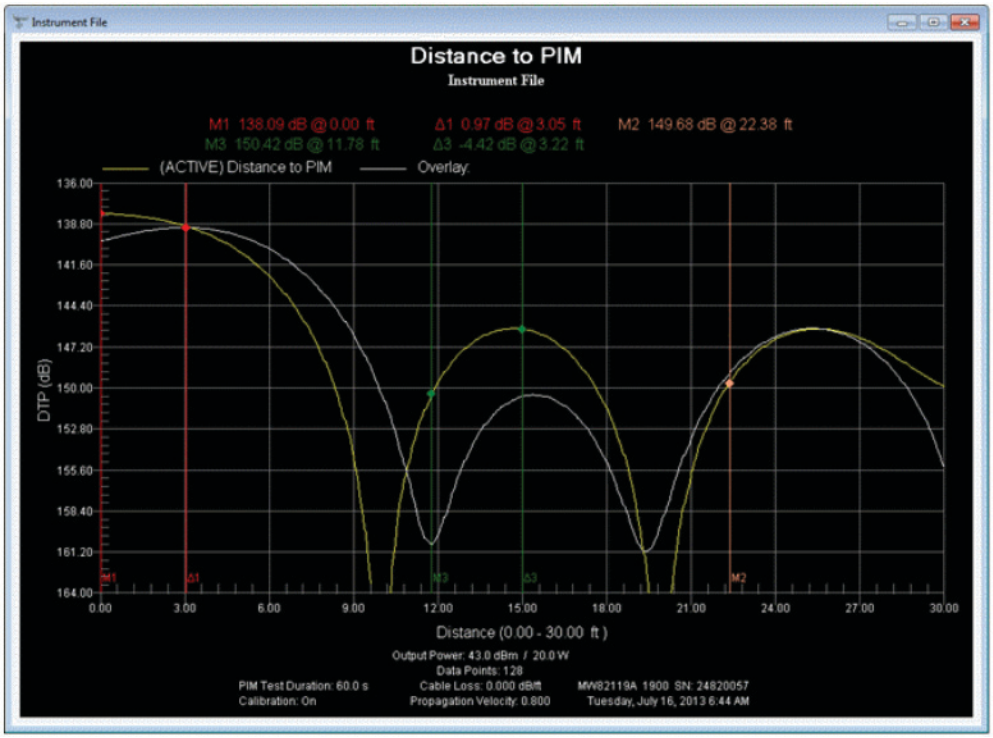


Figure 2-6. Distance to PIM Trace Overlay

The Marker toolbar allows you to activate markers within the measurement plot, open the Plot Properties dialog to edit marker properties manually, and toggle the marker table for viewing in the measurement plot.

Activate a Marker

Press the desired marker button to display the marker lines in the measurement display. The marker is a vertical line with a diamond that resides on the trace.

Move a Marker

Place the cursor on the desired marker, press the left mouse button, and drag it to the desired distance.

See following: Edit Markers using the Plot Properties Dialog

Display Marker Table

Press the **Marker Table Toggle** button to toggle on the dB/Distance values for the active markers.

Edit Markers Using the Plot Properties Dialog

Use the Plot Properties dialog to move a marker to the highest peak, to the lowest valley, edit its distance manually, or activate the associated delta marker. Delta Makers are useful in calculating the difference between two data points.

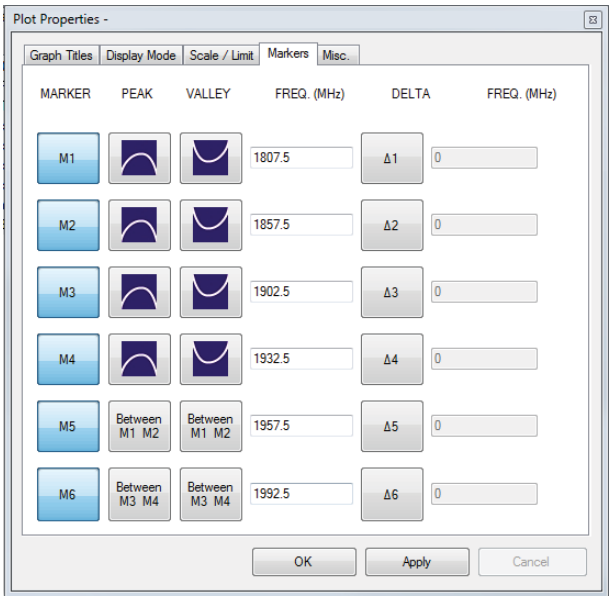


Figure 2-7. Delta Marker

1. Press the **Marker Edit** button in the Marker toolbar.
2. Click **Plot Properties** in the Edit menu, or click Marker in the pop up menu to open the Plot Properties dialog with Markers tab active.

Activate a Marker

1. Press the desired marker button/s to activate a marker,
   - The pressed button changes color and the PEAK, VALLEY, delta MARKER buttons, and DISTANCE window become active.The marker can be moved between traces by clicking on the Tx list button and then clicking on the desired trace.

Move Marker to PEAK

1. Press the **PEAK b**utton associated with the desired active marker and the frequency of the highest peak value of the measurement plot will be entered into the DISTANCE window.
2. Press **Apply** and the marker will move to that peak position on the active measurement plot.

Move Marker to VALLEY

1. Press the **VALLEY** button associated with the desired active marker and the lowest valley value of the measurement plot will be entered into the DISTANCE window.
2. Press **Apply** and the marker will move to that valley position.

Move a Marker

1. Press the desired marker button,
2. Type a value into the DISTANCE entry window.
   - The marker value updates immediately on the graph.

Activate Delta Markers

1. Press the associated delta marker button. The button changes color.
2. Enter a distance in the delta distance entry window.
    - The delta marker can be moved between traces by clicking on the Tx list button and then clicking on the desired trace.
3. Press **Apply** and the delta marker will move to that delta distance position.

Activate Delta Markers

1. Press the associated delta marker button. The button changes color.
2. Enter a distance in the delta distance entry window.
3. Press **Apply** and the delta marker will move to that delta distance position.

Distance to Fault

Distance to Fault (DTF) converts a previously saved Cable Loss plot, Return Loss (frequency domain) plot, or a VSWR (frequency domain) plot into a Distance to Fault plot. Click Distance to Fault in the Tools menu or press the Distance to Fault button on the Tools Toolbar.

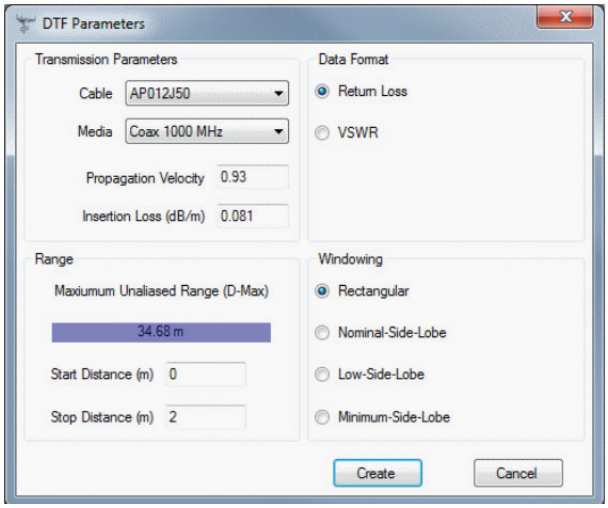


Figure 2-8. DTF Parameters

Transmission Parameters

Cable:

1. Press the down arrow on the list box.
2. Select a cable from the list.

Media:

1. Press the down arrow button on the list box.
2. Select the coax type from the list or enter the values for Propagation Velocity and Insertion Loss

Range

The highlighted field indicates the Maximum Unaliased Range (D-Max) is the maximum allowable stop distance that can be entered into the Stop Distance (m or ft) parameter setting.

Enter the start and stop distances for the measurement.

Data Format

Select either **Return Loss** or **VSWR** as the data format.

Windowing

Windowing reduces the side lobes by smoothing out the sharp transitions at the beginning and the end of the frequency sweep. As the side lobes are reduced, the main lobe widens, thereby reducing the resolution. Select the desired measurement plot view.

- **Rectangular:** Shows the maximum side lobe display and the greatest waveform resolution.

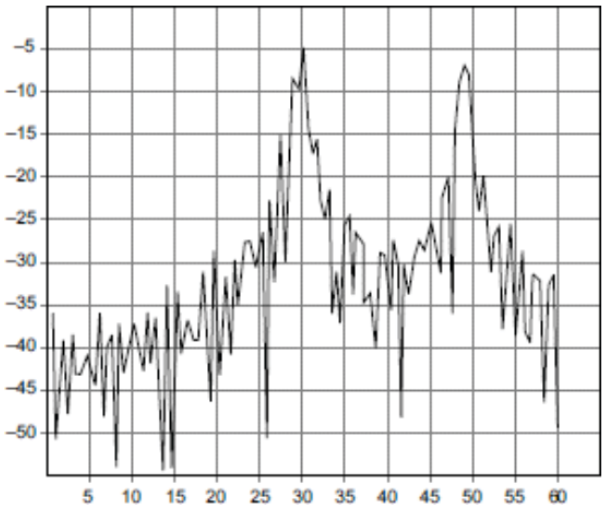


Figure 2-9. Rectangular View

- **Nominal-Side-Lobe:** Shows less side lobe than the Rectangular Windowing and more side lobe than Low Side Lobe Windowing. This level of windowing displays intermediate resolution

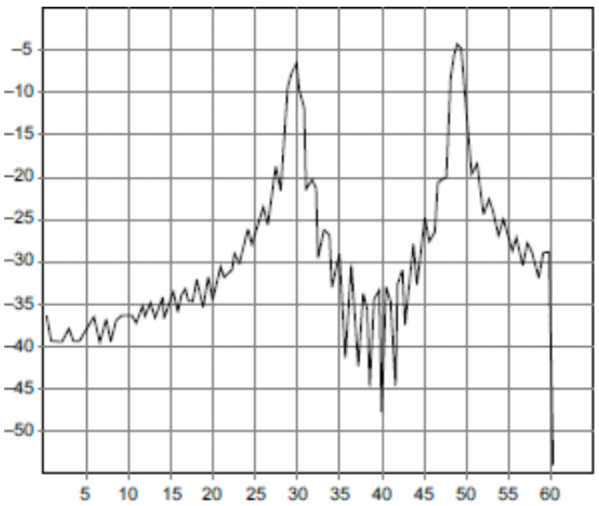


Figure 2-10. Normal Side Lobe View

- **Low-Side-Lobe:** Shows less side lobe than Nominal Side Lobe windowing and more side lobe than Minimum Side Lobe Windowing. This level of windowing displays intermediate resolution.

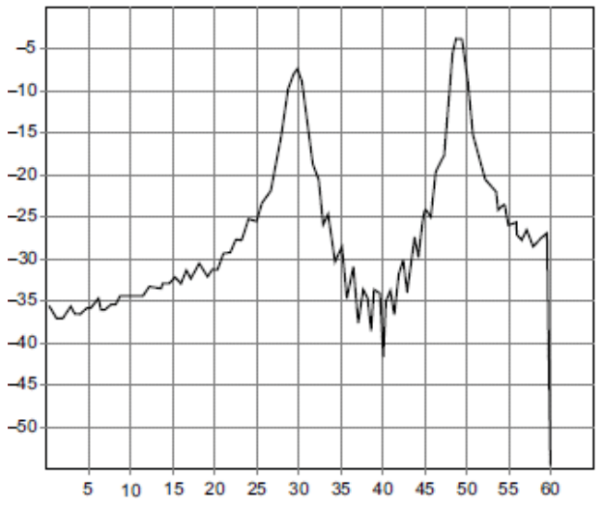


Figure 2-11. Low Side Lobe View

- **Minimum-Side-Lobe:** Shows less side lobe than the other three windowing levels. It also has the lowest waveform resolution.

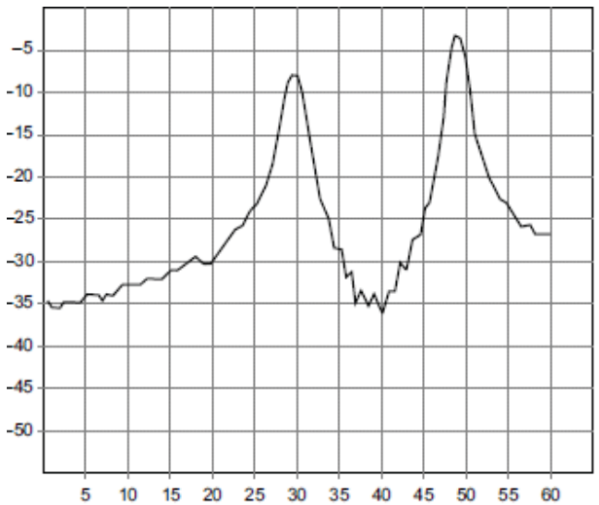


Figure 2-12. Minimum Side Lobe View

Copy

To Copy the active measurement plot information to the clipboard, Click **Copy** in the Edit menu or press **Ctrl+C** on the keyboard. The data format is set in the Program Preferences dialog under the Clipboard Format tab.

Overlay

Overlay allows you to compare up to ten traces of the same measurement type in a measurement plot. A warning dialog will pop up if ten traces are exceeded; the active trace plus nine overlay traces. Overlay trace colors can be set in the Graphs Color Options window. Because of the different types of handheld instruments, he Overlay feature will best reflect the Overlay Setup of that instrument.

1. Tile Vertically the measurement plots you want to compare.
2. Press the **Overlay** button in the Mouse toolbar.
3. Place the mouse cursor on the measurement trace you want to drag.
4. Hold either the left or right mouse button down.
    - A small rectangle with a plus sign will be displayed below the cursor.
5. Drag the trace to the measurement plot that you want to compare.
6. Release the mouse button and the first trace will overlay on the second.

When overlaying traces with different x and y scale values the following is recommended. Overlay the trace with the smaller scale value onto the trace with the larger scale value.

Autoscale both traces

1. Hover your mouse on the graph,
2. Click the right mouse button.
3. Click **Scale/Limit** which opens the Plot Properties dialog with the Scale/Limit tab selected.
4. Press the **Autoscale** button.
5. Press **OK**.

Overlay the smaller scale trace onto the larger scale trace

1. Press the **Overlay** icon on the Toolbar
2. Place the mouse over the trace with the smaller scale value.
3. Hold down either mouse buttons and drag it onto the trace with the larger scale value.

Note	Not all trace types are compatible to overlay, such as the Smith Chart and Return Loss traces.

The example below shows a trace (white) with a scale value of 1000-2000 MHz overlaid onto a trace (blue) with a 1000-4000 MHz scale value.

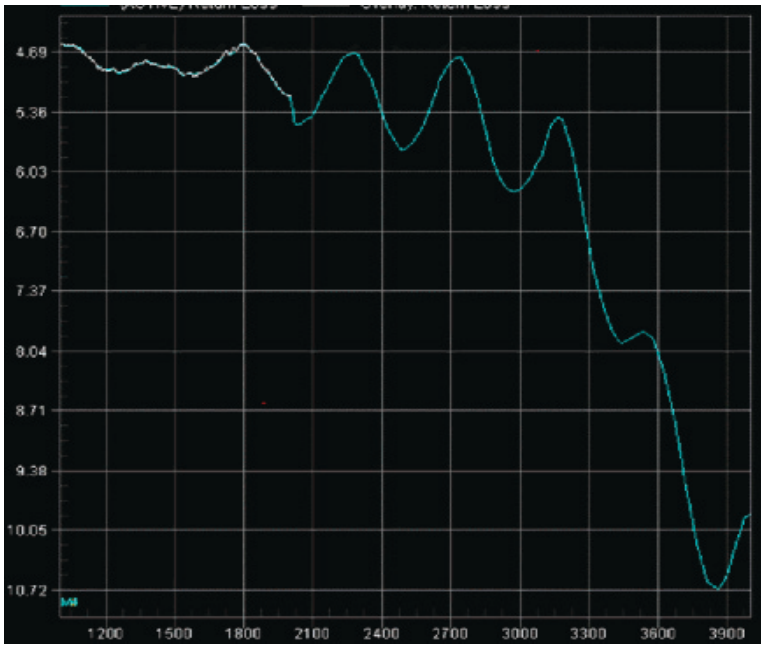


Figure 2-13. Overlay Traces

Note	For measurements that have multiple trace overlays, only the primary overlay will be downloaded into LST.

Undo Overlay

Use this command to remove the trace or traces that were dragged onto a measurement plot for trace comparison. Regardless of the number of traces overlaid, only the last trace overlaid will be removed. Note: Undo Overlay is not for use with the PIM Master DTP Measurement with Trace Overlay.

1. Select the plot with the overlay so it is the active measurement plot.
2. Click **Undo Overlay** in the Edit menu or press the **Alt+O** keys on the PC keyboard.

Measurement Calculator

Provides conversion between different measurement values. For example, entering a Return Loss value will give you equivalent VSWR, Reflection Coefficient, and Transmitted Power values. Enter the desired values into the measurement calculator and the other values are automatically calculated.

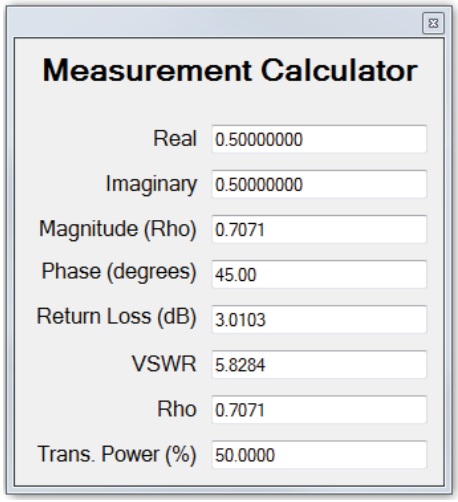


Figure 2-14. Measurement Calculator

Naming Grid

The Naming Grid is a method for creating preset Filenames, Titles, and Subtitles used in the measurement plot. Click Naming Grid in the Tools menu or press the Open Naming Grid button on the Naming Grid toolbar.

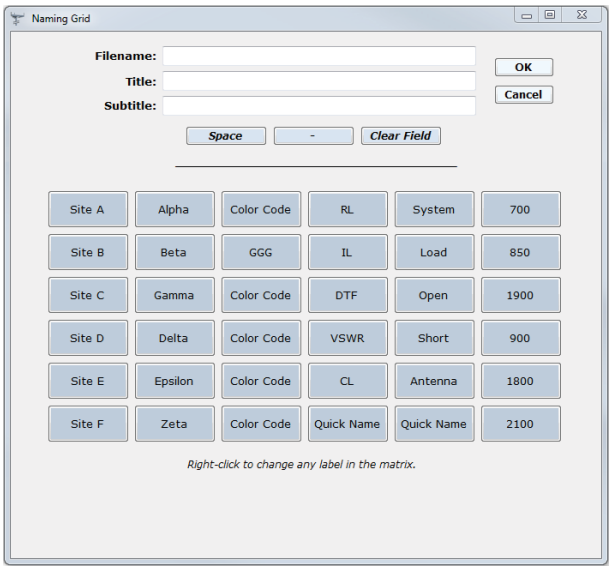


Figure 2-15. Naming Grid

Create a Filename, Title, and Subtitle

1. Place the cursor in the desired entry window – Filename, Title, or Subtitle.
2. Make an entry by typing the name on the keyboard or pressing the preset label buttons.
3. Use the Space button to add a space between two labels in the same entry window.
4. Use the (-) button to insert a dash between typed or labeled entries.
   - All button entries are appended to the entry window.
5. Press the **Clear Field** button to remove names in the entry window or to clear any entries.
6. Press **OK** to save the Naming Grid preset Filename, Title, Subtitle, and preset button labels.

Use the Created Filename on Saved Files

1. Press the **Use Filename from Naming Grid** button. The feature is active and highlighted.
2. Click any of the Save commands in the File menu or Save on the toolbar. The Save an unsaved trace as a DAT file dialog opens with the created filename from the Naming Grid entered in the File name: entry window. Also, you can add to the name to differentiate similar files using the preset filename. Example Filename01, Filename02, Filename03…Filename10.
3. Press **Save** when done.

Change Preset Button Label

1. Place the cursor over a label button in the naming grid dialog.
2. Right click the mouse. An entry window opens.
3. Enter the new name in the box.
4. Press the **Change** button.
   - The new name is changed and displayed on the button.

2-6 Marker Presets

Allows users to quickly and easily set the markers and limit line to pre-defined values when dealing with large numbers of traces with similar frequency ranges.

Setting the Preset Buttons

Open a sample trace and set up the desired amount of markers and the limit line where you want them. Press the EDIT Preset Mode button to enter learn mode. Next, press one of the red preset keys to capture the current positions of the markers and limit line. Finally, press the EDIT Preset Mode button again to leave learn mode. The preset keys should return to blue. Now the preset is ready to use.

Using the Preset Buttons

To use the preset limit line and marker values, open a trace with a similar frequency range and of a similar type to the one you used to create the preset. Press the desired preset button and the markers and limit line preset values will be applied to the active measurement plot. If you have multiple measurement plots open, press the right arrow key to go to the next trace and press the desired preset button to apply to the active measurement plot. You can create up to 7 presets for various trace types.

Figure 2-16. Marker Presets

Edit Preset: When activated, it turns preset buttons 1 through 7 red. Buttons are in learning mode.

Preset Buttons 1- 7: Contain limit line and maker information to be used in similar type measurement plots.

Previous/Next Buttons: Use to scroll through multiple measurement plots before applying preset limit lines and markers.

Saving the Preset Buttons to File

The Presets dialog is used to save preset limit lines and markers to file. This file is saved to a default folder in C:\Program Files\Anritsu\Anritsu Tool Box with Line Sweep Tools\presets. You may save this file or import a previously saved file to a folder of your choice by using the import and export buttons.

Set the limit line and the markers as desired and then follow the above instructions, Setting the Preset Buttons, to set the preset buttons.

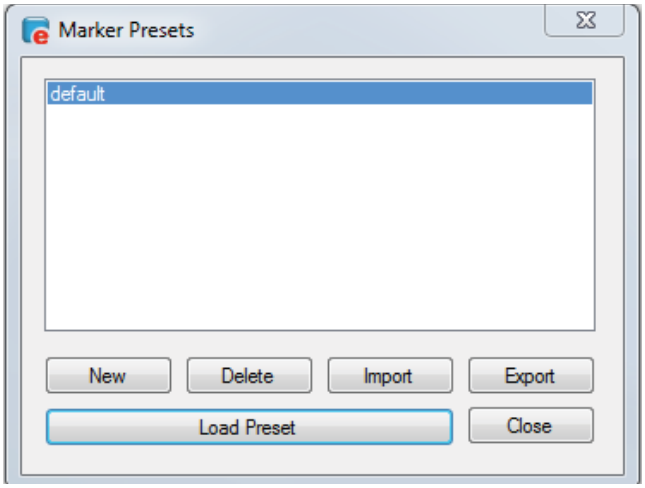


Figure 2-17. Marker Presets

New: Opens the Enter a Preset Name dialog to type a name for a new file to save the current button presets.

Delete: Press to delete the highlighted file from the Presets file list.

Import: Press to load a previously saved file from another folder.

Export: Press to save the current preset file to another folder.

Load Preset: Press to save the current limit line and marker preset buttons to the selected file.

Smith Chart

The Smith Chart tool is a tool available from the toolbar that converts a Return Loss (frequency domain) plot or VSWR (frequency domain) plot into a Smith Chart. This chart is a commonly used graph format for the analysis of the impedance of transmission lines and other RF components. It is also useful for fine tuning an antenna system. For Smith Charts with markers place the cursor on the marker and move the cursor horizontal. The marker will follow the movement of the cursor in the circular trace. The Zoom feature is not available for the Smith Chart.

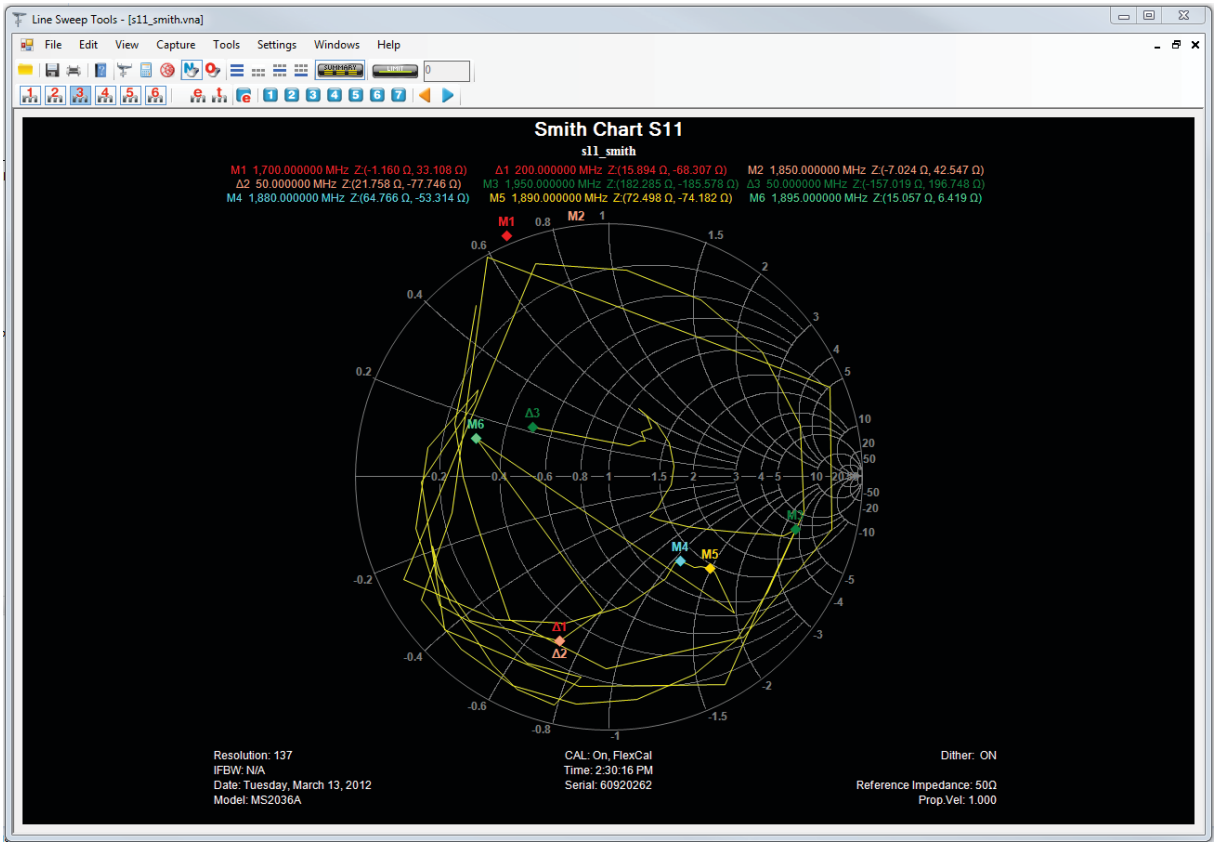


Figure 2-18. Smith Chart

Perform a Smith Chart Conversion

1. Capture or load a Return Loss or VSWR measurement plot.
2. Press the **Smith Chart** button.
    - The plot is converted into a Smith Chart.

Zoom

When the Normal Mouse Operation is active (default mode), the mouse function includes expanding a selected section of the measurement plot for closer analysis. The “Don’t” symbol in the measurement display means the area currently selected cannot be zoomed. Increase the zoom area and the “Don’t” symbol will change to a circle.

1. Place the mouse cursor near the area to be expanded.
2. Hold down the left mouse button.
3. Drag the mouse diagonally over the area to be expanded.
4. Release the mouse button to expand the selected area.

Undo Zoom

Returns the view of the active measurement plot from zoom to the original view. To Undo Zoom, execute one of the following:

- In the Edit menu, click **Undo Zoom**.
- Press the keyboard keys **Alt+Z**.
- Open the context menu by right clicking the mouse in the desired measurement plot. Click **Undo Zoom.**

Chapter 3 — Measurement Setups

3-1 Introduction

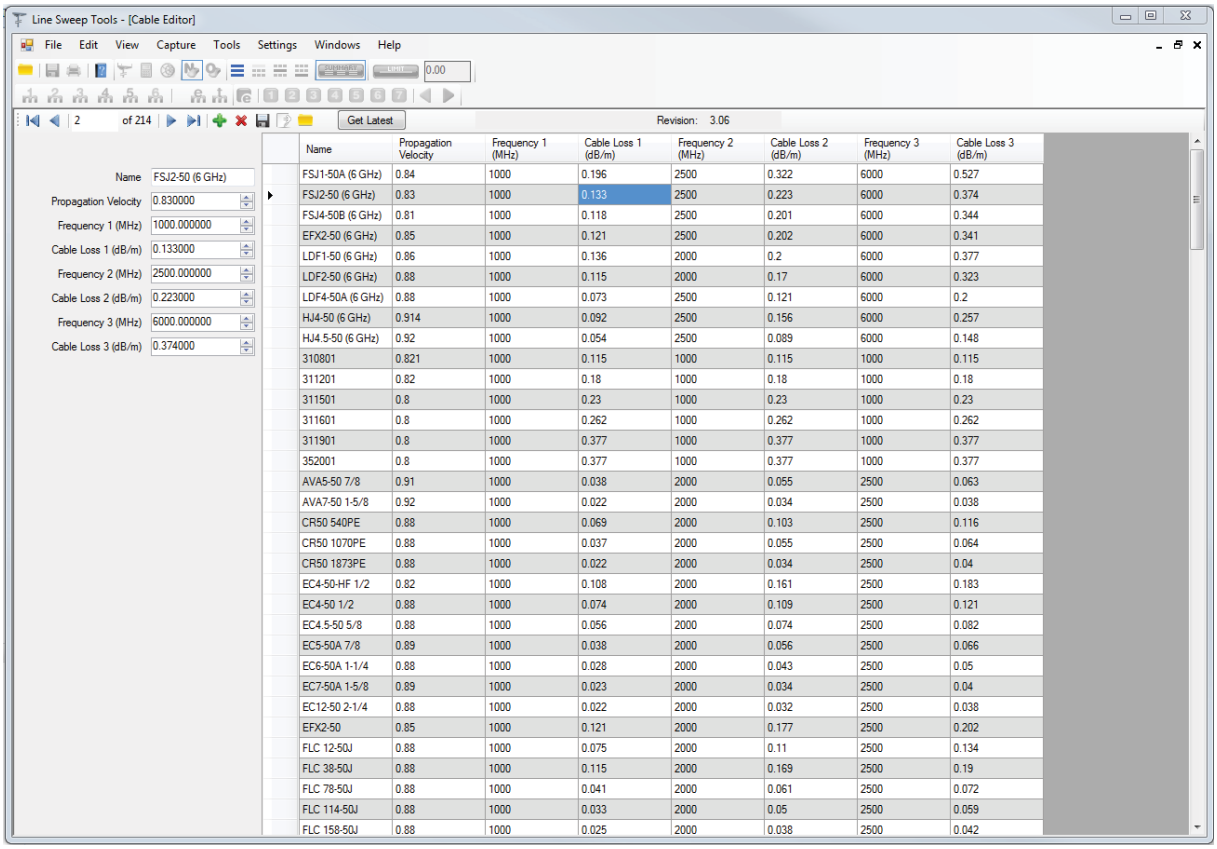
Measurement setups are provided through the Tools and Setting menus. This section provides the methods to capture, edit and display data.

3-2 Editor Tools

The editing tools from the Tools menu bar allow you to view and edit selected file measurements results.

Cable Editor

The Cable List Editor allows you to edit or add to a cable file which contains definitions of multiple cables. You can also upload the new cable definitions into the instrument in use or save them locally on a PC. The Get Latest button will retrieve a cable list from the Anritsu Web Site. Confirm that you have Internet connection before pressing this button. Revision, above the cable list, displays the current version of the cable file in the Cable Editor in LST. An original cable list from Anritsu will include values to two decimal places, n.xy. If the files were or are edited then an additional decimal and number will be added to Revision, n.xy.z. See Revision in the following picture. If using the Get Latest button to obtain a cable list from the Anritsu Web Site, all data in the cable editor will be over-written.



Name	Propagation Velocity	Frequency 1 (MHz)	Cable Loss 1 (dB/m)	Frequency 2 (MHz)	Cable Loss 2 (dB/m)	Frequency 3 (MHz)	Cable Loss 3 (dB/m)
FSJ1-50A (6 GHz)	0.84	1000	0.196	2500	0.322	6000	0.527
FSJ2-50 (6 GHz)	0.83	1000	0.133	2500	0.223	6000	0.374
FSJ4-50B (6 GHz)	0.81	1000	0.118	2500	0.201	6000	0.344
EFX2-50 (6 GHz)	0.85	1000	0.121	2500	0.202	6000	0.341
LDF1-50 (6 GHz)	0.86	1000	0.136	2000	0.2	6000	0.377
LDF2-50 (6 GHz)	0.88	1000	0.115	2000	0.17	6000	0.323
LDF4-50A (6 GHz)	0.88	1000	0.073	2500	0.121	6000	0.2
HJ4-50 (6 GHz)	0.914	1000	0.092	2500	0.156	6000	0.257
HJ4.5-50 (6 GHz)	0.92	1000	0.054	2500	0.089	6000	0.148
310801	0.821	1000	0.115	1000	0.115	1000	0.115
311201	0.82	1000	0.18	1000	0.18	1000	0.18
311501	0.8	1000	0.23	1000	0.23	1000	0.23
311601	0.8	1000	0.262	1000	0.262	1000	0.262
311901	0.8	1000	0.377	1000	0.377	1000	0.377
352001	0.8	1000	0.377	1000	0.377	1000	0.377
AVA5-50 7/8	0.91	1000	0.038	2000	0.055	2500	0.063
AVA7-50 1-5/8	0.92	1000	0.022	2000	0.034	2500	0.038
CR50 540PE	0.88	1000	0.069	2000	0.103	2500	0.116
CR50 1070PE	0.88	1000	0.037	2000	0.055	2500	0.064
CR50 1873PE	0.88	1000	0.022	2000	0.034	2500	0.04
EC4-50-HF 1/2	0.82	1000	0.108	2000	0.161	2500	0.183
EC4-50 1/2	0.88	1000	0.074	2000	0.109	2500	0.121
EC4.5-50 5/8	0.88	1000	0.056	2000	0.074	2500	0.082
EC5-50A 7/8	0.89	1000	0.038	2000	0.056	2500	0.066
EC6-50A 1-1/4	0.88	1000	0.028	2000	0.043	2500	0.05
EC7-50A 1-5/8	0.89	1000	0.023	2000	0.034	2500	0.04
EC12-50 2-1/4	0.88	1000	0.022	2000	0.032	2500	0.038
EFX2-50	0.85	1000	0.121	2000	0.177	2500	0.202
FLC 12-50J	0.88	1000	0.075	2000	0.11	2500	0.134
FLC 38-50J	0.88	1000	0.115	2000	0.169	2500	0.19
FLC 78-50J	0.88	1000	0.041	2000	0.061	2500	0.072
FLC 114-50J	0.88	1000	0.033	2000	0.05	2500	0.059
FLC 158-50J	0.88	1000	0.025	2000	0.038	2500	0.042

Figure 3-1. Cable Editor

Connected to an Instrument

Add a New Cable

1. Click **Cable Editor** in the Tools menu.
   - The Cable Editor opens with the parameters, from the instrument in use, loaded into the editor.
2. Press the **Add new** button on the toolbar.
   - The cursor moves to the empty field after the list of filled fields.
3. Enter the name of the cable and its parameters in the left column of entry windows in the Cable Editor.
   - Clicking the new entry updates the value in the parameter matrix.
4. Click the **Upload to Instrument** command in the Capture menu or the press the **F3** button on the PC keyboard to upload the new cable list to the instrument.
   - Or, press the **Export** button on the toolbar to save the list locally on the PC.
   - Or, press the **Save Data** button to save the list to update LST internal cable list.

Edit/Change an Existing Cable's Parameters

1. Click **Cable Editor** in the Tools menu.
   - The Cable Editor opens with the parameters, from the instrument in use, loaded into the editor.
2. Press the **Open** button on the toolbar to edit a previously saved cable list.
3. Select the desired cable in the list.
4. Enter the parameter values for the existing cable.
5. Click the **Upload to Instrument** command in the Capture menu or the press the **F3** button on the PC keyboard to upload the updated cable list to the instrument.
   - Or, press the **Export** button on the toolbar to save the list locally on the PC.
   - Or, press the **Save Data** button to save the list to update LST internal cable list.

Disconnected from an Instrument

Create a New Cable List

1. Click **Cable Editor** in the Tools menu.
   - The Cable Editor opens with the parameter fields empty.
2. Press the **Add** new button on the toolbar.
   - The cursor moves to the empty field after the list of filled fields.
3. Enter the name of the cable and its parameters in the left column of entry windows in the **Cable Editor**.
   - Clicking the new entry updates the value in the parameter matrix.
4. Repeat Step 2 and Step 3 until all cables have been entered.
5. Press the **Export** button on the toolbar to save the list locally on the PC. Or, press the **Save Data** button to save the list to update LST internal cable list.

Add a New Cable

1. Click **Cable Editor** in the Tools menu.
   - The Cable Editor opens with the parameter fields empty.
2. Press **Open** on the toolbar.
   - The Open a Cable File dialog opens.
3. Highlight the desired Cable file and press **Open**.
4. On the toolbar, press the **Add** new button.
   - The cursor moves to the empty field after the list of filled fields.
5. Enter the name of the cable and its parameters in the left column of entry windows in the Cable Editor.
   - Clicking the new entry updates the value in the parameter matrix.
6. Repeat Step 4 and Step 5 until all cables have been entered.
7. Press the **Export** button on the toolbar to save the updated cable list locally on the PC. Or, press the **Save Data** button to save the list to update LST internal cable list.

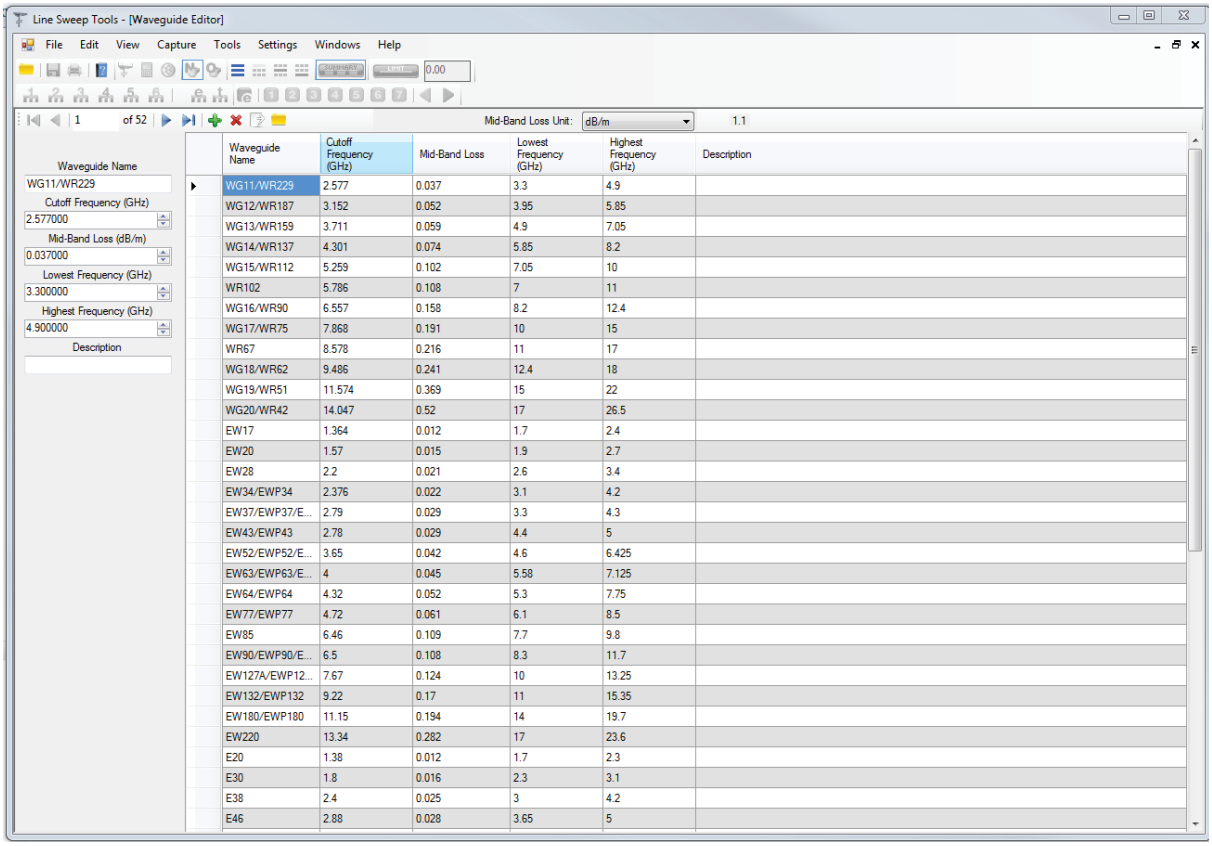
Edit/Change an Existing Cable's Parameters

1. Click **Cable Editor** in the Tools menu.
   - The Cable Editor opens with the parameter fields empty.
2. Press **Open** on the toolbar.
   - The Open a Cable File dialog opens.
3. Highlight the desired cable file and press **Open**.
4. Scroll to the desired cable or enter the number of the cable in the entry window.
5. Enter/change the parameter values for that cable.
   - Clicking the new entry updates the value in the parameter matrix.
6. Press the **Export** button on the toolbar to save the updated cable list locally on the PC. Or, press the **Save Data** button to save the list to update LST internal cable list.

Note	If pressing the Get Latest button to retrieve the latest Cable List from the Anritsu Web Site, you must be connected to the Internet. Revision: This is the current version for the Cable List internal to LST.

Waveguide Editor

The Waveguide Editor allows you to edit or add to a waveguide file which contains definitions of multiple waveguides and waveguide parameters. You can also upload the new waveguide definitions into the instrument in use or save them locally on a PC.



Waveguide Name	Cutoff Frequency (GHz)	Mid-Band Loss	Lowest Frequency (GHz)	Highest Frequency (GHz)	Description
WG11/WR229	2.577	0.037	3.3	4.9	
WG12/WR187	3.152	0.052	3.95	5.85	
WG13/WR159	3.711	0.059	4.9	7.05	
WG14/WR137	4.301	0.074	5.85	8.2	
WG15/WR112	5.259	0.102	7.05	10	
WR102	5.786	0.108	7	11	
WG16/WR90	6.557	0.158	8.2	12.4	
WG17/WR75	7.868	0.191	10	15	
WR67	8.578	0.216	11	17	
WG18/WR62	9.486	0.241	12.4	18	
WG19/WR51	11.574	0.369	15	22	
WG20/WR42	14.047	0.52	17	26.5	
EW17	1.364	0.012	1.7	2.4	
EW20	1.57	0.015	1.9	2.7	
EW28	2.2	0.021	2.6	3.4	
EW34/EWP34	2.376	0.022	3.1	4.2	
EW37/EWP37/E...	2.79	0.029	3.3	4.3	
EW43/EWP43	2.78	0.029	4.4	5	
EW52/EWP52/E...	3.65	0.042	4.6	6.425	
EW63/EWP63/E...	4	0.045	5.58	7.125	
EW64/EWP64	4.32	0.052	5.3	7.75	
EW77/EWP77	4.72	0.061	6.1	8.5	
EW85	6.46	0.109	7.7	9.8	
EW90/EWP90/E...	6.5	0.108	8.3	11.7	
EW127A/EWP12...	7.67	0.124	10	13.25	
EW132/EWP132	9.22	0.17	11	15.35	
EW180/EWP180	11.15	0.194	14	19.7	
EW220	13.34	0.282	17	23.6	
E20	1.38	0.012	1.7	2.3	
E30	1.8	0.016	2.3	3.1	
E38	2.4	0.025	3	4.2	
E46	2.88	0.028	3.65	5	

Figure 3-2. Waveguide Editor

Create a Waveguide List

1. Click **Waveguide Editor** in the Tools menu.
   - The Waveguide Editor opens with the parameter fields empty.
2. Press the **Add New** (+) button on the toolbar.
   - The cursor moves to the empty field after the list of filled fields.
3. Enter the name of the waveguide and its parameters in the left column of entry windows in the Waveguide Editor.
   - Clicking the new entry updates the value in the parameter matrix.
4. Repeat Step 2 and Step 3 until all waveguides have been entered.
5. Press the **Export** button on the toolbar to save the list locally on the PC.

Add a New Waveguide

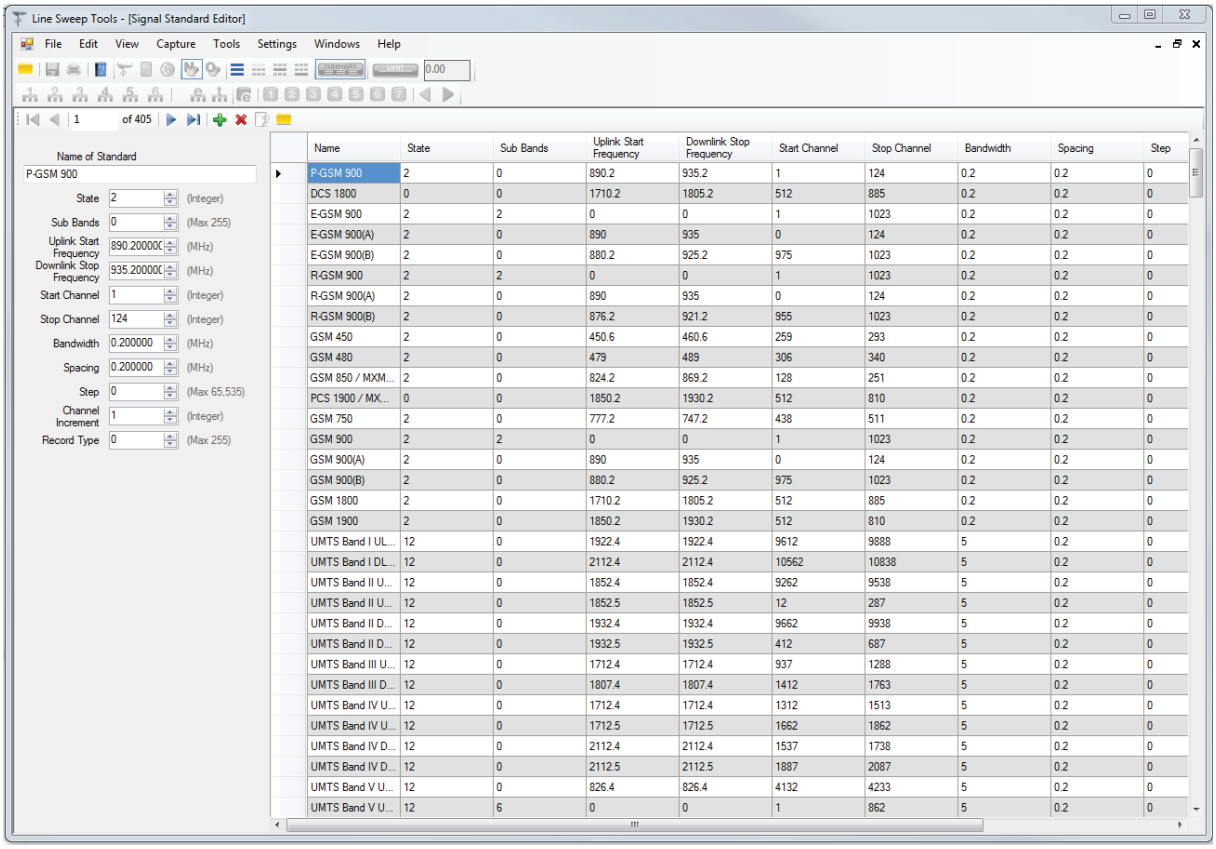
1. Click **Waveguide Editor** in the Tools menu.
   - The Waveguide Editor opens with the parameter fields empty.
2. Press the **Open** button on the toolbar.
   - The Open a Waveguide List File dialog opens.
3. Highlight the desired waveguide file and press Open.
   - The waveguide list and parameters are filled.
4. On the toolbar, press **Add New**.
   - The cursor moves to the empty field after the list of filled fields.
5. Enter the name of the waveguide and its parameters in the left column of entry windows in the Waveguide Editor.
   - Clicking the new entry updates the value in the parameter matrix.
6. Repeat Step 4 and Step 5 until all waveguides have been entered.
7. Press the **Export** button on the toolbar to save the list locally on the PC.

Edit/Change an Existing Waveguide's Parameters

1. Click **Waveguide Editor** in the Tools menu.
   - The Waveguide Editor opens with the parameter fields empty.
2. Press the **Open** button on the toolbar.
   - The Open a Waveguide List File dialog opens.
3. Highlight the desired waveguide file in the list.
4. Press the **Open** button.
5. Scroll to the desired waveguide or enter the number of the waveguide in the entry window.
6. Enter/change the parameter values for the existing waveguide.
   - Clicking the new entry updates the value in the parameter matrix.
7. Press the **Export** button on the toolbar to save the waveguide list locally on the PC.

Signal Standard Editor

The Signal Standard Editor allows you to edit or add to a signal standard file which contains definitions of multiple signal standards. You can also upload the new signal standard definitions into the instrument in use or export them locally onto a PC.



Name	State	Sub Bands	Uplink Start Frequency	Downlink Stop Frequency	Start Channel	Stop Channel	Bandwidth	Spacing	Step
P-GSM 900	2	0	890.2	935.2	1	124	0.2	0.2	0
DCS 1800	0	0	1710.2	1805.2	512	885	0.2	0.2	0
E-GSM 900	2	2	0	0	1	1023	0.2	0.2	0
E-GSM 900(A)	2	0	890	935	0	124	0.2	0.2	0
E-GSM 900(B)	2	0	880.2	925.2	975	1023	0.2	0.2	0
R-GSM 900	2	2	0	0	1	1023	0.2	0.2	0
R-GSM 900(A)	2	0	890	935	0	124	0.2	0.2	0
R-GSM 900(B)	2	0	876.2	921.2	955	1023	0.2	0.2	0
GSM 450	2	0	450.6	460.6	259	293	0.2	0.2	0
GSM 480	2	0	479	489	306	340	0.2	0.2	0
GSM 850 / MXM...	2	0	824.2	869.2	128	251	0.2	0.2	0
PCS 1900 / MX...	0	0	1850.2	1930.2	512	810	0.2	0.2	0
GSM 750	2	0	777.2	747.2	438	511	0.2	0.2	0
GSM 900	2	2	0	0	1	1023	0.2	0.2	0
GSM 900(A)	2	0	890	935	0	124	0.2	0.2	0
GSM 900(B)	2	0	880.2	925.2	975	1023	0.2	0.2	0
GSM 1800	2	0	1710.2	1805.2	512	885	0.2	0.2	0
GSM 1900	2	0	1850.2	1930.2	512	810	0.2	0.2	0
UMTS Band I UL...	12	0	1922.4	1922.4	9612	9888	5	0.2	0
UMTS Band I DL...	12	0	2112.4	2112.4	10562	10838	5	0.2	0
UMTS Band II U...	12	0	1852.4	1852.4	9262	9538	5	0.2	0
UMTS Band II U...	12	0	1852.5	1852.5	12	287	5	0.2	0
UMTS Band II D...	12	0	1932.4	1932.4	9662	9938	5	0.2	0
UMTS Band II D...	12	0	1932.5	1932.5	412	687	5	0.2	0
UMTS Band III U...	12	0	1712.4	1712.4	937	1288	5	0.2	0
UMTS Band III D...	12	0	1807.4	1807.4	1412	1763	5	0.2	0
UMTS Band IV U...	12	0	1712.4	1712.4	1312	1513	5	0.2	0
UMTS Band IV U...	12	0	1712.5	1712.5	1662	1862	5	0.2	0
UMTS Band IV D...	12	0	2112.4	2112.4	1537	1738	5	0.2	0
UMTS Band IV D...	12	0	2112.5	2112.5	1887	2087	5	0.2	0
UMTS Band V U...	12	0	826.4	826.4	4132	4233	5	0.2	0
UMTS Band V U...	12	6	0	0	1	862	5	0.2	0

Figure 3-3. Signal Standard Editor

Connected to an Instrument

Add a Signal Standard

1. Click **Signal Standard Editor** in the Tools menu.
   - The Signal Standard Editor opens with the parameters, from the instrument in use, loaded into the editor.
2. Press the **Add New** button on the toolbar.
   - The cursor moves to the empty field after the list of filled fields.
3. Enter the name of the signal standard and its parameters in the left column of entry windows in the Signal Standard Editor.
   - Clicking the new entry updates the value in the parameter matrix.
4. Click the **Upload to Instrument** command in the Capture menu or the press the **F3** button on the PC keyboard to upload the new cable list to the instrument. Or, press the **Export** button on the toolbar to save the list locally on the PC.

Edit/Change a Signal Standard Parameters

1. Click **Signal Standard Editor** in the Tools menu.
   - The Signal Standard Editor opens with the parameters, from the instrument in use, loaded into the editor.
2. Press the **Open** button on the toolbar to edit a previously saved signal standard list.
3. Select the desired signal standard in the list.
4. Enter the parameter values for the existing signal standard.
5. Click the **Upload to Instrument** command in the Capture menu or the press the **F3** button on the PC keyboard to upload the new cable list to the instrument. Or, press the **Export** button on the toolbar to save the list locally on the PC.

Disconnected from an Instrument

Create a New Signal Standard List

1. Click **Signal Standard Editor** in the Tools menu.
   - The Signal Standard Editor opens with the parameter fields empty.
2. Press the **Add New** button on the toolbar.
   - The cursor moves to the empty field after the list of filled fields.
3. Enter the name of the signal standard and its parameters in the left column of entry windows in the Signal Standard Editor.
   - Clicking the new entry updates the value in the parameter matrix.
4. Repeat Step 2 and Step 3 until all signal standards have been entered.
5. Press the **Export** button on the toolbar to save the list locally on the PC.

Add a New Signal Standard

1. Click **Signal Standard Editor** in the Tools menu.
   - The Signal Standard Editor opens with the parameter fields empty.
2. Press the **Open** button on the toolbar.
   - The Open a Signal Standard File dialog opens.
3. Highlight the desired signal standard file and press **Open**.
4. On the toolbar, press the **Add New** button.
   - The cursor moves to the empty field after the list of filled fields.
5. Enter the name of the signal standard and its parameters in the left column of entry windows in the Signal Standard Editor.
   - Clicking the new entry updates the value in the parameter matrix.
6. Repeat Step 4 and Step 5 until all signal standards have been entered.
7. Press the **Export** button on the toolbar to save the list locally on the PC.

Edit/Change an Existing Signal Standard's Parameters

1. Click **Signal Standard Editor** in the Tools menu.
   - The Signal Standard Editor opens with the parameter fields empty.
2. Press the **Open** button on the toolbar.
   - The Open a Signal Standard File dialog opens.
3. Highlight the desired signal standard file in the list.
4. Press the **Open** button.
5. Scroll to the desired signal standard or enter the number of the signal standard in the entry window.
6. Enter/change the parameter values for the existing signal standard.
   - Clicking the new entry updates the value in the parameter matrix.
7. Press the **Export** button on the toolbar to save the signal standard list locally on the PC.

Note	All entry units are in MHz. Signal Standards with the same start and stop frequencies are UMTS Standard Signals. They only have one channel in the band so only the center frequency is entered as start and stop frequencies.

3-3 Plot Properties

Go to the Edit menu and select Plot Properties to create a plot template. The tabs available are:

- Graph Titles
- Display Mode
- Scale/Limit
- Markers
- Misc.

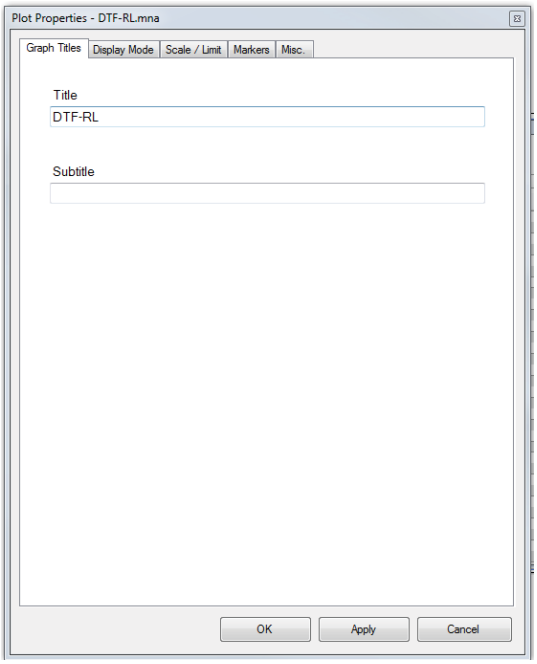


Figure 3-4. Plot Properties Dialog

Graph Titles

Use this dialog to set the titles in the measurement plot.

1. In the Main Menu, click Plot Properties from the Edit Menu.
2. Click the Graph Titles tab.

Title: The first title listed on the Plot Information dialog. This will be the main title displayed on each measurement in the Line Sweep Tools workspace or print out.

1. Type in a new title in the Title entry window
2. Press the **Apply** button.
3. Press the **OK** button when done

Subtitle: The second titled listed on the Plot Information dialog. This will be the secondary title displayed on each measurement in the Line Sweep Tools workspace or print out.

1. Type in a new title in the Subtitle entry window
2. Press the **Apply** button.
3. Press the **OK** button when done.

For MW82119B, PIM vs. Time Measurements Only

Calibration Due Date – Displays the date the instrument is due for calibration. If the trace was captured in firmware version v1.14, it has no calibration date. The Calibration Due Date will be active so you can set a date. Once the date is set, the Calibration Due Date entry box will become inactive and you can no longer change the date. For traces captured with firmware v1.14 or later, the Calibration Due Date is an inactive entry box. It just displays the calibration due date.

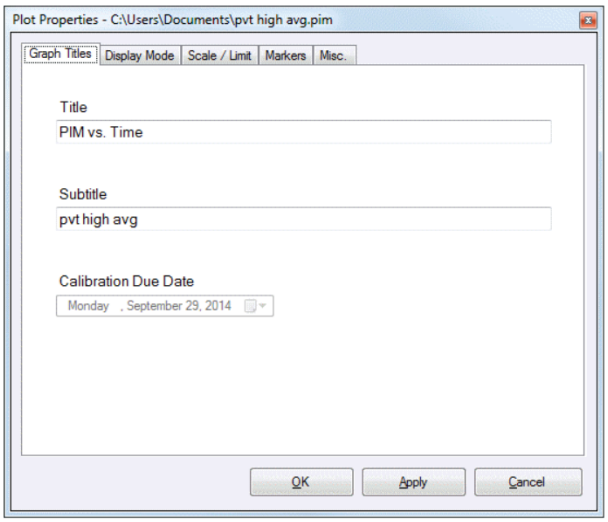


Figure 3-5. PIM Plot Properties

1. Click the list arrow and set the date.
2. Press the **Apply** button.
3. Press the **OK** button when done.

Display Mode

The Current Display Mode – Displays the Domain and Display Mode information of the current measurement plot. To change the display of the measurement plot, click Plot Properties in the Edit menu to open the Plot Properties dialog. Click the Display Mode tab.

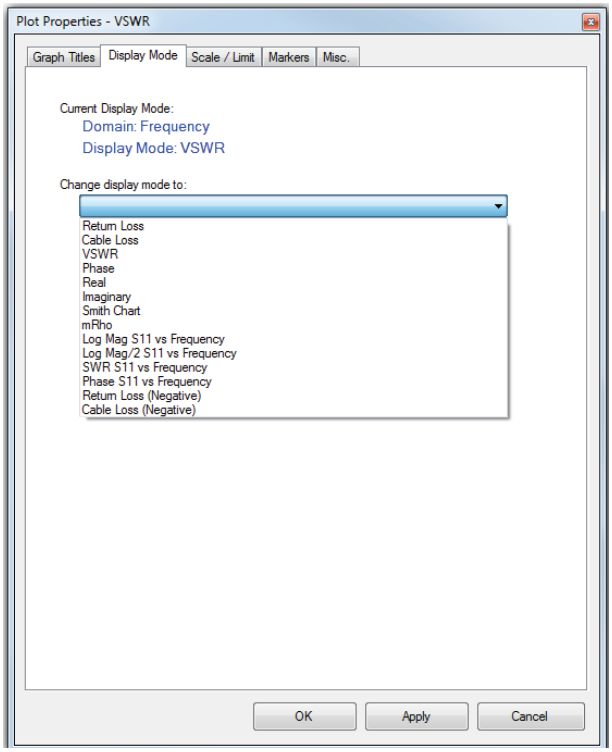


Figure 3-6. Plot Properties Detail

1. Click the arrow button of the list window.
2. Click the desired display mode as shown in the picture above.
3. Press the **Apply** button.
4. Press **OK** when done.

Scale/Limit

Use to change axis values and limit line settings.

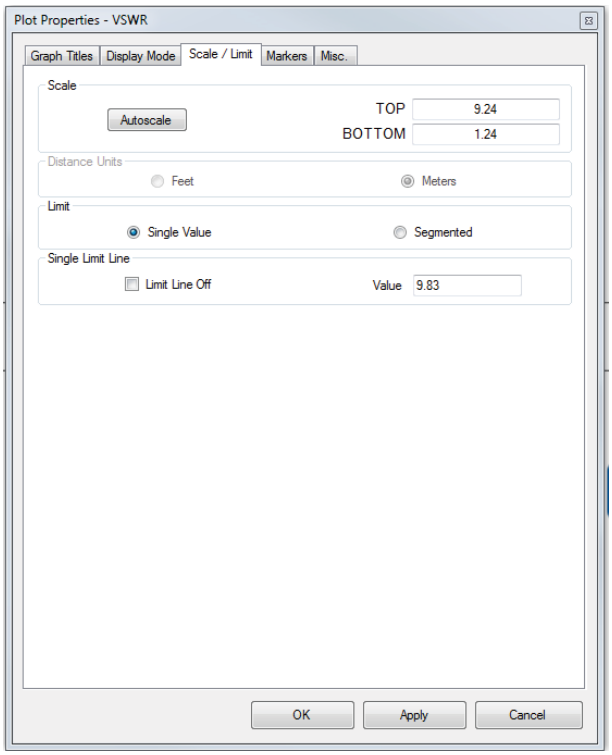


Figure 3-7. Single Limit Line Dialog

Limit Line Settings

The following settings are for single and segmented limit lines. Selecting either **Single Value** or **Segmented** in the Limit box will display different setting boxes.

Single Limit Line

Selecting the Single Value radio button displays the dialog in Figure 3-7.

Scale

When changing the y-axis value using Autoscale or manually, the new value will become the new default value for that trace.

1. Press the **Autoscale** button for setting the y-axis Top and Bottom values using the LST software algorithm.
2. Press the **OK** button.
3. Manually enter the desired Top and Bottom values for the y-axis.
4. Press the **Apply** button then the **OK** button.

Distance Units

When changing the x-axis value units, the last units selected will be the default value for that trace.

Click the desired unit for the measurement plot to display in either Feet or Meters.

Limit Line Off

Check the Single Value box to turn off the limit line in the Plot Information file. Limit Line on is the default value.

Segmented Limit Line Settings

The Segmented Scale/Limit dialog box provides the user interface described below.

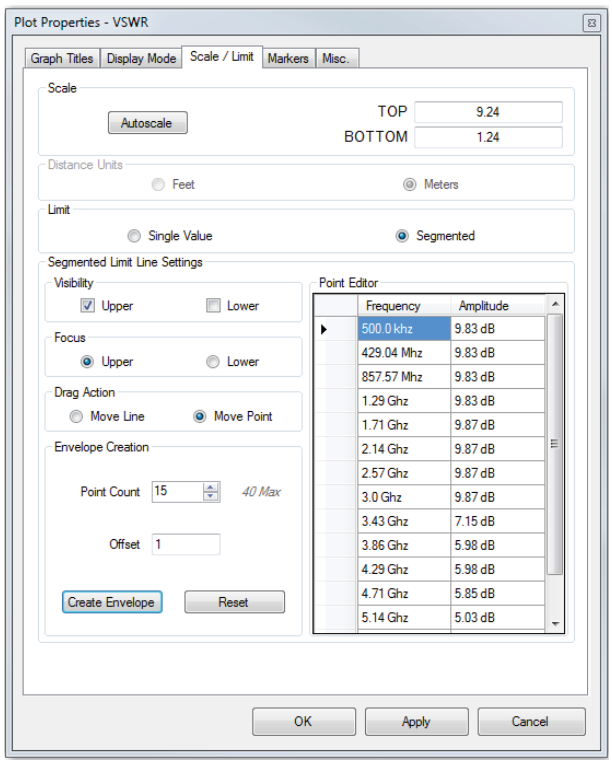


Figure 3-8. Plot Properties Scale / Limit Segmented Dialog

Visibility

Checking a box will display the Upper and/or Lower Limit Lines.

Focus

Only one line can be edited at one time. Click either **Upper** or **Lower**.

Drag Action

Selecting **Move Line** will allow you to move the whole limit line to the desired location. Selecting Move Point allows you to move a single point on the limit line to the desired location.

Envelope Creation

- **Point Count:** Enter the number of points to create a segmented line. The default value is 2.
- **Offset:** If focus is set to Upper, this value is the distance between the highest point of the measurement trace and the limit line. If focus is set to Lower, this value is the distance between the lowest point on the measurement trace and the limit line. The default value is 0.
- **Create Envelope:** Creates an envelope of segmented lines, determined by the number of points set in Point Count, around the measurement trace.
- **Reset:** Check the **Limit Line Off** box to turn off the limit line in the Plot Information file. Limit Line on is the default value.

Point Editor

Point Editor is a table of frequency and amplitude for each point in the segmented line.

1. To edit a specific parameter, click on the frequency or amplitude box. Repeat until all desired values are changed.
2. Click the **Apply** button.
3. Press **OK** when done.

Markers

Refer to Section "Edit Markers using the Plot Properties Dialog" on page 2-4.

3-4 Settings

The Settings menu drop-down selections are described in this section.

Graph Colors

With this dialog, markers, limit line, trace, and background colors can be set as desired. Click Graph Colors in the Setting menu to open the Graph Color Options dialog.

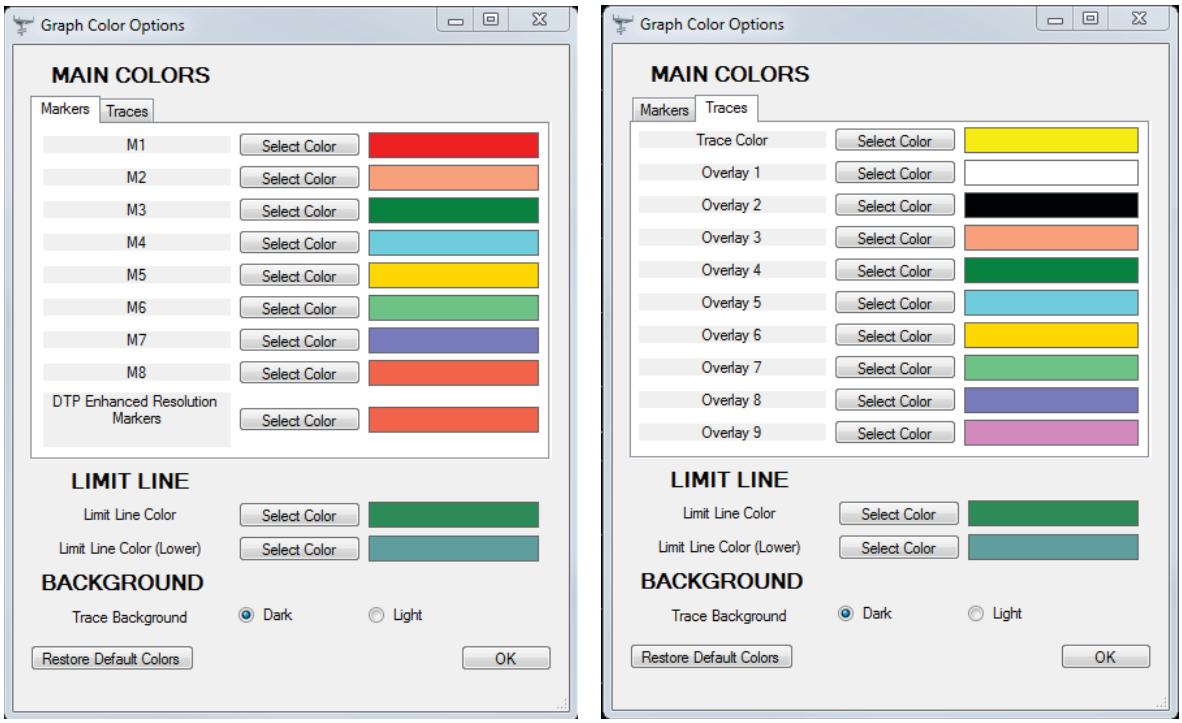


Figure 3-9. Graph Color Options

Set Marker Color (including PIM Enhanced Resolution Markers)

1. Press the Markers tab.
2. Press Select Color for the desired Marker.
3. Select a color from the Basic colors palette or create a color using the Define Custom Colors >> button and window. Press OK.
4. Press OK.

Set Limit Line Color

1. Press Select Color for Limit Line.
2. Select a color from Basic colors palette or create a color using the Define Custom Colors>> button and window. Press OK.
3. Press OK.

Set Trace and Overlay Color

1. Press the Traces tab.
2. Press Select Color for Trace Color or the desired Overlay.
3. Select a color from Basic colors palette or create a color using the Define Custom Colors>> button and window. Press OK.
4. Press OK.

Set Background Color

1. Perform either of the following instructions depending on the desired background color.
2. Click Dark to set the graph background to black and change the colors for markers, limit line, and trace to its associated colors for a black background.
3. Click Light to set the graph background to white and change the colors for markers, limit line, and trace to the associated colors for a white background.
4. Press OK.

Reset Colors to Default

Press the Restore Default Colors button to set the Markers, Traces, Limit Lines and Background to their original colors.

Instrument

Clicking **Instrument** in the Settings menu opens the Program Preferences dialog with Instrument Tab active.

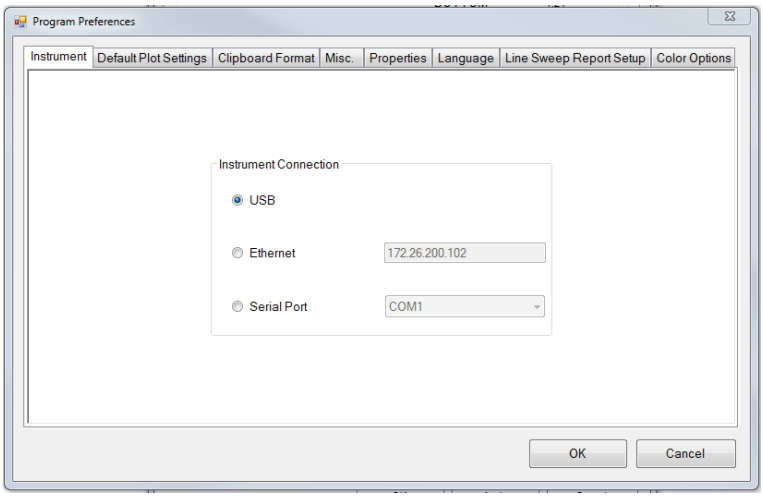


Figure 3-10. Program Preferences Instrument Tab

Instrument Connection

1. Select the port corresponding to the instrument in use.
   - If **Ethernet** is chosen, enter the IP address.
   - If **Serial Port** is chosen, go to Connection Settings to set up the port.
2. Press **OK**.

Connection Settings

1. Press the down arrow button in the COM Port: pull down menu.
2. Select the **COM** port that is in use by the PC. If necessary, view the System Settings in the Windows Control Panel.
3. Press **OK.**

Default Plot Settings

To open the Program Preferences in the Default Plot Settings tab, click **Default Plot Settings** in the Settings menu. These settings affect measurement plots opened after the settings have been made.

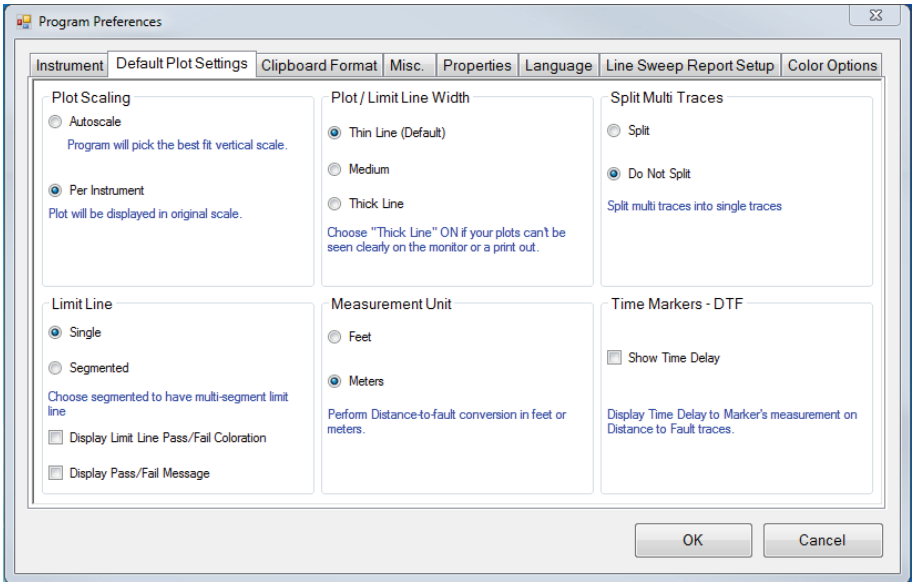


Figure 3-11. Default Plot Settings Dialog

Plot Scaling

1. Select either **Autoscale** or **Per Instrument** to view the scale on measurement plot.
   - If Autoscale is selected, the program will pick the best fit vertical scale.
   - If **Per Instrument** is selected, the measurement plot will be displayed in the original scale set in the instrument.

Plot/Limit Line Width

This setting allows you to select a thicker line if the thin line, viewed in the measurement plot, cannot be seen clearly. Select **Thick Line** to enhance the view of the plot, limit line, and marker line.

Split Multi Traces (For BTS Master, Cell Master, and Site Master "E" series instruments.)

Allows for multi traces from the stated instruments to be loaded into LST as displayed on the instrument in a single measurement window or be split and loaded into LST into separate measurement windows.

Dual traces from these instruments are split in the following cases:

Split Multi Traces is set to "Split" to:

- load the current sweep from the instrument into LST using **Capture Current Plot to Screen**.
- load a sweep stored on the instrument into LST using any of the **Open commands** or **Capture Plots to Screen**.
- load a sweep stored on the PC is loaded into LST using any of the Open commands.
- load a non-HHST sweep stored in the LST database using the **Import from Database** command.
- LST always splits dual, tri, or quad trace MNA files, even if "Do not Split" is selected from the Default Plot Properties.

Dual traces do not split in the following cases:

While Split Multi Traces is set to "Do Not Split", click:

- **Capture Plots to .dat Files** function in the Capture menu.
- **Capture Plots to Database** function in the Capture menu.
- **Capture Plots to JPEG** function in the Capture menu.

Time Markers - DTF (For Distance to Fault Traces Only)

Displays the Time Delay to Marker's measurement on Distance to Fault Traces.

Click the **Show Time Delay** check box to activate this feature.

Clipboard Format

Sets the data type to be copied to the clipboard. It can be either graphical or in tabular format. If Graphical Format is selected you can choose the graph to be displayed and printed in color or black and white. Color is the default setting. To open the Program Preferences in the Clipboard Format tab, click **Clipboard Format** in the Settings menu.

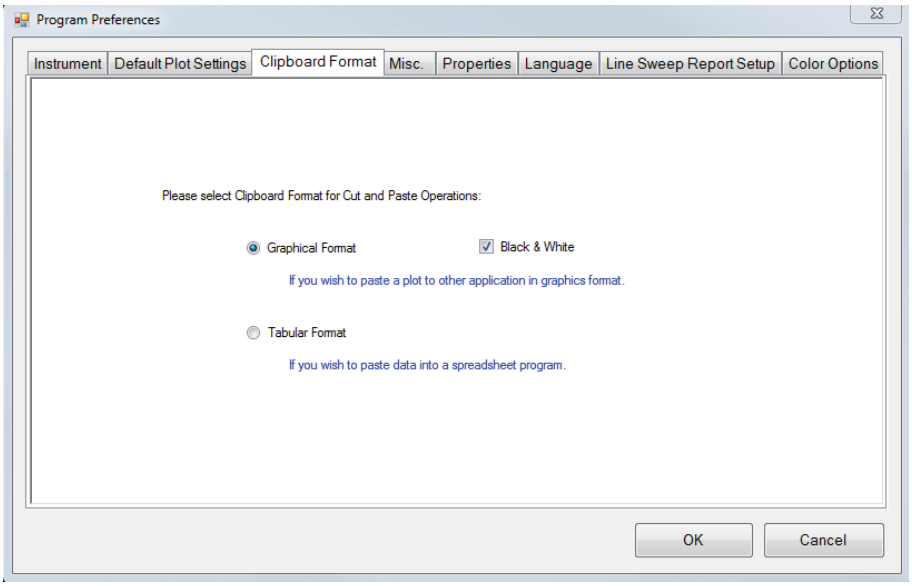


Figure 3-12. Clipboard Format Dialog

1. Click either **Graphical Format** or **Tabular Format**.
    - If Graphical Format is selected, set the print and display to color (unchecked) or Black & White (checked).

Misc.

To open the Program Preferences in the Misc. tab, click **Misc.** in the Settings menu.

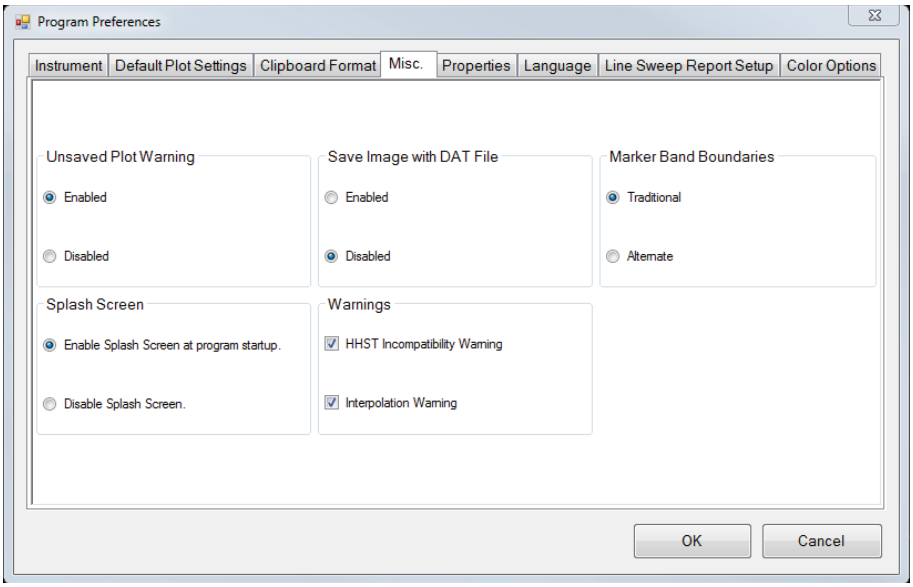


Figure 3-13. Miscellaneous Dialog

Unsaved Plot Warning: Use this setting to either turn on or off a prompt to save a new or modified plot. Click the desired function.

Splash Screen: Select the desired function to either display or not display the splash screen during the program start up. Click the desired function.

Save Image with DAT File: Adds an image to the DAT file.

Warnings: Click the desired check boxes to activate warnings for HHST Incompatibility and Interpolation.

Properties

Use this dialog to set the query categories for the database. To open the Program Preferences in the Properties tab, click **Properties** in the Settings menu.

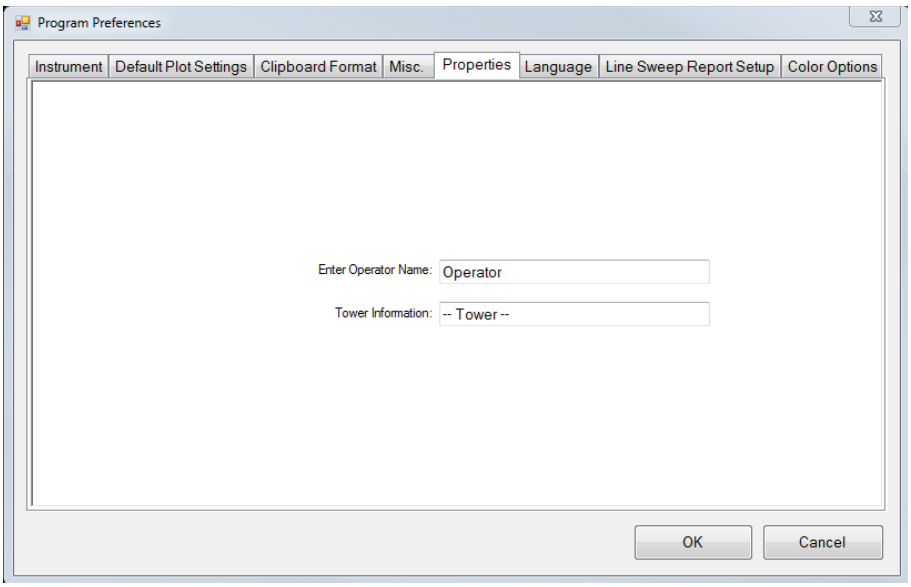


Figure 3-14. Program Preferences – Properties Dialog

1. Type a label in the Enter Operator Name entry window.
2. Type a label in the Tower Information entry window.
3. Press **OK** when done.

Language

To open the Program Preferences in the Language tab, click **Language** in the Settings menu.

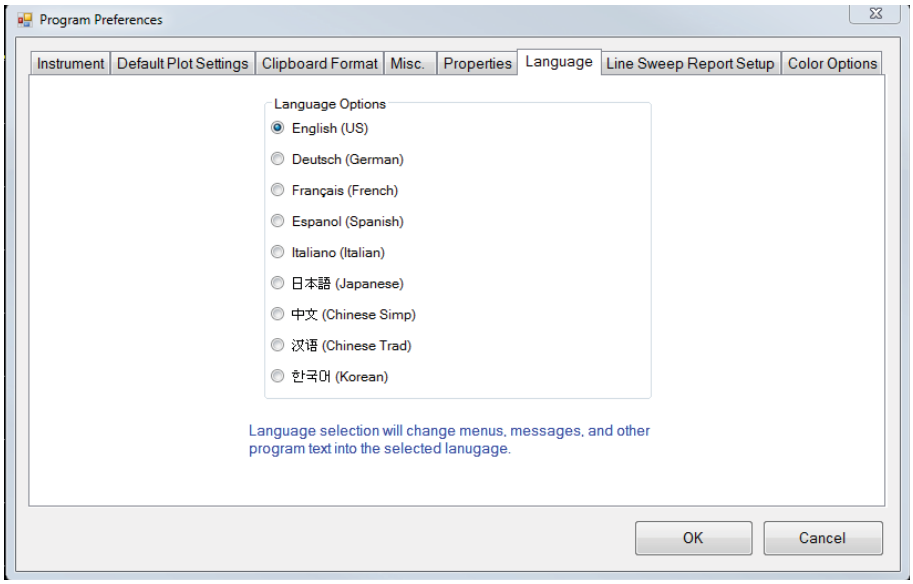


Figure 3-15. Language Dialog

Language Options: Select the desired language by clicking on the circle next to it.

Line Sweep Report Setup

This dialog sets the parameters of the generated report that includes Report Header, Signature Line, Output Format, Traces Per Page and Image Resolution.

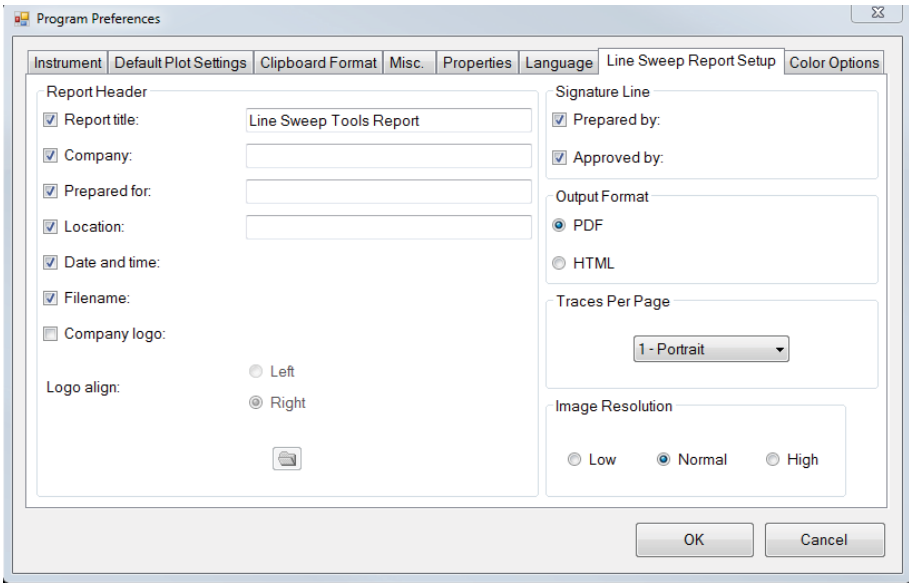


Figure 3-16. Line Sweep Report Dialog

Click **Line Sweep Report Setup** in the Settings menu.

Report Header

Select the desired header text to be displayed on the report.

- If Report title, Company, Prepared for, and Location are selected, enter their respective labels.
- If Company logo is selected, import the logo into the program and set the logo alignment to the left top corner or right top corner of the report by click **Left** or **Right**.
- The logo should be 80 pixels wide by 40 pixels high to fit on the report. Image can be saved in the following formats - PNG, BMP, GIF, or JPG.

Signature Line

Select the desired signature line/s by checking the appropriate box – **Prepared by:**, **Approved by:**.

Output Format

Select the desired output format **PDF** or **HTML**. To view the PDF file, you need a PDF file viewer.

Traces Per Page

The report can be printed multiple ways:

1. Select:

   1– Portrait: to have one plot printed in the portrait view.

   1– Landscape: to have a single plot printed in landscape view on a single page.

   2 – Portrait: to have two plots printed on a single page top and bottom.

   4 – Portrait: to have four plots printed on a single page top and bottom.

2. Press **OK** when done.

Image Resolution

Select the desired PDF output image resolution - **Low**, **Normal** or **High**.

Color Options

To open the Program Preferences in the Color Options tab, click **Color Options** in the Settings menu.

Print/Report Output Color: The printed report can be in color or black & white. Click the desired print setting. If multiple plots are to be printed, all of them will change according to selection.

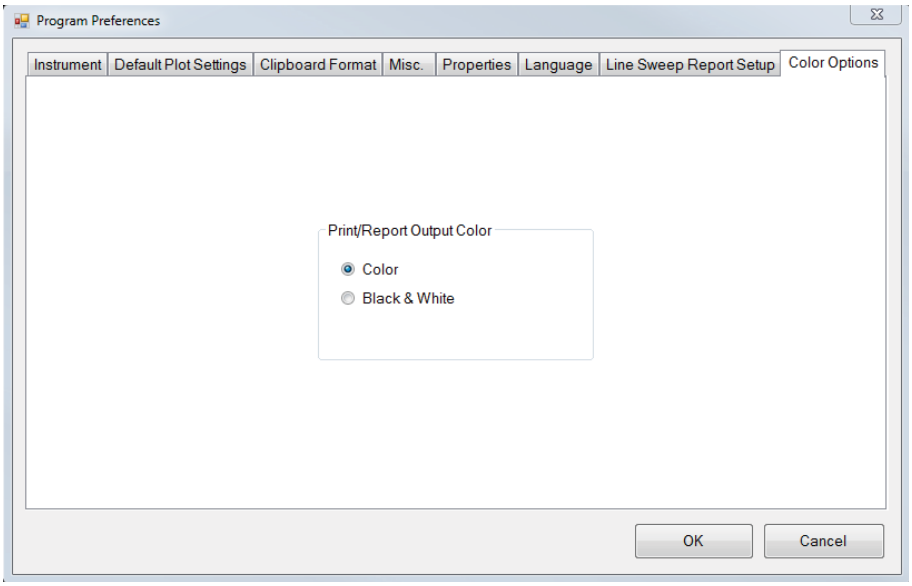


Figure 3-17. Color Dialog

Chapter 4 — File Management

4-1 Trace Source and Destination

This section describes how Line Sweep Tools files are opened, saved, and exported through the File menu. Instruments measurement plots supported by Line Sweep Tools can be transferred in both directions, to and from Line Sweep Tools and the instrument. Each model's data transfer is summarized below.

FieldMaster™/FieldMaster Pro™ (SPA and CAA Files)

- LST opens local .fmspa and .fmcaausb files. Saved files must be available on the local PC.
- LST doesn't capture files directly from this instrument via Ethernet connection.
- LST doesn't upload files to this instrument via Ethernet connection.

SiteMaster (MS2085A/MS2089A) (CAA and VNA Files)

- LST opens local .smcaa and .smvna files. Saved files must be available on the local PC.
- LST doesn't capture files directly from this instrument via Ethernet connection.
- LST doesn't upload files to this instrument via Ethernet connection.

BTS Master (VNA Files)

- LST opens VNA files via Ethernet, USB memory device, or USB cable using the Open and Capture commands.
- Files can be returned to the instrument via USB cable or Ethernet using the Upload to Instrument command.
- Files can also be saved to the PC or USB memory device as VNA files using the Export command.

Spectrum Master (Legacy PIM Files)

- LST opens PIM files via Ethernet, a USB memory device, or USB cable using the Open and Capture commands.
- Files can be returned to the instrument via USB cable or Ethernet using the Upload to Instrument command.
- Files can also be saved to the PC or USB memory device as VNA files using the Export command.

Microwave Site Master (DAT, SVNA, and VVM Files)

- Line Sweep Tools will open DAT files via Ethernet, a USB memory device, or USB cable using the Open and Capture commands.
- Line Sweep Tools will open SVNA files but will write them as DAT files.
- VVM files are intended to be read only files.
- Files can be returned to the instrument via USB cable or Ethernet using the Upload to Instrument command.

Site Master / Cell Master E Series (VNA Files)

- Line Sweep Tools will open VNA files via a USB cable and USB memory device using the Open and Capture commands.
- Files can be returned to the instrument via USB cable using the Upload to Instrument command.

- VNA files from an instrument can also be saved to the PC or USB memory device as VNA files using the Export command.
- Note that due to the S331P's different architecture, LST does not support direct connections/file capture like it does for other Site Master products. Instead, the S331P saves files directly to the user's computer. LST can then load files from the local file system.

Site Master / Cell Master E Series (DAT Files)

- Line Sweep Tools will open DAT files via a USB cable or USB memory device using the Open and Capture commands.
- Files cannot be returned to the instrument as DAT files.
- Files can be saved to the PC or memory device using the Save commands.

Site Master B, C, D Series and LMR Master D Series Files

- Line Sweep Tools will open files via a serial cable using the Open and Capture commands.
- Files can be returned to Site Master D series instruments via serial cable using the Upload to Instrument command.
- DAT files can be saved to the PC using the Save commands.

Site Master L Series Files

- To open DAT files in Line Sweep Tools, use the Capture command when connected via a USB cable, or use the Open command when reading from a USB memory device.
- L Series DAT files are ONLY compatible with L Series instruments.
- DAT files can be saved to the PC using the Save commands.

PIM Master (PIM and * Files)

- Line Sweep Tools will open files via Ethernet, USB cable or USB memory device using the Open and Capture commands.
- Files can be saved to the PC using the Save commands.

VNA Master (MNA &VNA) Files

- Line Sweep Tools will open files via Ethernet, USB cable or USB memory device using the Open and Capture commands.
- Files cannot be returned to the instruments.
- Files can be saved to the PC using the Save commands.
- MNA Files can ONLY be saved on the PC as DAT files.

Note	• For the MS202xA and MS203xA instruments, USB is the ONLY supported means of communication for file transfer. • Files from an instrument can only be returned to the same instrument model. Files cannot be transferred between different instrument models. • VNA files returned/uploaded to their respective instruments will not contain the title or subtitle set in Line Sweep Tools. If a VNA file does not have a subtitle, the Filename will be applied to the measurement plot's subtitle when in Line Sweep Tools. • The Y-axis scale for Return Loss, Cable Loss and DTF-RL measurement files are positive, unlike the y-axis scale in HHST, to match common usage. • Legacy PIM measurement files for the handheld instruments are supported by this version of Line Sweep Tools.

4-2 File Menu

The File menu provides file management options.

Open

Open Line Sweep Tools File.

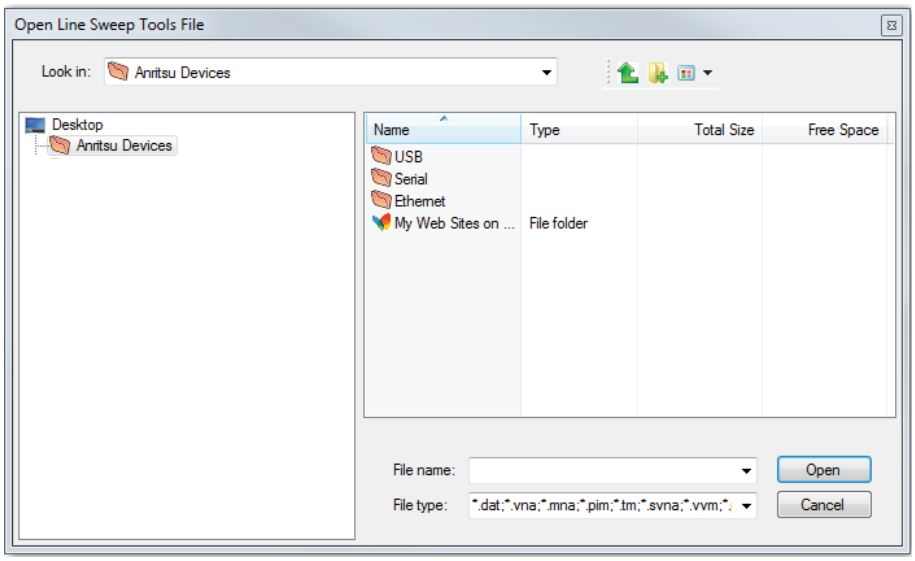


Figure 4-1. Open File Dialog

1. Click the Open command in the File menu to open a previously saved measurement plot.
   - The Open Line Sweep Tools File dialog opens.
2. Select the desired file or files.
   - To view files in the instrument in use, click the Anritsu Devices virtual folder under Desktop.
3. Click on the connection type of the instrument in use.
4. Press the **Open** button.
   - The selected file/files open in the Line Sweep Tools workspace.

Note	The New Folder button is only for creating folders under the Windows file directory. It will not create a new folder under the Anritsu Devices folder. LST does not allow opening files from a USB memory device attached to an instrument.

Save

Note that due to the S331P's different architecture, LST does not support direct connections/file capture like it does for other Site Master products. Instead, the S331P saves files directly to the user's computer. LST can then load files from the local file system.

Hand Held instrument measurement plot functions supported by Line Sweep Tools:

Save: Saves the active measurement plot.

1. Press Save in the File menu or on the toolbar.
    - A previously saved will be saved without queries or messages. If the file is saved for the first time the following will take place. The Save an unsaved trace as a DAT file dialog opens.
2. Use the current directory folder or select a different folder to save the measurement plot.
3. Enter a filename for the measurement plot.
4. Press the Save button to save the file to the selected folder.

Save As: Allows you to rename a measurement plot before saving it.

1. Press Save As in the File menu. The Save an unsaved trace as a DAT file dialog opens.
2. Use the current directory folder or select a different folder to save the measurement plot.
3. Enter a filename for the measurement plot.
4. Press the Save button to save the file to the selected folder.

Save All: Saves all the measurements in the workspace.

1. Press Save All in the File menu. The Save an unsaved trace as a DAT file dialog opens.
2. Enter a name for each of the measurement plots being saved.
3. Press Save after each name Notes:
    - If at any time a trace, that has been worked on, is closed but not saved, the warning dialog below will open to allow you to save that file.

Export

The Export functions provide a means of saving measurement plots as text, image, VNA, PIM, TM and MNA files. Image files can be stored as BMP, JPG, or PNG files.

Export A Single File

1. Highlight Export in the File menu.
2. Click the desired file type for the single measurement plot to be exported as text, image, VNA, PIM, TM or MNA.
    - If Image File(s) is selected, click BMP, JPG, or PNG for the desired file type. The Save As dialog opens to save that measurement plot.
3. Use the current destination folder or select a different folder to save the measurement plot.
4. Enter a name for that measurement plot and press Save.

Export All Measurement Files

1. Highlight Export All in the File menu.
2. Click the desired file type for the single measurement plot to be exported as text, image, VNA, PIM, TM or MNA.
3. If Image File(s) is selected, click BMP, JPG, or PNG as the file type.
    - The Browse For Folder dialog opens to select a folder that all these files will be placed.

4. Highlight the desired folder and press OK.
    - Files are automatically named and stored. Name format: subtitle_x.abc, where subtitle is the subtitle of the measurement plot, where x is 1-n, n=the total number of measurement plots, and where .abc is one of the file formats – VNA, CSV, PIM, TM, MNA, BMP, JPG, or PNG. For example: trace_7. csv.

Print

To print a measurement plots click Print… in the File menu, the File button on the Main Toolbar, or press the keyboard keys Ctrl+P.

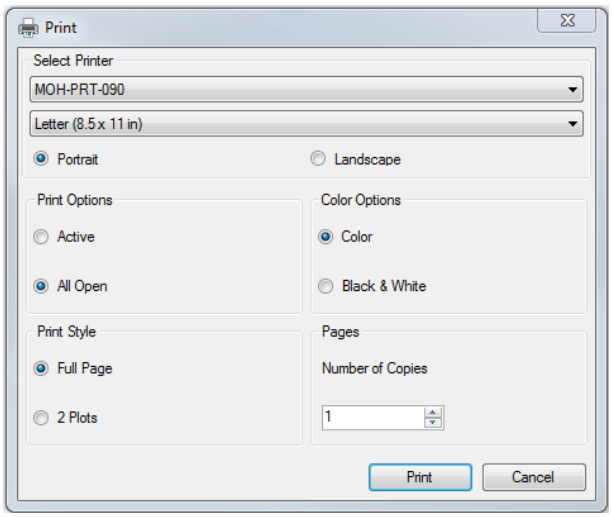


Figure 4-2. Print Dialog

Select Printer: Select the printer to be used for printing, the paper size, and whether the print will be in Portrait or Landscape orientation.

Print Options: Select to print the active plot or all plots by clicking their respective button. Default is Print All Open Plots.

Color Options: Select to print the active plot or all plots in black/white or color by clicking their respective button. If multiple plots are to be printed, all of them will print according to selection.

Print Style: Select to print one plot per page or two plots per page. Default is Full Page.

Pages: Set the desired number of copies to be printed.

Print: Press Print to print the measurement/s in the LST workspace.

Cancel

Stops a started printing session and disregards any changes made in the print setup parameters.

Database Functions

The database feature allows you to save parameters of multiple measurement plots into one location. Transferring files from one PC to another is very convenient using this file storage method. You can save individual measurement plots to a database or all measurement plots in the Line Sweep Tools workspace to a database.

Create a Database

1. Highlight Database in the File menu.
2. Click Create Database.
    - The Create Database dialog opens to select a directory for the database and to name the database.
3. Press the Save button once a directory has been selected and a name entered in File name. A message window will pop open that states “Successfully Created Database:”.

Import from Database

1. Highlight Database in the File menu.
2. Click Import from Database.
    - The Open dialog opens to select a database.
3. Highlight the desired database and press the Open button.
    - All files in the database are opened as measurement plots in the Line Sweep Tools workspace.

Save a Plot to the Database

1. Highlight Database in the File menu.
2. Click Save Plot to Database.
    - The Select the Database dialog opens to select a database where parameters of the measurement plot will be placed.
3. Press Open.
    - The measurement plot in the Line Sweep Tools workspace is saved to the database. A pop up message confirms that the trace has been stored successfully.

Save All Plots to a Database

Opened databases are appended which when re-saved will cause a duplication of measurement files. Close all previously saved files in the workspace and save only the new files. Another option is to create a new database and save all the measurement plots into the new database.

1. Highlight Database in the File menu.
2. Click Save All Plots to Database.
    - The Select the database dialog opens to select a database where parameters of the measurement plots will be placed.
3. Press Open.
    - The measurement plots in the Line Sweep Tools workspace are saved to the database. A pop up message confirms that the traces have been stored successfully.

Reporting

From the File Menu, select the Reporting menu to provide captured data options.

Line Sweep Report Setup

Opens the Program Preferences dialog with the Line Sweep Report Setup active allowing you to select/set the 5 major components of a report – Report Header, Signature Line, Output Formant, Traces Per Page and Image Resolution.

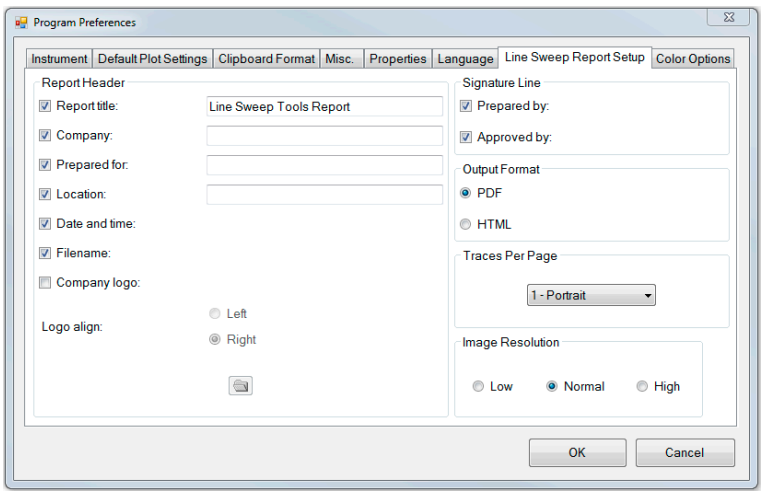


Figure 4-3. Program Preferences – Line Sweep Report Setup

1. Click Reporting in the File menu followed by clicking on Line Sweep Report Setup.
   - The Program Preference dialog opens with the Line Sweep Report Setup tab selected.
2. Setup the "look" of the generated report by selecting the desired parameters of the Report Header, Signature Line, Output Format, Traces Per Page and Image Resolution.
3. Press the OK button. The new settings are saved.

Line Sweep Generate Report

Generate Report can produce either PDF or HTML reports based on your selection made for Output Format in Report Setup. The steps below currently state PDF files. For HTML generated reports, substitute the PDF references with HTM.

1. Click Reporting in the File menu followed by clicking on Line Sweep Generate Report.
   - The Save a PDF File dialog opens.
2. Enter a name for the file or use the default name “report.pdf”.
3. Press the Save button when done.
   - The report is displayed in your default PDF viewer.

If the PDF file size is too large to fit within the limits of an email attachment, some suggestions for reducing the file size are:

- Keep file size to no more than 150 traces
- Keep file size to no more than 10 mega bytes
- Split report into multiple PDFs
- Reduce number of traces per page
- Decrease image resolution
- Set color option to black and white

PIM Report Generator

Create a PIM report.

1. Click Reporting in the File menu.
2. Click PIM Report Creator in the submenu and the PIM Report Creator dialog opens.

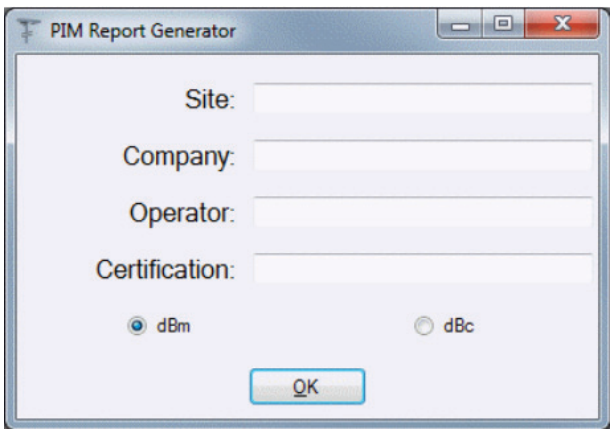


Figure 4-4. PIM Report Generator

3. Enter the information for Site, Company, Operator and Certification.
4. Select between dBm or dBc as the unit of power to be displayed in the Test Results.
5. Press the OK button. The new settings are saved.

Note	To view the PDF file, you need a PDF file viewer.

Trace Reporting Order

Trace Reporting Order allows you to rearrange the order of trace files that will be used in Line Sweep Generate Report. The reports to be used in Line Sweep Generate Report must be OPENED in measurement workspace.

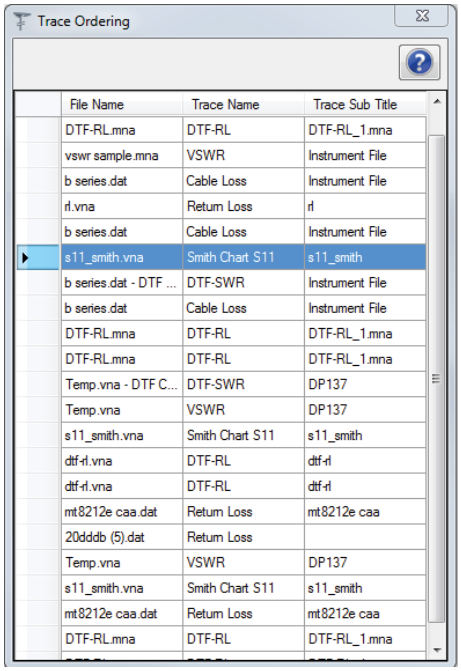


Figure 4-5. Trace Ordering Dialog

1. Click Open… in the File Menu and select the desired trace files for report generation.
2. Click Reporting in the File menu followed by clicking on Trace Reporting Order.
   - The Trace Order dialog opens.
3. Sort the files by File Name, Trace Name or Trace Sub Title.
4. Click on the desired category to sort the files in ascending order or descending order.
   - You can also manually move an individual file's order by highlighting it and dragging it to its new sequence order.
5. Press the X button in the top right corner of the dialog when done.
6. Generate a report. See Line Sweep Generate Report above.

Note	To view the PDF file, you need a PDF file viewer.

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